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POSTERS GROUP 1

P13-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Physics & Instrumentation & Data Analysis: Instrumentation

P0199

Quality characteristics and fields of application using a µ-Imager™ for autoradiography

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Aim: As a directly measuring digital autoradiography system a µ-Imager is used for high resolution scintigraphy (50µm) of tissue samples. The resulting images are obtained in real time. To quantify autoradiographic images, efficiency and count rate dependence of several radioisotopes used in clinical nuclear medicine (^{18}F;^{68}Ga;^{99m}Tc) were determined. Furthermore, the influence of the age of the scintillation layer was evaluated. Methods: Experiments were done using a µ-ImagerTM (Biospace Mesures). Cellulose aerials (1cm^2) were contaminated with different activities of ^{18}F, ^{68}Ga and ^{99m}Tc (max. 2MBq; volume 50µl). For the measurements a high resolution photomultiplier and scintillation film lying directly on the sample was used. To evaluate efficiency and count rate dependence several measurements of each contaminated cellulose sample were performed for a time interval of up to 10 half life times. To verify the influence of the age of the scintillation layer, the ^{99m}Tc experimental series was repeated 20 times using the same scintillation layer. In addition, a 4-year-old scintillation layer was tested in one experiment. Results: A continuous linearity was monitored for an activity range of 4 Bq - 22 kBq (18F); 100 Bq - 10 kBq (68Ga) and 20 Bq - 115 kBq (99mTc). In these ranges, efficiency of the µ-ImagerTM was 1.12 +/- 0.4 cpm/Bq (^{18}F); 0.83 +/- 0.19 cpm/Bq (^{68}Ga) and 0.22 +/-0.07 cpm/Bq (^{99m}Tc). Activity above these maximum values could be detected, but efficiency decreased due to dead time effects rapidly. Above an activity of ~30 kBq ^{18}F; ~120 kBq ^{99m}Tc and ~25 kBq ^{68}Ga no events could be detected. Below the linear range the influence of the statistical error is too high to allow exact measurements. Mean ^{99m}Tc efficiency of 20 measurements using the same scintillation layer was 0.18 cpm/Bq. A decrease of efficiency due to the age of the scintillation layer could not be detected. Even the 4-year-old scintillation layer showed comparable values and lead to high quality images. Conclusions: With the presented calibration measurement and quantitative evaluation of ^{18}F, ^{68}Ga and ^{99m}Tc is possible in the described linear activity ranges. The age of the scintillation layer as well as the amount of examinations done by using the same layer does neither influence image quality nor ^{99m}Tc efficiency. Only in cases of mechanical damage the layer should no longer been used. Possible fields of application may be quantification of tissue samples/-slices after surgery as well as the use in quality control and safety issues.

P0200

Phantom study on the detection of small lesions with a low-dose PET/CT acquisition protocol

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Aim: Every PET scanner suffers of the Partial Volume Effect (PVE), that is a loss of counts in lesions smaller than three times the spatial resolution of the system. In order to quantify the PVE in a last generation PET/CT scanner, we performed phantom measurements with hollow spheres. Materials and Methods: We utilized a cylindrical phantom equipped with ten mini- and micro-volume hollow spheres, with internal diameters ranging from 3.9 to 31.3 mm, in order to quantify the small lesion detectability and the PVE. for an intrinsic contrast of 8:1 in different acquisition/reconstruction conditions and for different absorber thickness. The 18F-FDG concentration in the background was 8.3 kBq/ml calibrated at the beginning of the first acquisition. PET scans both in 2D and 3D mode were acquired at different times in order to simulate patients injected 1 hour before scan start with a concentration of activity from 11.4 to 2.2 MBq/kg b.w. The effect of the reconstruction parameters (number of iterations, post-reconstruction filter and reconstruction matrix) was evaluated comparing the image noise (in terms of Coefficient of Variation), the lesion detectability (quantified by the Lesion Over Background Variation) and the Recovery Coefficients (RC). Results: Small lesion detectability resulted better in images acquired in 3D mode rather than 2D, mainly because of the lower noise produced by the fully-3D iterative algorithm implemented. Decreasing the 18F activity injected according to the low-dose protocol adopted in our Institution, the small lesions remained distinguishable from the background down to a diameter of 6.2 mm and the SUV accuracy did not deteriorate. Adding absorber thickness around the phantom, the image noise slightly increased while SUV accuracy did not change. Conclusion: The hybrid PET/CT scanner we evaluated showed good performances, mainly in 3D acquisition modality. The low-dose protocol demonstrated no loss in SUV accuracy and an adequate detectability also for small lesions smaller than 1 centimeter.

P0201

Setting up dose calibrators for I-124 measurements

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Objectives: I-124 emits several low-energy photons (< 35 keV) which cause vial-dependent readings in a dose calibrator. Furthermore, in many dose calibrators the settings for I-124 are either unknown or untested. The aim of this study was to use cross-calibrated I-124 activity measurements for developing a method for reliable and vial-independent readings in dose calibrators. Methods: A high purity germanium detector (HPGe, Canberra) was energy and efficiency calibrated using several NIST-traceable standards (Na-22, 4.398 kBq, Ge-68, 0.552 kBq and 0.408 kBq, Ba-133, 386 kBq). Measurements with I-124 were performed 5 days after in-house production with a GE PETtrace cyclotron to assure the absence of I-123. The activity of I-124 was determined in 30 min measurements of 2 series of aliquots (series 1: dilution 1:10, volumes: 1 µl, 2 µl, 5 µl; series 2: volume 450 µl, dilutions: 1:1000, 1:2000, 1:3000, 1:4000), with a statistical error < 1.6%. The readings of 2 dose calibrators (Veenstra VIK-202, Capintec CRC-15R) were cross calibrated using the HPGe-measurements. To minimize the influence of the low energy I-124 photons (< 35 keV) a cylindrical copper shielding (thickness 1.0 mm, diameter 18 mm) was used in the HPGe and in the dose calibrators. The change of the transmission for the 27, 30, 511 and 602 keV peaks was analyzed in the HPGe. Results: No I-123 was detected. The copper shield absorbs nearly all low-energy photons (for 27 and 30 keV: transmission < 1%) as confirmed by measurements in the HPGe. For 511 and 602 keV photons when using standard broad-beam attenuation coefficients the transmission is 93% for 511 and 602 keV. Slightly different values (difference < 6%) were found when measuring I-124 in the HPGe. As the mean positron ranges of I-124 are about 2.3 mm and 3.5 mm the analysis of the HPGe-measurements show the importance of introducing sufficient scatter material around the source to assure that most of the annihilation photons are produced in or near the source. Conclusions: By using an independent calibration with a HPGe-detector reliable settings of dose calibrators could be obtained. In addition, the use of a thin copper shielding reduced further the influence of the low-energy photons of I-124, therefore assuring a sufficiently stable reading and reducing at the same time the geometry dependency of the dose calibrators. The use of standard company provided dose calibrator settings without shielding should be avoided due to its inherent inaccuracy.

P0202

Performances of cardiac dedicated D-SPECT camera for simultaneous dual isotope tomographic acquisitions: evaluation in phantoms

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Objectives: D-SPECT camera with CZT detectors could offer better image quality for simultaneous dual radionuclide tomographic acquisitions compared to conventional cameras. The aim of this study was to compare imaging performances of D-SPECT for simultaneous Technetium 99m - Iodine 123 and Thallium 201 - Iodine 123 acquisitions in phantoms. Materials and Methods: A cylindrical phantom (∅=20.4 cm) with 3 hot and 3 cold spheres (∅=1.8, 2.5 and 3.2 cm) was used. Global activity and contrast between spheres and background were selected close to values measured clinically with cardiac SPECT. For single and dual isotope acquisitions, hot Sphere Contrast (SC = [$Activity_{Spheres}$] / [$Activity_{Background}$] - 1) was set to 4 for ^{99m}Tc, 1.5 for ^{201}Tl and 3 for ^{123}I with a total activity of respectively 120, 80 and 60 MBq. For all phantom preparations, 3 acquisitions corresponding to 3 orientations of phantoms were performed in order to evaluate the whole field of view (FOV). Duration of acquisitions was chosen close to times used in clinical practice (390 seconds). Data were reconstructed using OSEM with spectrum spillover and scatter compensations implemented by constructor in proprietary research software. Mean Contrast Recovery Coefficient (MCRC = ([$Activity_{Spheres}$]^{measured} / [$Activity_{Background}$]^{measured} - 1) / SC) was calculated for hot spheres and cold spheres as average value for each diameter and position in FOV. Results: Signal-to-Noise Ratio (SNR) in background of reconstructed images was measured at 7 for ^{99m}Tc and 10 for ^{201}Tl using single or dual isotope acquisitions. For ^{123}I images, SNR was measured at 4 in single isotope acquisition, 5 for ^{99m}Tc-^{123}I and 10 for ^{201}Tl-^{123}I. For hot spheres, MCRC in single isotope images was 0.70 for ^{99m}Tc, 0.36 for ^{201}Tl and 0.42 for ^{123}I. In dual isotope ^{99m}Tc-^{123}I images, MCRC was 0.50 for ^{99m}Tc and 0.54 for ^{123}I. In dual isotope ^{201}Tl-^{123}I images, MCRC was 0.34 for ^{201}Tl and 0.23 for ^{123}I. Similar values of MCRC were measured with cold spheres as with hot spheres (Table 1). For both hot and cold spheres, image quality was preserved in dual isotope ^{99m}Tc-^{123}I, but was significantly lower for ^{201}Tl-^{123}I images.

Conclusions: In this study, we demonstrate that D-SPECT camera allows for simultaneous dual isotope imaging with performances similar to single isotope acquisitions for ^{99m}Tc - ^{123}I acquisitions, whereas image quality decreased in ^{201}Tl - ^{123}I acquisitions. Hence, D-SPECT could prove particularly interesting in clinical practice for simultaneous ^{99m}Tc-MIBI - ^{123}I-MIBG acquisitions in contrast to conventional systems.

P0203

Quantitative Effect of Cold Plastic Walls on 18F-FDG PET Images

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Aim: Fillable spherical inserts are commercially available for use in phantom PET studies to simulate metabolically active anatomical regions. Such inserts involve a thick plastic wall, separating the inside of the spheres from the phantom background filled with different tracer concentrations. A few qualitative studies indicate that such inactive walls modify the image intensity distribution compared to a situation with no walls, due mainly to the low resolution of PET. The aim of this study was to assess the effect of inactive walls on quantitative PET scans and to investigate their effect on image analysis. **Materials and methods:** A custom plastic phantom with space for six spherical inserts in fixed position was built for the purpose of this study. Six spheres of diameters 10mm, 15mm, 20mm, 38mm, 48mm, 58mm were made with a “vacuum - moulding” technique, which allowed a wall thickness of 0.2mm. These spheres reproduced a commercially available set of spherical inserts (Liqui-Phil, The Phantom Laboratory, Salem, USA) with 1-2mm wall thicknesses. 18F-FDG scans were acquired on a GE 690 Discovery PET-CT scanner. Both sets of spheres were imaged in the same conditions, for three Tumour-to-Background Ratios (TBR=5, 2 and 8). The image intensity distributions (mean and maximum SUV) were compared for the different inserts. In addition, six delineation methods were applied to both thick- and thin-wall inserts. **Results:** Intensity measurements showed lower SUV mean (difference range: 16%-72%) and maximum values (difference range: 8%-23%) for thick wall inserts. These differences increased when the sphere size decreased, especially for SUV mean. The relative error in estimation of the sphere volume was larger for all thick shell spheres for five segmentation methods, with a difference in average segmentation error in the range 8%-25%. One clustering methods showed slightly lower errors for thick shell spheres (difference 7%). Again, the effect on segmentation error was larger for the smallest spheres. In addition, thick walls were shown to displace observed sphere boundaries by up to 5.5mm. **Conclusions**: Preliminary results indicate that inactive walls should be taken into account in quantitative PET studies, in particular when validating delineation algorithms. They also suggest that the use of thin wall inserts is feasible and useful in reference phantom studies.

P0204

SurgeoSight™: An Intraoprative Hand Held Gamma Camera for Precise Localization of Sentine Lymph Nodes

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Conventional gamma cameras are widely used to perform lymphoscintigraphy in the sentinel lymph nodes (SLN). However, they are not specified for this application and their sizes do not enable their use in the operative room to control the excision of the all SLN. We present design, optimization, manufacturing, and tests of SURGEOSIGHT, a hand held gamma camera for medical applications especially for the operative lymphoscintigraphy. This camera is based on a pixellated CsI(Na) scintillation crystal with 1 × 1 mm element size and a Hamamatsu H8500 flat panel multianode (64 channels) photomultiplier tube. This camera is equipped with 27 mm thick parallel hole lead collimator and dedicated electronics for data acquisition, processing and transmission. The actual field of view of the camera is 42 × 42 mm^2. SURGEOSIGHT spatial resolution is 1.4±0.1 mm at the collimator surface while this camera has energy resolution of 20% at the energy of 140 keV. The camera is mounted on an accurate and smooth movable mechanical arm that allows the camera to image small region of interest with high efficiency and so it can address the demand for specific clinical applications like thyroid scanning, scintillation mammography and sentinel node scintigraphy as well as radio-guided surgery. SURGEOSIGHT has the advantages of low weight (~2 kg), high portability with no significant loss of performance parameters such as sensitivity and spatial resolution. The camera connection to personal computer (PC) is made through the universal serial bus port and a specific software provides the control setting for both the camera acquisition parameters and the measuring process and analysis, by displaying on the PC the acquired image on real time. The results of both laboratory and clinical tests proved that the performance characteristics of the SURGEOSIGHT are highly desirable for intraoperative localization of sentinel nodes in breast cancer and imaging of superficial tumors.

P0205

Comparison between Imaging Performance of Ultrafast Cardiac and Standard SPECT Cameras: A Phantom Study

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Aim: In this study we compared imaging performance of novel ultrafast cardiac (UFC) camera with conventional cardiac SPECT and SPECT/CT using a cardiothoracic phantom. Material and Methods: Images were acquired with UFC camera (GE Discovery NM 530c) which uses Alcyone technology, consisting of an array of 19 pinhole collimators, each with 4 solid state cadmium-zinc-telluride (CZT) detectors, with all 19 pinholes simultaneously imaging the heart with no moving parts during acquisition. Nine of the pinhole detectors are oriented perpendicular to the patient’s long axis whereas 5 are angulated above and 5 below the axis for a true 3-dimentional acquisition geometry. The other conventional cameras were cardiac SPECT (Optima, GE Healthcare) and SPECT/CT (Discovery NM 670, GE Healthcare). The cardiothoracic phantom, a large body-shaped cylinder, comprised the lungs, liver, spine and cardiac inserts, simulating the upper torso of average patients was used. Cardiac phantom studies were performed with homogeneous activity in the left ventricle (100 KBq/cm3, 50 KBq/cm3 and 25 KBq/cm3 for ventricular walls and 10 KBq/cm3, 5 KBq/cm3 and 2.5 KBq/cm3 for ventricular cavity) and the following 1 cm and 2 cm myocardial defects (3 ml and 5.5 ml) filled with 0% and 50 KBq/cm3, 25 KBq/cm3and 5 KBq/cm3 activities, located at anteroseptal and inferolateral ventricular walls. Acquisition time was 5 min for UFC camera and 16 min for conventional SPECT cameras. Images reconstructed with 3D reconstruction for UFC camera and ordered-subset expectation maximization (OSEM) for conventional SPECT cameras. Myocardial count density, uniformity, edge definitions, defect size and location were evaluated in each set of study. Results: UFC camera qualitatively showed better image quality than the other conventional SPECT cameras. Images obtained by UFC camera revealed sharper edge definitions and more accurate defect identification in significantly shorter (1/3) imaging time. Perfusion defects were more discernible on the images which were acquired by UFC camera, especially with low activities inside the ventricular wall (i.e. myocardium) and defect to myocardium ratio was less which simulates triple vessel disease. Conclusion: UFC camera has been found to have superior image quality with better energy and spatial resolutions than the conventional SPECT cameras. These properties can be translated into clinical practice as higher quality and more accurate images in a significantly shorter time with less dose to both patient and personnel.

P14-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Physics & Instrumentation & Data Analysis: Image Reconstruction

P0206

Optimisation of acquisition and reconstruction parameters for I123 imaging

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Purpose: Experience of imaging I^{123}-MIBG using a Siemens Symbia T16 SPECT-CT has highlighted a non-uniformity artefact within SPECT images of the liver, attributed to acquisition and reconstruction parameters. An investigation was made to assess the variation in image quality with the use of different collimators, alternative triple energy window (TEW) scatter correction and iterative reconstruction methods and parameters. *Method:* Measurements of non-uniformity, volume sensitivity and contrast were made by acquiring SPECT images of a uniform Jaszczak phantom filled with 160 MBq of I^{123} and of a Jaszczak phantom with ‘hot’ and ‘cold’ sphere inserts (4, 8 and 16ml volumes) with 50:1 contrast respectively. *Results:* The current acquisition and reconstruction parameters - MELP collimators, standard Siemens scatter correction (159 keV ± 7.5% photopeak plus scatter windows of 15% width either side) and FLASH

reconstruction (4 sub-sets, 8 iterations and Gaussian filter FWHM = 10mm) resulted to CoV of 8.4% and contrast recovery coefficient (CRC) of 138% and 57% for 16 ml hot and cold spheres respectively. The use of LEAP collimators with the same FLASH reconstruction did not improve contrast (CRC of 76% and 61% for the 16ml hot and cold spheres respectively) and produce similar non-uniformity (CoV of 7.9%) results. Alternative scatter correction with a TEW (159 keV ± 7.5% photopeak and scatter windows at 174 keV ± 3% and 138 keV ± 3.5%) with MELP collimators resulted to significant contrast recovery of both hot and cold spheres (CRC of 110% and 59% for the 16ml hot and cold spheres respectively) and CoV = 7.9%. As expected volume sensitivity was higher (49cps/kBq/m^3) with the use of LEAP compared to MELP (35cps/kBq/m^3) collimators or MELP with TEW (33cps/kBq/m^3) scatter correction. OSEM reconstructions for all collimators and scatter corrections resulted in poor contrast recovery (34, 43 and 51% for LEAP, MELP and MELP with TEW scatter correction respectively). Varying FLASH reconstruction parameters for images obtained using current acquisition protocol showed a significant improvement in uniformity with the use of 2 sub-sets and 8 iterations (CoV = 6.0%). *Conclusion:* This investigation has demonstrated that the use of MELP collimators with either scatter correction method resulted in good contrast recovery and non-uniformity. Increased contrast above 100% for FLASH reconstructions indicates the possible introduction of artefacts. This is to be investigated further for protocol optimisation. Further studies should be undertaken to assess how these findings can be transferred into clinical practice.

P0207

Comparison of the image quality of multi-focus fan beam collimator vs. parallel whole collimator SPECT/CT system in myocardial perfusion image: Phantom studies

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Objectives: The aim of this study was to evaluate image quality IQ-SPECT system compared with conventional (180° apart) and L-mode (90° apart) system in myocardial perfusion imaging (MPI). We focus mainly to evaluate on spatial resolution, image reproducibility, and image quantitative with use of various physical phantom. Method: Imaging was performed with both standard parallel hole collimation (LEHR) using a Siemens Symbia T16 SPECT/CT and the same system with the IQ-SPECT modification employing SMARTZOOM collimators. Conventional (conv.) and L-mode were performed over 180°contoured orbits with 30 and 34 views per detector for 12.5 sec into 64x64 matrices and 4.8 mm pixels. IQ-SPECT images were acquired over 208° cardio-centric orbits with 17 views per detector for 6.25 sec per view to 128x128 matrices and 4.80 mm pixels, Both images were attenuation corrected using CT images acquired immediately before SPECT with the integrated CT. The reconstruction soft-ware was used of Flash3D. Spatial resolution was to evaluate FWHM obtained the point source phantom (in house) that were arranged 11 point sources (12 mmϕ) every 4cm from the center in the UFOV. Image quantitative was to validate cross-calibrated SPECT values against the radioactivity of pai-phantom that were enclosed different radioactivity concentration with 6 separate spaces in the cylindrical tube. The myocardial torso phantom was used to evaluate the image reproducibility and total image quality Results: FWHM value (radial) of IQ-SPECT at the point source in the central was increased 11% as compared with conv. and FWHM in the periphery was increased 41% with central FWHM. The aspect ratio (radial/tangential of FWHMl: ASR) of IQ-SPECT was shown 0.6-1.4. However, the phantom's myocardial wall thickness from short axis images resulted in significant correlation ($p < 0.001$) between the conv. (25.1±1.1 mm), L-mode (24.7±0.97 mm) and IQ-SPECT (18.2±1.2 mm). Image distortion was occurred L-mode system. As function radioactivity and cross-calibrated SPECT values were fitted to a straight line (Conv.; y=0.98x+0.03 R2=0.98, L-mode; y=0.89x+0.06 R2=0.98, IQ; y=0.98x-0.01 R2=0.99). The data implied that quantitatively the use of IQ-SPECT improved for in the myocardial perfusion imaging. Conclusions: IQ-SPECT provided myocardial perfusion SPECT imaging comparable to conventional and L-mode SPECT, and improved significant image resolution and quality. Our result suggests that IQ-SPECT is the most beneficial technology for MPI SPECT.

P0208

Accuracy of attenuation and scatter corrections in SPECT-CT Myocardial Imaging.

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Aim of the study: Myocardial studies with integrated SPECT-CT systems can be corrected not only for scatter but also for attenuation: we have evaluated the accuracy of these corrections with a dedicated phantom. *Materials and methods:* We used a SPECT-PET/CT thorax water phantom (Data Spectrum) to mimic a clinical condition of attenuation and scatter, the phantom is provided with two cylinders that were filled with the same radioactive solution, one positioned inside and the other outside the phantom. The phantom was scanned with Siemens Symbia T6 SPECT-CT using the clinical acquisition protocol for myocardial studies. SPECT was performed with a 90°detectors configuration, non circular orbit, 32 views, 64x64 matrix, 25 sec/view. CT scan was acquired with 130 kVp, 60 mAs, pitch 0.5, 4 mm slice thickness. The radionuclides used for this investigation were Tc-99m (396 MBq/l) and I-123 (162 MBq/l), commonly used in our Department to study myocardial perfusion and cardiac autonomic innervation. In order to perform scatter correction the clinical protocols employ a two-window and a three-window method for Tc-99m and I-123 respectively. Images were reconstructed using Siemens Flash 3D, an OSEM-3D algorithm, which provides corrections of nuclear data for attenuation using CT mu-maps and applies an addictive correction for scatter. We have performed three different reconstructions: without corrections, applying the attenuation correction only and applying both the corrections for attenuation and scatter. On the transverse images the percentage differencence of the mean counts between the inner cylinder and the outer was evaluated. Since in both cylinders the radioactive concentration is the same and the only difference is the attenuation and scatter due to the water surrounding the inner cylinder, with all the corrections performed this percentage should be ideally zero. Furthermore, reconstructions were performed using different combinations of iterations and subsets to evaluate their effect on image corrections. *Results* Without corrections, only with attenuation correction, and with both attenuation and scatter corrections applied, the percentage differences were respectively -77%, -27% ,-10% for Tc-99m and -75%,-21% and -8% for I-123 with 8 iteration/4 subset. Increasing the number of iterations and subsets (8i/8s, 16i/8s, 16i/16s, 24i/16s) the corrections were more accurate with a percentage difference ranging from -10% to -1% (24i/16s) for Tc-99m and from -8% to -1.6% (16i/16s) for I-123. *Conclusions* Myocardial images are slightly under-corrected for attenuation and scatter, using the standard settings, however good results can be obtained increasing the number of iterations/subsets.

P0209

Evaluation of the clinical impact of Time-OF-Flight (TOF) PET/CT-scans for F18-FDG whole body protocol on a Siemens Biograph mCT

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Many technological improvements in hardware and software lead to the latest generation of PET/CT scanners. The comparison and transferability of scanner's clinical routine from different vendors and generations is demanding. The aim is to prove an acquisition protocol for whole body FDG-PET-CT and the clinical impact value of TOF-technology. The mCT-PET-Scanner (Siemens Medical Solutions USA, Inc., Malvern, PA) is equipped with four rings of 48 detector-blocks (13×13LSOcrystals, 4mm×4mm×20mm) with an axialfield-of-view of 21.8cm. Images from 37 oncologic patients (non-diabetic) were reconstructed, using iterative, iterative plus TOF, HD-PET (jitter correction for line-of-response) and HD-PET plus TOF in comparison. The differences between these protocols are discussed quantitatively and qualitatively for malignant lesions (>1cm diameter) and non-pathologic regions as a reference. For attenuation correction a low-dose-CT (40-slice-configuration, 120keV, 18mA-effective) was exposed in expiration. The limited statistic of the firmer generation of PET scanners requires postfiltering to make the images more presentable therefore the lesion detection on clinical images was limited. The latest generation diminishes this lag between statistics and spatial resolution. Powerful computers and optimized algorithms results to improved image quality using TOF without postfiltering, increased number of iterations from 2 to 4 (21 subsets) and the matrix from 128/256 to 400. TOF improves the contrast and shows smaller anatomical and pathological structures also in patients with normal BMI (Body Mass Index).The most stable SUV (standardized uptake value based on body weight) as a reference regions was from the liver parenchyma 2.9±0.5 (parotid 1.9±0.6, lung 0.6±0.3). Using iterative reconstruction relative to HD-PET and TOF the SUV-max in the liver parenchyma raises a factor of 2.0±0.4 including TOF a factor of 1.9±0.3, in the lung SUV-max raises a factor of 1.8±0.6 including TOF a factor of 2.0±0.5, for parotid parenchyma SUV-max raises a factor of 1.5±0.3 including TOF a factor of 1.4±0.2, for malignant lesions SUV-max varies depending on the structure of the lesion within 21% including TOF 20%. The mean-SUV within the parenchyma regions does not change significantly. Based on the hardware configuration, HD-PET and TOF shows a significant quality improvement. SUV is used as an indicator for malignancy versus benignancy, as a prognostic value, to quantify spatial concentrations for dosimetry and radiopharmaceutical studies. Non-pathologic parenchyma can be used as a reference-region where liver-parenchyma is varying 16%, alternatively parotid-parenchyma 29% and lung-parenchyma 46%. Using HD-PET and TOF protocol exploits the whole available technology to utilize best diagnostic and interventional and scientific benefit.

P0210

An Innovative Rotation-Based Iterative Resolution Recovery for HiReSPECT™: a Dedicated Small Animal SPECT System

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A novel rotation algorithm was developed to speed up the application of rotation-based MLEM image reconstruction and to perform resolution recovery by rendering feasible Collimator-Detector Response Function(CDRF) compensation in the HiReSPECT™ camera. HiReSPECT™ is a dedicated dual head SPECT system for imaging of murine models. Each detector is composed of an array of 1×1 mm^2 pixelated CsI(Na) crystals. We derived the CDRFs via fitted Gaussian functions at multiple distances from the head. The CDRFs were applied within the forward and backward projection processes in every sub-iteration. To achieve very efficient yet accurate rotation operations, noting that the default acquisition protocol includes 60 views covering 360 degrees with angular view-to-view steps of 6 degrees, we utilized a 12-step jump (78 degrees) for each new subiteration within the reconstruction. It can be shown that for the proposed 78-degrees rotation, each pixel in the source image intersects with only 5 pixels in the target image, and vice versa. In our approach, the 5 pixels of the target image corresponding to each source pixel, and the fraction of counts assigned to each, were pre-computed analytically and stored in a N×N×2×5 look-up table, in which, N×N is the matrix size, and factors 2 and 5 respectively correspond to the Cartesian coordinates of the pixel centers prior to the rotation and the abovementioned fractional contributions from the 5 target pixels. To evaluate the implemented rotation approach, a 128×128 Shepp-Logan phantom image was rotated 60 times progressively with 78-degree steps via (i) our algorithm and (ii) the standard bilinear algorithm. Quantifying rotational accuracy using the bilinear method vs. our proposed algorithm, Normalized Square Error values of 0.3738 and 0.3740 were obtained, respectively, showing the same quantitative performance for the two methods. At the same time, the proposed rotational algorithm has improved computational efficiency as it requires N×N×5 multiplications utilizing the **pre-generated** LUTs, while N×N×8 multiplications are needed via the conventional approach. While the radial and tangential resolution of the system without resolution recovery is over 2 mm at nearly all positions within the FOV, reaching 2.5 mm at the edges, it did not exceed 1.8 mm anywhere within the FOV using the proposed approach. The proposed rotational approach to resolution modeling exhibited favorable computational efficiency compared to conventional bilinear approach, while depicting matched quantitative accuracy. Meanwhile, the code has a high convergence rate due to appropriately long angular steps of the sub-iterations and good resolution recovery power.

P0211

Experimental evaluation of the impact of Time-of-Flight (TOF) on edge definition of cold spots or cavities in a body phantom

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Aim: There is a theoretical spatial resolution limit to which TOF can improve the reconstruction accuracy. It is minimum detectable range of incorporating TOF imaging and radial distance of the cold spots in practice which we try to determine through this study. Materials and Methods: TOF-PET imaging improves the localisation of radionuclides by measuring the time difference between coincident annihilation photons to aid in the reconstruction process. Sharper images, with clearer hot and cold spot definition are expected. The improvement in reproducing hot spots within a homogeneous background has been well documented, but the improvement to cold regions is not as well known. For this experiment the analysis was performed with a Siemens Biograph mCT(TOF-PET/CT Camera), which has a time resolution of 0.5 ns (spatial resolution of 7.5 cm). A CT scan of the phantom was acquired for attenuation correction of PET data. Reconstructed diameters were measured from the FWHM of line profile across the cold lesions. The gain by using TOF was determined by comparing the line profile across the different cold lesions in the images reconstructed using TOF to that without TOF. The experiment used F18 with 88.3MBq of activity to surround cold spots spheres of diameters: 9.5–31.8mm and cold spot rods of diameters: 4.8 − 12.7mm. Results: From the initial results it was found that even though increasing the number of iterations with HD-TOF improves the contrast and edge definition, this did not produce a discernible increase in accuracy of reconstructed cold spot diameter. It was also found that there is a limit to the improvement in reconstructed cold spot diameter from the inclusion of TOF data, and that it is dependent the location of the cold spot. For cold spots found in isolation, TOF with High Definition (HD) iterative improves cold spot diameters < 20mm, with FBP there is no discernible improvement. For cold spots located in a region of cold spots, TOF improvement with HD was only appreciable for the 9.5mm diameter rod (the smallest measurable), with FBP the accuracy was improved for rod diameters:9.5 − 12.7mm. Conclusions: Any contrast improvement is shared between all the cold spots, limiting the effect of TOF. There is a limit to the improvement in reconstructed cold spot diameter from the inclusion of TOF data, and that it is dependent on the location of the cold spot.

P0212

Preconditioned Alternating Projection Algorithms for Maximum a Posteriori ECT Reconstruction

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Aim: To reduce radiation dose to the patients undergoing emission computed tomography (ECT) examinations. Materials and methods: We propose to lower the total amount of activity in the radiotracer administered. However, it would lead to very high Poisson noise in the raw ECT data. Consequently, such very noisy data if treated by conventional techniques, such as expectation maximization with total variation regularizer (EM-TV) or ordered subset EM (OSEM), would lead to very noisy and clinically unacceptable reconstructed images. To accomplish good quality ECT reconstructions from low-dose ECT examinations, we introduce a generalized fixed-point formulation of the total variation (TV) regularized maximum a posteriori (MAP) ECT reconstruction problem. Based on this formulation, we propose preconditioned alternating projection proximity (PAPP) algorithm for computing the fixed point. We theoretically prove the convergence for the special case of our proposed algorithm. To investigate performance of our PAPP algorithm, we performed numerical experiments on simulated SPECT data with low (15%) and high (56%) Poisson noise content. The data were simulated for a cylindrical uniform phantom containing hot and cold spheres with various diameters. The PAPP was compared with conventional MAP expectation maximization (MAP-EM) algorithm with TV regularizer (EM-TV) and with the recently developed nested EM-TV algorithm for ECT reconstruction. Results: We observe that our PAPP algorithm with the EM-preconditioner very significantly outperforms the benchmark EM-TV in both the convergence speed, the noise in the reconstructed images and the image quality. It outperforms the nested EM-TV in the convergence speed while achieving comparable image quality. Conclusion: The developed PAPP algorithm with the EM preconditioner might allow very significant reduction in the radiation dose to the patients imaged using ECT by providing the same contrast-to-noise ratio for hot and cold lesions as conventional EM-TV but with the total administered radiotracer activity 2 to 6 times lower than presently used in standard-of-care ECT examinations.

P0213

Combined and fan- and cone-beam collimators with circular orbit acquisition for brain SPECT imaging: optimization studies

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Aim: To optimize acquisition and reconstruction of brain SPECT by means of combined fan- and cone-beam collimators using triple-head camera and circular orbit under the constraints of fixed total acquisition time and radiopharmaceutical dose. Methods: Performance of a triple-head SPECT camera with combinations of low-energy ultrahigh-resolution fan-beam collimators (F) and cone-beam collimators (C) with focal length equal to 43.1 cm were investigated. The radius-of-rotation was fixed at 14 cm. The angular sampling was 120 views over 360 degrees rotation (i.e. 40 views per detector head). The following combinations of collimators were studied: CCC, CCF, CFF and FFF. Uniform cylindrical phantom with 7 hot and 7 cold spheres (0.64 - 3.2 cm diameter) simulatings hot and cold lesions was used. One noiseless and 4 noisy datasets were investigated. The noisy datasets were simulated using the Monte Carlo SIMIND software. An ordered-subset EM (OSEM) algorithm was used for combined reconstruction. Attenuation, system resolution and sensitivity were modeled. No scatter correction, post smoothing nor regularization was applied. Results: For noiseless datasets a triple-cone-beam system resulted in axial distortion artifacts and diminished transaxial resolution away from central slice. A triple-fan-beam system resulted in the best-reconstructed image quality in terms of bias, noise, contrast and artifacts. For noisy data a cone-fan-fan beam system resulted in best-reconstructed image quality for detection of small lesions. Conclusions: A cone-fan-fan-beam system is most promising for detection of small lesions using triple-head gamma camera with combined cone- and fan-beam collimators and circular orbit acquisition in brain SPECT imaging.

P0214

Cone-beam SPECT brain imaging using helical orbit and triple-head gamma camera: optimization studies

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Aim: To optimize acquisition and reconstruction parameters for brain SPECT acquired using triple-head gamma camera with cone-beam collimators in helical orbit under the constraints of fixed total acquisition time, radiopharmaceutical dose and pitch. Methods: Performance of triple-head SPECT camera with low-energy ultrahigh-resolution cone-beam collimators (with focal length, f=43.1 cm) was studied for data consisting of 90, 120, 180, and 360 views acquired in helical orbit over 360 degrees rotation and 6.6 cm table travel. SPECT data were simulated for a uniform cylindrical phantom with 7 hot and 7 cold spheres (0.44 - 3.2 cm diameter) simulating hot and cold lesions. One noiseless and 4 noisy datasets were investigated. The noisy datasets were simulated using the Monte Carlo SIMIND software. An ordered-subset EM (OSEM) algorithm was used for reconstruction. Attenuation, system resolution and sensitivity were modeled. No scatter correction, post smoothing nor regularization was applied. We investigated in-plane and out-of-plane OS groupings corresponding to sets of projections with the focal points of three detectors in the same or in different transaxial planes, respectively. Results: Varying the rotational sampling from 90 views to 360 views over 360 degrees for helical orbit with fixed pitch, radiation dose and scan time does not affect the reconstruction convergence and accuracy regardless of the object size. The out-of-plane subsets result in lower image quality and more artifacts, as compared to in-plane subsets. Conclusions : The optimized helical orbit for cone-beam SPECT brain imaging consists of 90 views per 360 degrees rotation. One should use only in-plane grouping of the ordered subsets in OSEM reconstruction.

P15-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Physics & Instrumentation & Data Analysis: Data Analysis & Management

P0215

Preliminary investigation of biomathematical modeling approach to predict clinical usefulness of PET amyloid imaging probes

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Purpose: The aim of the study was to develop a new methodology to predict clinical usefulness of amyloid imaging probes [^{11}C]PIB and [^{11}C]BF-227 using a binding index, standard uptake value ratio (SUVR). **Methods:** Time-activity curves (TACs) of the target and reference regions with 1-tissue compartment model (1TCM) were numerically generated using arterial plasma input function and kinetic parameters. K_1, k_2, BP_{ND} for each radioligands were predicted by biomathematical modeling approach [1] while fixing estimated K_1/k_2 in human cerebellum and plasma free fraction as 0.2. SUVR was calculated by dividing area under the curve (AUC) between 40 and 60min in the target over that in the reference. In order to simulate progression of amyloid β(Aβ) plaque deposition, the density of available Aβ (B_{avail}) was assumed as 3, 20 and 50 nM for healthy control (HC), preclinical-Alzheimer's disease (AD) and severe AD patients, respectively. We first validated how $SUVR_{40-60}$ estimated with 1TCM well agreed to that with 2TCM in the case of [^{11}C]PIB. Furthermore, for [^{11}C]PIB and [^{11}C]BF-227, predicted $SUVR_{40-60}$ with 3 and 50nM of B_{avail} were compared with in vivo $SUVR_{40-60}$ of HC and severe AD patients [2-3]. In order to evaluate statistical powers of [^{11}C]PIB and [^{11}C]BF-227, noise-added 1000 $SUVR_{40-60}$ for each HC, preclinical-AD and AD patients were preliminary simulated with randomly varied 10% of K_1, 20% of k_2 and 25% of B_{avail} and then sample size required to detect progression of disease (20 and 50nM) with 90% was investigated using a paired t-test with $\alpha = 0.05$. **Results:** For [^{11}C]PIB, $SUVR_{40-60}$ using 1TCM-TAC with 50 nM of B_{avail} was overestimated with 41% error. However 1TCM-TAC with 5 nM of B_{avail} resulted in 3.7% error of $SUVR_{40-60}$. 1TCM accurately predicted $SUVR_{40-60}$ in case of low B_{avail}. Overall predicted $SUVR_{40-60}$ (y) including both [^{11}C]PIB and [^{11}C]BF-227 showed positive correlation with in vivo $SUVR_{40-60}$ (x) ($y = 1.06 x + 0.33$, $r^2 = 0.32$). As the preliminary result, the sample sizes required to detect progression of Aβ deposition (20 and 50nM) were 6 and 3 for [^{11}C]PIB and 8 and 4 for [^{11}C]BF-227. **Conclusion:** Proposed methodology to predict in vivo $SUVR_{40-60}$ may have the potential to predict clinical usefulness of amyloid imaging probes. **Reference:** [1]J Nucl Med. 2009, 50(10):1715-23. [2]J Cereb Blood Flow and Metab, 2005, 25(11): 1528-47. [3]J Nucl Med, 2007, 48(4):553-61.

P0216

Resting Planar Radionuclide Ventriculography (RPRV) using Multi-Gated Acquisition (MUGA) - How does the choice of Left Anterior Oblique (LAO) angle affect the Left Ventricular Ejection Fraction (LVEF) result and how best to determine the optimal LAO angle?

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Aim RPRV using MUGA scans is used to monitor cardiotoxic effects of oncology drugs. LVEF is measured throughout treatment to guide management. In Sheffield, the optimal LAO angle, defined as the angle with the best left-right ventricular separation, is determined prior to MUGA scanning by visual analysis of 40s static scans acquired at 30°, 35°, 40° and 45°. It is often difficult to determine the optimum angle with confidence but some guidelines state it should be re-determined for each patient visit. There is limited published data on the affect of the selected LAO angle on the result. The study aim is to assess how variations in LAO angle affect the LVEF result and whether the use of four short MUGA scans during set-up improves identification of the optimal angle. The variation in heart angle between patient visits is also assessed from Myocardial Perfusion Imaging (MPI) SPECT to establish the validity of re-determining LAO angle for repeat MUGA scans. **Methods** Nine oncology patients had static, short MUGA (500kcounts, 6 frames) and full MUGA (6Mcounts, 20 frames) scans at the 4 standard LAO angles. LVEF was measured from the full scans using a semi-automated processing technique. Left-right ventricular separation was visually assessed for all three dataset groups. The optimal angle found from the static and short MUGA scans were compared to that from the full MUGA scan (gold standard). Thirty MPI studies were analysed to assess differences in the 'LAO' heart orientation (relative to camera axis) between the stress and rest scans (2 day protocol). **Results** The maximum difference in measured LVEF over the range of LAO angles was 6.5 - 11.5% (mean 9.0%). A 5° deviation from the optimal angle altered the result by between 1.75 - 10% (mean 5.6%). Determining the optimal LAO angle using 4 static images and 4 short MUGA scans resulted in a 63% and 47% agreement with the gold standard respectively. Analysis of the MPIs showed a stress-rest difference in 'LAO angle' of more than 5° in only one patient (mean difference = 1.4°, SD = 1.2°). **Conclusions** Small variations in LAO angle significantly affect the LVEF result. Short MUGA acquisitions appear to be worse than static scans for determining the optimal angle, although neither method is particularly accurate. The change in heart 'LAO' orientation between repeat visits is very small and it is therefore not recommended to re-determine the optimal angle for sequential scans.

P0217

A phantom study of repeatability of an intratumoral inhomogeneity index in FDG-PET

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Aim: PET images often reveal intratumoral metabolic inhomogeneity of FDG. It has been reported that the intratumoral inhomogeneity can be used to predict the response to therapy and the risk of recurrence. The derivative (dV/dT) of the volume-threshold function has been used as an index of the intratumoral inhomogeneity. We performed a phantom study to evaluate the repeatability of this index in PET. Materials & Methods: Four phantoms were used: (1) a simple spherical phantom with an inner diameter of 26.8 mm and a volume of 10 mL (type 0: uniform phantom); (2) a 26.8-mm-diameter spherical shell phantom with a 10-mm-diameter acrylic sphere (type 1: single cold-spot phantom); (3) a 26.8-mm-diameter spherical shell phantom with two 10-mm-diameter acrylic spheres (type 2: two cold-spot phantom); and (4) a 26.8-mm-diameter spherical shell phantom with a 20-mm-diameter acrylic sphere (type 3: single large cold-spot phantom). These phantoms were filled with 60 kBq/mL of ^{18}F solution and placed in an oval pool phantom. PET data (10 sets) were acquired, each with an acquisition time of 3 min. PET images were reconstructed using FORE+FBP. The absolute values of dV/dT for these phantoms were computed. The means and standard deviations (SD) of dV/dT were calculated from the 10 sets of data. Results: Type 1, 2, and 3 phantoms had larger absolute values of dV/dT than type 0. The ratios of the SD to the mean were less than 5%. A highly repeatable dV/dT could be used to clearly distinguish between the type 0 phantom (representing homogeneous tumors) and the other types of phantoms (representing inhomogeneous tumors). Conclusions: We demonstrated the high repeatability of the derivative (dV/dT) of the volume-threshold function in PET. This index thus has the potential to distinguish between homogeneous and inhomogeneous tumors in repeated PET measurements.

P0218

Optimal ROI Size for Parameter Determination in IVIM Imaging

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Introduction. Successful delivery of therapy agents to tumor cells depends on tumor tissue perfusion and diffusion. Assessment of these parameters prior to and during treatment would facilitate decision-making regarding e.g. treatment strategy. The intravoxel incoherent motion (IVIM) model (Le Bihan 1988) applied to multi b-value diffusion weighted MRI offers non-invasive quantification of tissue diffusion (D), perfusion-related pseudo diffusion (D*) and perfusion fraction (*f*). However, the quantification is highly affected by the size of the analyzed region of interest (ROI). Our aim was to investigate the optimal ROI size for quantification of D, D* and *f*. ***Methods.*** Liver IVIM images of healthy volunteers were acquired on a 3T MR equipped with a 16-channel torso XL phased-array surface coil using a navigator triggered SE-EPI: 12 b-values (0-800); fat suppression=SPIR; TR/TE/NSA=2000ms/53ms/2; voxel size=1.46*1.46*5mm^3; SENSE factor=2; scan time including triggering~12 min. Average signal intensity decay curves for 4 ROIs in different positions of the liver were fitted to the IVIM model function. Eight concentric ROIs with increasing size [ROI areas: 2, 19, 53, 104, 173, 258, 360 and 480 mm^2] were analyzed for each position and D, D*, *f* and SSE (error sum of squares) were extracted. The magnitude of the variation of the extracted parameters with increasing ROI radius was calculated for each ROI position and subject, and the average variation with increasing ROI size was analyzed. ***Results.*** The variation of D, D* and *f* with increasing ROI size approaches zero at a ROI size of approximately 5-6 pixels (radius) which corresponds to 170-260 mm^2 using the above described imaging parameters. SSE shows a strongly improved model fit with increasing ROI size (improves from 0.02 for the smallest ROI to approximately 0.005 the 5-6 pixels ROI radius). *Discussion/Conclusion.* The variation of the extracted parameters does not reach zero. This is probably due to the heterogeneity of the tissue. Nevertheless, the initial variation of the extracted parameters stabilize and we suggest using a ROI area close to the stabilization, i.e. a 5-6 pixels ROI radius or approximately 170-260 mm^2, where the parameters are least affected by ROI size.

P0219

Comparison of ECG-gated PET/SPECT and simulation data in optimized iterative reconstruction parameters using computer model observer

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Aim: The performance of the model observer, i.e., the channelized Hotelling observer (CHO) has been shown to correlate well with human observer performance. The CHO offers an alternative to human observer studies in the assessment of image quality, optimum image processing parameters, and system performance. However in order to perform a high quality model observer, many realizations of the equivalent image set are required. In general, a special software or a system is necessary though the Monte Calro simulation or the list mode acquisition data is widely used. The purpose of this study was to evaluate optimal reconstruction parameters of the ordered-subset expectation maximization (OSEM) algorithm using a combination of the ECG-gated PET/SPECT and the CHO. Methods: A PET scanner and a gamma camera, CTISiemens ECAT EXACT HR+ and GE Healthcare Millennium MG, were used to scan images of two type phantoms, a hot spot phantom (Japan Radioisotope Association phantom) and a 20 cm diameter cylindrical phantom filled with F-18 or Tc-99m. The ECG-gated PET/SPECT scans (10/16 frames per cardiac cycle) was acquired using an electrocardiogram simulator (AccuSync 71, AccuSync Medical Research Corporation, Milford, Connecticut), and the heart rate was at 60 cycles/min. To evaluate the performance of the present method, we also carried out the computer simulations with the elliptical phantom. The OSEM parameters was changing the numbers of subset and iteration, was a sixty different type of datasets. The CHO of PET/SPECT was applied to 50/64 slices (5 slices × 10 frames/4 slices × 16 frames) from the images of each type to compute detectability index (d_{CHO}), and the optimum image reconstruction parameter was evaluated. In this study, set with the low-frequency cut-off ρ0=0.02313, 0.03125, and 0.052 pixel^{-1} were tested. Additionally, we tested the 16 channels with an equal band width, i.e., Nyquist frequency/16. Results: The d_{CHO} value of PET and SPECT became the maximum when approximately 60 iterative updates (number of subsets×iterations). As for the simulation study, the d_{CHO} value became the maximum when the numbers of subsets and iterations were 8 and 9, respectively. In each case, when the number of subsets was 32, the d_{CHO} value decreased with increasing number of iterations, that is, the divergence phenomenon occurred. Conclusions: Our preliminary data suggested that a combination of the ECG-gated PET/SPECT and the CHO was useful and a widely available simple method in image processing such as iterative reconstruction parameters setting.

P0220

The simulation study of the effect of the deformed peak of input function on parameter estimation

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Aim: In analyzing dynamic PET data, the input function (IF) plays a key role in the estimation of model parameters. In our 15O-labeled water brain perfusion studies (in China) using manual sampling of arterial blood, we found that the parameter estimation in a few studies is poor and we found out that was caused by the seriously deformed peak of IF. The current study is designated to investigate the effect of deformed peak of IF on estimation of model parameters based on simulation data of 1-tissue compartmental model. Materials and Methods: The IF is generated by a bi-exponential function, i.e. Ca(t)=A*exp(-t/tou1)*(1-exp(-t/tou2))+b, where Ca(t) is IF, A is amplitude, tou1 is time constant for upstroke (0.3min), tou2 is time constant for decay (0.7min) and b is baseline(10% of A). The deformed peak of input function is simulated from maximum to 50% with a step change of 5%. The parameter estimation of simulated data is performed using Carimas2, which is developed in Turku PET centre in Finland and is freely downloadable for academic usage(http://www.turkupetcentre.fi/carimas). Results: Our simulation study showed that the deformed peak of IF causes significant bias in model parameter estimation. The estimated model parameters (K1 and k2) are overestimated when the peak of IF is deformed, especially when peak is less than 85% of normal, the bias becomes more significant, this is in accordance with previous study on the effect of IF dispersion, such as Iida et al (J Cereb Blood Flow, 1986). In 15O-labeled water perfusion model, K1 is larger than k2 since partition is less than 1 (usually 0.93) and k2=K1/partition. An interesting finding is that when the peak of IF is smaller than 65% of normal, the ratio of K1/k2 becomes reversed. This means that when the peak of IF is bigger than 65% of normal, even if K1 and k2 are overestimated, the ratio of K1/k2 is still unchanged, almost as a constant. But when the peak of IF becomes worse (smaller than 65% of normal), the ratio of K1/k2 is reversed. This finding suggests that the ratio K1/k2 may become an indicator for evaluating the quality of the input function. Conclusions: Based on the simulation study, the deformed peak of input function can contribute a significant bias in the modeling parameter estimation. Furthermore, the ratio K1/k2 may be an indicator of evaluating of quality of input function in practice.

P0221

Validation of a Poisson Resampling Algorithm for Simulation of Statistical Dagraded Images for Dose an Image Optimization in SPECT

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Aim: Dose optimization for SPECT is an iterative process balancing image quality and dosage of radiopharmaceuticals to reduce radiation exposure for the patients. Image acquisition for optimization studies is characterized by repeated time-consuming phantom and patient examinations. Modern nuclear medicine workstations provide the ability for the resampling of statistical reduced projection data respecting the Poisson character of the emission process. The aim of this study is a comparison of reconstructed SPECT images of phantom measurements with images generated by Poisson resampling with the intention of testing the usability of a specific Poisson resampling (PR) algorithm of dose optimization studies. Materials and Methods: Phantom examinations were performed using a Jaszczak phantom with 6 spheres V=[0.5, 1, 2, 4, 8, 16]ml. The spheres were filled with 25 MBq/ml Tc-99m. The surrounding cylinder was filled with an activity ratio 1:8. SPECT imaging was performed by a SPECT/CT (NM/CT 670, GE Medical, Haifa, Israel) with 60 projection angles at 360° (matrix: 128x128, 30 s/projection) for four activity concentrations (A0=100%, A1=81.0%, A2=59.5%, A3=39.8%), with A3 representing a patient equivalent activity concentration. Poisson resampling (Poisson Resampling Toolbox, GE Medical) of the A0 projection data was performed to generate simulated projection data corresponding to the measured activity distributions (A1 to A3). Images were reconstructed by the Evolution-Toolbox® with resolution recovery. The contrast (C) and the signal-to-noise ratio (SNR) were evaluated for both type of image data. Additionally the analysis was performed by linear regression analysis (adjusted R2) and Bland-Altman-Testing. Results: C and SNR provide a linear correlation between measured and Poisson resampled data (C: R2=0.968; SNR: R2=0.974). C and SNR were exemplary demonstrated for the largest Volume (V=0.5ml) at A1 (measured/PR: C=4.04/3.96; SNR=37.28/38.09), at A2 (measured/PR: C=3.61/3.91; SNR=33.46/34.18) and at A3 (measured/PR: C=3.63/4.07; SNR=34.11/31.83). The other spheres (V1-V5) represent an identical correlation between both methods. Based on the Bland-Altman-Testing the

differences between the measurements and the PR vary in a range of 2 standard deviations for C (mean difference between methods=0.02±0.27) and for SNR (mean difference between methods=1.44±2.24). While a comparable C is obtained by both methods, SNR estimated by PR is slightly higher estimated when compared to the measured phantom data. Conclusion: Our comparison of phantom measurements and PR data demonstrates that the simulation of statistically reduced images using the above mentioned specific Poisson resampling implementation is possible. Dose and image optimization procedures can utilize this algorithm to produce reliable SPECT images with varying count statistics.

P0222

Computer aided staging of lymphoma patients with FDG PET/CT imaging based on textural information

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Objectives To design a Computer Aided Diagnosis (CADx) system to assist the physician in staging lymphoma patients with enhanced FDG PET/CT. Special emphasis concerns the discrimination of normal suspicious FDG uptake (ie. inflammatory node, brown fat…) from malignant FDG uptake. **Methods** Within 25 patients assessed by enhanced FDG PET/CT for initial staging of aggressive lymphoma, 346 regions of interest (ROIs) were labeled by a nuclear physician using imaging, histopathological and follow-up data as a reference. Among 156 lymphomatous ROIs {M}, 158 physiologic ROIs {N} and 32 suspicious non-lymphomatous ROIs {NS}, the detection performances of the random decision forest (RDF) and support vector machine (SVM) classifiers were assessed based on a feature set of 115 PET and CT parameters (geometrical, first order and textural features). We plotted ROC curves combined with the whole feature set "No selection" and the most discriminant ones "Selection" (by Kruskall Wallis test, area under the ROC curves and mutual information indices). **Results** Both classifiers achieved very high score in discriminating the {N+NS} vs {M} classes (AUC range 0.94-0.97). Both classifiers also achieved high performance for the more complex task of discriminating {NS} vs {M} with AUC value of 0.91 for the SVM classifier with selection (Fig.1). The most discriminant feature set included 3 PET and 2 CT textural features and clinical SUVmax metric. **Conclusions** We designed a CADx system assessing the presence of lymphoma which achieved its best performance by combining the SVM classifier with a series of selected first-order and textural parameters extracted from the coregistered PET and enhanced CT images.

P0223

One-year-experience in the use of Partial Volume Correction: impact on the role of ^{18}FDG PET for the diagnosis, prognosis and therapy monitoring toward personalized medicine in oncology

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AIM: The identification of PET biomarkers able to characterize oncological diseases and to predict their response and outcome to therapy in vivo and non invasively is a challenging objective for a personalized medicine approach. To obtain accurate PET quantitative biomarkers from small oncological lesions, Partial Volume Correction (PVC) should be applied. This work presents results of one-year-experience in the use of PVC for the measurement of SUV by means of ^{18}FDG PET, showing the impact that PVC has on the diagnostic, prognostic and therapy monitoring value of SUV in different oncological pathologies. **MATERIALS AND METHODS:** In the Nuclear Medicine Departments of H San Raffaele Milan and H San Raffaele Giglio (Italy), a PVC method (Gallivanone et al., 2011) has been implemented 1 year ago and systematically used to obtain PVC-SUV_{BW} from PET oncological studies (173): 1) 40 breast cancer pre-surgical ^{18}FDG PET/CT studies were considered, to assess the value of PVC-SUV_{BW} in revealing tumor biological characteristics; 2) 56 gastro-esophageal cancer pre-surgical ^{18}FDG PET/CT studies, to understand the value of PVC-SUV_{BW} in evaluating pathological characteristics; 3) 19 head and neck cancer basal and follow-up (before radiotherapy) ^{18}FDG PET/CT studies, to evaluate the value of PVC-SUV_{BW} in predicting radiotherapy outcome; 4) 29 bone metastasis (primitive breast carcinoma) basal and follow-up (after chemotherapy and hormone therapy) ^{18}FDG PET/CT studies, to evaluate the value of PVC-SUV_{BW} in defining metastasis response to treatment. **RESULTS:** A general effect of PVC was to increase SUV_{BW} (>100% in very small lesions) and SUV_{BW} cut-off values, and to increase the significance of statistical analysis. ^{18}FDG PVC-SUV_{BW} has been found: 1) a biomarker of cell proliferation in breast cancer being more significantly associated to the positivity of the MiB-1 proliferation index ($p<0.001$ with PVC vs $p<0.03$ without PVC); 2) a diagnostic biomarker in gastro-esophageal cancer (SUV_{BW} without PVC was not), being significantly different in different cancer histological types ($p<0.05$) and in non infiltrating vs infiltrating pathologies ($p<0.05$); 3) a biomarker with prognostic value in HNC, being more significantly correlated with LRFS and DFS ($p<0.025$ and <0.010 with PVC vs $p<0.05$ and <0.025 without PVC); 4) noteworthy, the application of PVC changed the response of some lesions by means of PVC-SUV_{BW} (in 15% for EORTC1999 and 12.5% for PERCIST).**CONCLUSIONS:** Our experience shows that PVC has a high impact on the ^{18}FDG PET role in oncology, enhancing the value of SUV_{BW} for the diagnosis, prognosis and therapy monitoring and response.

P0224

Influence of reconstruction methods and parameters in quantification of uptake with Florbetapir imaging

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Aim: To evaluate the influence of reconstruction methods and parameters on the quantitative analysis of Florbetapir imaging with the computation of cortex-to-cerebellum SUVr. **Materials and methods:** Florbetapir PET scans were reconstructed with different methods (OSEM and Point Spread Function (PSF), with Time of Flight (TOF) when available) and parameters (2 to 8 iterations, 0 to 6mm FWHM). Cortex-to-cerebellum SUVr is computed with an automatic method, implemented in the syngo.PET Amyloid Plaque software, based on a reference semi-automatic method described in Fleisher et al. [Archives of Neurology 2011]. The variability of SUVr computation with respect to reconstruction methods and parameters is measured as the relative difference between the SUVr of a given image reconstruction and a reference SUVr. First, all reconstruction methods are compared together by defining the reference SUVr as the average SUVr from all methods and parameters (inter- analysis). Second, each method is studied independently by defining a reference SUVr for each of them as the average SUVr from all possible parameters within the same method (intra- analysis). The distributions of those relative differences of SUVrs are analyzed among a population of 17 patients, 10 scanned with a Siemens Biograph TruePoint and 7 with a Biograph mCT. Only the latter allows TOF reconstructions. **Results:** In the inter- analysis, the mean and max SUVr relative variability are 1.6±1.5% and 7.6% for OSEM, 2.0±1.5% and 7.5% for PSF, 1.0±0.8% and 4.7% for OSEM + TOF, 1.6±1.3% and 5.0% for PSF + TOF, 1.7±1.4% and 7.6% over all reconstruction methods and parameters. For the intra- analysis, the numbers are expectedly lower as the mean used as reference measure is the mean of that specific distribution. More specifically, the mean and max SUVr relative variability are 1.1±0.9% and 6.2% for OSEM, 1.5±1.4% and 8.4% for PSF, 0.7±0.5% and 3.2% for OSEM + TOF, 1.1±1.0% and 6.1% for PSF + TOF, 1.2±1.1% and 8.4% over all reconstruction methods and parameters. **Conclusion:** The SUVr quantification of Florbetapir images with syngo.PET Amyloid Plaque shows reasonable reproducibility with respect to a wide range of reconstruction methods and parameters.

P16-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Physics & Instrumentation & Data Analysis: Radiation Exposure & Protection

P0225

Assessment of radiation dose reduction techniques in PET/CT examinations

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Objectives: To investigate the level of radiation dose to the patients under going PET/CT examination for the whole body with dose reduction protocol keeping with good image quality **Methods and Results:** We reviewed cumulative radiation dose measurements in 153 patients (males 63, females 90) with age group of males (16-88 y), females (15-90 y)) who went whole body PET/CT examination with F^{18} FDG and compared with the data in literature. The whole body effective dose estimate for each male and female patient was calculated. The averages PET/CT dose was10.3±2.82mSv (range 6.15-14.78mSv). From the total dose the contribution of dose from the CT was 6.43±2.2mSv and the dose from of PET study was only 4.31±1.82mSv and in addition to PET/CT, 33% cases were also performed CT delayed study and the additional dose contribution was 0.80±0.41mSv only. The clinicians reviewed all PET /CT images and found them with significant diagnostic information **Discussion:** The radiation exposure from the whole body serial PET/CT studies performed was considerable less than the doses used for both PET and CT study without sacrificing image quality. The reduction in dose as compare to other studies is due to optimization of PET image quality with reduced F^{18} FDG dose average of 228MBq (3.91± 0.86 MBq / kg) and application of CARE dose 4D CT protocol. Various technical parameters of CT such as kVp, mAs, collimation, AEC and DLP and how they influence to patient dose were discussed. **Conclusion:** Significant reduction in effective radiation dose can be achieved with use of

reduction in mAs and less number of slices with an attenuation CT technique along with reduction in F^{18} FDG activity given to patient

P0226

Validation of CT Doses on Hybrid (SPECT/CT and PET/CT) Devices

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In the past few years, with the increases in the numbers of diagnostic CTs and hybrid devices, the patient doses have increased significantly. For a correct estimation of the risk to the population arising from the ionizing radiation emitted by this equipment, evaluation of the CT doses is essential. The vendors of different equipment provide Computed Tomography Dose Index (CTDIvol) values which can be used for the estimation of CT effective doses. The aim of our study was to validate the CTDIvol values pre-programmed in the equipment and displayed on the screen at the start of a CT scan. Materials and methods: For the investigations, phantoms comprising a cylindrical PMMA head (diameter 16 cm) and a body (diameter 32 cm) 15 cm long were used, with 4 holes inside at 90 degrees, 1 cm under the surface, and 1 hole in the middle. These phantoms are suitable for dose measurements (IEC 1999) with a 10 cm long calibrated pencil ionization chamber. The CTDIvol values of 4 sets of SPECT/CT and 4 sets of PET/CT equipment (produced by GE, Siemens, Philips and Mediso) were measured. The body phantom was used for the cardiac and whole-body protocols, and the head phantom for the head and paediatric protocols. The CTDIvol values were calculated as weighted averages of the absorbed doses measured in the phantoms, and compared with the values provided by vendors. Results: With the use of the body phantom the differences ranged between 0.5 and 29%, while with the head phantom they were between 0.5 and 95%. The main divergences were observed with the head and paediatric protocols, where the CTDIvol values provided by the vendor were about half of the real values. This was most probably caused by the fact that the companies used the body phantom instead of the head phantom for the predefined CTDIvol values. Conclusion: Nuclear medicine professionals should pay attention to the quality control of CT doses delivered by hybrid devices.

P0227

Massive cement bricks as cost-efficient radiation shielding in a Nuclear Medicine facility

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Introduction: Radiation protection is a key component of Nuclear Medicine facility design. New buildings can effectively achieve this goal by making use of shielding materials, such as standard concrete, which, albeit bulkier, are less expensive. However, renovations on existing hospital facilities face particular constraints, mainly lack of useful area, precluding thick walls, and logistical limitations. In this latter setting, lead sheets (LS), being thinner than other materials and feasible to apply on existing walls, are commonly used for radiation shielding, despite higher costs. Aim: The purpose of this work is to present the use of massive cement bricks (MCB) as a radiation shielding material, complementary to LS. MCB are less expensive, acceptably thin and logistically employable in the renovation of an existing Nuclear Medicine facility. Materials and methods: Two scenarios were considered for radiation shielding: LS over standard brick masonry (SBM) and LS over MCB. For each wall segment, the necessary radiation shielding thickness was calculated as the number of half-value layers necessary (nHVLness), taking into consideration the room's weekly workload and its confrontation's distance, dose limits and occupancy factor, according to standing national legislation. The shielding provided by SBM (nHVLsbm) and by MCB (nHVLmcb) was estimated. The difference between nHVLness and nHVLsbm or nHVLmcb determines the necessary LS thickness for each scenario (LTsbm and LTmcb). The costs of raw materials required for shielding 1m2 for each scenario were compared. The patient preparation and resting room for PET exams is presented as an example. Results: The calculated nHVLsbm, for PET radiopharmaceuticals, was 0,97 and nHVLmcb was 2,36. For each of the room's four walls, LTsbm1=7,3mm, LTsbm2=3,3mm, LTsbm3=0mm, LTsbm4=12,2mm; LTmcb1=1,6mm, LTmcb2=0mm, LTmcb3=0mm, LTmcb4=6,5mm. For the SBM scenario, square-meter costs for walls 1 to 4 were 400€, 188€, 13€ and 660€, and for the MCB scenario, 104€, 19€, 19€ and 369€, respectively. The MCB scenario results into a square-meter reduction of costs of 74%, 90% and 44% for walls 1, 2 and 4, respectively. Only for wall 3, which doesn't require LS shielding in any scenario, the MCB scenario proved to be more expensive. Similar results were found for the other facility rooms. Conclusion: Our results show that massive cement bricks significantly reduce the lead thickness necessary for radiation shielding in Nuclear Medicine facilities (or completely eliminate it). Therefore, this is an effective solution that allows for cost reduction while maintaining wall thickness and construction logistics acceptable for interventions in existing buildings.

P0228

Radiation Comparisom for Wrist between Medical Workers Working in Nuclear Medicine and PET/CT Departments

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Purpose: The dosimetric literature data concerning the medical personnel working in PET/CT departments are limited. Therefore, we measured the radiation dose of the wrist for staff working in the first PET/CT department in Greece at the Diagnostic and Therapeutic Center of Athens HYGEIA. As, at the time being, only 2-deoxy-2-[18F]fluoro-D-glucose (FDG) PET studies are performed, radiation dose measurements concern those derived from dispensing of the radiopharmaceutical as well as from the patients undergoing FDG-PET imaging. Our aim is to develop more effective protective measures against radionuclide exposure. Method: All 9 members of the staff (2 nurses, 2 medical physicists, 5 technologists) had TLD wrist badges worn at the right and left hand. Nurses and Medical Physicists also had TLD rings. The nurses and technologists 1,2 are working only in the PET/CT department, while technologists 3,4,5 are operating only in the Nuclear Medicine department covering the most common procedures. Medical Physicists 1, 2 are operating in both departments. Results: In the period of January 2011 to December 2011 a total of 976 PET/CT studies and 2421 conventional Nuclear Medicine procedures were performed. The collective effective wrist doses received by all 4 members of the PET/CT staff were the following: Nurse 1 received 16.72 mSv as a wrist dose and Nurse 2 received 22.3 mSv wrist doses respectively. Technologists 1 and 2 received 2.25 mSv and 1.17 mSv as wrist dose respectively. Medical Physicist 1 received 32.65 mSv wrist dose and Medical Physicist received 2 22.69 mSv respectively. Conventional Nuclear Medicine Technologists 3, 4 and 5 received 6.77 mSv, 9.88 mSv and 9.65 mSv as wrist doses respectively Conclusion: The doses are within the limits than the recommended annual doses by International Commission for Radiological Protection. The higher value of gamma wrist dose for PET/CT workers by comparison with the staff operating conventional Nuclear Medicine procedures is attributable to the higher specific gamma constant of 18F, as well as the longer exposure time required for accurate positioning.

P0229

An Update On Patients' Radiation Absorbed Dose From Diagnostic Nuclear Medicine Procedures In Hospitals Affiliated To Shahid Beheshti University Of Medical Sciences,Tehran

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Introduction Up to now there have been two nationwide surveys in Iran (1989 and 2003) regarding the population radiation absorbed dose from diagnostic nuclear medicine examinations. Considering the rapid growth of nuclear medicine activities in the country, this study was undertaken to determine patient absorbed doses resulting from such procedures in nuclear medicine departments affiliated to Shahid Beheshti University of Medical Sciences during 2009-2010. Materials and Methods Data on annual diagnostic nuclear medicine procedures including type and frequency of examinations, type of radiopharmaceuticals used, and mean administered activity for each examination were extracted from hospital records of four centers for 2 consecutive years. The effective dose equivalent per procedure was calculated by multiplying the mean administered dose by the dose equivalent value (obtained from ICRP 53). The total patient effective dose equivalent was obtained by multiplying the effective dose equivalent for particular procedure by corresponding number of patients. Results Total number of examinations had increased from 9415 in 2009 to 10031 in 2010 which shows an increase of 6.1%. Annual patient collective dose equivalent had also increased from 23094597 mSv to 23309175 mSv with a 0.9% growth. Bone scan was the most frequent (34%) and cardiac (32%) renal (20%), and thyroid (9%) scans came after. With respect to collective effective dose, cardiac scan had the first place (47%) and bone scan was second (42%). Overall, these two scans accounted for 89% of patients' collective effective dose. Discussion Bone scan is the most frequent scan and accounts for the greatest radiation absorbed dose to patients in our four departments, but in the last study of whole Tehran in 2003 cardiac, thyroid, and bone scans possessed first, second, and third ranks respectively. Thyroid scan which accounted for 83% of total exams in 1989 decreased to 26% in 2002 and 9% in 2010 with 99m-Tc nearly replacing 131-I. Cardiac scans on the other hand reveal a significant increase from less than 1% in 1989 to 35% in 2002 and have sustained this trend in 2010. The 131-I with relative administration of 11% in 1995 which accounted for 59% of

collective effective dose equivalent, has contributed to less than 1% of diagnostic examinations and 6% of collective effective dose to patients in 2010. Keywords patient absorbed dose, radiation exposure, nuclear medicine

P0230

Permeability of gloves used in Nuclear Medicine Departments to pertechentate and [^{18}F]-fluorodeoxyglucose for staff radiation protection

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Aim. To test the permeability of four different types of commercial gloves commonly used in hospitals to [99mTc]TcO4- and [18F]-FDG, to establish which individual protection disposal is the safest. Materials and methods. Four types of disposable examination gloves were tested: three were made of plastic materials (Type 1,2,4) and one of natural rubber (Type3). For simulating routine working conditions, solution concentrations were 420-3465MBq/mL and 53-233MBq/mL for [99mTc]TcO4- and [18F]-FDG, respectively. A drop of 0.1-0.2mL was put on the external surface of an opened and stretched glove on a 100cm2 support. The activity onto the inner surface was sampled at 5,15,25,40min by smear test technique. Smear tests were measured for 120s in a well NaI(Tl) detector (Captus 2000TM, Capintec Inc.) calibrated in efficiency for 99mTc and 18FDG (76% and 11%, respectively). The minimum detectable activity for the measuring conditions was 0.5 and 3.4Bq [99mTc]TcO4$^-$ and 3.4Bq for[18F]-FDG, respectively. Decay correction considered lapse between drop deposition and measurement, assuming a 10% smear test activity removal from the contaminated surface. Permeability P was tested on ten samples of each type of gloves and was expressed as Ap/Ad, where Ap is the permeated activity of each sampling time and Ad is initial dropped activity. For each type of glove and for each sampling time, mean value and standard deviation were evaluated. Results. P values @15min for [99mTc]TcO4$^-$, expressed as Bq of permeated activity per MBq of dropped activity, were: Type1: 0.526+1.709 Type2: 0.007+0.005 Type3: 0.820+2.218 Type4: 0.002+0.003 P values @15min for [18F]-FDG, expressed as Bq of permeated activity per MBq of dropped activity, were: Type1: 0.072+0.072 Type2: 0.157+0.138 Type3: 0.341+0.233 Type4: 0.140+0.108 Conclusions. Type3 showed low resistance to permeation for both radiopharmaceuticals, while Type1 only to [99mTc]TcO4$^-$. Type4 and Type2, are good performer, but the former shows a higher heterogeneity within the same batch, whereas the latter guarantees a stronger protection to users. From these values we can draw some practical hints. Let's consider the worst case scenario of a droplet (~0.05ml) falling on Type3 glove surface when manipulating high concentrations of radiopharmaceuticals (~1000MBq/ml), as is the case of MIBI preparation and [18F]-FDG. This would lead to effective dose rates of 1.2mSv/h and 7.7mSv/h, respectively, that cannot be disregarded. Testing both permeability and batch heterogeneity of gloves before adoption in clinical routine will provide a safer practice in handling radiopharmaceuticals from a radiation protection point of view.

P0231

Dosimetry in radio-guided sentinel lymph node dissection in patients with prostate carcinoma

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Objectives: The radio-guided detection of sentinel lymph node has recently been introduced by the European Association of Urology in the guidelines for staging of prostate cancer. Due to the multiple lymph nodes sites that directly drain the prostate, a higher dose of radiopharmaceutical is used compared to the one conventionally used for the other body districts thus potentially carrying a higher risk of personnel radiation exposure. Moreover tracer is directly injected in the tumour trough transrectal ultrasound in a dedicated clinical urology room. Purpose of this study was to measure radiation exposure levels for the staff involved in these procedures. Surface and personal contamination were also measured after tracer administration and surgical dissection. **Methods**: Data from 21 patients were evaluated. According to our internal protocol, dose administration of four doses of 60 MBq of Tc-99m-albumin nanocolloid each was scheduled at midday of the first day, followed by a SPECT 1/2 hours later and dissection at 8.00 am of the following day. Histological analysis of surgical specimens was made starting at least 36 hours from the administration. Radiation exposure levels were measured in contact to the patient and at 50 cm in front of him at the end and 1/2 hours after tracer administration. Exposure levels were recorded in the surgeons, scrub nurse and anesthetistis positions during surgical dissection. Measurements were used to evaluate radiation doses to the staff. **Results:** Immediately after radioactivity administration external exposure rates were 48.6±17.0 microGy/h (range 25-87) and 7.2±1.1 microGy/h (5-10) in contact to the abdomen of the patient and 50 cm in front of him respectively. These values reduce to 17.4±8.0 microGy/h (7-33) and 4.6±1.8 microGy/h (2-8) due to urinary excretion and radioactive decay 1/2 hours after the administration. Exposure levels in the surgical room were: 0.7±0.4 microGy/h for the first surgeon, 0.6±0.2 microGy/h for the second and third surgeons, 0.3±0.1 microGy/h for the scrub nurse and 0.2±0.1 microGy/h for the anesthetistis. The higher dose found was 22 microSv/precedure for nuclear medicine physician hands during administration, while global external exposure was lower than 2 microSv/procedure for all the operators. No surface contamination was recorded in any of the situations. **Conclusion:** external exposure levels in radio-guided detection of sentinel lymph node of prostate cancer are very low and don't represent an added risk for the staff involved.

P0232

Minimising Occupational Exposures : A 2-Yeas Radiation Protection Strategy to Achieve the Goal

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Introduction: Equivalent doses likely to be incurred when dispensing and injecting [^{18}F]-FDG doses manually or when positioning a patient on the scanning bed can be much higher than those involved in conventional Nuclear Medicine (NM). Appropriate shielding devices and handling procedures are required to minimise staff exposures. We purchased an automated PET infusion system MEDRAD Intego™ in 2010. Then in 2011, time-of-flight imaging provided physicians with the opportunity to lower injected doses from 5 to 3 MBq/Kg. The aim of this study was to evaluate the contribution of these measures to staff radiation protection. **Material & methods:** Personal dosimeters (Inlight, LANDAUER Europe) and TLD rings worn on each index (palm side) were used to assess whole-body (WB) exposure and finger doses Hp(0.07) respectively, for both standard NM and PET procedures. WB doses Hp(10) in PET were monitored on a daily basis using electronic dosimeters (DMC2000 XB, Mirion Technologies). We conducted a prospective series of measurements including 5510 NM procedures & 2284 PET scans in 2010, 5440 NM procedures & 2680 PET scans in 2011. Most of FDG doses, 71 % (1623) in 2010 and 84.3 % (2260) in 2011, were administered with Intego™. Average activity per injected dose was 326.15 ± 77.53 MBq in 2010 and 211.04 ± 46.72 MBq in 2011. Other patient doses were dispensed and injected manually. Exposures of 11 radiographers rotating through 3 gamma-cameras and PET/CT were compared to those reported in 2009. **Results:** In 2011 collective WB exposure was 16.6 mSv versus (vs) 21.0 mSv in 2010 and 22.2 mSv in 2009. Average WB dose Hp(10) per PET procedure was 1.7 µSv vs 2.6 µSv in 2010 and 3.2 µSv in 2009. Collective finger dose at the left hand (prevailing) was 264 mSv in 2011 vs 268 mSv in 2010 and 434 mSv in 2009. **Discussion:** Despite an increasing use of PET imaging (31 %), collective WB exposure decreased by 25 % in two years. The use of Intego™ reduced WB exposure per PET procedure by 19 % and the reduction of injected doses by 34 %. Collective finger dose decreased by 39 % since Intego™ has been used. Optimisation of injected doses and automation are key factors in the process of minimising occupational exposures.

P0233

Radiation protection in metabolic radiotherapy with 90Y

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Aim The aim of this work is to describe results obtained in radiopharmaceutical preparation in terms of equivalent dose to the fingertips discriminating between manual preparation (until august 2011) and automatic preparation (from september 2011). Materials and Methods In our lab we prepare 90Y-peptide (90Y-DOTATATE) and 90Y-peptide (90Y-DOTATOC) for metabolic radiotherapy. Radiolabelling was carried out in a dedicated cell for β-emitters. For manual radiolabelling procedures operators used tele-tongs, shielded (PMMA) syringes/vials and wore anti-contamination and anti X-ray gloves, with one TLD dosimeters placed over the fingertips of each hand; for automatic radiolabelling procedures operators used a modular-lab Pharma Tracer module, shielded (PMMA) syringes/vials and wore anti-contamination, with one TLD dosimeters placed over the fingertips of each hand. Results We registered a mean fingertip doses of 0.35 mGy/(radiolabelling) (range 0-2,46 mGy) with a mean administered activity of 2.6 GBq for manual procedures and a mean fingertip doses of 0.09 mGy/radiolabelling (range 0-0.12 mGy) with a mean administered activity of 2.6 GBq; moreover, with automatic synthesis module we registered less synthesis time (50 min. vs. 150 min) and numbers of failed synthesis (5% vs. 30%) . Conclusion With automatic radiolabelling procedures, from the radioprotection point of view, we obtained a considerable dose reduction to the operators, less synthesis time and failures and an overall safety.

P0234

Evaluation of dose exposure of family members involved in treatment with 131I-MIBG of pediatric patients with neuroblastoma

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AIM: The aim of this study was to evaluate the radiation exposure of children's relatives involved in treatment with 131I-MIBG of pediatric patients with neuroblastoma. The children were admitted to an isolation room for 5 days and the persons involved in the therapy were monitored. Radiation protection instructions to be followed during this period were given and accepted. **METHOD:** The effective doses evaluated correspond to relatives of 12 children, with ages varying from 3 to 13 years, who were treated in our Department between 2008 and 2011. Administered activity ranged from 3.8 GBq to 7.80 GBq (mean 7.00 ± 1.04 Gbq), according to weight. The effective dose (whole body dose) was monitored using a digital dosimeter, Bleeper Sv. **RESULTS:** The results of effective dose, administered activity and age group were as follows: Ages between 2 - 5 years: the mean administered activity was 7,19 GBq and the mean relatives effective dose was 0,93 mSv. Ages between 6 - 8 years: the mean administered activity was 6,49 GBq and the mean relatives effective dose was 0,60 mSv. Ages between 9 - 13 years: the mean administered activity was 7,23 GBq and the mean relatives effective dose was 0,56 mSv. The relatives effective doses ranged from 0.017 mSv to 2.80 mSv (mean 0.698 ± 0.675 mSv). There is no correlation between the administered activity and the effective dose (correlation factor = -0.089) and child age and the effective dose (correlation factor =-0.071). **CONCLUSION:** The effective doses of the various family members involved are independent of the child's age and administered activity. It is directly correlated with the time of permanence and the distance from the child. All the effective doses received by family members are inferior to 5 mSv by episode as established by law.

P0235

Radiation dose measurement of staff involved in Holmium-166 preclinical trial.

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Aim: Neutron-actived Holmium-166 (Ho-166) is an excellent radionuclide for internal radiation therapy (Eβmax =1.84 MeV) with an appropriate half life (26.8 hr), that also emits photons (81 keV, 6.2%) suitable to be detect by gamma camera. Preparing and injecting radiopharmaceuticals containing beta/gamma emitting Ho-166 implies the risk of exceeding the upper limit of skin and hand radiation absorbed dose (500mSv/an). The aim of this study was to estimate the effective dose and dose to fingers for the staff that is responsible for dose preparation, dose dispensing and dose injection in Ho-166 therapy. Methods: To estimate the finger dose from external exposure, all members of staff had an electronic sensor worn on the most exposed finger (unfors NED) which provided the dose and dose rate. Personal dose equivalent Hp(10) and Hp(0.07) were measured using an electronic personal dosimeters (APVL EPD MK2) placed on the upper left pocket. During our study, the staff performed 32 therapies with Ho-166. Appropriate radiation safety procedures and shielding were applied at each stage by the staff. In order to reduce radiation exposure during dose preparation, radionuclide was shielded with plexiglas with additional lead layer and radiopharmaceutical formulation was simplified in order to reduce time exposure. Injected dose ranged from 30 to 67 MBq. Results: In this study, the personnel dose equivalent was 14.1 µSv Hp(0.07) and 8.3µSv Hp(10) for 32 prepared and dispensed Ho-166 therapies (total time exposure =11 hours). During injection (n=32), Hp(0.07) and Hp(10) were 4.4 µSv and 1.7 µSv respectively. Finger doses of 5.3 mSv were measured during preparation and delivery of 32 Ho-166 therapies. Finger doses of 182 µSv were measured during injection. Conclusion: The effective dose which is received by staff performing Ho-166 therapies is very low. Nevertheless, finger dose is relatively high even if appropriate radiation safety is applied. Improved efficiency in Ho-166 dose preparation might further reduce dose to staff involved in Ho-166 preclinical trial.

P17-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Physics & Instrumentation & Data Analysis: Quality Control & NEMA

P0236

Determination of the DQE of gamma camera systems using the Monte Carlo technique

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AIM The aim of the present study was to determine the detective quantum efficiency (DQE) of a number of gamma camera systems from different vendors using the Monte Carlo technique and to investigate its dependency on a number of relevant imaging parameters, such as choice of collimator and size and position of the energy window. MATERIALS AND METHODS The Monte Carlo based software SIMIND, simulating a complete gamma camera system, was used in the present study. The modulation transfer function was determined from a simulated ^{99m}Tc point source and was combined with the system sensitivity and the photon yield to obtain the DQE of the system. The simulations were performed using different low energy parallel hole collimators and energy windows where the lower energy threshold were adjusted stepwise and the upper threshold was set to 200 keV. The point source was modeled and positioned at 2 cm depth in a 20 cm cylindrical water phantom and in the middle of phantoms of 20, 30 and 40 cm thickness. As a scalar measure of the imaging properties of a gamma camera system, a figure-of-merit (FOM) defined as the 2D integral of the DQE surface was used. RESULTS The simulated DQE curves agreed well with published data. The highest FOM values were obtained for high sensitivity (HS) collimators, irrespective of imaging depth. For a given gamma camera system, the variation of the optimum lower energy threshold was small and ranged from 126-127 keV at 2 cm depth and 130-132 keV at 20 cm depth, irrespective of collimator type. The simulated DQE curves also showed that general purpose collimators (GP) are favorable over high resolution collimators (HR) in the clinical significant frequency domain (~0.1-0.6/cm). This indicates that high resolution collimators may not always be optimal for detecting small objects because of loss of sensitivity and increasing noise. CONCLUSIONS The Monte Carlo software SIMIND can be used to determine the DQE of a gamma camera system from a simulated point source alone. The results indicate that the highest DQE is obtained using energy windows close to those used typically and that HS collimators in general results in higher DQE than other types of collimators.

P0237

NEMA NU1-2007 based and independent Quality Control software for gamma and SPECT cameras

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***Aim*:** Quality Assurance of gamma and SPECT-cameras requires a careful handling of the measured Quality Control (QC) data. Most manufacturers provide the users with camera specific QC-software, which is indeed a useful tool for monitoring the day-to-day performance of a single camera, but does not provide the user with all the measurements described in NEMA NU1-2007. When it comes to objective performance comparison of different cameras and a deeper understanding of the calculated numbers, the use of camera specific QC-software without access to the source code and technical documentation is rather avoided. Calculations and definitions might differ, and vendor independent standardized results are preferred. For this purpose we have developed a suite of QC-software. ***Materials and Methods*:** The QC-software runs in Matlab. Functions can be called directly in Matlab or with the graphical user interface. A novel method for determining pixel size and the resolution at the collimator's surface based on frequency analysis is presented. A Co-57 flood source with an orthogonal hole phantom (only pixel size) or a bar phantom is used. A detailed comparison between our and a vendor's QC-software of the calculation of the "SPECT Reconstructed Spatial Resolution without scatter" was performed. The measurements were carried out according to the NEMA-protocol with three point sources of Tc-99m or Co-57. ***Results and Conclusion*:** Based upon the NEMA Standards Publication NU1-2007, we have developed a suite of data handling software. The data handling programs are aimed at making the processing of acquired QC-data a simple task, providing the user with instructive images of the data as well as text files containing the results. The software is capable of calculating Intrinsic Spatial Resolution and Linearity, Intrinsic Energy Resolution, Intrinsic Flood Field Uniformity, Multiple Window Spatial Resolution and pixel-to-pixel correspondence (not a NEMA-measurement), Intrinsic and System Count Rate Performance, (Whole Body) System Spatial Resolution, System Planar Sensitivity, System Alignment, System Volume Sensitivity and SPECT Spatial Resolution with and without scatter. The results for pixel size and resolution based on frequency analysis agree well with the NEMA-measurements. It is shown that the accuracy of the applied filtered back projection algorithms differs, and that the differences can be minimized by interpolation of the projection data. It is also shown that the choice of the size and the geometry of the applied volumes of interest around the point sources can have a significant influence on the calculated reconstructed spatial resolution.

P0238

Prompt Gamma Compensation and image quality of I-124 PET

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Objectives: The aim of this study is to evaluate the quality of I-124 PET images with and without prompt gamma compensation (PGC) by comparing the recovery coefficients (RC), the signal to noise ratios (SNR) and the contrasts to F-18 and Ga-68. Methods: For measuring the image quality a phantom (NEMA NU2-2001 PET/SPECT-Phantom of the PTW-Freiburg) was used containing 6 spheres of 10 mm to 37 mm in diameter placed in water. Each sphere was filled with the same activity concentration, determined by a calibrated dose calibrator. The measurements of the "hot" sources without background activity were made with a full 3D PET/CT (Biograph mCT); acquisition times: 2 min for F-18 and Ga-68, 10 min for I-124 (to compensate for the lower I-124 branching ratio). In addition, a bottle (volume: 75 ml) filled homogeneously with activity was scanned. To reconstruct the images the iterative algorithm trueX was applied (3 iterations, 24 subsets, Gaussian filter with a FWHM of 2 mm). The I-124 images were reconstructed with and without PGC. In order to calculate the RC the activity concentration measured in each whole sphere was used. To determine the background activity concentration a spherical volume of interest was placed between the spheres. Results: For the 4 largest spheres all isotopes show the same behavior. F-18 reaches the best recovery values (89%). I-124 reaches 86% to 87% recovery (difference using the PGC < 3%). The RC of Ga-68 is the smallest (80%). For the two smallest spheres the RC for I-124 and Ga-68 is much smaller than the RC of F-18 whereas I-124 showed the lowest values. The SNR and the contrast decrease for the smaller spheres. For each sphere the SNR of I-124 with PGC is 3 to 4 times larger than for F-18 and ~ 2 times higher than for Ga-68. The contrast of the I-124 images with PGC is 1.5 and 2 times higher than the contrast of Ga-68 and F-18 each. There was very low background activity in the I-124 images without PGC which most probably originates from an overcorrection of the scatter contribution. Due to this low background, the SNR and the contrast without PGC were much higher than with PGC. Conclusions: For I-124 there is no influence on the RC if the built-in PGC is used or not. However, there are considerable differences with respect to the I-124 image quality.

P0239

GammaQUAL, a new set of ImageJ plugins for the quality control of homogeneities and COR offsets of gamma cameras.

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Aim: Integral and differential uniformities and center of rotation (COR) offsets are important parameters to be determined in the quality control of gamma cameras. Their calculations are usually performed with different softwares provided by the manufacturers. However, mainly for homogeneity reasons, medical physicists should ideally work with identical algorithms. Our aim was to develop a code for the calculation of the parameters mentioned above, considering the following constraints: 1. Made available to the medical physicists community 2. User-friendly 3. Working for all types and brands of cameras 4. Easily adaptable to requirements of the legislation **Material and method:** We thus present a new set of plugins (called GammaQUAL) for the calculations of uniformities and COR offsets characterizing gamma cameras. Our algorithms implement recommendations by the NEMA NU 1-2007 and allow a direct and easy analysis of the DICOM images acquired during a quality control. For the purpose of our work, the use of the *ImageJ* platform was ideal because several reasons: (i) it provides a large panel of image processing techniques; (ii): it is compatible with DICOM images and; (iii): it allows the development in open-source of java plugins that are compatible with all operating systems. **Results:** As first validation, we have checked the reproducibility of our results and have compared them to the values derived from two softwares widely used in nuclear medicine services (namely, Hermes and Micas). For the homogeneity indexes, we observe a good coherence between the three datasets even if small but significant differences are sometimes observed. Most of these differences are ascribable to different interpretations of the protocols and algorithms. For the COR offsets, we find that values derived from Hermes strongly disagree with the results of GammaQual and Micas. Such differences can lead to the rejection of a given camera by Hermes, while it is not the case when using the GammaQUAL or Micas codes. **Conclusions:** We have developed a new code (GammaQUAL) for the processing of DICOM images acquired during the quality control and the evaluation of the uniformities and the COR offsets of gamma cameras. The comparison of our results with those derived from Hermes and Micas highlights the necessity to provide more detailed algorithms and the interest to develop new codes that should be ideally validated by national agencies. **Key words:** Gamma camera, quality control, COR, homogeneity, ImageJ plugin

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Physics & Instrumentation & Data Analysis: Standardisation

P0240

Monte Carlo modelling provides accurate calibration factor for radionuclide activity meters

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Aim. In this work we developed and validated a Monte Carlo model of a radionuclide activity meter using the Geant4 simulation toolkit. **Materials and Method**. The modelled activity meter Talete (NEM, Ferrara, Italy) is a CE marked medical device used in the radiopharmaceutical preparation process, designed to offer state-of-the art performance. Geant4 is the CERN Monte Carlo simulation toolkit, increasingly applied in the medical field thanks to the continuous improvements in the field of low-energies. All the geometrical elements and materials of the ionizing chamber were accurately modelled. In this setup the modelled radioactive sources can be customized and located inside the detector, simulating a known activity. Calibration factors could be evaluated based on the energy deposited in the detector. The model was validated comparing simulations and measurements of a set of reference sources: ^{137}Cs (24.3±1.5% MBq at time of measure), ^{133}Ba (1.5±1.5% MBq), ^{131}I (71.5±1.5%), ^{57}Co (74.4±3%), ^{68}Ge "mock ^{18}F" (13.1±1.25%) and ^{99m}Tc (141.5 $\pm$ 5.0 %). The container of each source and the correct filling were suitably modelled with Geant4. In case of a double container, such as the source of ^{133}Ba (a glass ampoule enclosed in a plastic vial), a 45 µm resolution-CT scanner was used to evaluate the thickness of the walls. The entire decay scheme of each radionuclide was included in the simulations, including low-energy X-ray emission and the energy spectrum of beta particles. Enough disintegration events were simulated in order to get to a statistical error below 1%. The results of the simulations were normalized to the response of the modelled ^{137}Cs source. The dependence of the sensitivity versus position of the source was also assessed in a range of 15 cm. **Results.** An high accuracy energy - response curve for the activity meter was calculated, allowing for prediction of an initial calibration factor for new radionuclides. In the benchmark against known standards, the ratio between simulated and measured response was: ^{133}Ba 1.009±0.012, ^{68}Ge 1.030±0.018, ^{131}I 0.973±0.016, ^{57}Co 0.987±0.035, ^{99m}Tc 0.976±0.049. The sensitivity-position curve gave 3% as a maximum discrepancy. **Conclusion.** An accurate model of a widely diffuse activity meter has been validated for a variety of gamma-emitting nuclides, covering a wide range of energies and source positions, showing discrepancies below 3% for all the tested sources. Monte Carlo simulation with Geant4 proved to be a powerful tool for assessment of activity meter's calibration factors for radionuclides commonly used in radiopharmacy facilities.

P0241

Calibration of Traceable Solid Mock I-131 Phantoms Used in an International SPECT Image Quantification Comparison

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Objectives: As part of a Cooperative Research Project entitled "Development of Quantitative Nuclear Medicine Imaging for Patient Specific Dosimetry", the IAEA has organized an international comparison to assess SPECT image quantification capabilities in 12 countries in different regions around the world. Iodine-131 was chosen for the comparison because of its wide global use, but for logistical reasons solid Ba-133 sources were used as a long-lived surrogate for I-131. For this study, each participant was to receive a set of phantoms having 4 different volumes, each with traceable activity calibrations so that the results could be properly compared. The reported values were to be activity concentration of the phantom sources in terms of both Ba-133 and I-131 as determined from their own image quantification methods. This presentation will discuss the method we have developed for individually calibrating the sources for Ba-133 activity and relating them to equivalent activities of I-131 based on national standards. Materials and Methods: The sources are similar to the solid Ge-68 cylinder sources for PET that we have reported on previously, but have several design improvements, including a large diameter source that is free of partial volume effects for most scanners. The Plexiglas cylinders are used with a Jaczszak phantom and have fixed lengths and varying diameters for volumes ranging from 2 to 23 mL. Nominal activity concentrations were 200 kBq/g for all but the largest volume, which was 50 kBq/g. Each source was calibrated for total activity using 4π ionization chambers and γ-ray spectrometry systems that had been calibrated in the same geometries using standardized Ba-133 and I-131 solutions. Correction factors for geometry and

composition were calculated by Monte Carlo and verified experimentally. Results: The methodology developed allows for the activity calibration of each individual Ba-133 source with a standard uncertainty of 0.8 % for the largest sources and 1.3 % for the 2 mL cylinders. Excellent agreement for total activity and activity concentration was achieved between the two detection methods. Within each volume set, the standard deviation on the activity concentration was only 0.2 % to 0.5 %. Conclusions: The low uncertainties on the traceable activities obtained with this method allow for more powerful analysis of image quantification uncertainty components. The image quantification trial is underway and will provide information on the comparability of image quantification schemes used around the world.

P0242

PET imaging protocol variations in international clinical practice in lymphoma patients

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The requirement for standardization of PET methods across various centres using different imaging platforms has been a potential obstacle to the use of PET biomarkers in clinical trials especially using semi-quantitative methods and subsequent clinical implementation. The purpose of this retrospective analyses was to assess the variation in PET methods in routine clinical practice at large centres in patients with lymphoma worldwide. A total of 17 centres in Australia, Denmark, France, Israel, Italy, Poland, UK and US contributed patients to the International Validation Study (IVS) for the retrospective review of PET-CT scans performed between 2007-2009 following the routine local PET/CT protocol. Of 522 assessable scans, DICOM header data were confirmed for patient weight (n=431), height (n=268), uptake time (n=474), injected activity (n=472). Injected activity was 359±85 MBq (range 85-699); some centres scaling it to body weight others using a fixed activity. Effective dose, calculated from ICRP, was 6.85±1.57 mSv. Uptake time was 82±35 min (range 21-422). There was normal distribution of uptake time over the 55-100 min range, with only 30% of patients acquired in the standard 60±10 min range. This study demonstrated that there is a wide variation in clinical practice regarding administred activity for PET applications in lymphoma patients. A significant percentage of scans did not have DICOM header information that is essential to measure SUV (18%) or SUL (49%) or to review the images in a consistent way using an SUV scale. The publication of EANM guidelines for tumour imaging recommending standardization of PET methods is timely (Boellard 2010). Implementation of such recommendations should be expidited for PET to be validated as a response surrogate in lymphoma in the light of our results.

P0243

Optimization of Breast Specific Gamma Imaging protocols with a Contrast Detail phantom

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Breast cancer is one of the most common forms of cancer with a good prognosis if detected early. Breast Specific Gamma Imaging (BSGI) is a diagnostic imaging method that uses Sestamibi-labeled Tc-99m to track down malignant lesions in breast tissue. The BSGI protocol at our institute consists of acquisition of 8 minute static views after injection of 740 MBq of sestamibi-Tc-99m, leading to a patient dose of 5.9 mSv. The aim of this work is to minimize patient dose for BSGI without compromising diagnostic image quality. METHODS&MATERIALS: BSGI exams at the St. Antonius hospital were performed with a Dilon 6800 BSGI gamma camera. To investigate the contrast resolution properties within the range of relevant clinical acquisition parameters, a contrast-detail phantom was build. The hotspot sizes of the phantom were 2,3,4,5, 7.5 and 10 mm, respectively. The phantom was filled with 10MBq 99m-Tc. Acquisition was performed dynamically with a general purpose collimator and repeated with a high resolution collimator. From the dynamic images, static images were derived with varying acquisition durations. We evaluated the images both visually and by means of a ROI analysis from which we obtained the time development of contrast-noise-ratios (CNR) based on either maximum or mean ROI values. A hot-spot was defined to be detectable if its CNR exceeds 4. RESULTS&CONCLUSIONS: Good correspondence was found between visual evaluation of the phantom data and CNR analysis using the max value within the Rois around the nodes. The high-resolution collimator gave comparable results to the general purpose collimator for acquisition times of 8 minutes. The two biggest nodes of the phantom became visible after imaging times as short as 1 minute. Phantom nodes with a diameter as small as 3mm became visible, for the higher contrasts, with variable acquisition times up to 8 minutes. The 2mm nodes remained undetectable or invisible for all acquisition times. Our results suggests that reducing the patient dose by a factor of 4 could be achievable whilst maintaining an equal detectability for nodes larger than 7.5 mm and a reduction by a factor of 2 for an equal detectability of nodes larger than 5 mm. In this case the detectability of smaller nodes would be reduced. To more thoroughly evaluate the possibility of dose reduction, in the clinical setting, we have started a patient study in which views are acquired dynamically, and analysis will be performed in the same manor as our phantom study.

P19-1Sunday, October 28, 2012, 16:00 - 16:30, Poster Exnibition Area

Physics & Instrumentation & Data Analysis: New & Innovative

P0244

Quantification of the total lung HU and the total lung SUV in normal lung with 18F-FDG-PET/CT: a multivariable analysis

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Purpose Evaluation of inflammatory lung diseases in PET with 18F-FDG-PET/CT has been based on the focal evaluation using region of interest (ROI). We developed software to evaluate the total lung density (HU) and FDG uptake (SUV) in collaboration with Siemens Japan. The goal of this study was to build the normal data base for quantitative diagnosis of inflammatory lung disease. Methods We enrolled 81 healthy subjects that did not have abnormality on chest X-rays and a respiratory function test. We measured SUV, HU and lung volume in total lung by software. We conducted univariate and multivariate analysis about association of age, sex, height, weight, body mass index (BMI), blood glucose level, Brinkman index, smoking, lung volume, percent-predicted forced vital capacity (%FEV) and percent predicted forced expiratory volume in 1 second (%FVC) in both SUV and HU. In addition, we evaluated association between HU and SUV. Result In SUV, the significant factors were weight, BMI, Brinkman index, %FEV, %FVC, lung volume, smoking and HU. In HU, the significant factors were age, weight, BMI, %FEV, %FVC, lung volume, and SUV. BMI and HU were identified as significant factors for total lung SUV by stepwise multiple regression analysis ($P < 0.01$). Also, significant factors of total lung HU were age, lung volume and SUV ($P < 0.01$). Conclusions We have successfully developed a normal data base of the lung total HU and total SUV. Among normal subjects, various factors affected these indices such as smoking, BMI, age etc. Our new methods may be useful for quantitative evaluation of inflammatory lung disease with FDG-PET/CT.

P0245

Feasibility Study of a Time-of-Flight Dual Photons Emission Computed Tomography (TOF-DuPECT) System: A Monte Carlo Simulation

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Aim: A significant amount of research has focused on improving the time resolution of the scintillation crystal to achieve better time-of-flight capability. For the last three decades, extensive research has been done on time-of-flight positron emitter tomography (TOF-PET), but none applied TOF information on non-positron emission tomography functional imaging. In this study, we propose a novel system namely time-of-flight dual photons computed tomography (TOF-DuPECT) that reconstructs tomography images from data generated by dual-photons radionuclide, e.g., ^{75}Se, ^{111}In, ^{48}Cr. The purpose of this research is to assess the feasibility of TOF-DuPECT. **Materials and methods:** The simulations were performed by an in-house developed SimGATE Monte Carlo code which was the integration of SimSET and GATE simulation code. A PET with fast temporal resolution was used to detect the coincidence of the two photons with no directional correlation emitted from ^{75}Se. TOF information was analyzed to determine the source location. The difference of the arriving times of the two photons can be used to calculate their flying distances' difference. The possible locations of the emitter are on the hyperbola with the positions of the detector pairs as their focus. After numerous events, we used image reconstruction to obtain the distribution of the sources. All images were reconstructed by simple back-projection method. The radioisotope used is ^{75}Se which has a half life of 120 days and emits two angularly uncorrelated photons. The half-life of isotopes' energy levels was also taken into account in the simulation. **Results:** The simulation result showed that the spatial resolution in the central field-of-view was around 30 mm for a time resolution of 50 ps, and the sensitivity was 0.82%. There exist a strong relationship between coincidence resolving time and spatial resolution. **Discussion & Conclusion:** The preliminary Monte Carlo simulation study indicates that the TOF-DuPECT technique is feasible and able to provide high sensitivity with acceptable spatial resolution, on account of elimination of collimators. Real-time imaging can be achieved by TOF-DuPECT under suitable resolving time. The main

limitation of this study is that a fast coincidence resolving time of detector is required. With the improvement of detector with time, future implementation and application for TOF-DuPECT is promising.

P20-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Molecular & Multimodatliy Imaging: PET/CT

P0246

Intraoperative Somatostatin Receptor Detection after Peptide Receptor Radionuclide Therapy with 177Lu and 90Y DOTATOC (TANDEM PRRNT) in a Patient with a Metastatic Neuroendocrine Tumor

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The aim is to present the results of the first intraoperative somatostatin receptor detection after **peptide receptor radionuclide therapy (PRRNT)** with ^{177}Lu-DOTATOC and comparison with the findings of the pre-operative ^{68}Ga-DOTATOC PET/CT in a patient with a metastatic neuro-endocrine tumor (NET) of the ileum. **Material and methods**: A 56 year-old female patient, treated already twice by PRRNT, was admitted for the 3rd PRRNT cycle and subsequent surgery. Preoperative studies: ^{99m}Tc-MAG3+TER, ^{99m}Tc-DTPA+GFR, MRI of the abdomen, **^{68}Ga-DOTATOC PET/CT,** ^{18}F-fluoride PET/CT, abdominal ultrasonography and tumor markers. TANDEM PRRNT was performed using 3000 MBq ^{90}Y-DOTATOC and 6000 MBq ^{177}Lu-DOTATOC. WB scintigrams were performed after 23 h and 43 h. **Five days after PRRNT, the patient was operated and a gamma probe was used for guiding the surgeon.** Immunohistochemistry and pathohistology of the resected tissue were performed. **Results**: **^{68}Ga-DOTATOC PET/CT:** The primary tumor in the ileocoecal region as well as bilobular liver metastases and a right iliac bone lesion (osteoblastic on ^{18}F-fluoride PET/CT) were detected. Compared to previous findings, there was good therapy response (partial remission of the tumor lesions). On MRI, partial regression of the liver metastases was present. Renal scintigraphy (MAG3), GFR and TER were normal. In serum, chromogranin A (836 µg/l; n<100) and serotonin (852 µg/l; n<200) were strongly elevated. TANDEM PRRNT was very well tolerated by the patient. Post-therapy scans showed intensive tumor uptake. **Intraoperative gamma probe:** The primary tumor, liver metastases, but also bilateral ovarian metastases were detected which had not been visualized by ^{68}Ga-DOTATOC PET/CT. Bilateral adnexectomy, right hemi-colectomy, excision of hepatic metastases in S3 and partial resection of the peritoneum was performed. Histopathology confirmed metastases in both ovaries. **Conclusion**: Intraoperative somatostatin receptor detection of primary NET and metastases after Lu-177 PRRNT is feasible and more sensitive than ^{68}Ga-DOTATOC PET/CT. This technique might aid the surgeon to achieve more complete tumor resection by intraoperative detection of very small lesions (< 5 mm) directly after PRRNT.

P0247

First results of a comparative, prospective 11C-acetate and 18F-fluorocholine PET/CT study in prostate cancer patients relapsing after curative treatment with low PSA

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Aim: ^{18}F-fluorocholine (FCH) and ^{11}C-acetate (ACE) PET/CTs have shown promising results in the detection of recurrent prostate cancer (PC). We present preliminary results of a comparative PET/CT study of both radiotracers in the same patients presenting at recurrence with low PSA values, i.e., PSA≤3 ng/ml after radical prostatectomy (RP) alone or RP combined with salvage radiotherapy (RT) or PSA≤5 ng/ml after exclusive RT. Patients and Methods: We studied 12 PC patients, mean age 66 ±7 years, recurring after RP alone (N=5, mean PSA at PET 1.0±1.1ng/ml), RT alone (N=2, PSA=2.8 and 3.2ng/ml, respectively) or RP with salvage RT (N=5, mean PSA=2.5±0.8ng/ml). Both FCH and ACE PET/CTs (Siemens Biograph64 or Biograph16) were performed in these patients in a randomized sequence a mean of 4±3 days apart using twice low dose CT (4.5mSv). FCH PET/CT (309±21 MBq) was started at injection with a 10 min dynamic acquisition on prostate region, followed by whole-body PET (mid femur to skull) and late (45min) imaging of the pelvis. ACE PET/CT (986±82 MBq) was performed as dual whole-body PET starting 5 and 22 minutes post injection, respectively, and a late view (45min) on prostate region. PET/CTs were blindly reviewed by 2 independent groups of 2 experienced nuclear medicine physicians each. Results: ACE and FCH findings were concordant for all patients concerning local status and distant (bone) metastases. In particular, positive, negative and doubtful local status were observed in 4, 7 and 1 patients, respectively. In the latter a focal hyperactivity was equivocal since it could be either normal rectal activity or a perirectal recurrence. Two patients showed a single bone metastasis, confirmed by bone scintigraphy; however, in one case ACE uptake was positive but at low SUV while FCH SUV was much higher. Concordant lymph-node results were observed in 7 patients (4 positive, 2 negative, 1 equivocal, respectively) while differences between both PET/CTs were observed in 5 patients. Further concordant hyperactivities were observed in 2 patients concerning once the thyroid, currently investigated, and once the pituitary gland (surgically removed macroadenoma). Conclusions: ACE and FCH PET/CT performed equally regarding local recurrences. Bone metastases were positive in 2 patients, both unique, but showed a different uptake in 1 patient with a higher FCH SUV. Discordant results were observed for lymph node status in 5 of 12 patients. Current follow-up is too short to provide a gold standard regarding the differences observed between ACE and FCH PET.

P0248

A double-threshold method for FDG-PET tumour delineation appropriate for radiotherapy planning

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ABSTRACT Aim PET plays an important role in accurate delineation of the gross tumour volume (GTV). Various PET-based tumour delineation approaches are proposed in literature, but are often too complex to implement in clinical practice. The aim was to investigate a double-threshold method for FDG-PET tumour delineation that can straightforwardly be applied in radiotherapy planning. **Methods** FDG-PET imaging (Biograph 40 TrueV, Siemens) was performed on 29 consecutive lung cancer patients with 37 tumours. A double-threshold method was applied to obtain two PET tumour contours, based on percentages of the maximum pixel value. Under super vision of experienced nuclear medicine physicians, percentages were varied from 10-65% to obtain an inner contour that only encloses tumour tissue and an outer contour that fully excludes tumour tissue. Analysis was performed per tumour group (small-sized, round-averaged-sized, lobed-large-sized and tumours with necrosis), by determining the distance between the contours. Results were compared to margins applied in radiotherapy plans. **Results** Average threshold percentages were 46% and 26% for the inner and outer contour, respectively. For small-sized and round-average-sized tumours (73% of cases) the distance between the contours varied from 2 to 6 mm, which was within margins used in radiotherapy. For necrotic and lobed-large-sized tumours the distance was significantly larger, in all cases > 5 mm, and strongly depending on tumour shape. **Conclusion** The double-threshold method can straightforwardly be applied in radiotherapy planning and has a built-in quality control check. Hence, it has more potential in treatment of lung cancer patients than the historically used single-threshold method. In majority of cases, application of double-thresholding is sufficiently accurate to automatically define the GTV and can speed up delineation in radiotherapy-planning.

P0249

Quantifying 11CO2 exhaled during 11C-acetate PET-CT scans, and minimising detriment to staff, environment and image

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Introduction: Addenbrooke's PET-CT Unit uses ^{11}C-acetate scans to assess changes to myocardial metabolism in response to trialled drugs. The metabolised tracer is exhaled as $^{11}CO_2$ and extracted via the aircon system. This study was designed to quantify the $^{11}CO_2$ exhaled by the patient, extracted by the aircon, and inhaled by staff. We also attempted to trap the gas to minimise detriment to staff and the environment as well as to the image from extraneous activity in the field-of-view. **Methods:** Four studies were performed with injected activity 317±37 MBq. Gaseous emissions were measured by a calibrated stack monitor attached to the air vents. Following two of the studies the patient breathed for three minutes into valved tubing via soda-lime to absorb the exhaled $^{11}CO_2$. This was then measured in a whole-body-counter (WBC). After two of the studies the assisting technologist was measured in the WBC. For the last study we designed a system to absorb the $^{11}CO_2$ during the 10-min scan by drawing it via a funnel into a cylinder vacuum cleaner with soda-lime in the filter and barrel. The apparatus was measured in the WBC. **Results:** The stack monitor recorded a mean of 13.6±0.8 MBq $^{11}CO_2$ extracted to the environment. This was double our prior estimate for the EPR application (based on published data). The breathing apparatus collected 0.21±0.03% of the injected activity per minute. Assuming 100% collection and constant rate of metabolism/exhalation, 14% of the injected activity was exhaled over the first hour. 15 minutes after a 4-minute exposure to the patient, the WBC staff

measurements showed approximately 0.1 kBq in each person. The figure does not account for decay, attenuation or re-exhalation following exposure. The vacuum system collected a disappointing 0.3% of the injected activity. **Conclusions:** Our EPR limits for ^{11}C gaseous emission will be exceeded at the current rate. Staff working in close proximity are inhaling an unnecessarily high quantity of activity. Therefore current work is focused on improving the vacuum system to maximise metabolite trapping for safe decay. This will also reduce $^{11}CO_2$ activity in the FOV. The risk to staff from exposure to the patient will be modelled in detail to determine whether further measures are required. We are now keeping patients in the imaging room for 2 hours p.i. (while waiting for an FDG scan) to minimise staff exposure and to ensure that all gaseous emissions are accounted for by the stack monitor.

P0250

FDG-PET/CT finding of seminal vesicle reflux after transurethral resection of prostate (TUR-P)

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Aim: Transurethral resection of prostate (TUR-P) is a standard operative procedure for patients with benign prostrate hypertrophy. Seminal vesicle reflux is one of the complications from TUR-P. We investigated FDG-PET/CT finding of seminal vesicle reflux after TUR-P. Materials & methods: We enrolled 61 male cases (mean age: 77.5±5.9 years) who had the past history of TUR-P and were undergone 2-[^{18}F]fluoro-2-deoxy-D-glucose (FDG)-PET/CT at our hospital from July 2009 to March 2012 in this study. All patients fasted for at least 5 hours before FDG injection. FDG-PET/CT was performed 60 minutes after FDG injection (3MBq/kg body weight) using a PET/CT scanner. All patients urinated just before PET/CT scan. PET was acquired from the head to thigh for 120 seconds per frame. PET data were collected in 2D acquisition imaging mode and reconstructed with ordered-subset expectation maximization algorithm. The CT data on PET/CT was used for attenuation correction and anatomical localization. Two double board-certified nuclear medicine physicians and radiologists visually interpreted the FDG-PET/CT images with reference to PET/CT fusion and CT images and checked abnormal finding (uptake : filing with urine containing FDG) at seminal vesicle by consensus reading. Results: In 5 cases of 61 (8.2%), abnormal findings were visualized at seminal vesicle. As all abnormal uptakes of seminal vesicle were as high as those of urine (bladder), it was thought reasonably that the abnormal uptakes were caused for seminal vesicle reflux. At 3 of 5 in which abnormal findings were found, the uptakes located at right seminal vesicle, and at 2 of 5 located at left seminal vesicle. Conclusion: Since TUR-P may give rise to abnormal uptake at seminal vesicle for seminal vesicle reflux and cause false positive findings, it should be careful to avoid misleading for the patients after TUR-P.

P0251

Anatomical and Functional Imaging of Cholangio-carcinomas using quantitative and semi-quantitative parameters

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Introduction: Cholangiocarcinoma is a rare but highly fatal tumor. It is the most common primary malignancy of the biliary tract. The incidence of intrahepatic cholangiocarcinomas is increasing worldwide. Complete surgical resection is the only therapy for a cure. Unfortunately, only 10% of patients present with early stage disease and are considered for surgical resection. Chemotherapy and radiotherapy have been ineffective for patients with inoperable tumors. Materials and Methods: Several anatomical imaging modalities like US, MRI and CT are used for pretreatment staging. We evaluated the impact of functional imaging using fluorodeoxyglucose positron emission tomography (FDG PET) using semi-quantitative parameters and compared these with quantitative parameters on a CT scan, and assessed if they correlate to to AJCC 7th edition of staging of cholangiocarcinomas. We evaluated 42 patients with cholangiocarcinomas. 13 patients were eligible for analysis having had a pre resection/prechemotherapy 18F-FDG PET-CT. 8 female/ 5 male, with mean age of 60.6(55-84). 10 were mass forming and 3 were intraductal cholangiocarcinomas. PET images were evaluated visually for the presence of FDG uptake, pattern of FDG uptake and semiquantitative parameters were extracted by drawing a VOI(volume of interest) over the tumor and noting SUVm, SUVav, 3D volume, SUVm/Mediastinal blood pool ratio reference. The presence or absence of necrosis and any local or distant metastases was also noted. A companion CT without contrast was evaluated for maximum HU (Max NonCon HU) by drawing an elliptical ROI. 11/13 patients had a CT scan with contrast available for evaluation, and Max Contr HU was noted for these patients. All lesions were evaluated histopathologically. Results: Females had higher SUVm values than males (mean SUVs for females=13.5, for men =7.6). Females were mostly stage 1 while males were more stage 4 (Figure). We did not find any positive correlation between SUVm and stage of cancer. There was no correlation between HU (on non contrast and contrast scan) and stage of cancer. SUVm was found to correlate with a composite variable of Max NonCon HU and Gender ($p<0.0177$). A ratio of Maxcontrast to Max noncontrast HU did not show a significant correlation with SUVm. Neither did MaxContrast HU when evaluated independently. Conclusion: No significant correlations could be found between SUVm and other morphological variables, at the exception of a composite variable of Max NonCon HU and Gender. Further evaluation in a larger sample is required.

P0252

Estimation of the amount of tumor stroma as a prognostic factor for pancreatic cancer using FDG-PET

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Objective FDG-PET provides quantitative information regarding the tumor glucose metabolism which is useful for the clinical diagnosis of tumor diseases. It is said that the amount of tumor stroma correlates with prognosis of patients with cancer. FDG accumulates in cancer cells but does not accumulate so much in stroma tissues. So cancer tissue with abundant stroma might show relatively lower accumulation of FDG than that with scanty stroma. We estimated the amount of tumor stroma with FDG-PET (STR_{PET}), and evaluated prognosis of patients using STR_{PET} after surgery of pancreatic cancer. Methods Sixteen pre-surgery patients with either proven or suspected primary pancreatic cancer underwent FDG-PET/CT. The pathologically confirmation found out 13 malignancy in all cases. The STR_{PET} in tumor was evaluated for the 13 cases with the following equation: STR_{PET} = [Mean value of spherical VOI of 10mm in radius with SUV_{max} in the center of it] / [SUV_{max}] The tumor with abundant stroma might be low STR_{PET}, because the tumor cell accumulates FDG avidly but stroma does not so much. According to pathological findings, the stroma of tumors (STR_{patho}) were quantitatively classified in the following 3 types (Scirrhous type: abundant stroma, Intermediate type: a type intermediate between the scirrhous type and the medullary type, and Medullary type: scanty stroma). The STR_{PET} were statistically compared with STR_{patho} using the Mann-Whitney's U test. The 1-year disease-free survival (DFS) and overall survival (OS) for STR_{PET} and STR_{patho} were calculated using Kaplan-Meier method. Results There is no patient with Medullary type in our cases. Statistically-significant difference was observed in STR_{PET} between Scirrhous type and Intermediate type ($p<0.04$). Scirrhous type has a lower STR_{PET} than Intermediate type. The patients with $STR_{PET}<0.7$ or scirrhous type had markedly lower 1-year DFS rate than those with $STR_{PET}\geq0.7$ or intermediate type (0% vs. 50% $p<0.03$, 0% vs. 57% $p<0.01$). The patients with $STR_{PET}<0.7$ or scirrhous type had markedly lower OS rate than those with $STR_{PET}\geq0.7$ or intermediate type (0% vs. 50% $p<0.05$, 0% vs. 57% $p<0.03$). The STR_{PET} could make a prediction of prognosis with FDG-PET. Conclusion We think that STR_{PET} could estimate the amount of tumor stroma, It is useful for predicting prognosis of the patients with pancreatic cancer.

P0253

State of the art 'one-stop' percutaneous PET-CT guided biopsy : a new local experience

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Introduction PET-CT using 18F-FDG has been widely employed in cancer detection, staging, restaging and non-neoplastic applications like in infection, inflammation, cardiology and neurological diseases. Another unexplored feasibility of PET-CT application is in providing guidance during percutaneous biopsy. We share our experience in performing PET-CT guided biopsies in two patients who underwent several episodes of unsuccessful percutaneous guided biopsy using conventional modalities . We illustrate in detail the step-by-step procedure in obtaining sufficient tissue sample during 18F-FDG PET-CT image acquisition. Methodology We performed PET-CT guided biopsy in two patients presented with anterior mediastinal mass at Centre for Diagnostic Nuclear Imaging, Universiti Putra Malaysia. Contemporaneous contrasted CT during PET-CT imaging performed to map the most suitable entry point avoiding vital structures. We aimed at the highest FDG uptake area in both cases. The procedure was successfully accomplished under aseptic technique using 16-gauge trucut biopsy needle with local anaesthesia. Results Taking high precautions, a single puncture was carefully performed in each patient. The biopsy yield from the procedures were successful. The results came back as aggressive thymic tumour and T-Cell lymphoma. There were no complications observed in both patients in post procedure period. Soon after confirming the diagnosis, both patients received appropriate treatment and successfully completed 6 cycles of radiotherapy. Conclusion Our study showed percutaneous PET-CT guided biopsy, a simple but superior technique, can be successfully performed for tissue samples in view for early diagnosis. The technique

can be recommended in selected cases to optimize the utilization of both modalities in a 'one-stop' session.

P0254

Multimodality imaging PET-CT using 18F-labeled 2-deoxyglucose (FDG) ensures effective treatment delivery by improving the staging of head and neck malignancy

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Introduction Accurate staging of head and neck malignancy is important. Initial clinical assessment of cancers in this region is complicated by the complexicity of regional anatomy. Since conventional imaging is limited by size, location and morphological changes of lesion during post-operative or therapy periods, we conduct this prospective study to demonstrate the initial staging discrepancy between clinical and FDG PET-CT, highlighting the percentage of management change during initial staging. Methodology The study was conducted upon local institutional ethic approval. 30 patients were recruited between February 2010 till March 2012 from ENT clinic of Serdang Hospital and Clincal Oncology Unit of University Malaya Medical Centre Kuala Lumpur. All patients were clinically assessed and staged using the American Joint committee on cancer [AJCC] TNM staging. All patients also underwent whole body 18F-FDG PET-CT study at the Centre for Diagnostic Nuclear Imaging of Universiti Putra Malaysia. The diagnosis of all lesions were histologically confirmed. Staging from clinical conclusion was compared with staging using FDG PET-CT imaging findings . The percentage of management changes were recorded from the discrepancies. Results There were 17 chinese , 12 Malay and 1 Indian ethnicity. The mean age is 49.9± 14.5 with initial and second peak age incidence of 30-39 year old and 60-69 year old. Nasopharyngeal carcinoma was the commonest malignancy (56.7%). FDG PET-CT improves sensitivity and accuracy in detecting head and neck malignancy in comparison with clinical assessment at 96% and 93% from 89.2% and 86.7% respectively. The T and N-stage were altered in 63% of cases while there was no management change in the remaining 27% . There were 27 true positive cases, 1 false positive and false negative cases and 1 true negative case found on PET-CT. The negative predictive value from clinical assesment was lower than PET-CT imaging. Conclusions Multimodality imaging using 18F-labeled 2-deoxyglucose PET-CT improves initial clinical staging thus ensuring effective treatment delivery in head and neck cancer patients.

P0255

The value of functional imaging in monitoring anti-tuberculosis treatment using 18F-FDG PET in comparison to morphological 3-dimensional CT changes.

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Introduction Effective treatment delivery is desireable in tuberculosis infection. CT characteristic and clinical parameters have been used in confirming the diagnosis and following treatment with acceptable limit of 10mm diameter in cases of nodal involvement measured in transverse and longitudinal axis. Chronic granulomatous inflammatory conditions such as TB is known to demonstrate high FDG activity in PET-CT with acceptable cut-off SUVmax of 2.8 at our centre. Thus, the objective of this study is to evaluate lesion respond to anti-TB treatment using CT characteristics and functional evaluation using SUVmax on 18F-FDG PET in comparison to post treatment clinical outcome. Methodology This study compare the results of 16 PET-CT studies performed on 8 patients before and after anti TB treatment at Centre for Diagnostic Nuclear Imaging, University Putra Malaysia. All patients received DOT regime for at least 6 months duration and clinically assessed through general physical conditions and blood inflammatory markers at diagnosis and follow up. They had 18F-FDG PET-CT study twice with a total of 19 lesions found at imaging. The metabolic activity in SUVmax, size of lesions in 2-dimensional and 3-dimensional measurement were recorded. Lesions were categorized as complete or partial/non responding depending on complete physical and metabolic disappearance including nodal size measuring less than 1 cm in diameter . Partially responding lesions are categorized as SUVmax less than 2.8 or lesions measuring >1 cm in diameter on CT scan. The accuracy of each method was assessed in comparison with final clinical outcome and/or infection parameters. Results The average time for repeat 18F-FDG PET-CT imaging is 6.6 months. The mean SUVmax of TB lesions before treatment is 7.0. Following treatment the mean SUVmax reduced to 1.4 On CT scan, the average diameter of lesions prior to treatment on 3D measurement are 22.6, 27.0 and 38.6 mm. Following treatment, the average diameter decreased to 13.3, 13.2 and 21.1 mm respectively. 3D measurement demonstrate higher false negative in depicting non responders compared to 2D measurement. SUVmax is more sensitive in depicting treatment responders. The overall accuracy was similar with higher NPV for SUVmax in excluding residual infection (71% and 63.6% respectively). Conclusion Our study highlight the importance of z-axis as an additional parameter to be included in measuring respond to anti-TB treatment. Thus, diagnostic informations from integrated imaging system 18F-FDG PET-CT can provide useful combined informations with higher accuracy in navigating anti-TB treatment.

P0256

Evaluation Of A New And Novel ^{18}F-Labeled Tracer, ^{18}F-Fluorophenyl Tetraphenyl Phosphonium Nitrate(BF-PET) For Measuring Myocardial Perfusion

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Aim: To evaluate the MPI characteristics of BF-PET in human subjects. This will be performed in CAD patients with histories of myocardial ischemia or scar. **Materials and Methods**:The patients were divided into two groups. The first group was 19 Patients with myocardial ischemia as determined by cardiac catheterization and MPI-ETT SPECT. The second group was 19 patients with myocardial scar as determined by cardiac catheterization and MPI-ETT SPECT. Each group has been imaged with BF-PET to determine its utility for evaluating these conditions. Imaging was performed with a two day protocol. On the first day of the study, the patients were injected with 10 mCi of ^{18}F- BF-PET at rest. One hour after injection, the patient was positioned supine in the gantry of a Siemens Biograph/64 PET/CT, with the heart centered in the field of view, and a 15 min. gated acquisition was performed. On the second day of the study, the patient had a stress test (Bruce protocol) and 10 mCi of ^{18}F- BF-PET was injected at peak exercise level. One hour after injection, the patient was positioned supine in the gantry of a Siemens Biograph/64 PET/CT, with the heart centered in the field of view, and a 15 min. gated acquisition was performed. Uptake of BF-PET in the myocardial segments and the results of MPI SPECT or cardiac catheterization was compared by analysis of variance followed by Duncan's new multiple range test. The uptake (SUV-average and SUV-maximal) in each myocardial segment was recorded. **Results:** Of 342 segments, 252 segments of SPECT MPI were positive (74%), While 312 segments of BF-PET were positive(92%). The results of 252 segments in SPECT MPI were consistent with CardioPET. Kappa value was 0.59. On BF-PET imaging, Mean SUV value and maximum SUV value of nine segments in standard cardiac orientation (short axis, horizontal long axis and vertical long axis) were recorded. The uptake of BFPET in the myocardial segments and the results of MPI SPECT were compared by analysis of variance followed by Duncan's test. It showed significance.($P<0.05$) . **Conclusion:**BF-PET will be consistent with the results of MPI SPECT; however, image quality was much more superior. In patients with balanced ischemia BFPET may reveal metabolic defects that are missed by MPI SPECT.

P0257

Use of neutral oral contrast agents in PET-CT imaging procedures

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Introduction: Adequate distension of the bowel is a prerequisite for a good quality PET-CT procedure. However the use of positive contrast agents has its own pitfalls, inclusive of attenuation overcorrection by increasing intraluminal attenuation, thus reducing the overall study quality. Additionally, mucosal lesions are not too well appreciated on the positive oral contrast studies. This study was carried out to attempt to overcome these pitfalls by using a neutral oral contrast for PET-CT procedures. Aim: To qualitatively and quantitatively assess the efficacy of diluted Mannitol (1.5%) as neutral oral contrast agent in comparison to the positive iodinated contrast (Gastrografin). Materials and methods: Heterogeneous group of 100 patients, who were referred for a whole body FDG-PET-CT were included in the study. 50 cases were administered the conventional iodinated contrast (Gastrografin) while the other group of 50 cases was administered Mannitol solution (1.5%). PET-CT was acquired using the standard protocols. Following parameters calculated in both groups and were analysed: - The average distention (in cm) achieved of the stomach, jejunal and ileal loops - Mean SUV over the bowel loops. - Costing Results: - Bowel distention in the group with Mannitol was comparable, and in some cases, better, than those with iodinated oral contrast administration. The mean distention over stomach with Mannitol was 6.7 cm (vs 6.3 cm with iodinated), over jejunal loops was 2.37 cm with Mannitol (vs 2.1 with iodinated) and over ileal loops 2.07 with Mannitol (vs 2.0 cm with iodinated contrast). - The mean SUV obtained over the bowel loop was significantly lower in the neutral contrast group (2.1) vs the iodinated contrast (3.9). - An added advantage with this group is better visualization of mucosal lesions. - The economics of using diluted Mannitol (costing Rs. 71 per patient) is much favourable than iodinated contrast (costing Rs. 749). Conclusion: Diluted Mannitol as a neutral oral contrast in the PET-CT procedures provides atleast comparable, and in some cases, better bowel dilatation than the iodinated contrast agents, and avoiding contrast induced attenuation over-correction artifacts. There is also better visualization of the mucosal bowel wall lesions. This comes with the added benefit

of being more economically favourable. This provides enough evidence for using neutral oral contrast for PET-CT procedures. We at our institution have been following this protocol as a routine and have since then performed over 5000 PET-CT scans using neutral oral contrast.

P0258

BTV Estimation: a Multi-center Study of the Robustness of an Adaptive Thresholding Method Incorporating PET Reconstruction Parameters

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Aim To evaluate the robustness of an adaptive thresholding algorithm incorporating PET reconstruction parameters for ^{18}FDG PET-based BTV estimation and its reproducibility in different PET-CT scanners. **Materials and Methods** A NEMA IEC Body Phantom with spheres of different diameters (d=6.5,8.1,10,13,22,28,37,57.4 mm) was filled with ^{18}FDG at different target-to-background ratios (TBR=2.5,4,8,16,25,35,47,55,70), and scanned for different emission scan duration (ESD=2,3,4,5 min) with different PET-CT scanners (n. 2 Discovery 600, n. 2 Discovery ST, n. 1 Discovery STE, n.1 Biograph HI-REZ, n.1 Biograph TRUEV, n. 1 Gemini XL and n.1 Gemini TF). Routine clinical image reconstructions were used for all scanners (e.g. iterative, LOR) and reconstruction parameters were varied such as the number of iterations (IT=from 16 to 99) and post-reconstruction smoothing (FWHM= from 4 to 9 mm) . For each sphere, thresholds (TS) were determined as a percentage of the maximum intensity in the cross section area of the spheres (A). A cross sectional area of 133 mm^2 (i.e. a sphere internal diameter of 13 mm and approximately the twofold FWHM of the scanners) was selected as the inferior threshold for data analysis, due to the resolution characteristics of the scanners. The TS versus predictor variables-plot was fitted by multiple linear regression techniques using the model: $Y_{ij} = B_0 + B_1$ *sphere A (mm^2)+* B_2 *(1-1/TBR)+* B_3 *ESD(sec)+* B_4 *IT +* B_5 *FWHM (mm)+ E* and parameters Bi were calculated in each scanner. **Results.** For all scanners, TBR was confirmed a significant predictor of TS (partial R^2 from 0.74 to 0.91) while ESD and IT were not (R^2 <0.01). For all scanners, but the Geminis, FWHM was an independent predictor of TS (additional R^2 from 0.012 to 0.061), the functional form of the algorithm being specialized as: $Y_{ij} = B_0 + B_2$ *(1-1/TBR)+* B_5 *FWHM (mm).* Small differences in the coefficients B_0 (from 88.0 to 96.7), B_2 (from -66.8 to -56.0) and B_5 (from 0.68 to 1.04) were observed among the different scanners, while no significant differences were detected between identical scanners. In the Gemini GXL and TF the cross sectional area was a significant predictor of TS (additional R^2 =0.07 and 0.12), the algorithm being specialized as: $Y_{ij} = B_0 + B_1$ *sphere A (mm^2)+* B_2 *(1-1/TBR)* **Conclusions** The incorporation of PET reconstruction parameters in an adaptive thresholding algorithm for the BTV estimation allows to obtain a robust and reproducible method to be applied to a variety of different scanners by different vendors.

P0259

Correlation between Standardized Uptake Value of [18F]FDG and Hormone Receptor Status, HER2 Status and Ki-67 Proliferation Index in Patients with Invasive Ductal Carcinoma of the Breast: Preliminary Results

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Aim: The correlation between [18F]FDG maximum standardized uptake value (SUVmax) and hormone receptor status in patients with breast cancer remains controversial, possibly related to patient selection bias. The aim of this study was to correlate the [18F]FDG SUV max with estrogen-receptor (ER), progesterone-receptor (PR), HER2 status and Ki-67 proliferation index in patients (pts) with invasive ductal carcinoma of the breast (IDC). In fact, these specific molecular markers have direct prognostic and therapeutic implications for patients' management. Material and Methods: Breast tumors from 25 consecutive pts with IDC who have undergone [18F]FDG-PET prior to surgery were excised and examined for ER, PR, HER2 and Ki67. The association between SUVmax and ER, PR and HER2 status as well as Ki-67 was investigated. Results: The SUVmax in ER-negative pts (n=9) was significantly higher than and in the ER-positive pts (n=16) (10.7±3.0 vs. 5.9±2.4, P= 0.001), regardless of the PR and HER2 status. Moreover, there was an inverse correlation between the fraction of ER-positive cells and SUVmax (r=-0.59, p=0.002). In the ER-positive group, there was no significant difference between pts with PR-positive and PR-negative status (P=0.29) and there was no correlation between PR-positive cells and SUVmax (P=0.27); likewise, there was no significant difference in SUVmax values between the HER2-positive and the HER2-negative pts (p=0.65). As previously reported, pts with triple-negative status (ER-negative, PR-negative, HER2-negative) had significantly higher SUVmax than those with ER-positive/PR-positive/HER2-positive or ER-positive/PR-positive/HER2-negative status. The correlation between SUVmax and Ki67 was borderline (r=0.39, p=0.05). Conclusion: The results obtained in this study indicate that ER receptor status is the most important determinant of SUVmax in pts with invasive ductal carcinoma, being more important than PR or HER2 status or Ki67. These preliminary data support a growing body of evidence that ER+ and ER- breast cancers have distinct disease-specific patterns.

P0260

Semiquantitative assessment of 18F-FDG PET/CT for lymph nodes in breast cancer and its relation with biological prognostic factors.

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Aim: To analyze the correlation between ^{18}F-FDG uptake in lymph nodes assessed by PET/CT and histopathological and inmunohistochemical prognostic factors. **Material and methods:** Seventy five women with locally advanced breast cancer were prospectively evaluated. PET/CT was requested in the initial staging previous to adjuvant chemotherapy. All the patients underwent an ^{18}F-FDG PET/CT with a dual-time-point acquisition. Both examinations were evaluated semiquantitatively with calculation of SUVmax values in PET-1 (SUV-1) and in PET-2 (SUV-2) and the percentage variation of the SUVmax or retention index (RI), between PET-1 and PET-2 in axillary lymph nodes with the greater FDG uptake. The biological prognostic parameters, such as the steroid receptor status, *p53* and *c-erbB-2* expression, proliferation rate (Ki-67), and grading were determined from a sample of the primary tumour. The relation between lymph node metabolism and biological parameters was analyzed using the Spearman's rank-order to measure the association between semiquantitative parameters and the numerical prognostic variable, and Mann Whitney U and Kruskal-Wallis tests to assess the association between SUVmax or RI and categorical measures. **Results:** Negative steroid receptor status was correlated with higher SUV-1, SUV-2 and RI in lymph nodes. The results were significant for progesterone receptor status and SUV-2 with a mean±SD for SUV-2 in progesterone receptor positive and negative tumors of 4.79±3.75 and 8.39±6.55 respectively. *p53* over-expression and triple negative status had associated greater semiquantitative metabolic parameters in lymph nodes. The results were significant for the triple negative and SUV-1 with values of 7.95±5.61 with respect to 4.53±4.38 for not triple negative tumors. A higher tumoral grade was related with greater semiquantitative parameters (p>0.05). **Conclusion:** Poor biological prognostic factors were correlated to higher semiquantitative metabolic values in lymph nodes. These results appear to reveal biological significance of lymph node ^{18}F-FDG accumulation.

P0261

FDG-PET versus ultrasonography, mammagraphy and MRI for the diagnosis of breast cancer and lymph nodes metastases

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Objective: To evaluate the diagnostic accuracy of FDG-PET in detecting primary breast cancer as compared with mammography, ultrasonography, mammography combined ultrasonography and magnetic resonance imaging (MRI), and in axillary, internal mammary and supraclavicular lymph nodes staging. **Methods:** One hundred and seventy six patients, 175 female and 1 male, with operable and clinical node negative invasive breast carcinoma were recruited and analyzed retrospectively. All patients underwent ^{18}F-FDG-PET, mammography, ultrasonography and MRI. The results of FDG-PET scan for the diagnosis of primary breast cancer were compared with mammography, ultrasonography and MRI. And

the results of FDG-PET in axillary, internal mammary and supraclavicular lymph nodes staging was compared with histopathology of axillary lymph nodes dissection (ALND). Annually followed up by ultrasonography, mammography and/or CT or MRI for relapse and distant metastases were performed in all patients. **Results:** In 176 patients with cytologically established breast carcinoma, FDG-PET was positive in 150 (85.22%) patients and negative in 26 (14.77%) patients. The sensitivity of FDG-PET, mammography, ultrasonography, mammography combined ultrasonography, MRI was 85.22%(150/176), 85.88%(146/170), 92.17% (153/166), 98.73% (156/158) and 96.55% (28/29), respectively. Significant difference of sensitivity were found between FDG-PET and mammography combined ultrasonography (p<0.001) while no significant difference between FDG-PET and mammography, ultrasonography, MRI, respectively. Diagnostic performance of PET had significant correlation with primary tumor staging and size (p=0.003 and 0.0008), respectively. The sensitivity, specificity, overall accuracy, positive predictive value, and negative predictive value of FDG-PET in ALN staging (SUVmax cutoff at 1.5) were 34.1%, 81.8%, 71.4%, 40.5%, and 80.7%, respectively. The false negative and false positive rate was 61.36% (27/44), 18% (25/138), respectively. In total of 9 internal lymph nodes pathologically examined, 2 of the 9 were metastasis positive by histopathology, but FDG-PET was negative (false negative). No relapse and metastases were found in patients with FDG-PET false negative primary breast cancer (p=0.006) and axillary node micrometastases. **Conclusion:** FDG-PET is not superior to mammography, ultrasonography and MRI, instead, mammography combined ultrasonography showed significant higher sensitivity for breast cancer. MRI seems superior to FDG-PET, but further large population study is needed. The mammography or ultrasonography or the combination of mammography and ultrasonography should still remain the first line for the diagnosis of breast cancer. FDG-PET could neither accurately stage the axilla nor the internal mammary and supraclavicular nodes. However, FDG-PET false negative primary breast cancer and micrometastases not visualized by FDG-PET had little clinical significance for no relapse and metastases.

P0262

18F-FDG PET/CT in gastro-oesophageal cancer: correlations between Partial Volume Corrected Body-Weight Standardized Uptake Value (PVC-SUVBW) and biological characteristics of primitives

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AIM To assess the diagnostic value of 18F-FDG PVC-SUVBW as possible biomarker in gastric cancer (GC). MATERIALS AND METHODS 49 biopsy-proven gastro-oesophageal cancer patients were enrolled in an integrated protocol. Patients underwent a basal 18F-FDG PET/CT study. 18F-FDG PET/CT specificity was assessed. Averaged PVC-SUVBW was calculated on primitive gastric lesions [1]. Correlation tests (Mann-Whitney and Kruskal Wallis tests for univariate analysis and hierarchical clustering for multivariate analysis) were performed to evaluate the relationships between 18F-FDG PVC-SUVBW and histotype and grade of gastric malignancy evaluated by biopsy. RESULTS: 18F-FDG PET/CT was able to detect gastric cancer with a specificity of 82%. In 9 biopsy-proven GC, 18F-FDG PET/CT images were classified as negative, showing no 18F-FDG uptake in the GC primitive lesions. Signet ring cell histology showed a lower 18F-FDG PVC-SUVBW compared to squamous cell carcinomas and to other adenocarcinoma subtypes (PVC-SUVBW: 5.57±3.22 g/cc vs 9.90 ± 1.91g/cc vs 9.32 ± 4.26g/cc; p=0.05). No correlations were found between tumor grading and 18F-FDG PVC-SUVBW. Multivariate analysis showed that poorly differentiated signet ring cell carcinomas were significantly associated with 18F-FDG PVC-SUVBW smaller than 6.25 g/cc (p<0.05). CONCLUSIONS Confirming literature results, 18F-FDG PET/CT shouldn't be considered the gold standard modality to evaluate gastric primitive lesions [2]. However, these preliminary results suggest that the 18F-FDG PVC-SUVBW is a valuable biomarker to assess the biological characteristic of GC in vivo. REFERENCES [1] F. Gallivanone, et al. (2011) "PVE correction in PET-CT whole-body oncological studies from PVE-affected images", IEEE Trans Nucl Sci, vol. 58(3), pp. 736-747. [2] Podoloff DA et al. (2009) NCCN task force: clinical utility of PET in a variety of tumor types. J Natl Compr Canc Netw. 7(Suppl2):S1-26.

P0263

Impact of acquisition time on image quality in whole-body 18F-FDG-PET- CT for cancer staging

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Purpose: The purpose of the study was the evaluation of the impact of acquisition time using F-18 fluorodeoxyglycose positron emission tomography (18F-FDG PET) in cancer patients on different parameters: image quality, lesion detection rate, standard uptake values and lesion volume . Methods and Materials: 33 cancer patients were included in this study over a time period of 7 months. In these patients a total of 63 lesions were independently evaluated by two radiologists (experienced and beginner). A whole-body 18F-FDG PET-CT scan with 3 min and 1.5 min acquisition time per bed position was performed in each patient. Lesions were visually identified and their locations were compared. Lesion volumes and maximum standard uptake values (SUVmax) of the primary tumour, lymph nodes and metastases were obtained and compared. For all parameters, interrater agreement was assessed. Results: All relevant lesions were identifiable at both acquisition times. As a main result, image quality was significantly reduced in scans with an acquisition time of 1.5 min (p <0.001). Nevertheless, the image quality was rated excellent/good in 86 % of the scans with an acquisition time of 1.5 min. The quality of lesion visualization was excellent regardless of the acquisition time. Lesion volume on PET images and SUVmax were not significantly different between both acquisition times (p < 0.001). Interrater agreement was good (κ: > 0.8). Conclusion: Despite of a significant decrease in image quality, a reduction of acquisition time per bed position from 3 to 1.5 min seems to be clinically feasible without reduction of the lesion detection rate even for less experienced observers.

P0264

Thyroid Incidentalomas in PET-CT Studies

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Aim: Thyroid findings or incidentalomas in PET-CT studies are relatively frequent. The aim of this retrospective study was to show the experience of the Sant Pau Hospital of Barcelona in the detection of thyroid incidentalomas by PET-CT studies. Material and Methods: Between June 2010 and February 2012, 2257 PET-CT studies for several purposes were performed. Forty-nine of these studies (2.2%) showed thyroid incidentalomas. These 49 studies corresponded to 43 patients scanned for the following: 8 breast cancer, 6 lung cancer, 5 lymphoma, 4 colorectal cancer, 3 ovarian cancer and 17 other malignancies or non malignant diseases. The follow-up of thyroidal incidentalomas was evaluated retrospectively. Results: Eleven patients showed a diffuse increase of glucose metabolism in the thyroid gland and 32 showed a focal increase of glucose metabolism. Nine out of 11 patients with diffuse increase of glucose metabolism in the thyroid (82%) had autoimmune hypothyroidism, one had ulcerative colitis and the other one was not followed, even though he has a second PET-CT that showed normalization of thyroid glucose metabolism. Twenty-one out of 32 patients whit focal increase of glucose metabolism were followed by ultrasound study and/or fine needle aspiration biopsy, the results being: 15 (71%) benign nodules (9 in the context of multinodular goiter, 1 follicular adenoma and 5 were considered banal nodules by ultrasound study) and 6 (29%) positive cytologies for malignant nodes (3 papillary cancer, 2 recurrence of thyroid cancer and 1 metastasis of bladder cancer). At present, 3 patients are awaiting ultrasound study. Five patients died due to their malignant disease before being followed, and in the remaining 3 the thyroid incidentaloma was not followed. In this series of patients, SUVmax in benign nodules was significantly lower than SUVmax in malignant nodules (11.7±2.6 vs. 16.7±4.4, P<0.02). Conclusion: In our experience, thyroid incidentalomas, consisting on a focal increase in glucose metabolism in PET-CT studies, are related to a significant risk of malignancy (29% of patients with follow-up). For this reason, in these situations an ultrasound study with fine needle biopsy should be recommended. Moreover, and as described in the literature, a diffuse increase of glucose metabolism in the thyroid gland is often associated with autoimmune disease.

P0265

Contrast Enhanced PET/CT for the Assessment of Liver Metastases after Chemotherapy in Patients with Colorectal Cancer

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AIM: To assess the utility of contrast enhanced PET/CT (CE-PET/CT) in a combined protocol, in the evaluation of post-chemotherapy liver metastases in patients with colorectal cancer. **MATERIAL AND METHOD:** We prospectively analyzed 36 PET/CT studies corresponding to 21 patients (15 male, 6 female), with a mean age of 61y (42 - 78), and liver metastases from colon (14) or rectal (7) cancer after chemotherapy. An initial PET/CT study was acquired 1 hour after the injection of 370 MBq of ^{18}F-FDG. On the 3rd hour, a second study centred on the liver and with intravenous contrast in portal phase was acquired, with a modulated mA of up to 440 and 120 keV on the CE-CT. The PET images were interpreted by 2 expert nuclear medicine specialists, classifying as malignant all the lesions with FDG activity higher than the surrounding liver parenchyma, and measuring the SUV on the 1st and 2nd study. The CE-CT images were interpreted by 2 expert radiologists classifying the lesions as benign or malignant. The final diagnosis was histopathological or by follow-up. **RESULTS**: The medium time after chemotherapy

was 8,5 weeks (range: 2-44). A total of 9 patients (20 studies) had antecedent of liver surgery. Medium time between surgery and PET/CT was 38 weeks (Range: 8-124). A total of 136 liver lesions were recorded. On PET, 81 were classified as benign and 55 as malignant (9 only on the delayed images). On CT, 19 were benign and 117 malignant. Final diagnosis was established in 15 patients, 28 studies (25 during follow-up and 3 from histopathology) with a total of 93 lesions: 81 malignant (77 correctly diagnosed as malignant with CE-CT and 42 with PET), and 12 benign lesions (11 correctly diagnosed as benign with CE-CT and 10 with PET). The sensitivity and specificity values of CE-CT were 95% and 91% respectively, and in PET were 51% and 83%. **CONCLUSION:** The use of a CE-PET/CT protocol in our patients shows a higher detectability in the evaluation of hepatic lesions suspicious of malignancy with respect to conventional PET/CT study. The combined use of both techniques improves the tumoral detection rate with respect to conventional PET/CT, and allows a better management of these patients.

P0266

Combined 18F-FDG-PET/CT and 111In-Octreotide SPECT for Evaluation of Thymic Epithelial Tumors

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Aim: To test the role of combined imaging with 18-F-FDG-PET/CT and 111In-Octreotide SPECT in the characterization of thymic epithelial tumors (TET). **Methods:** We evaluated 19 patients with newly diagnosed TET who had undergone 18-F-FDG-PET/CT and 111In-Octreotide SPECT within an interval of 6 weeks. Using WHO classification, 5 TET were classified as low risk thymomas, 4 as high risk thymomas and 10 as thymic carcinomas (among which 5 neuroendocrine tumors). All patients were staged according to the Masaoka staging system. 18F-FDG PET-CT scans were acquired after fasting for 8 h and 60-90 min after i.v. injection of 370 MBq of 18F-FDG using an integrated PET/CT system. SUVmax of each primary tumor was recorded. 111In-Octreotide scan and SPECT of the thorax was performed 4 and 24 h after i.v. injection of 200 MBq of 111In-Octreotide using a dual-head large field-of-view gamma camera equipped with medium-energy parallel-hole collimators. SPECT data were then transferred in Dicom format to an OsiriX workstation and, using 3D ROI analysis, the tumor-to-background ratio was determined on the 24 h coronal sections. **Results:** All patients showed increased uptake of 18F-FDG in mediastinal lesions. SUVmax values were significantly correlated with histologic classification (r=0.70 p<0.01) and with Masaoka stage (r=0.61 p<0.01). Low risk thymomas showed SUVmax values (mean±SD, 2.87±0.83) significantly lower than those of high risk thymomas (mean±SD, 7.21±1.73) (p<0.01) and of thymic carcinomas (mean±SD, 9.61±6.06) (p<0.05) whereas no statistically significant difference was found between SUVmax values of high risk thymomas and thymic carcinomas (p=0.46). All high risk thymomas and thymic carcinomas showed SUVmax values ≥4.5. All primary tumors were detected by SPECT with 111In-octreotide and tumor-to-background ratios ranged between 1.67 and 8.64. No statistically significant correlation was found between tumor-to-background ratios and histologic classification (r=0.17, p=0.53) and Masaoka stages (r=0.45, p=0.11). However tumor-to-background ratios of thymic neuroendocrine tumors (mean±SD, 4.83±2.48) were significantly higher than those found in all other TET with SUVmax≥4.5 (mean±SD, 2.41±0.56) (p<0.05). ROC curve analysis was performed and a cut-off level for tumor-to-background ratio of 2.66 identified thymic neuroendocrine tumors among 18F-FDG avid TET with a sensitivity of 100% and specificity of 83% (AUC=0.93). **Conclusion:** 18F-FDG PET-CT scan allows to differentiate high risk epithelial tumors and thymic carcinomas from low risk thymomas whereas 111In-Octreotide SPECT may identify neuroendocrine tumors among those having a high 18F-FDG uptake.

P0267

Evaluation of solid pulmonary nodules with dual time point 18F-FDG-PET/CT. Preliminary data

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Purpose: Solid pulmonary nodules (SPN) are one of the major indications for performing PET/CT examination, with high accuracy in characterizing nodules >1cm as benign or malignant. However smaller nodules, as well as well differentiating and specific histologic types that accumulate FDG in a less degree and inflammatory processes can provoke differential diagnostic problems and lead to further unnecessary examinations. In this study we examined the possible role of delayed PET acquisition in addition to standard PET in characterizing SPN. Method-Material: 17 patients, 7 female average 54y.o., 10 male average 66y.o. were included in the study. 8 presented with SPN ≤1cm, 6 with SPN 1-2cm and 3 with SPN>2cm. 60min after the IV administration of 18F-FDG PET/CT was performed at a Siemens LSO Biograph PET/CT device. 60min after the first acquisition, delayed data of pulmonary fields were acquired. The size of the nodule, the uptake of the radiopharmaceutical (SUVmax) at the first and delayed acquisition were evaluated. For all patients histologic confirmation or 6 month surveillance was available. Results: In 8 patients with SPN≤1cm, mean first SUVmax was 1.7 and mean delayed SUVmax 2.1. 1 nodule did not accumulate FDG at both first and delayed images and proved benign. 1 nodule presented with SUVmax 1.2 at first and 1.5 at second PET, however due to morphologic characteristics of the nodule, the patient was put under surveillance and no further therapeutic action was taken. For 6/8, the delayed SUVmax was higher than the first, with increase 1-1.38 folds and the final diagnosis was adenocarcinoma. In 6 patients with SPN 1-2cm, mean first SUVmax was 1.97 and mean delayed SUVmax 2.75. In 2 cases delayed SUVmax decreased and patients were put under surveillance, while in the rest 4 delayed SUVmax increased by 1.2-1.9 folds. Final diagnosis for these 4 patients was neuroendocrine tumor for 2 and adenocarcinoma for 2. In 3 patients with SPN>2cm, mean first SUVmax was 4.8 and mean delayed SUVmax 6.1, raise of 1.28-1.48 folds and final diagnosis was adenocarcinoma. Degree of SUVmax alterations was not correlated with the grade; however this is justified considering the low tumor volume. Conclusion: Delayed imaging can contribute to the differential diagnosis of SPN, particularly in small <1cm pulmonary nodules and in further management of the patients. Although morphologic appearance of the nodule should not be overlooked, increase of FDG uptake is correlated with malignancy, while decrease with benign condition.

P0268

Use of ^{18}FDGPET/CT in the management of Post-Transplant Lymphoproliferative Disorders

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Aim: To investigate the role of ^{18}FDG PET/CT in Post-Transplant Lymphoproliferative Disorder (PTLD), a serious complication of solid organ and bone marrow transplantation. Materials and Methods: Between January 2002 to December 2011, 32 patients (pts) (18 male, median age 47 years, range 19-77years) underwent 58 ^{18}FDG PET/CT exams in our department for diagnostic evaluation of PTLD assessment. Results: Of the 32 pts 14 (44%) had undergone liver transplantation, 13 (41%) pts kidney transplant, 3 (9%) pts heart transplant, 1 (3%) pt heart and lung transplant and 1 (3%) pt bone marrow transplant. Fourteen (44%) out of 32 pts had ^{18}FDG PET/CT exam for diagnosis of PTLD, 13 (41%) pts for staging at diagnosis, 4 (12%) pts post chemotherapy and 1 (3%) pt for relapse. The primary histopathologic diagnoses were diffuse large B-cell lymphoma (n=17) and plasmablastic lymphoma (n=1), while the median SUV of the foci was 7.2 (range: 3.5-34). The median interval time between transplant surgery and ^{18}FDG PET/CT study was 62 months (range 12-240). Twenty-one (66%) pts had negative ^{18}FDG PET/CT exam and 11 (34%) pts had positive exam, which revealed extra nodal metastases in 4 cases. In one pt ^{18}FDG PET/CT depicted infection of the native kidney and in another pt showed an ^{18}FDG avid skin lesion histologically confirmed to be malignant melanoma. On the basis of our results, a ^{18}FDG-PET/CT scan had sensitivity of 95.4% [CI 0.75 to 0.99], specificity of 100% [0.65 to 1], positive predictive value of 100% [0.8 to 1] and negative predictive value of 91% [0.57 to 0.99]. Moreover there was no significant statistical difference between pts with and without PTLD in terms of age, sex, type of transplantation, histopathologic type. The only statistical significant factor was the time after transplantation, which was higher in patients with PTLD (p<0.05). Conclusion: Our findings demonstrate that ^{18}FDG-PET is an excellent tool for diagnosis, staging and treatment evaluation of PTLD. ^{18}FDG-PET also depicts extranodal PTLD, not detectable by conventional imaging methods.

P0269

Evidence of Brown Adipose Tissue Activity Assessed by 18F-FDG-PET/CT in Females with Constitutional Leanness

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The mechanisms involved in energy balance regulation underlying low weight steadiness in females with constitutional leanness have not been fully elucidated yet. Recent studies using 18F-FDG-PET/CT have shown the presence of brown adipose tissue (BAT) in adult humans. This tissue has a well documented role in thermogenesis and energy homeostasis. Indeed, BAT activation has been associated with increased thermogenesis. **Aim.** To assess the presence of BAT activity in females with constitutional leanness by using whole-body 18F-FDG-PET/CT. **Methods.** Forty-one young female subjects (mean age 24.4±3.9 years)

were studied: 7 constitutionally lean (CL) with a Body Mass Index (BMI) of 18.8±1.1 kg/m^2, 7 restricted anorexia nervosa patients (AN) BMI 15.5±0.8 kg/m^2, 3 stable reefed AN patients (RAN) BMI 18.8±1.1 kg/m^2 and 24 normal weight (NW) BMI 22.2±1.5 kg/m^2. All patients underwent whole-body 18F-FDG-PET/CT. Increased FDG uptake showing distinct patterns compatible with hypermetabolic BAT was identified and SUVmax was measured. In order to minimize temperature influences on BAT activity, all studies were performed between October and March, under temperature control conditions in both waiting and scan rooms. **Results.** In all CL subjects studied 18F-FDG-PET/CT showed increased FDG uptake in typical BAT areas: neck and sopraclavicular region in 7 subjects (100%); mediastinum and paravertebral region in 6 (86%); prevertebral and intercostal regions in 3 (43%); paracardiac region in 2 (28%). In addition to the above mentioned regions, 2 (28%) CL subjects showed FDG uptake also in other infradiaphagmatic areas such as perirenal and periepatic regions. In all these subjects the area showing the highest metabolic rate was localized in the sopraclavicular region. SUVmax values of this region ranged from 1.7 to 21.9 with an average of 11.4. None of the AN and RAN patients studied showed increased FDG uptake on 18F-FDG-PET/CT scan. Moreover, only 3 (12%) of the 24 NW females studied showed increased FDG uptake in some of the typical BAT areas. In these subjects the SUVmax of the area with the highest metabolic rate ranged from 3.7 to 8.3 with an average of 5.5. **Conclusion.** Active BAT tissue can be shown by using 18F-FDG-PET/CT and is well represented in constitutional leanness. BAT activation may be one of the factors involved in low weight steadiness in these subjects.

P0270

PET/CT in Breast Carcinoma - Preliminary Results

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Introduction: Breast carcinoma is the most common cancer in women population. Positron emission tomography presents nuclear medicine visualisation method, in which biologically active substances labelled with positron emitters are used. Most commonly used radiopharmaceutical is 2-fluor-2-deoxy-D-glucose (FDG). FDG PET is considered to be the most sensitive conventional imaging method in breast tumor detection, as well as in detection of its metastases. Aim: The aim of this research is to estimate recurrence and metastases of breast cancer using FDG PET/CT, and comparison of these results with the results of CT and NMR imaging, and the values of tumor markers, as well. Material and methods: 35 women, who underwent PET/CT examination in the period from December 2009 to January 2011 were included in this study. All of them were suspected to have breast carcinoma recurrence or metastatic disease, based on clinical examination, tumor marker values (CA 15-3) and findings on other imaging methods (including FDG PET/CT). Scanning was performed on Biograph 64 PET/CT (Siemens) in National PET centre in Clinical Centre of Serbia. Results: Using the test of correlation, we concluded that there was no correlation between the results of breast cancer diagnosed by PET and CT (P=0.402), nor between the results of PET and NMR (P=0.501). There was statistic correlation between the results of PET and the values of tumor markers (P=0.000). Conclusion: This study showed that FDG PET/CT has significant role in breast carcinoma restaging, with high tumor marker values and negative or equivocal findings on other conventional imaging techniques. Well-timed detection of disease recurrence can improve outcome and enable prompt onset and/or modification of the therapy.

P0271

[18f]FDG PET in diagnostics and treatment vasculitis

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Aim. [18F] fluorodeoxyglucose (FDG) PET is a noninvasive metabolic imaging modality based on the regional distribution of [18F]FDG and has become increasingly important in the management of oncologic patients. Remarkable images of patients with active vasculitis have been generated through [18F]FDG-PET scans. The family of vasculitides has been defined with reference to the size of vessels involved in large, medium, and small vessel vasculitis. The group of large vessel vasculitides includes giant cell arteritis and Takayasu`s arteritis. Both of these diseases are challenging with respect to their diagnosis and follow-up, because affected patients regularly present with a set of nonspecific symptoms and laboratory test results. Application PET- FDG for monitoring of carried-out therapy is very important as well for definition of a role of this method in complex inspection of patients with large vessel vasculitis and an assessment of their treatment. Materials and methods. PET scan it was carried out at patients fasting for at least 6 hours before the scan, the blood glucose level should not exceed 9,0 mmol\l. Depending on weight of the patient the preparation [18F]FDG in a dose of 350-450 MBk was intravenously entered and acquisition should be started 60 minutes after injection. [18F]FDG-PET studies were performed in 30 patients with suspicion of giant cell arteritis and Takayasu`s arteritis. Results. Of these patients in 19 giant cell arteritis and in 7 patients - Takayasu`s arteritis was diagnosed. The final diagnosis of 4 patients remains while to unknown. At 15 patients [18F]FDG-PET was used in monitoring of therapy response from 3 weeks to 6 months after an initiation of treatment. Conclusions. Whole-body imaging with [18F]FDG-PET is highly effective in assessing the activity and extent of giant cell arteritis and Takayasu`s arteritis, respectively: Metabolic imaging using [18F]FDG-PET has been shown to identify more affected vascular regions than MRI in both diseases. The visual grading of vascular [18F]FDG uptake helps to discriminate arteritis from atherosclerosis and therefore provides high specificity. High sensitivity is attained by scanning during the active inflammatory phase. Thus, [18F]FDG-PET has the potential to develop into a valuable tool in the diagnostic workup of giant cell arteritis and Takayasu`s arteritis, respectively, and might become a first-line investigation technique.

P0272

Clinical efficiency of FDG-PET in patients with Oesophageal Carcinoma. Explorative analysis of retrospective data of 81 patients.

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Aim of the study: Oesophageal cancer is one of the most difficult malignancies to cure since at the time of initial diagnosis most of the tumors are locally advanced, develop lymph nodes and distant metastases in an early stage. FDG-PET is a useful diagnostic modality in the management of the patients with oesophageal cancer due to its high accuracy in the detection of the primary tumor and distant metastatic lesions. However, the diagnostic accuracy of PET in M-staging of oesophageal cancer is arguable owing to discrepancies in literature. The aim of this study was to appraise critically the sensitivity and specificity of the FDG-PET, in comparison to histological results (Gold standard), in staging of oesophageal cancer in respect of recent trials. Materials and Methods: We analyzed 140 patients retrospectively, who underwent a PET-scan examination with the referral diagnosis “oesophageal cancer” at the Department of Nuclear Medicine at Vienna´s General Hospital. Among those, 81 patients were appropriate for this study. The following aspects have been assessed in this study: classification of the patients according to their referring diagnosis, demographic characteristics of the patients and analysis of diagnostic modalities (PET-scan findings, CT-findings, tumor markers and histological results). Finally, the sensitivity and specificity of PET, CT and tumor markers have been calculated in comparison to histopathological results. Results: The sensitivity and specificity of PET and CT were as follows: in detection of the primary tumor (n=74) 96% and 100% (PET) and 100% and 33% (CT), in N-staging (n=27) 54% and 79% (PET), 92% and 36% (CT) and in M-staging (n=18) 63% and 90% (PET) and 43% and 36% (CT), respectively. The sensitivity and specificity of tumor markers in staging of oesophageal cancer were as follows: CA 19-9 (n=59) 21% and 50%, CEA (n=63) 43% and 50%, SCC (n=41) 10% and 100%, respectively. The sensitivity of CYFRA 21-1 (n=33) was 20%. Conclusion: In this study FDG-PET showed a moderate sensitivity and high specificity in M-staging of oesophageal cancer, however, the literature shows ambiguity in this regard. Therefore, the performance of prospective studies with a larger number of patients is important. Additionally the diagnostic accuracy of PET-CT in staging of oesophageal cancer should be assessed as this is the only non-invasive diagnostic tool that may improve patient management.

P0273

Clinical value of 18F- FDG-PET/CT scan in nodal staging of patients with Non Small Cell Lung Cancer. Evaluation of retrospective data of 401 patients.

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Aim of the study: During the last decades the development of PET and the newer PET/CT offered a non invasive method to examine functional processes in lung cancer. The results of the 3rd German Interdisciplinary Consensus Conference “Onko-PET III” suggested that FDG-PET has a sensitivity of 96% and a specificity of 80% for differentiation of benign versus malignant pulmonary lymph nodes. Hellwig et al. (2007) showed a negative predictive value of 96% choosing a SUV threshold of 2,5 for mediastinal staging. These data allow the omittance of further surgical investigation like mediastinoscopy to complete the tumor staging if PET shows no mediastinal findings and therefore boosts the value of FDG- PET in clinical use. To further improve accuracy in diagnostics the use of combined PET and CT scanners seems advantageous. Methods: 401 patients with suspected or proven NSCLC were evaluated. All patients underwent initial staging with succeeding surgical mediastinal lymphadenectomy with patho-histological tissue sampling (gold-standard) and with the final diagnosis of NSCLC. Patients included have not had chemotherapy or radio- chemotherapy before PET/CT scan and surgery. PET/CT results were compared with those from patho- histology. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated

as well as diagnostic accuracy and the inter observer concordance k (Kappa). Results: 64 patients out of 401 had a patho-histological verification of the N stage. 23 patients of those fulfilled all inclusion criteria. Sensitivity was 80%, specificity 88%, accuracy 87%, PPV 67% and NPV 94%. Kappa was 0,46 (0,30- 0,62) showing clear concordance between PET/CT and patho-histological results. Conclusion: 18F-FDG PET/CT has a high clinical efficiency in the diagnosis of regional lymph node involvement in patients with NSCLC. If PET/CT shows negative mediastinal findings further invasive diagnostics are to be done in respect to the high NPV (94%). Additional studies, particularly evaluating the PPV with a larger number of cases would be interesting. Other radiotracers may show more favourable characteristics in differentiating reactive from malignant lymph nodes.

P0274

Retrospective analysis of 85 patients for evaluation of the clinical efficiency of FDG-PET in ovarian cancer

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Aim of the study: 18-F-fluoro-2-deoxyglucose positron emission tomography (FDG-PET) plays an important role in the management of ovarian cancer. The first aim of this study was to evaluate, if FDG-PET improves the staging accuracy by offering additional information to recent diagnostic modalities (laparoscopy, ultrasound, CT, MRT). Secondly, a possible benefit by monitoring the therapy with FDG-PET was assessed. Additionally, another important aspect was to evaluate the ability of PET scans to detect recurrent ovarian cancer, after levels of CA-125 are rising or clinical signs for recurrent ovarian cancer occur. Finally, a correlation between SUV and patient outcome has been investigated. Material and Methods: 117 out of total 130 patients were appropriate for this study. Three aspects have been evaluated: 1. Number and demographic characteristics of patients 2. Classification of referring diagnosis 3. Analysis of the clinical information system data (evaluation of PET scans, evaluation of all relevant diagnostic findings within the same time (± 3 months) to the PET scans). Sensitivity and specificity calculation of PET in staging examinations, a semi-quantitative analysis concerning the value in therapy monitoring, analysis concerning correlation of PET and biochemical recurrence and analysis concerning correlation between SUV and patient outcome has been made. Results: In 11 patients with referring diagnosis “restaging examination” and either positive PET or CT result, PET scan showed additional lesions in 45% (n=5). In patients with rising CA-125 levels and referring diagnosis “suspected recurrence”, CT, MRI and FDG-PET found the morphologic correlate of this biochemical recurence with a sensitivity of 0.62, 0.67, and 0.73-0.85 respectively. In 12 patients with referring diagnosis “suspected recurrence” and histopathological confirmation, CT, MRI and FDG-PET showed a sensitivity of 0.81, 0.80 and 1.00 respectively. Conclusion: The current study confirms the existing literature characterising FDG-PET as a highly accurate noninvasive imaging technique, which improves diagnosing recurrent ovarian cancer after rising CA-125 levels. Furthermore, the study shows evidence that FDG-PET can improve staging accuracy by detecting distant metastases. Hybrid cameras such as PET-CT or PET-MRI, may further increase accuracy in diagnosing ovarian cancer, however, this has to be evaluated in future studies.

P0275

18F-FDG PET-CT as an initial imaging modality for evaluation of patients with metastasis of unknown site of primary malignancy

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AIM: To evaluate advantages of using contrast enhanced 18F-FDG PET-CT (PET-CECT) as an initial imaging modality in patients presenting with metastasis of unknown site of primary. **MATERIALS AND METHODS**: We retrospectively analysed 70 patients with FNAC/biopsy proven metastases for detection of primary tumor. Of total 70 patients, 39 were male and 31 were female with age group between 40 - 70 years. These patients underwent PET-CECT study before conventional work up was completed for locating the primary. All the patients underwent whole body time of flight PET-CECT with standard protocol on Philips GEMINI TF PET-CT scanner. The patients were categorized into four groups on basis of site of metastatic disease like nodal (34.2%), visceral (30%), skeletal (20%) and others (11%) at presentation. PET-CECT images were read by two experienced nuclear medicine physicians and radiologists. The probable site of primary was decided based on combined findings of PET and CECT. PET-CECT was used for staging the disease as well where probable site of primary was detected. In remaining cases, extent of disease was noted. PET-CECT findings were later confirmed by biopsy and follow up. **RESULTS:** PET-CECT was able to detect probable site of primary tumor in 58/70 (82.8%) patients. Histopathological examination confirmed the site of primary in 45/58 (77.5%) patients, most common being lung and second most common being in head and neck. Rest 13/58 (22.4%) cases were false positive, most commonly located in oropharynx. In 12/70(17.1%) cases, PET-CECT could not identify the site of primary. These patients underwent conventional work up for detection of primary where one case was found to be appendicular carcinoid. Rest 11/12 (91.6%) cases were followed up for period of 6 months but the site of primary remained unknown. In two cases PET could not locate site of primary, however CECT suggested lung and liver as possible primary sites; which were confirmed as mucinous bronchoalveolar carcinoma of lung and hepatocellular carcinoma respectively on biopsy. PET-CECT accurately diagnosed the site of primary in 45/70 (64.2%) cases. The positive predictive value of PET-CECT was 77.58% with sensitivity of 97.82%. CONCLUSION: FDG PET-CECT appears to be one stop shop as an initial non invasive modality allowing whole body survey for unknown primary, helps in simultaneously staging the disease and in guiding the site for biopsy. In our opinion, only those patients where PET-CECT is unable to detect primary, should be subjected to further intensive work up.

P0276

Standardized Uptake Value-Based Evaluations of Respiratory-Induced Errors in CTAC PET Images: A Simulation Study Using 4D XCAT Phantom

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CT-based attenuation correction (CTAC) is a widely used option in commercial PET/CT scanners which provides the attenuation map for PET attenuation correction. The current clinical CT scan provides only a snapshot of the respiratory cycle, whereas PET occurs over multiple respiratory cycles. The fast data acquisition of CT compared to PET may cause potential misregistration problems, leading to inaccurate attenuation correction factors and artifacts in the attenuation corrected PET image, especially in the thorax and the upper abdomen. Therefore, an incongruent lesion position during CT acquisition will bias activity estimates using PET and the standardized uptake value (SUV) that is typically used to discern malignant lesions from benign lesions. This study determines the magnitude and location of respiratory-induced errors in radioactivity uptake measured in thorax and abdomen PET/CT. Using the dynamic computer phantom, XCAT, we simulate the respiration motion and produce the time-averaged, end-exhalation and end-inhalation attenuation maps for several tumor size in different locations in the abdomen and thorax. Therefore, the AC was based on (1) a time-averaged attenuation map, (2) CT map from the end-exhalation and (3) CT map from the end-inhalation phases of the respiratory cycle. Lesions with 6, 9, 12 and 15 mm in size were simulated in different locations in the abdomen and thorax and the activity ratio of 8:1 was used for all the simulated lesions. Simulation studies of dynamic phantom have shown errors of as much as 24% on attenuation-corrected PET images from respiratory motion-mismatched CT acquisitions. The ROI analysis showed the differences of up to 24% in the upper liver tumors and about 15% in the lower lung tumors. Also, the magnitude of the artifacts was more for the right lung tumors in comparison of the left ones. The SUVs were compared and differences of up to 45% were found between the single-phases of CTAC method and the average method. In this study we explored the effects of respiratory motion on attenuation mismatch with PET/CT scanners which have received growing interest in the past few years.

P0277

Significance of 18F-FDG-PET/CT in the selection of patients prior to surgical treatment of colorectal liver metastases, a single centre study

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Objectives : This retrospective study evaluates the significance of pre-surgical [F-18]-Fluorodeoxyglucose-positron emission tomography (FDG-PET/CT) for patients with potentially resectable colorectal liver metastases. Methods : A total of 84 patients primarily selected for surgical treatment of colorectal liver metastases by conventional imaging (CT or MRI) underwent FDG-PET/CT prior to the surgery. Histopathology and imaging follow up served as reference standards. Results : PET-CT identified additional extrahepatic lesions not detected on conventional images in 23 patients. As a result, 13 patients received palliative therapy while the other 10 patients underwent surgical intervention for extrahepatic disease as well. Two patients with equivocal findings in contrast enhanced CT proved to have no extrahepatic metastases in PET/CT. Altogether 201 hepatic lesions were diagnosed by FDG-PET/CT scan and 5 patients proved to have no vital liver metastases. The sensitivity and specificity of PET/CT in detecting liver metastases were 96% and 99% respectively. The therapy plan was changed according to the results of FDG-PET/CT examination in 30 patients. Conclusions : FDG-PET/CT allows a more accurate selecting of patients for surgical treatment of colorectal liver metastases and should be an integral part of pre-surgical work up in these patients.

P0278

Detection of colorectal carcinoma hepatic and pulmonary metastases using 18F-FDG PET-CT: evaluation of respiratory gated scan compared to delayed scan

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Surgery of hepatic and/or pulmonary metastases prolongs significantly survival of patients with metastatic colorectal adenocarcinoma. An exhaustive analysis of metastatic disease is so essential in these patients to determine indication and extend of surgery. Several studies have reported the limits of 18F-FDG PET/CT sensitivity in an accurate diagnosis of this cancer recurrence, particularly about liver metastatic lesions. Many factors could explain the sub-optimal sensitivity of standard PET/CT particularly respiratory motions and hight FDG uptake in normal liver parenchyma. We have tested prospectively two alternative 18F-FDG PET/CT methods, early respiratory gated scan and delayed scan, which included lungs and liver. The objective was to increase detection sensivity of hepatic and pulmonary metastases, in patients with metastatic colic or rectal carcinoma. Maximal SUV and lesion to normal tissue ratio were measured in 60 pulmonary lesions and 21 hepatic lesions, for early standard (realized one hour after FDG injection), early respiratory gated and delayed scans. These measurements were statistically compared. In liver, compared to standard scan, the lesion to normal tissue ratio is significantly increased on delayed scan (p<0,001) but not on respiratory gated scan, and SUV max lesion is significantly increased on delayed scan (p=0,001) and on respiratory gated scan (p=0,004). More liver lesions were detected on delayed scan. In lung, compared to early scan and for lesion of more than 7 mm size, the lesion to normal tissue ratio is significantly increased on delayed scan (p<0,001) but not on respiratory gated scan, and SUV max lesion is significantly increased on delayed scan (p<0,001) and on respiratory gated scan (p=0,003). Indeed, for pulmonary lesions of less than 7mm, none difference was significant. According to these findings, we recommend to routinely acquire delayed hepatic scans in all patients referred for evaluation, search for recurrence or supervision of a colorectal adenocarcinoma. Delayed pulmonary scans may be useful for large metastatic lesions and may be used in addition of an early scan. In our experience, early respiratory gated scans are less arguable than delayed ones to detect pulmonary or hepatic metastatic lesions: their contribution to detection is poor and the technical issues important.

P0279

Value of quantitative C-11 methionine PET/CT imaging in the assessment of skeletal metastatic deposits

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Objectives: This retrospective study aimed (1) to evaluate the role of C-11 methionine PET/CT (C-11 MET PET/CT) imaging in the detection of skeletal metastatic deposits, and (2) to evaluate the potential value of semi-quantitative tumor to non-tumor radioactivity ratio (T/N) in the differentiation between benign and metastatic osseous MET uptake. **Methods:** We searched retrospectively among 222 C-11 MET PET/CT studies performed for oncologic patients, however 17 cases were included in the current study because of fulfilling the inclusion criteria which include the presence of abnormal skeletal methionine uptake on PET/CT images, and the availability of follow up bone scan, CT and MRI scans for confirmation of nature of skeletal lesions. Evaluation of bone areas with suspected abnormal methionine (MET) uptake was done according to 3-point-scale as high, equivocal or low possibility metastatic. (T/N) ratio was calculated for all suspected areas to quantitatively differentiate between metastatic and non-metastatic uptake. **Results:** Accuracy of C-11 MET PET/CT imaging in the detection of skeletal metastatic lesions by visual interpretation was 87% with NPV (negative predictive value) of 93.3%. Mean (T/N) for metastatic lesions was 5.2 ± 0.9, while mean (T/N) for non-metastatic sites was 2.3 ± 0.8. All skeletal areas with (T/N) > 3.8 were proved to be malignant by follow up method, while all non-metastatic skeletal sites showed (T/N) < 3.8. **Conclusions:** C-11 methionine PET/CT imaging can have a potential role in the evaluation of skeletal lesions in oncologic patients. The semi-quantitative (T/N) ratio of skeletal C-11 methionine uptake can add valuable information in the differentiation between metastatic and non-metastatic skeletal MET uptake.

P0280

Evaluation of 68Ga-DOTA-TATE and 68Ga-DOTA-NOC PET/CT in Patients with Differentiated Thyroid Cancer

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Introduction: Differentiated thyroid cancer (DTC) are claimed to express somatostatin receptor subtypes 1,2,3 and 5. Commonly used radiolabeled oktreotid derivatives, i.e Octreoscan, target exclusively somatostatin receptor subtype 2 (sstr2) and useful in imaging and treatment of iodine-negative DTC. However DOTA-NOC has been suggested to be the most promising peptide because of a broader SSTR subtype affinity including sstr2, sstr3 and sstr5 as compared to those of DOTATOC and DOTATATE Aim: We aimed to compare diagnostic value of 68Ga-DOTA-NOC and 68Ga-DOTA-TATE (characterized by a very high affinity for sstr2) PET/CT in patients with iodine negative DTC. Materials and Methods: 13 patients (F/M: 8/7, median 63) with iodine negative differentiated thyroid cancer were prospectively examined. Patients were injected intravenously 125±25 / 122±29 MBq 68Ga-DOTA-TATE and 68Ga-DOTA-NOC at least in 24 hours intervals. 30-60 minutes after injection of radiolabelled peptides PET/CT images were obtained. Images were evaluated visually and SUVmax values of the lesions were calculated. Results: In 5 patients (38%) no pathologic uptake was seen with both tracers. In 7 patients (62%) pathologic uptake was seen with both radiotracers. Uptakes of lesions were significantly higher with DOTA-TATE (TATE:12,9±9,1; NOC:6,2±4; p<0,005) . DOTA-TATE detected more lesions (TATE: 45 NOC: 42) however the difference was not significant. There were discordant results in two patients regarding SUVmax of lesions Conclusion: Our study demonstrated that the images obtained by two tracers are comparable and of equally high quality. Sensitivities of both radiopeptide are equal however uptake of DOTA-NOC is lower presumably due to receptor distribution heterogeneity.

P21-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Molecular & Multimodatliy Imaging: SPECT & SPECT/CT

P0281

Development of the molecular imaging agent for the detecting of cancer using Technetium-99m 6-mer peptides

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PURPOSE: Tripeptides play essential roles in the body, especially associating with the micro-environment of cancer. Thus, several tripeptides could be excellent candidate for the targeting ligand of tumor imaging agent. The aim of the present study was to develop 6-mer peptide-designed as a tumor imaging agent, and to evaluate the diagnostic performance. METHODS: Successful synthesis of 6-mer peptide (ECG-ELR) was done and confirmed using NMR spectra. Radiolabeling with Tc-99m of ECG-ELR and ELR-NH was done. In CT-26 adenocarinoma-bearing mice and inflammatory mice models, in vivo imaging study using Tc-99m ECG-ELR, were performed. Tumor-to-normal muscle ratio was calculated after co-injecting with Tc-99m ECG-ELR (0.05 mg/kg) and three different concentrations of free ELR (1.0, 2.5 and 5.0 mg/kg). RESULTS: Tc-99m ECG-ELR showed high labeling efficiency up to 90-95% in vivo and vitro condition. Tc-99m ELR-NH had showed 100% of colloid formation and 0% of labeling efficiency. On in vivo imaging, tumor to non-tumor ratio was 2.5, 3.7, 4.5, 5.4 and 7.0 at 15 min, 30 min, 1 hour, 2 hours and 4 hours after injection, respectively. Otherwise, liver, kidney and bladder were the most radioactive organs. Modest uptake of kidney, liver and bowel represented the excretion of ECG-ELR via urinary and hepatobiliary systems. Other organs, such as lung, spleen, stomach and heart showed minimal uptake. In vivo imaging of inflammation model showed mild uptake of ECG-ELR in inflamed site (target to non-target ratio was 2.1, 2.8, 3.4, 3.3 and 3.1 at 15 min, 30 min, 1 hour, 2 hours and 4 hours after injection, respectively). In the competition study, the tumor uptake was blocked by the co-injection of high concentrations of free ELR. CONCLUSION: Tc-99m ECG-ELR was successfully developed and was good candidate for a tumor imaging agent. Also, Tc-99m ECG-ELR had showed the ability for differentiating the tumor from inflammation.

P0282

Gated myocardial perfusion SPECT as compared to other imaging modalities in ischemic heart disease patients

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Purpose: retrospectively compare gated 99mTc-MIBI single-photon emission tomography (G-SPECT) with other imaging modalities in myocardial structural/functional status assessment in patients (pts) with proven ischemic heart disease (IHD). Methods: 140pts with proven IHD underwent G-SPECT (two-day rest-treadmill stress study), Cardiac US, Coronary angiography (CAG), 41 of them additionally underwent cardiac MRI, 23 - MDCT-Coronarography (CTA). Results: Rest accumulation defects comparison, performed using 17-segment (sgm) model, showed 62,4% SPECT-MRI agreement, though their SRS correlated closely (r=0,85). In 78.0% of pts transient ischemia (TI) detected with stress-SPECT, with no reliable

rest-MDCT/MRI TI-patterns. CTA showed sensitivity 96,7%, specificity 96,4% in detecting >50% stenoses, compared to CAG. Calcium burden (MDCT), stenosis severity (CTA\CAG) weren't predictive for TI in SPECT-MDCT group. Only 28,6% pts with 50-80% stenoses had reliable TI (>10% of LV area). Sensitivity of G-SPECT TI predicting >50% and >70% stenosis was 55,9% and 67,7%, respectively, specificity was 86,2%. G-SPECT diagnostic accuracy was better for LAD, for one-vessel involvement, and for TI in aggregate with post-infarction cardiac sclerosis. Discussion: TI is major coronary reserve indicator and IHD course predictor, assessed only with rest+stress protocols. SPECT is obligatory for CAG pts selection, especially in negative, equivocal or unfinished stress-tests. Rest-MRI subendocardial scar detection is superior, SPECT and MRI have similar overall irreversible area calculating capability. MDCT proved NPV in suspected CAD (not obligatory IHD). Conclusion: Anatomical/functional (MDCT/MRI) and perfusion/cellular (SPECT/PET) methods aren't competitive but complementary. Knowing exact study purpose, each method's advantages profound understanding, enables every IHD case optimal diagnostic algorithm.

P0283

Patients with Normal Exercise Stress Myocardial Perfusion Studies Who Achieve Less Than 75 Percent of Maximum Predicted Heart Rate Are Incresased Risk for Cardiac Events

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Objective Exercise stress myocardial perfusion imaging (MPI) provides important diagnostic and prognostic information. To confirm weather patients with normal stress MPI who achieve < 75% Maximal Predicted Heart Rate (MPHR) with the Bruce protocol are at higher risk for cardiac events compared to those who achieve higher levels of MPHR. Methods We studied 1000 patients (614 male, 386 female; mean age 60±12y) with normal MPI in whom Bruce protocol stress MPI was performed. The patients were divided into two groups based on MPHR; 116 patients with MPHR< 75% were placed in the Group 1 and 884 patients with MPHR ≥75% were placed in Group 2. Follow-up data over 2±0.3 year were obtained from hospital records. Death, myocardial infarction (MI), myocardial revascularization procedures (PTCA, CABG) and unstable angina were considered as adverse cardiac events. Associated cardiac risk factors, medications and prior cardiovascular medical history were compared in these two groups, and prognostic value of exercise treadmill stress variables analyzed. Results Of 1000 patients studied, 116 (11.6%) failed to achieve 75% MPHR with the standard Bruce protocol. In all of the patients studied, there were a total of 30 adverse cardiac events. In Group 1, with less than 75%MPHR, there were 16 events (13.0%). In Group 2, with ≥75% MPHR, there were 14 events (1.5%). The difference in number of events in the two groups was highly significant (P< 0.001). Group1 patients were more likely have a history of MI, PTCA, diagnosed CAD, symptoms of typical angina, smoking history, hypertension, or treatment with β-blockers. Resting HR, peak HR, peak SBP, METS, frequency of ST depression ≥1 mm and EF were significantly higher in Group 2 patients; the Duke score was significantly lower in the Group 2 patients. Stepwise regression analysis demonstrated that the variables most likely to be related to cardiac events were MPHR, followed by ischemic ECG changes, and METS. Duke score and systolic blood pressure did not have a strong influence on adverse cardiac events. Conclusions Patients that had a normal exercise MPI who failed to achieve 75% of MPHR with the Standard Bruce protocol are at about 9-fold higher risk for adverse cardiac events compared to those who reached higher levels of MPHR. Thus patients with normal exercise MPI with MPHR below 75% should be evaluated with pharmacological stress testing or other appropriate procedures for protection from future adverse cardiac events.

P0284

Potential tumor targeted SPECT probe 99mTc-TMP-Asp- 8-OHQ: Synthesis, characterization and preclinical evaluation

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Abstract: Aim: SPECT use radiotracers to image, map and measure target site activities (e.g. angiogenesis, metabolism, apoptosis and proliferation) and are considered as molecular imaging modalities. The enhanced uptake and anti-cancer activity of 8-Hydroxyquinoline(8-OHQ) has motivated the development of radiolabeled 8-OHQ derivative as diagnostic marker for imaging cell membrane proliferation and non-invasive detection of prostate, brain and breast tumour. The studies have revealed that if the hydroxyl group is protected than the moiety loses the anticancer activity and it is being presumed that Cu(II) binds with 8-hydroxyl of 8-OHQ forms an active complex to kill cancer active cells. The addition of methylenephoshonic moiety trough optically active modified aspartic acid group 8-OHQ for labelling with 99mTc to develop specific SPECT imaging agent. Methods: The 8-hydroxyquinoline-2-carbaldehyde was synthesized by selenium dioxide oxidation of 2-methylquinolin-8-ol. The oxidized 8-hydroxyquinoline-2-carbaldehyde was attached to the aspartic acid and reduced to give bifunctional 2-((8-hydroxyquinolin-2-yl)methylamino)succinic acid with a good yield (75%), which was further chloroacetylated to give 2-((2-chloro-2-oxoethyl)((8-hydroxyquinolin-2-yl)methylamino)succinnicacid with the yield of 80%.the chloroacetylated product was phosphorylated to give desired ligand: TMP-Asp-8-OHQ with the yield of 70%.The radiolabeling efficiency was found to be > 97% and the stability in serum indicated that 99mTc remained bound to 8-OHQ- conjugate under physiological conditions. Results: The synthesized ligand has been characterized by different spectroscopic technique (NMR and Mass).Radiolabeling was achieved above 97% and radio conjugate is stable for 24hrs in human serum and get dissociated less than 0.5%. The biological studies in experimental model showed excellent uptake at tumour site .The tumour grafted in athymic mice was readily identifiable in gamma images using Animal SPECT-CT system. Conclusion: We have successfully synthesized and characterized the ligand and the 99mTc-TMP-Asp- 8-OHQ derivative has showed excellent tumour targeting and has promising utility as SPECT-radiopharmaceutical for imaging. References: International journal of radiation oncology 1991, vol-20(6),1263-1271

P0285

Diagnostic gain of SPECT-CT in skeletal scintigraphy in oncologic and non-oncologic applications

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Introduction: Skeletal scintigraphy, although having high sensitivity, has low specificity in characterizing a lesion with abnormally increased Tc-99m MDP uptake. This can partly be overcome by doing a regional SPECT study of the indeterminate lesion on planar images. At times, even SPECT may be of not much use due to low resolution and hence poor lesion characterization. Under such circumstances, regional SPECT study along with low-dose CT, may be carried out for accurate anatomical localization and at times characterization also. Aim of the study: To assess the utility of SPECT-CT, in comparison to planar skeletal scintigraphy, in patients with oncological and non-oncological diseases. Materials and methods: Patients referred for bone scan for oncological as well as non-oncological diseases (viz; polyarthralgia, infection, vague skeletal pain, etc.) were injected with ~ 15 - 25 mCi of Tc-99m-MDP and 3-4 hours later whole body planar scans were acquired. Patients showing indeterminate focal area or areas of abnormal tracer concentration were further subjected to regional SPECT study with low-dose CT for anatomical localization and characterization of the lesion. Separate analysis of the whole body scans and whole body scans in conjunction with SPECT-CT study were carried out. Results: Total of 21 indeterminate lesions, identified on planar skeletal scintigraphy in 20 patients, were assessed with regional SPECT-CT study. Eleven lesions (52.4%) in 11 patients on SPECT-CT study were in concordance with the findings on planar images while 10 lesions (47.6%) in 9 patients showed discordance with planar scintigraphy. Discussion: In the cases that were included in this study, addition of CT to the SPECT study, for suspected abnormal skeletal lesions on planar scintigraphy, provided complimentary information in the form of accurate anatomical localization and lesion characterization. Combined SPECT-CT imaging using single machine and during the same imaging study proved advantageous to the patient as considerable time and expenditure was saved, to the referring Physician as the scintigraphic findings either closely matched the clinical diagnosis or was provided with a different diagnosis not consistent with the clinical suspicion and to the Nuclear Medicine Physician in providing confidence and accuracy to the final interpretation. Conclusion: Combined SPECT-CT study improves the specificity of skeletal lesions, by reducing the uncertainties associated with indeterminate lesions identified on planar whole body imaging.

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Molecular & Multimodatliy Imaging: PET/MR

P0286

Our initial experience of integrated simultaneous whole-body PET/MRI compared to PET/CT for oncological applications

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Aim:Implementation of the first integrated whole body PET/MRI in the UK has been done in our department recently. Aim of the study is to present our initial experience in PET/MRI regarding MR-based attenuation correction, standardized uptake values (SUV) and evaluation of images' quality. **Materials and methods**: Between March 2012 and April 2012, 12 patients (pts) (8 male, median age 53 years, range 32-81 years) with known malignancy had undergone PET/CT and subsequent PET/MR imaging following a single ^{18}FDG administration in our department. According to our protocol 370±30MBq of ^{18}FDG administered and PET/CT images acquired after 68±9min with 2.5-5min/bed position depending on

pt BMI. The low dose CT was used for the iterative reconstruction (OSEM 3D). After 122±9min post injection, PET/MR images were acquired with 4min/bed position. MR images are segmented based on 2-point DIXON technique, which divides the body into 4 tissue classes air, water, fat and soft tissue (excluding bone) and each class is assigned a default linear attenuation value. SUVs max from brain, lung, liver, spleen, and hyper metabolic lesions suspicious of malignancy were acquired, calculated and compared from both imaging techniques. Moreover the quality of PET/MR images compared to PET/CT images was assessed independently by two certified radiologists/nuclear physicians using a 4-point scale: 0: absent; 1: mild, 2: moderate, and 3: severe artefacts. **Results:** There was significant correlation between SUVs max of PET/CT and PET/MRI images for the brain, lung, liver, spleen with an expected decrease over the time of ^{18}FDG for normal tissue (p0.05). **Conclusion:** Our study demonstrates that attenuation correction of simultaneous whole-body PET/MRI provides reliable SUV values, highly correlated with that of PET/CT. Furthermore, the image quality and quantitative data achieved using PET/MRI is similar to that using PET/CT.

P0287

Biomarkers in dementia and MCI: combining amyloid imaging and structural MRI

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Background: New NIA-AA diagnostic guidelines for Alzheimer's Disease (AD) incorporate biomarkers in the diagnostic criteria and suggest two categories: Aβ accumulation and neuronal degeneration or injury. Objective: To compute neocortical standard uptake value ratios (SUVR) from amyloid PET and hippocampus volumes from MRI and investigate the performance of these biomarkers when used individually and when combined. Methods: All subjects with baseline MR and [^{11}C]PIB scans from the AIBL study, available for download from ADNI, were used. The cohort included 68 healthy controls (HC), 83 healthy subjects with subjective memory complaints (SMC), 41 mild cognitive impairment (MCI) and 34 AD. The MCI group was divided into stable MCI (sMCI) and progressive MCI (pMCI) based on the clinical status at 18 month follow up. PET data was processed using a fully automated method. The 50-70 min PET sum images were spatially normalized into MNI space using a PET-based adaptive template method and SUVR values for regions corresponding to frontal, lateral temporal and parietal cortices as well as anterior and posterior cingulate/precuneus were computed using a cerebellar cortex reference region. A composite neocortical SUVR value was computed as an average of the above-mentioned cortical regions. The hippocampus was segmented using an extended multi-atlas segmentation method. Volumes reported were the sum of the left and right hippocampus corrected for total intra-cranial volume. Results: SMC subjects showed a slightly higher SUVR and lower hippocampal volume compared to HC. A much higher SUVR and much lower hippocampal volume was observed in pMCI (n=12) when compared to sMCI (n=29). When both measures were combined, most pMCI subjects clustered in the area with high SUVR and low hippocampal volumes indicating that these subjects were in different stages of neurodegeneration as compared to the sMCI subjects. Conclusion: Combining amyloid PET with structural MRI in MCI may enable improved disease characterization.

P0288

Ultra fast gradient echo (GRE), balanced gradient echo (bGRE) and ultra fast spin echo (SE) PET/MRI vs. PET/CT in abdominopelvic oncological lesions - initial results on sequence selection

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Purpose: To compare three MR sequences (ultra fast gradient echo (GRE), balanced gradient echo (bGRE) and ultra fast spin echo (SE)) and PET/CT for lesion conspicuity in PET-positive findings by using non-contrast enhanced PET/CT (PET/CT) and PET/MRI imaging. **Methods and Materials:** 15 patients (mean age 52.3 years, range 22 to 72 years, 8 female, 7 male) with various oncological diseases (e.g. colon cancer, breast cancer, melanoma) were referred for a clinical PET/CT. An additional PET/MRI was performed within a Tri-modality PET/CT-MRI system (GE Discovery 750 3T) with ultra fast gradient echo (GRE), balanced gradient echo (bGRE) and ultra fast spin echo (SE) sequences (T1, T2 and FIESTA) acquired with body array coils. All lesions (lymph node metastases/organ metastases) were compared concerning lesion conspicuity (qualitative score 1 (<25% tumor border detectable) up to score 4 (>75% tumor border detectable)). ANOVA analysis was used to compare detectability and conspicuity for both modalities, p values < 0.05 were considered significant. **Results:** 37 PET-positive lesions were evaluated (29 abdomdinal lesions, 8 pelvic lesions). All lesions were seen on PET/CT as well as in PET/MRI. Mean conspicuity between between PET/CT(2.1/2.6 - liver lesions/other) was significantly different when compared to ultra fast GRE T1 (3.5/2.6, p<0.001) and ultra fast SE T2 (3.2/2.7, p=0.0042. No difference was found when compared to bGRE (2.5/2.6, p>0.05). No change concerning N- and M-stage was found between PET/MRI and PET/CT. **Conclusion:** Ultra fast GRE T1 and SE T2 sequences in PET/MRI are superior concerning lesion conspicuity in abdominopelvic cancer compared to PET/CT. Thus, those two basic sequences might be sufficient in PET/MRI to achieve the same diagnosis than with standard PET/CT.

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Molecular & Multimodatliy Imaging: Biology

P0289

Imaging of Carrageenan-Induced Acute Inflammation and Adjuvant-Induced Chronic Arthritis with 11C-PBR28 microPET

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Objectives: 11C-PBR28 binds to the translocator protein (TSPO), also called peripheral benzodiazepine receptor (PBR), which is known to play a role in microglial activation. Because the TSPO can also be expressed on peripheral macrophages, we evaluated 11C-PBR28 for potential applications in acute and chronic inflammation using 2 different established rat models. Methods: Performance of 11C-PBR28 was assessed in T-cell mediated adjuvant arthritis induced by systemic heat-inactivated Mycobacterium butyricum injection in genetically susceptible Lewis rats (model A) and in acute inflammation induced by local Carrageenan-injection into the paw of Fisher 344 rats (model B). A 60 min. dynamic micro-PET scan (Concorde R4 scanner) was performed after iv injection of approx. 35 MBq 11C-PBR28 at the time point of known maximal inflammation (3 hours and 14 days post treatment for model B and A, respectively). Standardized ROIs were defined in the root of the tail, inguinal lymph nodes and thigh muscle in model A (n=9) and compared with non-treated controls (n=8). In model B, VOIs were defined in the paw of Fisher 344 rats (n=6) with contralateral sham treatment (NaCl 0.9% injection) as control. Peak SUVs were obtained for further analysis. Immunohistochemistry for CD68, a macrophage stain, was performed from lymph nodes and paw tissue. In addition, the 11C-PBR28 uptake was measured in lipopolysaccharide (LPS)-stimulated and non-stimulated bone-marrow derived rat macrophage cultures. Results: 11C-PBR28 lesion uptake increased over time in acute and chronic models indicating accumulative tracer kinetics in inflammation. Modal A showed that the 11C-PBR28 SUV (at 30-60 min.) of the tail (+53%) and lymph nodes (+55%) were significantly increased, while muscle uptake was unchanged. In Carrageenan-treated animals (model B), a 2-fold increase of the mean 11C-PBR28 SUV was observed compared to sham ($p < 0.01$). Increased CD68 staining was identified in both models. In cell cultures, LPS stimulation increased the 11C-PBR28 uptake in a dose-dependent fashion. Conclusions: 11C-PBR28 PET may have potential for imaging of acute and chronic inflammatory processes involving activation of macrophages. Given accumulative lesion kinetics, a 18F-labeled compound would be preferable for clinical applications.

P0290

Bortezomib induces changes in proliferation, metabolism and differentiation in anaplastic thyroid carcinoma

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The ubiquitin/proteasome pathway has been identified as a potential molecular target for cancer therapy. In this study, we investigated the effect of the proteasome inhibitor Bortezomib on the anaplastic thyroid (ATC) carcinoma characterized to be insensitive to multimodal therapeutic approaches. **Methods:** The ATC cell lines C643 and SW1736 were treated with Bortezomib (1 nM - 1 µM) for 12h to 72 h. Thereafter, growth inhibition was analyzed by thymidine uptake experiments and determination of the viable cell number. Apoptosis measurements and cell cycle analysis were performed by the Caspase-Glo 3/7 assay and FACS analysis. Using Affimetrix gene chip analysis and the Step one plus real-time quantitative PCR (qPCR) system we quantified transcriptional changes. The activity of the nuclear factor (NF)-κB and p53 signal transduction pathways was monitored using the reporter constructs pNF-κB-TA-Luc and pp53-TA-Luc in the luciferase activity assay. Uptake measurements using fluorodeoxyglucose (FDG), aminoisobutyric acid (AIB) and Na^{125}Iodide were performed to investigate metabolic changes and iodide symporter (NIS) activity *in vitro.* Moreover, the FDG uptake was evaluated in C643 or SW1736 tumor-bearing nude mice 1 d or 2 d after treatment with Bortezomib.**Results:** Bortezomib induced growth inhibition, apoptosis and G_2-M cell cycle arrest associated with upregulation of $p21^{CIP1/WAF1}$expression in both cell lines. In addition, the glucose metabolism and AIB uptake significantly decreased *in vitro* whereas *in vivo* only in SW1736 tumors 2 d after the Bortezomib-treatment. The transcriptional profile in Bortezomib-treated

SW1736 and C643 cells revealed increased expression of genes involved in stress response, apoptosis, regulation of the cell cycle and differentiation. Employing qPCR for quantification of gene expression we noticed upregulation of the tumor necrosis factor (TNF)-related apoptosis-inducing ligand (TRAIL) and of the thyroid-specific transcription factors Pax8 and TTF-1 leading to expression of the thyroid-specific target genes thyroglobulin (Tg), sodium iodide symporter (NIS), thyreoperoxidase (TPO) and thyroid stimulating hormone receptor (TSHr) and to a moderate accumulation of iodide in SW1736 and C643 cells. **Conclusion:** Based on our data Bortezomib represents a promising antineoplastic agent for the treatment of ATC. To improve the clinical outcome further investigation into the potential of Bortezomib therapy of thyroid cancer is warranted.

P0291

Targeting the B7-H3 molecule with high affinity peptides found through phage display technology

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Introduction B7-H3, a transmembrane type I protein, is allocated to the immunglobuline family. In contrast to the other members of the B7 family, the protein is widely expressed on human tissues. Interestingly the membrane protein is overexpressed on many cancer types like prostate, ovarian and non small cell lung cancer. Expression levels may be used as predictor of cancer progression since they correlate with poor outcome in prostate and colon cancer. Due to the upregulation in cancer cells and the low expression or even absence in healthy tissue these molecules might be suitable targets for therapies and imaging. Aim of this study was to identify peptides specifically binding B7-H3. **Methods** Biopanning was carried out using a 12-mer peptide library against the purified extracellular domain of B7-H3 using phage display technology. After four selection rounds the phage vectors were sequenced and one sequence (CD276.11) was chemically synthesized. CD276.11 was labeled with ^{125}I and characterized in vitro on cell lines with different expression levels of B7-H3. Kinetics, competition experiments with unlabeled peptide as competitor and internalization experiments should give information about target affinity. Additionally stability tests were carried out in human serum followed by HPLC analysis. **Results and conclusion** First cell based assay showed a correlation of cell binding affinity with target expression. Two cell lines,the prostate cell lines PC-3 with high expression of CD276 and DU-145 with low expression of the target were used for characterization experiments. The ^{125}I labelled peptide showed 3.6 % binding/ [applied dose/ 1 million cells] to PC-3 cells, whereas the affinity to the DU-145 cells was 0.3 %. Competition experiments with the unlabelled peptide demonstrated a decreased binding of 95 % at a competitor concentration of 10^{-4} M. The determined IC50 was 2.7 10^{-7} M. Furthermore, the internalization of CD276.11 in PC-3 cells could be shown. HPLC analysis showed degradation of the original peptide to a stable metabolite in human serum, which needs to be identified in relation to application in *in vivo* experiments.

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Molecular & Multimodatliy Imaging: Optical Imaging

P0292

PET biomarkers of beta-amyloid deposition and neuronal injury in Mild Cognitive Impairment due to Alzheimer's disease

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We have recently demonstrated that a diagnostic framework with a beta-amyloid (Aβ) deposition by [11C]-PIB PET allows for an earlier and more specific AD diagnosis. This study is to define "mild cognitive impairment (MCI) due to Alzheimer's disease (AD)" using Aβ deposition and neuronal injury as biomarkers. Furthermore, we sought to determine whether episodic memory impairment, age and apolipoprotein-E (APOE) genotype have an effect on progression from MCI to AD. Fifty-six MCI patients underwent cognitive testing, 60-min dynamic [11C]-PIB PET for Aβ deposition and 20-min static [18F]-FDG PET for neuronal injury at baseline, 12 months and 24 months, and APOE genotype assessment at baseline. Regions of interest were defined on co-registered MRI. PIB distribution volume ratios (DVR) were calculated using Logan graphical analysis, and quantitative analysis for [18F]-FDG used the standardized uptake value ratio (SUVR) on the same regions. Twenty-eight (50%) of all 56 MCI patients (MMSE: 27.0 ± 1.6, CDR: 0.5, CDR SB: 0.8± 0.3) converted to AD (MMSE: 22.7 ± 2.3, CDR: 0.6 ± 0.2, CDR SB: 2.7 ± 1.0) over 17.5 ± 8.0 months. Of 44 MCI patients with positive Aβ biomarker (PIB DVR ≥ 1.49) 28 (63.6%) converted to AD. In addition, for 43 MCI patients with both positive biomarkers of Aβ and neuronal injury (FDG SUVR ≤ 0.99), the rate of conversion was 65.1%. In contrast, of 39 MCI patients with impaired paragraph delayed recall (WMS-R Logical Memory II) in addition to both positive biomarkers, 27 (69.2%) converted to AD. In 14 MCI patients aged 75-89 years with impaired paragraph recall and both positive biomarkers, the rate of converters increased to 84.6% compared to 61.9% of 21 MCI patients aged 65-74 years. Four (80%) of 5 APOE ε4/4 carriers with positive Aβ biomarker converted to AD while 52.6% of the 19 APOE ε4/3 carriers converted. All of 12 MCI patients with negative biomarkers of Aβ did not convert to AD despite neuronal injury biomarker. In distinguishing "MCI due to AD" from MCI individuals aged 75-89 years, a biomarker of Aβ deposition showed a sensitivity of 100% and a specificity of 66.6%. The positive and negative predictive values were 85.7% and 100%, respectively. A biomarker of Aβ deposition, in addition to neuronal injury, predicts conversion to AD and discriminates "MCI due to AD". Furthermore, The MCI individuals who have APOE e4/4 allele or are older than 75 years old have greater risk of converting to AD.

P0293

Serial Angiography Depicts and Confirms the Neo-Angiogenesis Destroy in PRRT Treated Patients

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Aim: It is well investigated that tumor neo-angiogenesis is the prerequisite of tumor growth and metastatic dissemination. Focusing on the liver neuro-endocrine metastases due to GEP-NETs, their neo-vasculature can be angiographically clearly observed, during the therapeutic procedure dealing with infusions of high doses of radiopeptides (PRRT), after selective catheterization of the hepatic artery. This study aimed to prove the changes of the affected tumor neo-vasculature net, characterized by sst2 receptor overexpression, before, during and after the accomplished PRRT schemes. **Material and Methods**:The adopted protocol procedure by the Research and Ethical Committee of our Institution, called 'Aretaieion' Protocol, is dealing with the confrontation of neuroendocrine tumours and consists in the exclusively intra-arterial infusions (femoral artery → iliac artery → aorta → hepatic artery) of the radiopeptide to irradiate the neuroendocrine neoplasm. Compared to the ordinary i.v. (antecubital vein) application, trans-arterial PRRT technique, performed as close as possible to the tumour-vessel-net has two main advantages: (a) the markedly higher dosage deposit to the tumour, consequently ensuring a more direct irradiation , and (b) the reduced dosage delivered to the kidneys which with bone-marrow are the critical organs. In 11 GEP-NET patients, the average dose per session administered monthly to each of them was 7.3±2.3 GBq. Repetitions did not exceed 6-fold with treatment intervals of 5-8 weeks. Response assessment was classified according to the RECIST criteria. Selective hepatic angiography was conducted with a digital angiographic unit. A 5.0-F valved sheath was inserted into the femoral artery with the patient under local anaesthesia. After obtaining arterial access, a diagnostic visceral arteriogram was performed to delineate the arterial supply to the tumour, determine the presence of variant arterial anatomy and confirm portal vein patency. **Results:** In the angiographies obtained on the course of repeated catheterisations, a tumour bulk reduction in the total tumour vessel net could be observed. Comparing the consecutive angiogram series from the initialisation of PRRT up to the end of the scheme an obvious vessel-net degression was depicted confirming and predicting the positive response to the treatment. **Conclusion:** Since angiogenesis is a key event in neoplasm's progression and therefore a promising target for cancer treatment, sst-2 receptors over-expressed in the endothelium of neuroendocrine character neo-plasmatic disease consist an excel-lent target of radiolabelled somatostatin analogues. The latter is proved in 11 PRRT-treated patients serial angiographies, obviously depicting the neo-vessel destroy.

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Radiopharmaceuticals & Radiochemistry: Radiopharmaceuticals - PET

P0294

Biodistribution and radiation dosimetry of F-18 labeled amyloid imaging probe [18F]FACT in humans

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Purpose: Biodistribution and radiation dosimetry of F-18 labeled amyloid imaging probe [18F]FACT in human was investigated. Methods: 6 healthy subjects (3 male and 3 female, mean of age ± SD: 76.3 ± 3.2 y.o.) were conducted in this study. Averaged 160.8 MBq of [18F]FACT were intraveneously administrated, and then series of whole body PET scans including four emission scans were performed. Nineteen source organs for male and twenty source organs for female and the remainder of the body were studied to estimate residence times. Mean absorbed dose in each target organs and effective dose were estimated from the residence

times in the source organs. Biodistribution data of [11C]BF-227 and [18F]FACT from mice were also used to estimate absorbed doses and effective dose in human, which were compared with estimated doses of [18F]FACT from human PET data. Results: High absorbed dose in human PET data was observed in gallbladder (360 µGy/MBq), liver (77.8 µGy/MBq), small intestine (33.6 µGy/MBq), upper large intestine (30.0 µGy/MBq) and lower large intestine (25.0 µGy/MBq). Averaged effective dose estimated from human PET data was 18.2 µSv/MBq. High absorbed dose of [18F]FACT from mouse data was observed in small intestime (38.5 µGy /MBq), liver (25.5 µGy /MBq) and urinary bladder wall (23.8 µGy /MBq). Effective dose from mouse data was 14.3 µSv/MBq and 3.39 µSv/MBq for [18F]FACT and [11C]BF-227, respectively. Conclusion: The biodistribution pattern of [18F]FACT in human showed predominant hepatobiliary excretion. Estimated effective dose from human PET data indicates that [18F]FACT PET study was acceptable for clinical purpose.

P0295

Simultaneous determination of radiochemical and chemical purity of [18F]FDG by new normal phase HPLC method

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Aim: [18F]FDG produced by nucleophilic substitution method followed by an acidic hydrolysis may contain two radiochemical byproducts beside the active ingredient, namely free [18F]-ions and partially acetylated [18F]FDG as well as inactive impurities FDG and ClDG. To avoid the use of separate chromatographic methods for the determination of radiochemical and chemical purity of the product as recommended by Ph.Eur.6.2, in this work we report a new single normal phase HPLC method. Materials and Methods: The HPLC system used for method development consisted of an HPLC pump (Jasco), a syringe-loading sample injector valve (Rheodyne), a radiometric detector (atomki, Hungary) and a refractive index detector (Knauer). Standards of FDG and ClDG were purchased from ABX GmbH. Results: Using Inertsil NH2 column (4.6 mmx250 mm; GL science, Japan) at 1 ml/min flow rate with mobile phase acetonitrile/water 85/15 V/V% we achieved the separation of FDG and ClDG with resolution of 1.74 ± 0.07, and the retention was 1.09 ± 0.04. The concentration of FDG and ClDG standards was 100 µg/mL. The injected volume was 20 µL. The retention times of FDG and ClDG were 7.2 min and 8.2 min, respectively. Under the same chromatographic conditions partially acetylated [18F]FDG and [18F]FDG were eluted with retention times of 2.0 min and 7.0 min, respectively. In order to make free [18F]-ions eluted we used gradient elution, with a flow rate 1 ml/min, and the eluent composition was 85/15 V/V% acetonitrile/water for 8 minutes. After that the flow rate was 2 ml/min and the eluent composition was 5/95 V/V% acetonitrile/0.1 mM sodium acetate solution (pH6) for 7 minutes. Due to gradient elution [18F] was eluted with a retention time of 12.4 min. The resolution between partially acetylated [18F]FDG/[18F]FDG and [18F]/[18F]FDG were 2.2 and 4.8, respectively. To validate the analytical method, we determined the linearity, precision and limit of quantification. According to our results the RSD% of FDG peak height was 1.9% (n=3) and the [18F]FDG peak area was 0.07% (n=8). The detector response was linear for [18F]FDG in the range of 2-840 MBq/ml with a coefficient of determination (r2) of 0.998. The LOQ for [18F] and partially acetylated [18F]FDG are 2.0 MBq/ml and 2.7 MBq/ml, respectively. LOQ for FDG and ClDG is 100 µg/mL. Conclusion: Our HPLC method gives an opportunity to decrease the workload during the routine quality control of [18F]FDG at 5 ml of maximum recommended dose of injection.

P0296

Cassette-based synthesis of 11C-raclopride

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Introduction: Development of automated synthesis modules for PET-radiopharmaceuticals are dictated by the requirement to comply with Good Manufacturing Practice. Therefore cassette-based systems have become available to prevent mix-up, cross contamination. Additional advantage is use of sterile disposables and elimination of cleaning procedures. We developed a cassette-based synthesis of ^{11}C-raclopride using Eckert&Ziegler PharmTracer to demonstarte that even complex production process such as 11C-methylation. HPLC purification and formulation are feasible. Methods: The cassette-based PharmTracer synthesis system consisted of one part for methylation and one for formulation. Cassettes were assembled using sterile PharmTracer cassette scaffolds, standard tubing material, syringes (all pharmaceutical grade) and cartridges. All cassette components were tested for stability against organic solvents like acetonitrile and DMSO. HPLC-purification was integrated using conventional equipment of the same supplier. ^{11}C-Methyl triflate was produced in gas phase using ^{11}C-methyl bromide as intermediate. A few minutes before delivery of ^{11}C-methyl triflate the precursor was dissolved in DMSO and added manually to a sodium hydroxide solution. . ^{11}C-Methyl triflate was trapped in the precursor solution at rt. After reaction at 90 ^{o}C for 2-3 min, the mixture was diluted by HPLC mobile phase and submitted to HPLC-purification. The ^{11}C-raclopride fraction was collected in 100 ml water and subsequently formulated using C18 seppak resulting in a sterile solution of ^{11}C-raclopride in saline with 10% ethanol. Results: The synthesis proved to be reliable over 10 productions.The conversion rate of the injected activity was analyzed from the semi preparative HPLC chromatogram to be 74-81% product. The radiochemical yield ranged from 26-37% and synthesis time was 26 min (decay corrected calculated from trapping of ^{11}C-methyl triflate). Radiochemical purity was >98%. Compared to our established clinical synthesis method using a Zymark robotic system, RCY and synthesis times are comparable. Conclusion: The PharmTracer synthesis modules offers a suitable platform for reliable synthesis of 11C-radiopharmaceuticals using disposable cassettes. under GMP-conditions.

P0297

Radiosynthesis of 10-(2-[18F]fluoroethoxyl)-20(S)-camptothecin as a potential imaging agent for tumor

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Objectives: 10-[^{18}F]fluoroethyl-20(S)-camptothecin, which is derived from camptothecin, an active constituent of the native Chinese tree Camptotheca acuminate, exhibits an anti-tumor action due to its inhibitory effect on DNA topoisomerase I. In this study, 10-[^{18}F]fluoroethyl-20(S)-camptothecin was exploringly synthesized, characterized, and to provide possibility for further study in vivo.**Methods:** The reference compound of 10-(2-[19F]fluoroethoxyl)-20(S)-camptothecin was synthesized by organic synthesis, and identify ^{1}H NMR and mass-spectrography.1-Bromo-2-[^{18}F]fluoroethane was synthesized automatically using 2-bromoethyl triflate as precursor by multifunction mode(Beijing PET Company), and subsequently reacted with 10-hydroxycamptothecin in DMSO at 60°C for 20 min. the objective product of 10-[^{18}F]fluoroethyl-20(S)-camptothecin was purified by HPLC. **Results:** The reference compound of 10-(2-[19F]fluoroethoxyl)-20(S)-camptothecin as a yellow solid was successfully systhesized and yield was 19.7%,mp: 139-143 °C. Rf= 0.33 (CH_2Cl_2:CH3OH = 20:1). 1H NMR (DMSO-d6, 400 MHz) δ: 0.86 (t, J = 7.24Hz, 3H, 18-CH3), 1.84 (m, 2H, 19-CH2), 4.40 (dm, J = 29.7 Hz, 2H, 10-O-CH2), 4.82(dm, J = 44.8 Hz, 2H, F-CH2), 5.21 (s, 2H, 5-CH2), 5.39 (s, 2H, 17-CH2), 6.51 (s, 1H20-OH), 7.25 (s, 1H, 14-CH), 7.48-7.52 (m, 2H, 9-CH and 11-CH), 8.04 (d, J = 10.6 Hz, 1H, 12-CH), 8.41(s, 1H, 7-CH). **ESI-MS** *m/z* 411.1 (M+1)..The total radiosynthesis time of 10-[^{18}F]fluoroethyl-20(S)-camptothecin was 70-80 min, and the radiochemical yield of the radiotracer was 10%-20% (not correcred, n=20). The radiochemical purity of the radiotracer was greater than 96%, and the activity of the radiotracer was 740-1480Mbq at EOS (base on 7400Mbq ^{18}F).**Conclusions:** 10-[^{18}F]fluoroethyl-20(S)-camptothecin can be prepared via ^{18}F-fluoroethylation using 2-bromoethyl triflate with high radiochemical yield,which made it possible for further in vivo study. **Acknowledgments** The project was supported by grants from the Natural Science Foundation of China (No.30870730), the Science and Technology Planning Project of Zhejiang Province (No.2009C33109).

P0298

Automated synthesis of [18F]FMISO on Synthera®

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Aim The synthesis of the hypoxia tracer 1-[^{18}F]fluoro-3-(2-nitro-1*H*-imidazol-1-yl)propan-2-ol ([^{18}F]FMISO) has been automated on the IBA Synthera® for routine clinical use. Being able to quantify the degree of hypoxia in cells is a useful tool in therapy planning, since hypoxia can cause resistance to both radio- and chemotherapy. **Materials and Methods** Standard nucleophilic integrated fluid processor (IFP™) was used for the synthesis on the IBA Synthera®. The precursor 1-(2'-nitro-1'-imidazolyl)-2-O- tetrahydropyranyl-3-O-p-toluenesulfonyl propanediol (NITTP, 5 mg) was heated at 100 °C for 10 min with ^{18}F/Kryptofix/K_2CO_3 and thereafter subjected to hydrolysis with 0.1 M hydrochloric acid at 90 °C for 2 min. Purification of the product was performed by using a combination of SCX, HLB and Alumina B cartridges. **Results** [^{18}F]FMISO was obtained in 49 ± 4% radiochemical yield (decay-corrected) in 35 min total synthesis time, with radiochemical purity of ≥98%. The specific radioactivity was 130-200 GBq/µmol. The product solution was ready for injection in human, without any need for subsequent HPLC purification. **Conclusion** This is the first reported automated synthesis of [^{18}F]FMISO on the Synthera® using only cartridge purification and no HPLC purification. The use of disposable IFP™ and cartridge purification simplifies the handling and shortens the total synthesis time. Using this setup also minimizes the radiation dose for the operator and gives high reproducibility and reliability.

P0299

New Multimodal Fluorinated and Iodinated Radiotracers for Melanoma PET Imaging and Targeted Radionuclide Therapy

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Aim: Our lab develops arylcarboxamides as melanoma tracers because of their high melanin binding capacity. In this context, a new multimodal approach has consisted in designing iodinated and fluorinated melanin-targeting molecules offering diagnosis (PET imaging/^{18}F) and therapeutic (targeted radionuclide therapy/^{131}I) applications. Herein we present (i) synthesis of 3 iodinated and fluorinated quinoxaline-derivative compounds, (ii) radiolabelling with ^{125}I and screening by γ-scintigraphy, and (iii) radiolabelling with ^{18}F and PET evaluation. **Methods:** ***Chemistry:*** ICF02022, ICF15002 and ICF15038 were prepared and used as standards for characterization of their radioactive counterpart by HPLC. Structures of intermediates and final compounds were confirmed by NMR, IR and SM. ***^{125}I Radiolabelling and γ-scintigraphy:*** ICF02022, ICF15002 and ICF15038 were radiolabelled with ^{125}I by isotopic exchange ([^{125}I]NaI, $CuSO_4$, 130°C) and purified by semi-preparative HPLC. *In vivo* biodistribution of radiotracers were evaluated by γ-scintigraphy in B16F0 primary melanoma-bearing mice. ***^{18}F Radiolabelling and PET imaging:*** ^{18}F radiosyntheses were fully automated using a SynChrom® R&D module (Raytest). First, [^{18}F]F^- was converted into dry K[^{18}F]F-K_{222}-complex. [^{18}F]ICF02022 was synthesized in a two-steps-one-pot procedure from secondary amine precursor and ethylene ditosylate at 110°C in MeCN for 20 min. [^{18}F]ICF15002 and [^{18}F]ICF15038 were synthesized in one step from their corresponding mesylate precursor at 90°C in MeCN for 10 min. After purification and formulation, radiotracers were evaluated by PET in B16Bl6 melanoma-bearing mice. **Results:** ICF02022, ICF15002 and ICF15038 were synthesized in 27%, 15% and 17% overall yields, respectively, and fully characterized. [^{125}I]ICF02022, [^{125}I]ICF15002 and [^{125}I]ICF15038 were produced in 33%, 50% and 22% overall radiochemical yield (RCY) with a radiochemical purity (RCP) >97%. *In vivo* biodistribution of [^{125}I]ICF15002 showed a specific and long-lasting tumor uptake up to 10 days p.i. with a fast clearance from non-specific tissues. [^{18}F]ICF02022 was produced within 73 min, a decay-corrected (dc) yield of 11% and a RCP>99%. [^{18}F]ICF15002 was synthesized within 54 min, a dc yield of 23% and a RCP>99%. [^{18}F]ICF15038 was obtained in 65 min with a dc yield of 34% and a RCP>99%. TEP imaging of [^{18}F]ICF15002 demonstrated very promising results in terms of specific tumor uptake (15.65±0.89 %ID/g as early as 1 h p.i.), contrast (9.41±0.66 tumor/muscle ratio) and clearance (mainly urinary elimination). **Conclusion**: The 3 compounds radiolabelled with both 125I and 18F showed a specific tumor uptake with a highly contrasted tumor imaging, suggesting an excellent potential for melanoma diagnosis/staging. ICF15002 has been identified as a lead candidate and [131I]ICF15002 is actually evaluated in targeted radionuclide therapy.

P0300

Old and new radiopharmaceuticals for PET: what is the role of 18F-FDG and 18F-CHO in prostate cancer?

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Introduction: Application of 18F-Fluorodeoxyglucose (18F-FDG) in nuclear oncology is based on tumor hyperglycolysis. Regarding to prostate cancer (PC), it was not yet established a clear and direct relationship between biochemical alterations that support clinical application of 18F-FDG. Although several clinical studies correlate cellular uptake of 18F-FDG with the increase of prostate-specific antigen (PSA), 18F-FDG is not commonly used in the diagnosis and staging of PC. For these reason, new oncological tracers for PC have recently emerged, such as 18F-Fluorocholine (18F-CHO). Aim: To determine the uptake of 18F-FDG and 18F-CHO in two PC cell lines under normoxia and hypoxia conditions, as well as in low and high glucose environment. Material and methods: Studies were performed in two PC cell lines (ATCC): LNCaP (androgen/estrogen dependent) and PC3 (androgen/estrogen independent). Cell suspensions were incubated with 18F-FDG or 18F-CHO (25µCi/ml). Samples were collected to eppendorfs, centrifuged and radioactivity of cell pellets and supernatants was measured with a well-type gamma counter. Studies were conducted under conditions of high (4.5g/L - HG) and low (1g/L - LG) glucose medium content. Experiments were also conducted in normoxia (20% oxygen) and hypoxia (2% oxygen). Results: In normoxia, uptake of 18F-FDG in PC cell lines and in both culture medium did not differ (LNCaP: 1.41% in HG and 12.19% in LG; PC3: 2.31% in HG and 13.6% in LG), being evident that uptake of 18F-FDG in a LG medium is higher than in a HG medium. In hypoxia, LNCaP seems to uptake twice 18F-FDG in LG medium. In HG medium, the same cell line did not uptake more 18F-FDG in hypoxia than in normoxia. It was found the same behavior for PC3 in HG medium. However, PC3 presents a four times higher uptake of 18F-FDG in LG medium in hypoxia (52.16%) than in normoxia (13.6%). Regarding the results obtained with 18F-CHO, in normoxic conditions and in LG medium, PC cell lines uptaked the same percentage of 18F-CHO and of 18F-FDG. However, in condition of HG, PC cell lines uptake more 18F-CHO than 18F-FDG (about nineteen times more in LNCaP and thirteen times more in PC3). Hypoxia does seem to change 18F-CHO uptake in cell lines under study. Conclusion: Our results show the importance of glucose blood levels control when a PET image is obtained, both with 18F-FDG or 18F-CHO. The successful use of 18F-FDG or 18F-CHO in clinical practice may depend of the phenotype and tumor microenvironment.

P0301

68Ga-labelled DOTA-Biocytin Analogue: Optimization of Radio-Synthesis Procedure and In-Vitro Evaluations for Preclinical Application.

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Biocytin analogues labelled with 111-Indium, 90-Yttrium and 177-Lu have shown their effectiveness in the imaging of infections/inflammation of osteomyelitis as well as to provide an efficient tool of pre-targeted antibody-guided radioimmunotherapy. In this study the labelling of a biocytin analogue coupled with DOTA, namely r-BHD, with 68-Gallium was attempted and quality and stability of the preparations were assessed with the purpose of a clinical use. **Methods.** Synthesis of ^{68}Ga-r-BHD was performed by heating a fraction of ^{68}Ge/^{68}Ga eluate in a reactor containing the biocytin analogue with the proper buffer. The influence of the precursor amount (from 2.5 to 140 nmol), the pH of the reaction (from 2 to 5.5) and the buffer species (1.5 M sodium acetate, 1.5 M sodium formate, 4.5 M HEPES) on RCY and RCP was assessed. Studies on stability and maintained affinity for avidin (Av) were also performed in different media. **Results.** In the best labelling condition (56 nmol of precursor, 3.8 pH, sodium formate buffer) synthesis of ^{68}Ga-r-BHD yielded 64±3 % not decay corrected. RCP was around 95 % because a ^{68}Ga-coordinated sulfoxide form of the ligand was detected as by-product of the reaction (^{68}Ga-r-SBHD). The by-product was identify and characterized by LC-ESI-MS. At the natural 1:4 Av / ^{68}Ga-r-BHD molar ratio affinity results 62±2 % and 80±2 % in saline and human serum, respectively. Stability of ^{68}Ga-r-BHD and radiotracer/Av complex remains almost constant within 180 minutes. ^{68}Ga-r-BHD appears a good candidate for pre-clinical applications.

P0302

Synthesis and evaluation of ^{64}Cu-labeled hematoporphyrin for tumor diagnosis using microPET in mice

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Aim: 64Cu is a metal positron emitter with long half-life (12.8hr) and it has a suitable property for labeling of various PET tracers. In this study, we planned to develop radiopharmaceuticals labeled with 64Cu using for tumor diagnosis with PET. Hematoporphyrin has been widely used as photosensitizer in photodynamic therapy and can specifically accumulate in tumors, so we synthesized 64Cu-labeled hematoporphyrin (64CuHp) and evaluated its potential as PET tracer for tumor diagnosis in mice. Materials and Methods: 64Cu was produced via the 64Ni(p,n)64Cu reaction by irradiating 64Ni target on gold disk with 12 - 18 MeV proton beam. 64CuHp was synthesized from hematoporphyrin react with 64CuCl2 in methanol. We prepared model mice bearing various tumors, such as human intestinal epithelial LS180 cell, murine squamous cell carcinoma (SCC7) and MDA-MB-231 human breast cancer cell, for biodistribution studies of 64CuHp. PET studies were performed on mice bearing MDA-MB-231 tumor using microPET. Results: The yield of 64Cu was almost 250 MBq for 12hr irradiation. Radiochemical purity of 64CuHp was over 90% for animal study. The biodistribution studies of 64CuHp in mice bearing various tumors indicated high uptake to tumors (1 - 1.5 %dose/g at 24hr), and tumor/blood ratio and tumor/muscle ratio was high in each mice. We obtained clear tumor images of 64CuHp using microPET. Conclusion: 64CuHp was successfully synthesized in this sutdy. 64CuHp accumulated highly to tumor and we obtained clear images of tumor, so 64CuHP has great potential for tumor diagnosis with PET.

P0303

Development of [11C]Me@APPI, a novel PET-tracer for the Norepinephrine Transporter

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Objectives: The norepinephrine transporter (NET) is involved in the pathophysiology and treatment of neurodegenerative diseases. Compared to other

monoamine transporters such as serotonin transporter (SERT) and dopamine transporter (DAT), the density of NET in the human brain is rather low. As a consequence, new PET-tracers should be very high both in selectivity and affinity towards NET. Already existing tracers, like [11C]MeNER, [18F]FMeNER and [18F]FMeNER-D2, display high affinities but selectivities are amendable. Recently, new potential NET-antagonists were presented by Zhang et al [1]. Thereof, 1-(3-amino-1-phenylpropyl)-3-phenyl-1H-benzo[d]imidazole-2(3H)-one (APPI:0) showed promising affinity and selectivity towards NET. The aim of this work was the radiolabelling of APPI:0 with 11C, its first preclinical evaluation, and furthermore the development of a fully automated preparation of [11C]Me@APPI. Materials and Methods: The 11C-radiolabelling was performed from APPI:0 using [11C]methyl triflate in acetonitrile. After optimization of the reaction conditions, a fully automated procedure on a GE TRACERlab FxC Pro synthesizer was established. After reaction under heating (75°C, 5min), the crude mixture purified via semi-preparative HPLC. The [11C]Me@APPI fraction was diluted with water, purified via a C18 SPE-cartridge, formulated and sterile filtered under aseptic conditions. LogP values of the precursor and the cold references were determined using a standard HPLC-assay. Also blood-brain-barrier-penetration experiments using IAM-(immobilized artificial membrane)- chromatography were performed. Affinity to NET and Ki were determined using NET-expressing membranes in a standard binding experiment. To determine the metabolic fate of [11C]Me@APPI, in-vitro testing against phase I metabolism was performed using human liver microsomes. Results: Radiosynthesis evinced optimum conversion of [11C]methyl triflate at 75°C for 5min; 32±1.4% were achieved. The automated procedure yielded 1.82±0.48GBq of [11C]Me@APPI (8.8±4%, EOB) within 45 min. Specific radioactivity was found to be 52.2±8.4GBq/µmol. A suitable HPLC assay was set up allowing the reproducible quantification of APPI:0 and Me@APPI within 10 minutes. The measured logP value of Me@APPI (3.14±0.01) is comparable to APPI:0 (3.08) and within the ideal window proposed for blood-brain-barrier penetrating radioligands. Preliminary IAM-chromatography indicate same behavior for Me@APPI (logkIAMw=1.88) as for DASB-(logkIAMw=1.88)-a well-established SERT-PET-tracer. Human liver microsome experiments revealed no metabolites after 1h, emphasizing the stability of [11C]Me@APPI. Ki values of Me@APPI were 8.1±1.75nM; for comparison: reboxetine 3.3nM, APPI:O 19.3nM. Conclusions: First data and experiments are encouraging; radiolabelling, optimization of reaction parameters and automation were achieved in sufficient yields. Currently, determination of selectivity, metabolic and plasma stability is performed. [1] Zhang et al., J. Med. Chem., 2009

P0304

Bis-Trp-NPHE-DO2A a potential PET probe for TPH1 receptor: Synthesis, characterization and preclinical evaluation

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Aim: PET is an excellent technique for examining various biochemical processes in diseased tissues using radiotracers. Large neutral L-amino acids, substrates of system L amino acid transporters, the level of one of these, LAT1, is increased in many tumors along with the level of aromatic L-amino acid decarboxylase (AADC). Serotonin, the monoamine neurotransmitter is derived from tryptophan, via a two-step enzymatic conversion. The first and rate-limiting enzyme in the serotonin pathway is tryptophan hydroxylase (TPH). L-tryptophan, the main substrate for TPH1, is transported into cells via the L-type amino acid transporter 1 (LAT1). Increased expression of TPH isoform 1 (TPH1) is associated with malignant phenotype in tumors. Tryptophan oxidation via the kynurenine pathway has been implicated in tumoral immune resistance. As it has been suggested that indoleamine 2, 3-dioxygenase (IDO), the initial and rate-limiting enzyme of the kynurenine pathway, LAT1 and serotonergic markers could serve as potential molecular targets to inhibit tumor cell growth so, we aimed to synthesize molecule conjugated with tryptophan having application in PET. **Method**: This work describes the potential of 2-[2-(17,22-bis-carboxymethyl-3,12-dioxo-1,4,11,14,17,22-hexaaza-tricyclo[12.5.5.05,10]tetracosa-5,7,9-trien-7-ylamino)-acetylamino]-3-(1H-indol-2-yl)-propionic acid as diagnostic pharmaceutical by evaluating its deposition in cancerous tissues after the synthesis and radiolabeling with ^{68}Ga. Bis(t-butyl ester) of 1,7-bis(carboxymethyl)-1,4,7,10-tetraazacyclododecane was synthesized and reacted with N-[4-amino-2-(2-chloro-acetylamino)-phenyl]-2-chloro-acetamide to give cross bridged compound, **NPHE-DO2A**. The free primary amine of **NPHE-DO2A** was then conjugated with 2-(2-chloro-acetylamino)-3-(1H-indol-2-yl)-propionic acid methyl ester to form **Trp-NPHE-DO2A-ET**. Finally, **Trp-NPHE-DO2A-ET** was treated will 0.1 M HCl and gave 2-[2-(17,22-bis-carboxymethyl-3,12-dioxo-1,4,11,14,17,22-hexaaza tricyclo[12.5.5.05,10]tetracosa-5,7,9-trien-7-ylamino)-acetylamino]-3-(1H-indol-2-yl)-propionic acid, **Bis-Trp-NPHE-DO2A** and the designed compound was labeled with ^{69}Ga for optimizing labeling and purification conditions. The parameters for radiolabeling with Ga-68 were also optimized. The cell toxicity and trans stimulation experiments will be performed on glioma cell lines, U-87 MG. Blood clearance studies will be studies in normal, healthy New Zealand rabbit from 5.0 min-24.0 h followed by biodistribution studies in tumor model at various time intervals. **Results**: **Bis-Trp-NPHE-DO2A** was synthesized and characterized by NMR and Mass spectrometry. **Bis-Trp-NPHE-DO2A** was complexed with Ga-69 and various conditions for complexation and purifications were optimized. Radiolabeling efficiency with ^{68}Ga was found to be >97% and the stability in serum indicated that ^{68}Ga remained bound to **Bis-Trp-NPHE-DO2A** up to 36h. **Conclusions: Bis-Trp-NPHE-DO2A** has been synthesized and labeled with Ga-68. Biological studies to evaluate its tumor accumulation property are underway which would provide valuable information for the further development of 67/68Ga labeled radiopharmaceutical for molecular imaging applications using PET.

P0305

18F-FDG and 18F-choline: what is the best for cholangiocarcinoma diagnosis

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Introduction: Cholangiocarcinoma (CC) is the second most common primary liver tumor. The incidence of CC is increasing worldwide. This disease often presents with advanced non-specific symptoms. Local invasion, regional extension and distant metastases preclude resection in the majority of patients, and neither radiation nor conventional chemotherapy significantly improves survival. The use of PET with 18F-FDG has been widely used in the detection of various solid tumors. More recently, another radiopharmaceutical, 18F-choline, has emerged as a promising weapon in tumor detection. Thus, this study aims to evaluate 18F-FDG and 18F-choline uptake in a cholangiocarcinoma cell line and compare them, in order to verify which is the best tracer for tumor detection. Methods: The cell line used is TFK-1 (DSMZ). 18F-FDG and 18F-choline were incubated in a cell suspension with 2×106 cells/ml (25µCi/ml). Samples of 200µl were collected to eppendorf tubes for tracer uptake calculation. Eppendorfs were then centrifuged and radioactivity of cell pellets and supernatants was measured with a well-type gamma counter. Results: We observed a higher 18F-choline than 18F-FDG uptake. After 120 minutes incubation with radiopharmaceuticals, the 18F-FDG uptake is about 3% and 18F-choline uptake is about 30%, i.e., about 10 times more. Conclusions: These results show that the cell line under study has a 18F-choline uptake about 10 times higher than 18F-FDG. In clinical practice, 18F-choline may be a better option for cholangiocarcinoma diagnosis than 18F-FDG.

P0306

One pot preparation of ^{68}Ga-labelled macroaggregated albumin for PET-imaging of acute pulmonary embolism and myocardial perfusion quantification

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Aim: Radiolabelled macroaggregated albumin (MAA) is used for the acute diagnosis of pulmonary embolism and assessment of regional pulmonary perfusion with gamma cameras. Implementing MAA for PET could provide high resolution images with absolute quantification of pulmonary perfusion. The aim of this work was development of an accessible preparation method for the production of the respective imaging agent, 68Ga-MAA. Materials and Methods: Formation of MAA and its labeling with 68Ga was achieved in one pot procedure under microwave irradiation. Light microscopy, TLC, autoradiography were used for the assessment of particle size distribution, radiolabelling, stability. Formation and labeling of the particles were studied using bovine serum albumin (BSA), human serum albumin (HSA), and NOTA conjugated HSA (NOTA-HSA). Commercial MAA served as a standard. The tracer was tested (PET-CT) in a piglet with induced artificial lung embolus caused by an inflatable catheter balloon in the right lower lobe of the lung. First, the heart was scanned for 2 minutes and the area under the curve (AUC) of the first pass was calculated from a ROI in the right heart blood pool. Then, a static image of the lungs was acquired. The AUC was used to calculate cardiac output by the indicator dilution principle, which was compared to invasive measurements. The pixel data in the static lung image was divided by the AUC to produce parametric images of absolute regional perfusion rates. Results: Time, concentration, temperature, heating modality (conventional and microwave), buffer, pH, stirring rate conditions were optimized resulting in radioactivity incorporation over 95% and particle size distribution of 10-100 µm (>90%). The labeling efficiency of NOTA-HSA was higher as compared to HSA. The particle size distribution was comparable with somewhat higher content of 100-150 µm for NOTA-HSA, but no particles over 150 µm. The particles were stable in the buffer at 4°C (>one month) and human serum at 37°C (>3 h). High resolution images with quantitative information were acquired and revealed absence of the radioactivity

uptake in the area of the artificial lung embolus. Conclusions: 68Ga-MAA was prepared in a one pot procedure under 10 min microwave irradiation. The tracer was successfully tested in a pig model and demonstrated strong potential for the diagnosis of pulmonary embolism and quantitative evaluation of cardiopulmonary function.

P0307

Synthesis and evaluation of ^{68}Ga-labelled Benzamide analogue for melanoma imaging

H. Kim[1], D. Kim[2], J. Park[1], M. Hur[1], S. Yang[1], S. Kim[3], K. Yu[2]; [1]Korea Atomic Energy Research Institute, Jeongeup, KOREA, REPUBLIC OF, [2]Dongguk University-Seoul, Seoul, KOREA, REPUBLIC OF, [3]Dongguk University, Gyeongju, KOREA, REPUBLIC OF.

[1]Radiation Instrumentation Research Division, Korea Atomic Energy Research Institute, Jeongeup, Republic of Korea, [2]Department of Chemistry, Dongguk University-Seoul, Seoul, Republic of Korea, [3] Department of Nano Bio Materials, Dongguk University, Gyeongju, Republic of Korea Aims: Benzamide analogs have an affinity for melanin, suggesting that labeling of such benzamides with radiometals could potentially produce melanin-targeted probes able to identify melanoma in vivo with high sensitivity and specificity. Here we report the development of a ^{68}Ga-labeled benzamide derivative for in vivo imaging of melanoma with positron emission tomography (PET). Methods: A 185 MBq ^{68}Ge/^{68}Ga-Generator was eluted with 0.1M HCl and labeling of ^{68}Ga was performed in 1 M sodium acetate buffer (pH=4) with 30 µg of 2,2',2''-(2-(4-(3-(4-(2-(diethylamino)ethylcarbamoyl)phenyl)thioureido)benzyl)-1,4,7-triazonane-1,4,7-triyl)triacetic acid (SND). After HPLC purification, 3.7 MBq of ^{68}Ga-2,2',2''-(2-(4-(3-(4-(2-(diethylamino)ethylcarbamoyl)phenyl)thioureido)benzyl)-1,4,7-triazonane-1,4,7-triyl)triacetate (^{68}Ga-SNB) was injected via tail vein. In vivo distribution and Micro PET studies were conducted on mice bearing B16F10 melanoma. Cellular uptake of ^{68}Ga-SNB by B16F10 cells with or without L-tyrosine (2mM) treatment was evaluated. Results: In vitro, uptake of ^{68}Ga-SNB was ~ten folds higher in B16F10 cells treated with L-tyrosine. The in vivo biodistribution of ^{68}Ga-SNB was examined in B16F10 bearing mice. In biodistribution studies of ^{68}Ga-SNB performed at 1 and 2 h in the B16F10 model, ^{68}Ga-SNB displayed a significant tumor uptake, with 1.57±0.66 and 0.69±0.14 %ID/g at 1 and 2 h, respectively. At 1 h, the tumor-to-blood ratio was 3.37±0.3 and the tumor-to-muscle ratio was 8.28±1.41. Small-animal PET clearly identified tumor lesions in B16F10 tumor models. Conclusions: ^{68}Ga-SNB localized in melanotic melanoma tumor xenografts. This preliminary study indicates that ^{68}Ga-labeled BZA analogue is promising candidates for PET imaging of melanoma.

P0308

Production, Purification and Radiolabelling of Zirconium-89 for Positron Emission Tomography (PET) Radiopharmaceuticals

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BACKGROUND: Zirconium-89 (Zr-89) is a Positron Emission Tomography (PET) radionuclide with a half-life of 78.4 hours that is suitable for imaging tumours over an extended period with monoclonal antibodies. Zr-89 can be produced from yttrium-89 (Y-89) using a medical cyclotron with a Y-89(p, n)Zr-89 reaction. Purification and radiolabelling processes must be developed before Zr-89 can be realised for monoclonal antibody imaging. The aims of this study were to produce Zr-89 radioisotope using a solid Y-89 foil target and to purify and label the Zr-89 radionuclide with monoclonal antibody. METHOD: Y-89 foil (0.1 mm, 100% natural abundance) was cut into a size and loaded to a target plate. The foil was irradiated in a 12 MeV medical cyclotron at 10 µA current for 2.5 hours. The Zr-89 produced was dissolved in hydrochloric acid and purified in high radionuclidic and radiochemical purity as [Zr-89]Zr-phosphate using a solid-phase hydroxamate resin column. The ion chamber is used to ensure that the irradiation has successfully produced a radioisotope. Radionuclidic purity was determined by measuring the energy peaks in its gamma ray spectrum using a multi channel analyser (MCA) gamma counter. For radiolabelling studies, herceptin (trastuzumab), a monoclonal antibody for the treatment of metastatic breast cancer, was conjugated with a novel bifunctional chelate ρ-isothiocyanatobenzyl-desferrioxamine B (Df-Bz-NCS) and labelled with Zr-89 using previous procedures with a slight modification and the radiochemical purity was analysed using TLC and HPLC. RESULTS: The bombardment of Y-89 foil target in the cyclotron delivered a high amount of Zr-89 radioactivity approximately 400 MBq. Zr-89 was extracted using phosphoric acid with more than 60% from the hydroxamate resin column. Preliminary result for radiolabelling studies of Zr-89 with trastuzumab-Df-Bz-NCS indicated that the Zr-89 radioisotope was labelled to trastuzumab-Df-Bz-NCS according to the ITLC and HPLC analysis result. CONCLUSION: Bombardment of Y-89 foil target in a 12 MeV medical cyclotron at 10 µA current for 2.5 hours has successfully delivered a high amount of Zr-89 radioactivity and the result showed the potential use of phosphoric acid as an extractor other than oxalic acid which is currently being used for Zr-89 elution from the hydroxamate resin column. Preliminary result on ITLC and HPLC analysis of trastuzumab-Df-Bz-NCS-Zr89 radiolabelling indicated that the labeling of Zr-89 radioisotope with trastuzumab-Df-Bz-NCS is possible.

P0309

Fully automated one-step synthesis of 11C-Pittsburg Compound B

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Objective: Develop and validate an automated one-step method for obtaining 11C-Pittsburg Compound-B (11C-PIB) Methods: The 11CO2 was produced in a PETtrace by the nuclear reaction 14N (p,α) 11C. The 11CO2 reacts with hydrogen, becoming 11CH4, which in turn reacts with iodine to form the methyl iodine (11CH3I) via a gas recirculation system. The 11CH3OTf is automatically generated by the reaction of the produced 11CH3I with 500 mg of silver trifluoromethanesulfonate and 500 mg of Graphpac GC-80/100 mixed together in a glass column and heated during the process at 200ºC. The 11CH3OTf reacts directly with 1 mg of 6-OH-BTA-0 previously dissolved in 0.4 ml of anhydrous acetone. After one minute, the reaction product is injected into a semi-preparative HPLC system, using an acetonitrile / water (50/50) as mobile phase. The retention time of 11 C-PIB is about 7 minutes. The following steps included; 1. 11C-PIB collection and reformulated by diluting with 25 ml of water; 2. Trapping in a C-18 cartridge; 3.Elution with 1 ml of ethanol, further elution with 9 ml of physiologic solution and final filtration through a 0,22 um filter. Results: A set of 50 syntheses of 11C-PIB was perfomed. The average activity obtained after 33 minutes of synthesis was 1323 ± 315 MBq, with a yield of 34.6 ± 2.8% (referred to 11CH3I, decay correction). Radiochemical purity was above 99% in all cases. All batchs were non-pyrogenic and sterile. The stability test showed that the radiopharmaceutical remains stable for at least for two half periods. Conclusion: This method allows a fast, simple and automated radiosynthesis of 11C-PIB and with high radiochemical yield.

P0310

Synthesis and Quality Control of [18F]fluoropropanoyl-Gluc-Lys-TOCA for Somatostatine Receptors Imaging

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Materials & Methods: [^{18}F]FTOCA synthesis starts from 9-anthrymethyl-2-brompropionate precursor using tetrabutylammonium hydrogencarbonate as the catalyst. Two methods providing the highest peptide labelling yields were used - acylation reaction of 2-[^{18}F]fluoropropionate in the presence of triethylamine and TBTU (O-(Benzotriazol-1-yl)-N,N,N',N'-tetramethyluronium tetrafluoroborate) activator and acylation reaction of 4-nitrophenyl-2-[^{18}F]fluoropropionate in the presence of KOBt activator (potassium salt of 1-hydroxobenzotriazole). Labelled peptide was purified using reverse phase HPLC, trapped on the HLB column and eluted by ethanol. Residual solvent were analyzed using GC with manual SPLIT injection of 1 uL of sample and FID detection, column temperature program was maintained from 40°C to 150°C. Radiochemical purity was checked using HPLC with C18 column Phenomenex (Synergi 4u Hydro-RP 80A 250 x 4,6 mm). Following gradient elution was used for separation: 0-3 min 5%B, 3-30 min from 5%B to 60%B, 5 min, 35-40 min from 60%B to 5%B. Mobile phase A: water with 0.1% trifluoroacetic acid (TFA), mobile phase B: acetonitrile with 0.1% of TFA. **Results:** Preparation of 4-nitrophenyl-2-[^{18}F]fluoropropionate acylating agent by the three-step synthesis was simplified by omitting the HPLC separation of 9´-anthrylmethyl-2-fluoropropionate as intermediate. Synthesis time was therefore cut down from 90 to 60 minutes, while decay corrected radiochemical yield was maintained from 60% to 65%. The highest yield of peptide acylation 84% was obtained using 4-nitrophenyl-2-[^{18}F]fluoropropionate and KOBt, while method of direct labeliing of 2-[^{18}F]fluoropropionate in the presence of TBTU and triethylamine provided yield of 64%. Analytical methods excluded the presence of dimethylsulfoxide, dimethylformamide, dichloromethane and TFA in the product. Common solvents such as ethanol and acetonitrile didn't exceed pharmacopoeia limits. Developed HPLC method allows to separate the individual products from the reaction mixture. Final product [^{18}F]FTOCA was found as the chromatographic peak with *Rf*=30 min. **Conclusion:** [^{18}F]FTOCA was synthesized using TracerLab Mx FDG commercial automatic module. Total synthesis time of the labelled peptide (starting from target material) was 120 minutes. Decay corrected radiochemical yield obtained using methods described above was from 25% to 30%. Analytical methods for quality control were designed and optimized parallel with development of synthesis methods.

P0311

Inhalation of cigarette smoke decreases the binding of [18F]DPA-714 to 18 kDa translocator protein (TSPO) in several tissues: a PET study in baboons.

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Tobacco use is the leading cause of preventable illness and death. Smokers develop cancers in several tissues. The TSPO is a mitochondrial protein that is implicated in apoptosis. Chronic smoking was shown to decrease the affinity of TSPO (in saliva) for the ligand PK11195. Here we investigated the effect of acute cigarette smoke inhalation on the binding of [18F]DPA-714, a new TSPO positron emission tomography (PET) radioligand. Materials and methods: PET studies were carried out in male Papio anubis baboons (n=2). Animals were anesthetized using propofol and are imaged three time each (with and without cigarette smoke inhalation). Animals inhaled the smoke of three cigarettes during the transmission scan (as described previously). Baboon brain and parotid gland (both in the field of view) or heart were imaged for 90 min on a HR+ tomograph following i.v injection of [18F]DPA-714 (188.7±1.6 MBq). Arterial blood samples corrected for metabolites were used as input function. PET time activity curves were generated in the 3 organs. Results were expressed as SUV. VT were estimated using 2TC in the brain and parotid gland and 1TC model in the heart. Results: [18F]DPA-714 penetrated rapidly in the brain with a SUV max of 1.4 at 4 min p.i. and decreased rapidly a SUV of 0.6 at 90 min p.i.. In the parotid gland and the heart [18F]DPA-714 uptake was rapid with a SUV max of 4.1 and 7.8 respectively. This uptake decreased slightly with time in the parotid gland (-15% at 90 min p.i.) while it remained unchanged in the heart. In the 3 tissues, cigarette smoke inhalation increased the wash-out of the tracer. VT was strongly decreased in the heart (by 85±0.02%), in the brain (by 44±10%) and to a lesser extent in the parotid gland (by 17±2%). Conclusion: Unknown component(s) of tobacco smoke could modify the binding of [18F]DPA-714 to TSPO Therefore, these components could influence apoptosis in several unexpected tissues.

P0312

Simple and high efficient preparation of [18F]FMISO by SPE purification with impurity control

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Aim: 1-H-1-(3-[^{18}F]fluoro-2-hydroxypropyl)-2-nitro-imidazole ([^{18}F]FMISO) is the most widely used hypoxia-imaging agent in oncology. For the routine production of [^{18}F]FMISO, cassette type of chemistry module is better than non cassette type. TracerLab Mx (GE Healthcare) module is widely used for [^{18}F]FDG production but this module has not HPLC system. The aim of this study is to develop a new method for the synthesis of [^{18}F]FMISO using TracerLab Mx module with SPE purification. **Materials and Methods**: We used potassium methanesulfonate (KOMs) solution as elution buffer for elution of [^{18}F]fluoride from the QMA. [^{18}F]Fluorination was conducted with 1-6 mg 1-(2′-nitro-1′-imidazolyl)-2-*O*-tetra-hydropyranyl-3-*O*-toluenesulfonylpropanediol (NITTP) and 0.5-4 mg $KHCO_3$ as base at 100 ^{o}C for 20 min. After hydrolysis with 1 N HCl and neutralization with 2 N NaOH, crude [^{18}F]FMISO was trapped on the HLB cartridge and then HLB cartridge was washed using 5% ethanol solution to remove polar impurities. Trapped [^{18}F]FMISO was eluted from the HLB with 20 % ethanol. Finally purified product, crude [^{18}F]FMISO solution and waste solution from the HLB cartridge were analyzed using HPLC to check the purity of product, impurities of crude mixture, and waste solutions. Optimized reaction and purification condition were applied to TracerLab Mx Module. **Results:** We achieved high [^{18}F]-incorporation yield of 67.62% with 1 mg precursor and 1.5 mg $KHCO_3$. In the crude mixture, 4 major impurities were detected. Impurity 1 and 2 are more polar impurity and others are more nonpolar than [^{18}F]FMISO. Impurities 1 and 2 are increased and impurities 3 and 4 are reduced according to the amount of $KHCO_3$. Although 3.5 mg $KHCO_3$ showed [^{18}F]-incorporation yield of 50%, impurity pattern was best for SPE purification. Under the same condition, 3 mg and 6 mg precursor showed [^{18}F]-incorporation yield of 79.24% and 91.72 %, respectively. As the amount of precursor was increased, the amounts of impurities were also increased. Therefore the amount of washing solution was also increase to remove all of the impurity 1 and 2. From the results of manual experiments, Optimized condition was that 3.5 mg KHCO3 and 3 mg precursor for the labeling and 12 mL 5% ethanol solution for the SPE purification. Optimized condition was applied to the automation with TracerLab Mx module and the radiochemical yield was also promising. **Conclusion:** A high radiochemical yield of [^{18}F]FMISO was prepared by SPE purification with small amount of precursor and cassette type chemistry module.

P0313

A biotin containing compound derivative of DO3A via Asp Scaffold: Synthesis, Radiolabeling with Ga-68 and Biological Evaluation as Radiotracer for neuronal tracing

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Introduction: In identification of the impact that a powerful new anatomical tool, the tracing of neural pathways continues to be an important concern for neuroanatomy to advance our knowledge of brain function and disease. During the second half of the nineteenth century, at a time when the foundations of neuroanatomy were being established, tracing pathways often required laborious dissections by hand or to depend on less sensitive and non-specific techniques. We have directed our effort to develop tracer technique to reveal physiology and anatomy more specifically using PET probes in vivo topography and connection non-invasively using PET technique. DO3A-**Asp-[bis-Lys-biotin**] was synthesized in 70% yield. Radiolabeling with Ga-68 was performed by converting $GaCl_3$ as $Ga(OAc)_3$ **Materials & Method:** DO3A-**Asp-[bis-Lys-biotin**] was obtained from DO3A, choloroacetylated aspartic acid and Lys-biotin in 70% yield. Radiolabeling was achieved using a solution of DO3A-**Asp-[bis-Lys-biotin**] (2 mg) in 0.1M NaOAc (pH~5) added to the peconstituted solution of $Ga(OAc)_3$ After heating at 80 °C for 15 min, radiolabeld compound was diluted into 0.9% saline (1 mL) and loaded onto a C_{18} Sep-Pak cartridge. Cartridge was eluted with 0.1M NaOAc (pH~5). Cytotoxity assay were determined by MTT and clonogenic assay in cultured primary hippocampal cultures. **Results:** DO3A-**Asp-[bis-Lys-biotin**] was prepared in good yield and good RCY was achieved by heating at 80 °C in sodium acetate buffer at pH 5 for 15 min. It shows excellent stability under physiological conditions **Discussion/Conclusion:** The new tracer DO3A-**Asp-[bis-Lys-biotin]** provides suitable in vitro results. Preclicinal studies is under way to demonstrate its applicability as specific PET probes for neuronal topography and connection non-invasively using PET technique

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Radiopharmaceuticals & Radiochemistry: Radiopharmaceuticals - SPECT

P0314

Separation Aspects of the 99mTc Cyclotron Production

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Direct production of Tc-99m by the (p,2n) reaction on highly enriched Mo-100 is a realistic alternative to Mo-99/Tc-99m generators. Besides the major issues of the available yield and radionuclidic purity of the product that we already addresssed in our previous work, efficient separation of Tc-99m from the target is another condition for successful implementation of this production method. Therefore, we have been now focused on testing the separation process using extraction chromatography. The process was optimized with the aim to obtain the highest separation yield, while a) removing efficiently the major radionuclidic impurities that are not isotopic with Tc-99m, in particular Mo-99, Nb-97 and Nb-96, b) converting Tc-99m into pertechnate, c) keeping the volume of the final Tc-99m solution at acceptable level for labellings, d) performing the separation in as short time as possible. Since the final goal is routine production of Tc-99m, all the experiments were performed on an in-house designed automated system. The results demonstrate feasibility of the large-scale cyclotron production of Tc-99m.

P0315

Synthesis and Biological Evaluation of a Novel 99m Tc - Nitrido Labeled Substance P Derivative

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Aim. Substance P (SP) is an 11-amino acid neuropeptide of the tachykinin family. SP has the greatest affinity for the neurokinin-1 (NK1) receptor presented in a variety of normal tissue such as brain, lymphatic tissue, thymus and salivary glands. High affinity binding sites for SP have been found in various neoplasms with increased expression of NK-1 receptor. SP also plays an important role in the pathogenesis of inflammatory disease. Recently, an In-111 labeled SP analog has been developped for diagnostic imaging. This study investigated the preparation, characterization, and first biologic evaluation in vivo of a novel substance P analog with 99mTc(V), which has more ideal imaging characteristics and availability. The complex is characterized by the presence of a terminal [Tc=N]2+ multiple bond. The complex is represented by the general formula [99mTc(N)(SNS-SP)(X)], where SNS-SP is the

tridentate Substance P derivarive [SP = Cys-Cys-Arg-Pro-Lts-Pro-Gln-Gln-Phe-Phe-Gly-Leu-Met] and X is a monodentate ligand; specifically, we used the monophosphine tris(2-cyanoethyl)phosphine (PCN) for modeling this "3+1" complex. Materials and Methods. Reagents required for the preparation of the Tc-99m complex were provided through a two-vial freeze-dried kit formulation (vial A and B). The preparation involves two steps: (1) formation of the [188Tc≡N]2+ core (Vial A), (2) reaction of this core with the SNS-SP derivative and the PCN to afford the "3+1" complex nitrido technetium(V) [99mTcN(SNS-SP)(PCN)] (vial B). Purification of the complex from excess of reagents and free ligand was carried out by passing the activity through a reversed-phase SepPak cartridge. The radiochemical yield was determined by HPLC chromatography. SPECT studies and X-ray data acquisition have been performed using the integrated digital X-ray imaging system of YAP-(S)PET scanner. Results. The radiochemical yield for the complex 99mTcN(SNS-SP)(PCN) was found to be in the range 94.5 ± 3.0. Evaluation of stability of 99mTc complexe in serum and towards transchelation with GSH and cysteine revealed no significant change in radiochemical purity (RCP) after 24 h of incubation at 37°C. Imaging data indicates high activity concentration of the complex in kidneys and urinary bladder; a lower concentration was observed in liver and activity traces in digestive apparatus. Some spots are comparable with thymus and salivary glands. Conclusion. The new "3+1" complex have been prepared in high yeld. 99mTcN(SNS-SP)(PCN) can be interested for imaging SP receptor positive tissue (inflammatory diseases and neoplasms with increased expression of SP receptor) and may also be an attractive alternatives to In-111 labeled molecules for SP receptor.

P0316

Synthesis of Technidazole: a potential new 99mTc ligand for imaging tumor hypoxia

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The existence of hypoxic cells in tumors has long been recognized as a major problem in radiotherapy and is also a potential problem in chemotherapy of cancer. The identification and quantitative estimation of tumor hypoxia is an important factor in planning the therapeutic strategy for a better clinical outcome. Nuclear medicine is the most popular non-invasive method for detecting tumor hypoxia. Because of the advantageous characteristics of 99mTc (ideal half-life time, optimal γ-energy, low cost and good avaibility), research has mainly focused on 99mTc-labeled hypoxia imaging agent. In the development of imaging probes for tumor hypoxia, nitroimidazoles have received particular attention as markers because of their unique behavior in hypoxic environments owing to their high electron affinity . In this study, we report the synthesis of tecnhidazole, a new 99mTc-labeled nitroimidazole analogue using tripeptidic N3S chelator to form stable and strong 99mTc complex. First in vivo assessement showed fast clearance from blood, and good target to non-target tissue ratios. These findings suggest that technidazole is a promising agent for the detection of hypoxia.

P0317

An innovative 99mTc-MAG3 labeling procedure characterized by higher activity and radioactive concentration compared to traditional preparation: radiochemical purity evaluation along 10 hours since labeling

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AIM 99mTc-mertiatide (MAG3, mercaptoacetyltriglycine) is the most used radiopharmaceutical for nefro-urological studies. Instructions prescribe two different labeling procedures (1.1 GBq of pertechnetate in 10 ml of saline solution, or 920 MBq of pertechnetate in 4 ml of saline solution), with low radioactive concentration (110 MBq/ml and 230 MBq/ml, respectively), and very short stability after labeling (four hours and one hour, respectively). To overcome activity and concentration limits, we experimentally labeled MAG3 kit (Technescan MAG3; Mallinkrodt) using 1.5 GBq of pertechnetate in 2.5 ml of saline solution (with a final concentration of 600 MBq/ml) and compared its labeling yield and radiochemical stability to 99mTc-MAG3 standard preparation 1.1 GBq in 10 ml. Pertechnetate was obtained by generators (Drytec, GE Healthcare) eluted at least once in the previous 24 hours. Labeling was performed in standard conditions: 10 minutes at 100°C followed by cooling in cold water. MATERIALS AND METHODS Radiochemical purity was determined by double (thin layer chromatography) TLC, where stationary phase were ITLC-SG strips (Varian, Agilent Technologies, USA); butanone:ethylacetate (40:60) was applied to separate pertechnetate and acetonitrile:water (60:40) for reduced hydrolized technetium analysis. Detection was performed by autoradiocromatography (Cyclone plus, PerkinElmer). Labeling performed immediately after elution was compared to 99mTc-MAG3 preparation obtained three hours after elution both for standard labeling procedure (1,1 GBq in 10 ml) and for experimental preparation (1,5 GBq in 2.5 ml). Stability was evaluated up to ten hours since labeling with the following radiochemical purity timing test: 0 min, 30 min, 1h, 2h, 3h, 4h, 6h, 8h, 10h. RESULTS Radiochemical purity immediately after labeling was significantly higher than minimum prescribed both for traditional and for innovative preparation. In both cases radiopharmaceuticals labeled three hours after elution were not affected by eventually occurred radiolysis of eluate. All preparations showed radiochemical purity higher than minimum prescribed up to ten hours after labeling, while stability referred by manufacturer was only four hours, after which period the preparation should be discarded, even if still useful as residual activity. CONCLUSION MAG3 experimental preparation was demonstrated to be advantageous both for clinical (an increased number of administrations for every labeled kit) and chemical reasons (dilution in a smaller volume of saline and increased stability till to 10 hours since labeling). In conclusion, our results on 99mTc-MAG3 open the possibility of a really more flexible planning of daily work in Nuclear Medicine, able to compensate the time consuming procedure required by renal dynamic scintigraphy.

P0318

Formulation of a two-step kit for IgG labelled with Tc-99m using SAMSA as a bifunctional chelating agent

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Introduction Immunogamma Globulin (IgG) is a polyclonal antibody with a molecular weight of ~ 150,000, which accumulates at sites of infection or inflammation. It will also accumulate in certain carcinomas. IgG labelled with Tc-99m can be used to detect and locate the site of infection, inflammation, fever of unknown origin and certain carcinomas. Appropriate bifunctional chelating agents (BFCA's) are used to bind to a biological active moiety as well as to provide a binding site for Tc-99m. The BFCA of choice in this study is S-acetylmercapto succinic anhydride (SAMSA). **Purpose** The objective was the development of a single IgG kit which could be reconstituted simply in Nuclear Medicine Departments using Tc-99m from the Molybdenum Mo-99 / Tc-99m generator. Two step kit formulations were evaluated consisting of IgG, derivitised with SAMSA, and a series of different intermediate ligands, as well as to optimize a formulation into a one-step cold kit if it showed potential in the formulation stage. **Method** IgG powder was purified by dialysis to remove sucrose and other excipients. The IgG was derivatised with SAMSA and purified with dialysis to remove any excess reactants. The SAMSA-IgG was formulated into a frozen and a freeze-dried formulation with 2mg of IgG-SAMSA per vial. The two formulations were labelled with $^{99m}TcO_4^-$, tin sulphate as reducing agent and one of four intermediate ligands which were; tartaric acid, tricine, MDP and DTPA. Labelling efficiency and radiochemical purity were assessed with ITLC-SG paper chromatography with saline and acetone as mobile phases, as well as with RP-HPLC**.** Labelling effects of various parameters such as pH, reaction temperatures, molar ratios and incubation time were monitored and assessed to obtain the optimum labelling efficiency parameters. **Results** ITLC chromatography showed that of the four intermediated ligands tricine gave the best results with a labelling efficiency of 92-99%, followed by tartaric acid. MDP and DTPA exhibited poor results and showed no improvement during the optimisation of the formulations. The optimised formulation consisted of 2 mg SAMSA-IgG, 20 mg tricine and 0.05g tin sulphate. Labelling efficiency improved with longer incubation times. The freeze dried kits consistently gave better results than the frozen formulations. **Conclusion.** The formulation of a single step inflammation/infection kit is possible with the Tc-99m-IgG-SAMSA-tricine combination showing the best potential. Further research is pursued to optimise this formulation into a one-step cold kit

P28-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Radiopharmaceuticals & Radiochemistry: Radiopharmacy

P0319

Quality Control of the Radiopharmaceutical Precursor ItraPol (90YCl3) Produced at POLATOM

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Aim: ItraPol, the solution of $^{90}YCl_3$ in 0.04 M hydrochloric acid, is a radiopharmaceutical precursor intended for radiolabelling of specific carriers, such as monoclonal antibodies, peptides or other chemical vectors for radiotherapeutic applications. ^{90}Y-labelled radiopharmaceuticals are usually administered to patients in relatively high doses (ca. 3.7 GBq) and the treatment is repeated 3-4 times. Therefore, the purity of this radionuclide precursor is of great importance, particularly in terms of labelling efficiency and safety of application. The set of QC

methods for testing and quality confirmation of ItraPol has been proposed. ***Material and Methods*** ^{90}Y is produced at POLATOM by chemical separation from the long-lived ^{90}Sr. ^{90}Sr contamination in ItraPol was determined by LSC counting when separated from the tested solution by extraction chromatography using DGA resin. Gamma impurities in the lead-shielded sample of 50 MBq $^{90}YCl_3$ were quantified using gamma spectrometer (GC1520, Canberra). ICP-OES (OPTIMA, Perkin-Elmer) technique was applied for determination of metallic impurities (Cu, Zn, Ni, Fe and Pb). For radiochemical purity testing, TLC method was developed using ITLC-SG plates and the acidified potassium chloride solution (0.05 M, pH 1.8) as the mobile phase. The safety tests, i.e., bacterial endotoxins limit and sterility were performed according to Ph. Eur. monographs, using semi-quantitative LAL method and direct inoculation technique, respectively. Finally, the binding efficiencies of ItraPol to model DTPA and DOTA-TATE molecules were evaluated under the stability testing program. ***Results and conclusions*** The LOQ of the method for determination of strontium-90 contamination was $3.5x10^{-6}$% of ^{90}Sr in 230 MBq sample of $^{90}YCl_3$ applying 200 s measurement time. Gamma spectrometry method enabled fast (within 1 h) determination of ^{137}Cs impurity at the limit as low as $2.5x10^{-4}$%. The LODs (µg/mL) for metallic impurities determined by ICP-OES technique were as follows: Cu 0.085, Zn 0.038, Ni 0.103, Fe 0.027 and Pb 0.534. RCP test using carrier Y(III) ion and arsenazoIII staining solution showed that ^{90}Y is present in the form of Y^{3+} ion. Radiochemical purity of ItraPol was greater than 99.5% in all tested samples. High (>98%) and repeatable radiolabelling efficiency of model DTPA and DOTA-TATE molecules proved the quality of ItraPol, as well confirmed the suitability of analytical methods used at POLATOM for routine QC of this radionuclide precursor for radiolabelling.The results of our study may contribute to the discussion on the quality requirements of yttrium-90 chloride precursor for radiolabelling, initiated in order to develop the relevant Ph. Eur. monograph.

P0320

Influence of the formula used in calculating the body surface to determine the Glomerular Filtration Rate in renal transplant patients

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INTRODUCTION: Determining the Glomerular Filtration Rate (GFR) by radioisotopic methods (51Cr-EDTA) is considered as an accurate and reliable measure used in the management of renal disease. It can be normalized by body surface area (BSA) of each individual using different formulas (GFRn). The Dubois-Dubois (DD) formula is the most commonly used, in addition to those of Gehan and George, Haycock, Boyd and Mosteller. **OBJECTIVE**: To analyze the correlation and clinical concordance between the values of GFRn using the formulas cited to calculate the BSA compared to DD, in renal transplant patients, to see if they would be interchangeable in clinical practice. **PATIENTS AND METHODS**: 217 renal transplant patients (141 men and 76 women). GFR was determined by the two-compartment method described by Sapirstein using 51Cr-EDTA. GFRn was calculated using DD formula as reference . Other GFRn were calculated using the equations from Gehan and George, Haycock, Boyd and Mosteller by applying: TFGn = GFR * 1.73 / BSA for each formula. Differentiating by gender, We calculated the average (A) and standard deviation (SD). The Pearson correlation coefficient (r) and kappa index (k) were estimated for the GFRn DD method versus other equations. **RESULTS:** Transplanted men (n=141) TFGn DD: A= 44,68; SD= 11,28. TFGn Gehan and George: A=43,83; SD= 11,0; r= 1,00; K= 0,92. t-student: p>0,05. . TFGn Haycock: A=43,66; SD=10,95; r= 1,00; K=0,92. t-student: p>0,05. TFGn Boyd: A=58,66; SD=16,91; r= 0,64; K= 0,89. t-student: p>0,05. TFGn Mosteller: A=46,94; SD=12,32; r=0,93; K= 0,65. t-student: p>0,05 Transplanted women (n=76) TFGn DD: A= 44,43; SD= 12,91. TFGn Gehan and George: A=43,04; SD=12,53; r=1,00; K=0,84. t-student: p>0,05. TFGn Haycock: A=42,92; SD=12,50; r=1,00; K= 0,87. t-student: p>0,05. TFGn Boyd: A=62,05; SD=19,61; r= 0,62; K= 0,84. t-student: p>0,05. TFGn Mosteller: A=51,58; SD=16,13; r= 0,93; K= 0,38. t-student: p<0,05 Total Transplanted (n=217) TFGn DD: A= 44,56; SD= 11,84. TFGn Gehan and George: A=43,44; SD=11,53; r=1,00; K=0,89. t-student: p>0,05. . TFGn Haycock: A=43,29; SD=11,49; r=1,00; K=0,90. t-student: p>0,05. TFGn Boyd: A=60,36; SD=17,93; r=0,62; K=0,87. t-student: p>0,05. TFGn Mosteller: A=49,26; SD=13,92; r= 0,91; K= 0,55. t-student: p<0,05 **CONCLUSIONS**: The correlation and clinical concordance between the GFRn calculated by the equation DD and Gehan and George and Haycock are good. This doesn´t occur with those from Boyd and Mosteller, despite its simplicity and its frequent use in clinical practice, which tend to overestimate the GFRn, accusing statistically significant differences compared to the last one.

P0321

A comparison of the determination of Glomerular Filtration Rate by radioisotopic methods and predictive equations in kidney donors and transplanted patients

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INTRODUCTION: A reference method for calculating the Glomerular Filtration Rate (GFR) is the clearance´s determination of exogenous substances labeled with radioactive tracers (^{51}Cr-EDTA), because they give an accurate and reliable measure for the management of renal disease. Predictive equations have been developed to estimate the plasma creatinine clearance with anthropometric factors. The Cockcroft-Gault (CG) and Modification of Diet in Renal Disease (MDRD-4) equations are used in renal disease management. **OBJECTIVES:** To determine the correlation and test clinical agreement with the stages described by the Kidney Disease Outcomes Quality Initiative, the values of the standard Glomerular Filtration Rate normalized (GFRn) obtained with the ^{51}Cr-EDTA bicompartimental clearance method are compared against the values obtained by MDRD-4 and CG equations in kidney donors and transplanted patients. **MATERIAL AND METHODS:** 217 renal transplanted patients (141 men/76 women) and 28 kidney donors (10 men/18 women). GFRn was determined in all cases by bicompartimental clearance model described by Sapirstein using ^{51}Cr-EDTA (six samples) and also applying MDRD-4 and CG prediction equations. We calculated the mean and standard deviation (SD) for each different method. Pearson correlation coefficient (r) and kappa (k) were determined between the GFRn obtained by ^{51}Cr-EDTA method against the GFRn obtained by MDRD-4 and CG equations. Potential differences against the reference radioisotopic method were analyzed using Student's t test. All GFRn values in mL/min per 1.73 m^2. **RESULTS: CONCLUSIONS:** Correlation and test clinical agreement are not good between the determination by ^{51}Cr-EDTA GFRn method against the values obtained by the predictive equations. MDRD-4 and CG methods overestimate renal function in transplanted patients and kidney donors compared with ^{51}Cr-EDTA bicompartimental clearance method. For this reason, the radioisotopic Sapirstein method must be the preferred method in the assessment of renal function in these patients.

P0322

Molecular modeling of copper complexes with meso-2,3-dimercaptosuccinic acid.

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The aim of our work was to study Cu complexes with meso-2,3-dimercaptosuccinic acid by using computational chemistry. The complexes were studied at the level of molecular mechanics - MM+ (Hyperchem8.0.6) and semi-empirical method - PM6 (MOPAC2009). 25 most energy favorable complexes of the 415 possible complexes Cu-DMSA/Cu-(DMSA)2 were selected by using molecular mechanics, which structure was later additionally studied (semi-empirical method - PM6). In the most stable complex of one ligand, Cu2 + is bounded to DMSA by two -COO- and one-S-group. Furthermore this complex showed the best stability, when three molecules of H2O are bounded to the central atom (achievement of coordination number 6). The binding energy of this complex in an aqueous environment (100 molecules of water) is -39.01655 eV. The most stable complex of Cu with 2 molecules of DMSA has a binding energy of -40.85854 eV (aquatic environment). Copper atom in each ligand binds through the two -COO- and one -S- group Acknowledgments The authors wish to thank the Grant Agency of Slovak Republic Grant No. 1/0664/12 and the Comenius University (Grant No. UK/86/2012) for their financial support.

P0323

The effect of base on [18F]fluorination in aprotic and protic solvent

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Aim: Unlike cold fluorination in organic synthesis, a basic environment is preferable for obtaining a high radiochemical yield, but large amounts or strong bases such as K_2CO_3, KOH, and TBAOH may cause side reactions such as elimination and hydroxylation. The aim of this study is to understand the fundamental effect of base for [^{18}F]fluorination in protic solvent and aprotic solvent. **Materials and Methods**: We used 3-(naphthalene-2-yloxy)propyl methanesulfonate as precursor for [^{18}F]fluorination in both acetonitrile and *t*-BuOH. After trapping of [^{18}F]fluoride on QMA cartridge, we eluted it using KOMs/K222 and base was directly added 1) 1 equiv of base (*t*-BuOK 1.00 mg or KOH 0.5 mg or $KHCO_3$ 0.89 mg) to evaluate the basicity effect. 2) 0.5-1.0 equiv of KOH to evaluate the amount effect. We also tried other method adding 0.5-1.0 equiv of KOH to the vial including [^{18}F]fluoride/$H_2{}^{18}O$ without use of QMA to separate them. [^{18}F]Fluorination was carried out at 80-100°C for 20 min and then at 5, 10, and 20 min, 20 µL of resultant was analyzed [^{18}F]-incorporation yield using radioTLC and side product using HPLC. **Results:** Without base, 40% of [^{18}F]fluoride was absorbed on the reaction vessel in both solvent. As the amount of base was increased, absorbed amount of [^{18}F]fluoride

was reduced. In the CH_3CN, weak base show the fastest rate of [^{18}F]fluorination and interestingly *t*-BuOK showed highest Y_{MAX} as 91.3 %. In the *t*-BuOH, [^{18}F]fluorination rate was slower but Y_{MAX} was higher than CH_3CN. After reaction, residual amount of precursor was similar in both cases. When reaction temperature was reduced at 80°C, regardless of amount of base, *t*-BuOH showed [^{18}F]-incorporation yield of >89% but the amount of base was effected on the [^{18}F]-incorporation yield in CH_3CN. When we did not use QMA, the effect of base, in both solvent, manifested. As the amount of base was increased from 0.03 to 0.5 equiv, [^{18}F]-incorporation yield was also increased from 17.2 to 93.94%, in CH_3CN. In contrast, [^{18}F]-incorporation yield was 69.83% using just 0.03 equiv of base and 0.12 equiv of base show the highest yield as 98.79% in *t*-BuOH. **Conclusion:** The first role of base on [^{18}F]fluorination is inhibition of [^{18}F]fluoride absorption on the wall of reaction vessel. The rate of [^{18}F]fluorination is accelerated by base and the amount of base is more critical in CH_3CN than *t*-BuOH.

P0324

Study of the influence of the first elution from generators 99Mo/99mTc in the radiochemical purity of radiopharmaceuticals preparations

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OBJETIVES -Check if the first elution of a generator 99Mo /99mTc (48 hours or more since the last one) affects the Radiochemical Purity (RCP) of radiopharmaceuticals preparations, due to the specific activity of technetium. -Compare these values (RCP) with those obtained by using elutions equal to or less than 24 hours. MATERIAL AND METHOD We analyzed a total of 176 vials between Oxidronato (HDP), Tetrofosmin (MYOV), Human Albumin Macroaggregates (MAA) and Nanocolloids (NANO) labelled with different eluates of generators ^{99}Mo/ ^{99m} Tc (IBA-Molecular), separating two groups based on the time since the last elution: 1st ELUT: 48 hours or more since the last elution. 2nd ELUT: Equal to or less than 24 hours since the last elution The RCP of the radiopharmaceuticals preparations by paper chromatography and the count (scanner) in a Mini Raytest Radiochromatograms was determined. All the date were subjected to statistical analysis (t-Student and Mann-Whitney U test). RESULTS The RCP mean and standard deviation: 1st Elut-HDP (N= 37) (95,73 ± 0,48) and for 2nd Elut-HDP (N=37) (95,58 ± 0,39), the statistical analysis using t-Student test (p = 0,131) no significant differences.; 1st Elut-MYOV (N= 19) (95,04 ± 1,10) and for 2nd Elut-MYOV (N=19) (94,38 ± 1,39), the statistical analysis using Mann-Whitney U test (p = 0,175) no significant differences.; 1st Elut-MAA (N= 16) (97,87 ± 0,69) and for 2nd Elut-MAA (N=16) (97,89 ± 0,75), the statistical analysis using t-Student test (p = 0,938) no significant differences.; 1st Elut-NANO (N= 16) (99,14 ± 0,35) and for 2nd Elut-NANO (N=16) (99,16 ± 0,34), the statistical analysis using Mann-Whitney U test (p = 0,850) no significant differences.; CONCLUSION The use in the radiopharmaceuticals labelled of the first elution of the generator does not affect the Radiochemical Purity of these radiopharmaceuticals.

P0325

Fully automated synthesis and SPE purification of [11C]methionine for routine production

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Aim: [^{11}C]Methionine ([^{11}C]MET) has been widely used to image brain tumors with positron emission tomography (PET). Conventional methods such as loop method and C18 solid phase extraction cartridge synthesis sometimes showed unstable yield. The aim of this study is to develop a new method for the synthesis of [^{11}C]MET by solution phase C-11 methylation and SPE purification. **Materials and Methods:** [^{11}C]CH4 and TracerLab FX C pro were used to production of [^{11}C]MET as C-11 source and chemistry module, respectively. [^{11}C]MET was prepared from C-11 methylation of the precursor, L-homocysteine thiolactone hydrochloride (3 mg), in 0.8 mL acetone at 120 ℃ for 5 minin the present of 0.8 mL 0.5 N NaOH. Crude [^{11}C]MET was purified two kinds of ion exchange cartridge. 1) Crude mixture was diluted with 30 mL 0.1 N HCl and passed through the MCX (cation exchange cartridge). 2) diluted with 30 mL 0.1 N NaOH and MAX (anion exchange cartridge). After trapping the product on cartridge, the cartridge rinsed with 3 mL water and the product eluted with 5 mL phosphate buffer. Chemical and radiochemical purity was analyzed using HPLC and enantiomeric purity was also evaluated using chiral HPLC column. Under acidic and basic condition, stability and enantiomeric purity of [^{11}C]MET were also evaluated. **Results:** We achieved a moderated radiochemical yield of 29.50±5.59% (decay corrected) on the MCX cartridge. MAX cartridge showed lower radiochemical yield than MCX. >99% of radiochemical purity was obtained with both ion exchange cartridges. 88-92% and >98% of enantiomeric purity were obtained with the MCX and MAX cartridges, respectively. Radiochemical purity was very stable under both acidic and basic condition. On the contrary, enantiomeric purity was unstable under acidic condition. After 20 min under acidic condition, D-form was dramatically increased up to 50%. **Conclusion:** This simple purification method using ion exchange cartridge shows stable yield. But we have to concern about the pH of final solution to maintain the enatiomeric excess purity.

P0326

A new simplified method for the determination of ^{99m}Tc-L,L-ethylenedicysteine radiochemical purity

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Aim : Technetium-99-metastable-L,L-ethylenedicysteine (^{99m}Tc-$_{L,L}$EC) is a renal tubular radiopharmaceutical for dynamic renal study and proposed as an alternative to commonly used ^{99m}Tc-betiatide. Determining the radiochemical purity (RCP) of ^{99m}Tc-$_{L,L}$EC using the method described in the package insert is a time-consuming process: thin layer chromatography (TLC) with two stationary and mobile phases are needed for determining the RCP : Whatman ET-31® in acetone for determining free ^{99m}Tc-pertechnetate and Kieselgel 60® in ethanol 96% $^{v}/_{v}$ for hydrolyzed-reduced ^{99m}Tc.. Hence, we have investigated whether it was possible to use only one stationary phase as a rapid and alternative technique in order to determine the RCP Methods : ^{99m}Tc-$_{L,L}$EC was prepared according to the manufacturer's instructions. Alternative RCP testing method were performed using different media (Whatman ET-31®, Whatman 1CHR®, Whatman 3MM®, ITLC SG) and various concentrations and combinations of solvents (NaCl 0.9%, ACN/water, MEK) to develop a new procedure. In theses systems, free ^{99m}Tc-pertechnetate moved with the solvent front, while ^{99m}Tc-$_{L,L}$EC complex migrated toward the center of the strip. Hydrolyzed-reduced ^{99m}Tc remained at the origin. The strips were then read and quantified in a TLC scanner. The package insert method was used as a control for each experiment. Results and discussions : Four methods have been validated (n =30) for determining RCP of ^{99m}Tc-$_{L,L}$EC : Whatman ET-31® (system 1) and Whatman1CHR® (system 2) eluted with a 60:40 ACN:water mixture and Whatman1CHR® (system 3) et Whatman3MM® (system 4) developed in NaCl 0.9%. The results obtained are in agreement with those obtained from reference technique indicated by the manufacturer with an excellent linear correlation (r>0.99). Nevertheless, the 30 min or more needed for the entire process for sytem 2, 3 and 4 was not practical in daily routine. The use of system 1 reduced analysis time to less than 15 min. Conclusion : System 1 (Whatman ET-31 in ACN:water 60:40) proved to be a rapid and an alternative technique that could be used to determine radiochemical impurities in ^{99m}Tc-$_{L,L}$EC prior to patient administration.

P0327

Design of Radiolabeled Gelatinase Inhibitor Peptide with for Imaging of Gelatinase Activity in Tumors

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Aim: In malignant tissues, the mostly detected matrix metalloproteinases related to the tumor aggressiveness and metastatic potential are MMP-9 (gelatinase B, 92-kDa type IV collagenase) and MMP-2 (gelatinase A, 72-kDa type IV collagenase). Since elevated levels of gelatinases are associated with a poor prognosis in cancer patients, these enzymes are potential targets for tumor imaging. In the present study, a cyclic decapeptide, CLP (Cys-Leu-Pro-Gly-His-Trp-Gly-Phe-Pro-Ser-Cys), was selected as a basic peptide because of its selective inhibitory activity toward gelatinases. In this study, CLP (Cys-Leu-Pro-Gly-His-Trp-Gly-Phe-Pro-Ser-Cys) and DTPA-CLP peptides were labeled with ^{99m}Tc. After determining the appropriate conditions for radiolabelling, biodistribution studies of radiolabeled peptides in Albino Wistar rats is done and their radiopharmaceutical potentials are investigated. **Material and Methods:** First step, CLP and DTPA-CLP peptides were labeled with Tc-99m using stannous chloride method. Radiolabeling efficiency was confirmed by RTLC and RHPLC quality control methods. After the radiolabeling, these compounds were done optimization studies. Biodistribution of radiolabeled peptides are achieved in Albino Wistar rats in order to investigate their potentials as diagnostic radiopharmaceuticals. **Results:** Radiolabeling efficiency was confirmed as 94.6±4.8% for ^{99m}Tc-CLP and 97.01±2.8% for ^{99m}Tc -DTPA-CLP. Radiolabeled conditions were optimized. Biodistribution studies are continued. **Conclusion:** As ^{99m}Tc-CLP and ^{99m}Tc -DTPA-CLP display good radiolabeling, they might be useful in the early detection and imaging of primary tumors.

P29-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Radiopharmaceuticals & Radiochemistry: Radiometals

P0328

Method for 90Sr determination in 90YCl3 solution used as precursor for labeling

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Aim: The recommendation of ICRP Publication 30, Part 1, 1979) sets very low permissible level of ^{90}Sr contamination in ^{90}Y of ≤10^{-5}% at the time of administration. Hence, reliable methods for assessment of ^{90}Sr contamination in ^{90}Y are needed. Our aim was to develop analytical procedure for rapid determination of ^{90}Sr activity in ^{90}Y solution obtained from ^{90}Sr/^{90}Y generator after ^{90}Sr separation using DGA resin. **Materials and Methods** DGA resin (N,N,N'N'-tetra-n-octyldiglycolamide) is a selective extractant system (Eichrom). To determine the strontium recovery yield from DGA column ^{85}Sr was used as a tracer. Based on the gamma spectrometry measurement results from 2 separations the recovery was 99,86% ± 0.14%. To validate the analytical procedure of ^{90}Sr recovery from ^{90}Y solution a method of standard addition was used. To 4 mL of strontium solution (31.25 mg Sr/mL in 5M HNO_3) 0.030 mL of ^{90}Y solution (230 ± 5 MBq) and suitable weighed aliquots of ^{90}Sr standard corresponding to approximately 50, 100 and 250 Bq were added (each repeated 6 times). These solutions were loaded on columns containing 100 mg of DGA resin, which were instantly rinsed in turn with 6 mL of 5 M HNO_3 and 2 mL of 0.1 M HNO_3 at 1 mL/min flow rate. Effluent fractions were collected of 8 mL, 2 mL and 2 mL (fraction 1,2 and 3, respectively). From each fraction 1.0 g aliquots were taken by weight to 20 mL LSC vials followed by 1.5 mL deionized water and 10 mL of Ultima Gold AB liquid scintillator. Measurements were carried out with Wallac 1411 spectrometer. **Results and conclusions** Fraction 1 contained the total activity of ^{90}Sr with a few counts of ^{90}Y from the decay of ^{90}Sr during collection of ^{90}Sr fraction and measurement. The intersection of regression line with Y axis was the ^{90}Sr activity in ^{90}Y product. The mean value of ^{90}Sr recovery was 100.32% ± 0.74%. The determination limit of ^{90}Sr in 230 MBq of ^{90}Y was equal to 3,5x10^{-6}% for 200 s measurement time. This limit can be lowered to 1x10^{-6}% for 3600 s measurement time. The separation of ^{90}Sr from ^{90}Y is very fast and after about 30 minutes the ^{90}Sr aliquot mixed with scintillator is ready for measurement which lasts about 15 minutes. In this way the activity of ^{90}Sr in ^{90}Y is determined after about 1 h. This is practically the online control of ^{90}Y quality.

P0329

Semi-automated labelling and fractioning of 90Y and 177Lu somatostatin analogues using disposable syringes and vials.

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The treatment of tumours expressing somatostatin receptors with ^{90}Y and ^{177}Lu labelled somatostatin analogues is one of the most interesting therapeutic approach adopted in nuclear medicine in the last years. However, the synthesis and fractioning of these radiopharmaceuticals is still mainly performed manually in spite of the high radiations exposure for the operators and GMP compliance needing. In this study a semi-automatic synthesizer (ADD-2) using only disposable syringe and vial is presented. **Methods**: Small-scale syntheses (185-555 MBq) of ^{90}Y/^{177}Lu-DOTATATE were performed by adding the appropriate amount of peptide to a ^{90}Y/^{177}Lu chloride solution (n=10). The radionuclide/peptide molar ratio was 1:17 and 1:2 for ^{90}Y and ^{177}Lu, respectively. The solutions were buffered to 4.6 pH by ascorbate buffer and heated at 90°C for 30 min. Radiochemical purity was assessed by two independent radio-TLC systems. The solutions were fractioned for mimicking the preparation of patients doses. **Results:** All the synthetic and fractioning steps were performed by using the ADD-2. Radiochemical yield was 92±3 % for ^{90}Y and 97±1 % for ^{177}Lu labelling, respectively. Radiochemical purity was > 99.5 %. Accuracy and reproducibility of the instrument in transferring and fractioning radioactive solutions were high (maximal error ca. 5 %). **Conclusion:** ADD-2 appears suitable to be used in clinical preparations of ^{90}Y/^{177}Lu-DOTATATE with therapeutic amount of precursors (20-30 GBq). Operators exposure by using ADD-2 in comparison to manual preparations is under investigation.

P0330

Effect of Liquid Ga on Nb and Mo Surfaces at Temperature Estimated in the Environment of ^{68}Ge Production by Proton Irradiation of Ga

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^{68}Ga has attracted great attention in medical research such as position emission tomography (PET) because it decays mainly by positron emission and has short half-life (~68 min). Encapsulation should be required when the natural Ga target is proton-irradiated for the production of ^{68}Ge, parent radioisotope of ^{68}Ga, because the natural Ga has relatively low melting point (~30°C) and therefore is easily liquefied by the temperature increase resulted from the bombardment of energetic protons. In order to search for the candidate material for the encapsulation of Ga, the heating experiment of Nb and Mo foils in the liquid Ga was carried out, and the effect of liquid Ga on the morphology and chemical composition of those metals was investigated, and then compared. Nb and Mo foils were heated in the liquid Ga at 120°C for maximum 2 weeks. After the heating, the changes in the morphology and chemical composition of metal surfaces were analyzed by using a field emission scanning electron microscope, energy dispersive X-ray spectrometer, X-ray diffractometer, and X-ray photoelectron spectrometer. The result of analysis indicated that Ga is only physically attached on the metal foil surfaces without any chemical bonding. The Nb foil showed less adhesion of liquid Ga to the surface compared with the Mo foil. In addition, the Nb foil was oxidized while the Mo foil was rather reduced during the heating. Considering comprehensive effect, we can conclude that Mo also can be possibly used as the encapsulation material of Ga, as well as Nb which is a conventional encapsulation material of Ga, due to its chemical resistance against oxidation in hot liquid Ga.

P30-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Radiopharmaceuticals & Radiochemistry: Radiopharmacokinetics & Drug Development

P0331

Biokinetics and dosimetry of 111 In-DOTA-NOC-ATE compared with 111In-DTPA-Octreotide

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Aim: Biokinetics and dosimetry of ^{111}In-DOTA-NOC-ATE (NOCATE) and ^{111}In-DTPA-octreotide (Octreoscan™, OCTREO) were comparatively studied in the same patients. Patients and Methods: Seventeen patients (10 males, 7 females), mean age 60 years referred for an Octreoscan™ because of carcinoid (N=9), unspecified neurodendocrine tumors (N=6), thymoma (N=1) or medullary thyroid carcinoma (N=1) accepted a second study with NOCATE. Four patients had no detectable tumor at the time of scanning. Whole-body (WB) anterior-posterior scans were recorded 0.5 (100% reference scan), 4, 24 and 48 hrs (N=17) and 120 hrs (N=6) after injection. OCTREO (178±15 MBq) preceded NOCATE (108±14 MBq) imaging with 16±5 days in 16 patients while 1 patient had first NOCATE followed 14 days later by OCTREO. Blood samples were taken 5, 15, 30, 60, 240 and 1440 min after injection. Background corrected geometric mean counts of WB, lung, kidney, liver, spleen and blood counts expressed in % of the initial composite WB and blood counts, respectively were fitted to bi- or single exponential curves and dosimetry was performed for male and female patients using MIRDOSE3.1 and OLINDA/EXM. Results: Initially, WB, lung and kidney activity was similar but retention was significantly higher for NOCATE compared with OCTREO. Liver and spleen uptake of NOCATE was higher from beginning ($p<0.001$) and remained so over time. Activity in rest of body showed similar α and β half-lives, but the β half-life fraction of NOCATE was much higher than OCTREO (49% vs. 19%, respectively). Blood $T_{1/2}\beta$ was longer for NOCATE compared with OCTREO (19 vs. 6h). Residence times were similar in male and female patients while they were in both genders higher for NOCATE than OCTREO. Consequently, effective dose (ED) for NOCATE (ED 114 and 134 µSv/MBq for man and women, respectively) exceeded that of OCTREO (ED = 61 and 71 µSv/MBq), the latter results being close to the ICRP-published radiation dose of OCTREO (ED = 54 and 71 µSv/MBq, respectively). Differential activity measurement in blood cells and plasma showed that only a minor fraction of NOCATE and OCTREO (<5 % in the mean) was bound to globular blood components. Conclusions: NOCATE showed higher retention in normal organs and delivered roughly twice the radiation dose of OCTREO. The ED of OCTREO in these patients was similar to ICRP80 report when adopting a bladder voiding interval of 2 hours.

P0332

Human biodistribution and dosimetry of 11C-ketoprofen methyl ester, a potential biomarker of neuroinflammatory process for Alzheimer and other brain disorders.

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Aim: Neuroinflammatory processes play an important role in the pathogenesis of Alzheimer's disease and other neurodegenerative disorders, and nonsteroidal anti-inflammatory drugs (NSAIDs) have been considered candidates of therapeutics. As a biomarker of neuroinflammatory processes, 11C-ketoprofen methyl ester (11C-KTP-Me, Ref. 1) was designed to increase cerebral penetration of ketoprofen (KTP), which is an NSAID and is a selective inhibitor of cyclooxygenase-1. Animal studies indicated that 11C-KTP-Me entered the brain and was retained in inflammatory model lesions as it accumulated in activated microglia, while it was washed out from normal tissues, leading to the present first-in-human exploratory study. Methods: 11C-KTP-Me was synthesized by 11C-methylation followed by HPLC purification and was prepared in PEG400 solution, providing radiochemical purity of >99 % and specific activity of >25 MBq/nmol at injection time. Three young male normal subjects (ages 25 to 38) were injected with 11C-KTP-Me (121 to 294MBq) for scanning with a PET camera (Shimadzu SET-3000 G/X) to acquire early-phase brain time course followed by three whole-body scans starting at 8, 20 and 40min post injection, together with sequential blood sampling and labeled metabolite analysis. Urine was collected at 60 min to measure the excreted activity. Results: No adverse effects were observed. In plasma, 11C-KTP-Me was rapidly metabolized into a hydrophilic form in 2-3min, probably 11C-KTP acid, which was gradually cleared from blood. The early-phase brain images indicated that the radioactivity entered the normal brain with a peak cortical SUV of 2.0 at 2min, which was lower than 11C-PiB. The cortical activity was washed out to 75% of the peak at 6min and further to 35% at 34 min. The brain images showed higher activity in the venous sinus than in the cortex from 6 min post injection throughout the scanning period. The whole-body images indicated that urine was the major excretory pathway, probably in the form of hydrophilic metabolites. Using the hermaphroditic adult phantom in OLINDA/EXM, the organs with highest radiation dose were the urinary bladder (31 microGy/MBq), the kidneys (25 microGy/MBq) and the lungs (11 microGy/MBq), and the effective dose was 4.0 microSv/MBq. Conclusion: 11C-KTP-Me is a safe PET tracer with radiation exposure being comparable to other known 11C labeled PET drugs. 11C-KTP-Me enters the human brain, while its labeled metabolites did not, and the activity was washed out from normal cerebral tissue, warranting further exploratory studies on diseased subjects. References: 1. Shukuri et al: J Nucl Med 52: 1094-1101, 2011

P0334

Evaluation of ^{11}C-ketoprofen-methyl ester as a potent PET probe for cyclooxygenase imaging

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Aim: Neuroinflammation is an important phenomenon during the progression of neurodegenerative diseases including Alzheimer's and Parkinson's diseases. For noninvasive imaging of neuroinflammation, we developed a novel PET probe against cyclooxygenase (COX), ^{11}C-ketoprofen-methyl ester (KTP-Me), which is crucially involved in inflammatory process. ^{11}C-KTP-Me is designed to penetrate BBB and to be subsequently hydrolyzed into a pharmacologically active "ketoprofen". Recently, we have succeeded to visualize the activation of microglia in rat brain by PET with ^{11}C-KTP-Me. In the present study, we evaluate the biodistribution and kinetics of ^{11}C-KTP-Me in rodent and non-human primate to further characterize it as a PET probe for human use. Methods: Biodistribution of ^{11}C-KTP-Me in rat was investigated by whole-body scanning with animal PET camera (microPET Foucus 220; Siemens), and γ-counting of dissected tissues from the body. Dynamics of metabolites from ^{11}C-KTP-Me in plasma and dissected brain samples were determined by the radio-HPLC analysis. In the study with monkeys, to quantify the binding activity of ^{11}C-KTP-Me in various brain regions, we performed PET scan together with the arterial blood sampling, and calculated kinetic rate constants by the Logan plot analysis using metabolite-corrected arterial plasma input function or time-activity curve of cerebellum, as the input function. Results: The whole-body distribution studies showed that ^{11}C-KTP-Me was rapidly metabolized to ^{11}C-KTP acid, and was excreted mainly through urinary and hepatobiliary systems in rats, and mainly through urinary system in monkeys. Metabolite analysis in rats revealed that ^{11}C-KTP-Me was incorporated into the brain and then hydrolyzed promptly to ^{11}C-KTP, indicating that ^{11}C-KTP-Me could be useful as a pro-radiotracer. In the monkey study with arterial sampling, ^{11}C-KTP-Me was similarly and rapidly metabolized to ^{11}C-KTP within 90 sec. Using plasma input function with metabolite correction, the total distribution volume (Vt) in brain regions were determined by Logan plot analysis, which showed the higher value in the cerebral cortex and lower in the cerebellum. In addition, the distribution volume ratios (DVRs) in brain regions obtained by Logan plot reference tissue model were well correlated with each regional Vt value. Conclusion: In conclusion, pharmacokinetics, distribution pattern, and metabolite dynamics of ^{11}C-KTP-Me strongly indicate its usefulness as a pro-radiotracer for COX imaging in rats and monkeys. Therefore, ^{11}C-KTP-Me should be acceptable for the use of study in human. Moreover, calculation of kinetic rate constants with Logan plot analysis could be valuable for evaluation of the specific ^{11}C-KTP-Me accumulation in the patients with neuroinflammation.

P0335

Quantification of [11C]erlotinib studies

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AIM The aim of this study was to determine the optimal pharmacokinetic model for analysis of dynamic [11C]erlotinib scans in patients with non-small cell lung cancer (NSCLC). A second aim was to assess various simplified models that do not require arterial sampling or long scan durations. METHODS Dynamic [15O]H2O and [11C]erlotinib test and retest scan were performed in 10 NSCLC patients, 5 with and 5 without an activating epidermal growth factor receptor (EGFR) mutation (exon 19 deletion). Recently it was shown that [11C]erlotinib uptake is higher in the mutation group.. [11C]erlotinib data were analysed using various plasma input models: single tissue (1TC), and reversible (2TC-4k) and irreversible two tissue compartment models (2TC-3k). In addition, two models that account for uptake of radiolabelled metabolites were evaluated: a) two parallel 1TC models with parent and (separate) metabolite plasma input functions (1TCx2), b) modified 2TC model using whole blood input function (2TC-4k-WB). Moreover, use of image derived input functions (IDIF, ascending) was evaluated. Finally, simplified methods were evaluated, i.e. standardized uptake values (SUV) and tumour to blood ratios (TBR) averaged over various intervals. RESULTS Comparison amongst 1TC, 2TC-3k and 2TC-4k, the Akaike criterion showed preference (70%) for the 2TC-4k model. In a separate comparison, a slightly higher preference was seen for 2TC-4k-WB (47%) than for plasma input based 2TC-4k (37%), and the least for 1TCx2 (16%). Differences between both patients groups (with and without EGFR mutation) using volume of distribution (VT) of 2TC-4k-WB and 2TC-4k models were similar (two-tailed t-test $p< 0.05$). Furthermore, group differences were similar when IDIF was used, but only after recalibration based on manual arterial samples. In contrast, there was a large overlap in SUV values between the two groups. TBR 40 min post injection or later, however, did show a good group discrimination. TBR showed good correlation with 2TC-4k VT (R2=0.74), but not with [15O]H2O derived blood flow (R2=0.02). CONCLUSION The optimal plasma input kinetic model for [11C]erlotinib is 2TC-4k. The need for metabolite correction of the input function needs further investigation. The preferred simplified method so far is TBR, but some arterial blood samples were still required to obtain blood concentrations. Future studies are needed to assess whether venous samples can be used for the latter purpose.

P0336

In-vivo imaging of Tc-99m labeled Elafin in rats

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Backgound: The human peptide Elafin is a potent reversible inhibitor of the pro-inflammatory leukocyte-elastase, protease 3 and endogenous vascular elastase. The last one has a significant influence in the induction of endothelial and vascular muscle cell proliferation, especially in ischemic and pulmonary arterial hypertension. Elafin is successfully used as a potent anti-inflammatory agent e.g. in the lung. Aim of this study was to investigate the unknown pharmacokinetics of Tc-99m labeled Elafin after intravenous (iv) and subcutaneous (sc) administration in healthy rats. Methods: 40 ± 5MBq of Tc-99m labeled Elafin were applied both iv and sc to healthy adult male Wistar rats respectively (each n = 10). A control group (n = 8) received only Tc-99m pertechnetate. Dynamic imaging was performed up to 120 min using an E-CAM camera and SPECT imaging was performed up to 24h p.i. with a multiplexed multi-pinhole collimator (HiSPECT, company Scivis). Blood samples were obtained at 10s, 20s, 30s, 1min, 2min, 5min, 10min, 30min, 1h, 2h, 4h and 24h p.i. After 24h the animals were perfused with saline and the gamma-radiation levels of the organs were determined with a gamma-counter. The organ time activity curves (TAC) were calculated using ROI analysis. Results: Labeled Elafin accumulated mainly in kidneys and bladder while no significant accumulation in other organs could be detected. The kidney TAC for labeled Elafin exhibited initially a steep rise until the 4th minute followed by a decrease period until the 14th minute. Afterwards the activity in the kidneys increased again until a constant level after 45 minutes (24.0 ± 1.7 % after 24h). The blood TAC describes a straight increase within the first minutes and then rapidly decreases down up to the 10th Minutes (alpha phase). Thereafter the blood activity decreases slower (beta phase). The elimination of Elafin from the blood occurred much faster compared to Tc-99m

pertechnetate and the renal uptake for Tc-99m labeled Elafin is with 6.7 ± 1.9% after 24h about 14 times higher than the renal uptake of Tc-99m pertechnetate. Conclusions: Elafin is effectively used in treatment of inflammatory diseases e.g. in the lung. The pharmacokinetics of Elafin in animals suffering from inflammatory diseases might be different. Although no significant uptake of Elafin except in kidneys could be observed, the high accumulation of Elafin in the kidneys could be therefore very important for the treatment of reperfusion injury of the kidney.

P0337

Radiolabeling and in vivo imaging of a newly developed [I-123]-iodopentamidine prodrug for the treatment of African trypanosomiasis

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Backgound: Pentamidine is an effective antimicrobial agent and approved drug for the treatment of African trypanosomiasis (sleeping sickness). Due to the strong basic amidine moieties pentamidine suffers from poor oral bioavailability and lacks CNS delivery limiting its applicability for iv or im treatment of first stage African trypanosomiasis. To improve oral and CNS bioavailabilities of pentamidine, many prodrug approaches have been pursued by our group to overcome this substantial problem. The aim of the herein presented work was to perform in vivo imaging studies with a newly developed and radiolabeled pentamidine prodrug to examine its oral bioavailability and biodistribution. Materials/Methods: First, iodinated reference substances were synthesized and characterized by NMR and LC/MS. Radiolabeling with n.c.a. [I-123] via isotopic exchange reaction was accomplished using either ammoniumsulfate in acetic acid for iodopentamidine or copper(I)chloride in DMSO for N,N´-dihydroxyiodopentamidine. Identification, separation, purification and quality control of the tracers were done by HPLC. In the imaging experiments the distribution and bioavailability of intraveneously and perorally administered tracers were compared using 12 male SD-rats for each substance (n=6 iv, n=6 peroral) over a period of 24 hours. After the last SPECT-images had been acquired rats were perfused, disembowelled and γ-radiation levels of the organs were determined with a γ-counter. VOI-analysis of reconstructed SPECT-images was performed with PMOD-Software. Results: The data showed, that [I-123]-iodopentamidine was mainly renally eliminated while [I-123]-N,N´-dihydroxyiodopentamidine was rather metabolized in the liver and underwent biliary elimination. Analysis of organ-AUCs from processed SPECT-images as well as organ activity levels suggested that the relative bioavailability of orally administered prodrug compared to orally administered [I-123]-iodopentamidine was significantly improved (e.g. 20.5% vs 0.7% (liver), 13.1% vs 2.2% (heart), 23.0% vs 6.1% (lung), 18.4% vs 2.1% (brain)). The specific activity levels of intravenously injected [I-123]-iodopentamidine were set to 100%. Furthermore, a seven times higher activity in the brain has been observed after iv injection of [I-123]-N,N´-dihydroxyiodopentamidine compared to iv injection of [I-123]-iodopentamidine. In general, activity levels of all organs (except for kidneys and spleen) were significantly higher after prodrug than after [I-123]-iodopentamidine injection. Conclusion: In conclusion, [I-123]-N,N´-dihydroxyiodopentamidine exhibited a highly improved oral bioavailability supporting the possibility for developing oral drug formulations that can be used to treat patients suffering from sleeping sickness. Notably, even the CNS bioavailability was apparently improved. However, additional efforts will need to be considered to further increase the drug concentration in the brain for effective treatment of second stage African trypanosomiasis.

P31-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Radiopharmaceuticals & Radiochemistry: Antibodies & Peptides

P0338

125Sn is potentially better than 90Y for peptide receptor radionuclide therapy in combination with 177Lu

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Aim: Preclinical studies and dosimetry considerations support that, due to their different beta ranges, the combination of ^{90}Y (64h, 12mm) and ^{177}Lu (162h, 2mm) is well adapted to simultaneously control large heterogeneous and small homogeneous tumours. Two recent clinical trials used empirical ^{90}Y-^{177}Lu activity proportions: 30%-70% and 50%-50%. Long half-life is also important to profit of the longer radionuclide (RN) transit time in tumour than in kidney. Our aim is to investigate whether ^{66}Ga (9.5h, 30mm) with its long range or ^{125}Sn (232h, 12mm) with its long half-life could favourably replace ^{90}Y in the combination with ^{177}Lu. **Method:** Homogeneous active spheres of diameter ranging from 1 to 25mm were modelled, as well as heterogeneous active spheres including 1, 3, 5 and 7mm-heterogeneities. Tumour control probabilities (TCP) for ^{66}Ga, ^{90}Y and ^{125}Sn in combination with ^{177}Lu in variable proportions (that kept constant the renal cortex biological effective dose) were derived by 3D dose kernel convolution. For all the RNs, the pharmacokinetics was assumed to be identical to that of ^{86}Y-DOTATOC measured in the 86Y-SMT-487 trial: i.e. a biological washout half-life of 210h and of 92h for the tumours and for the kidney, respectively. **Results:** Despite the long range of ^{66}Ga, due to its shorter half-life, ^{66}Ga-^{177}Lu performed less well than ^{90}Y-^{177}Lu for simultaneous control of large heterogeneous and small homogeneous tumours. For a mean tumour absorbed dose of 180Gy, 2mm-homogeneous tumours and tumours with 3mm-heterogeneities were both well controlled (TCP>0.9) using a 25%-75% activity proportions of ^{90}Y-^{177}Lu. However, using a 13%-87% activity proportions, ^{125}Sn-^{177}Lu achieved a significantly better result by controlling 1mm-homogeneous tumour simultaneously with 5mm-heterogeneites. According to the literature; i) ^{125}Sn is produced in large amount during ^{99}Mo/^{99m}Tc generator manufacturing by thermal neutron irradiation of ^{235}U and can be easily purified from the wastes by automated chemical process, ii) ^{117m}Sn-DTPA is stable and ^{125}Sn coupling to somatostatin analogue appears thus feasible. **Conclusion:** This study strongly supports the merit to perform clinical trials using RN combinations, but with adapted RNs proportions. In addition the present results show that, regarding decay properties, ^{125}Sn is significantly better than ^{90}Y for internal radiotherapy in combination with ^{177}Lu and provides significantly better tumour control. This justifies biodistribution and pharmacokinetics studies in rodent of ^{125}Sn labelled somatostatin analogues.

P0339

Selection and characterisation of human CD44v6-binding antibody fragments for specific targeting of head and neck squamous cell carcinoma

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Background: Head and neck squamous cell carcinoma (HNSCC) is an aggressive form of cancer. New diagnostic tools for early detection and novel targeted treatments of small residual disease constitute major challenges. Radio-immunodiagnosis and radio-immunotherapy, facilitated by antibodies or antibody fragments targeted to tumour associated markers, may have great potential in this field. Aim: The aim of this study was to develop and characterize novel fully human Fab-fragments with affinity to the v6-sequence of CD44 isoforms, which commonly are over-expressed in HNSCC. Material & Methods: An epitope-guided phage display selection of human Fab-fragments with affinity to CD44v6 was first performed. Characterization of the binding of the Fab-fragments to the defined epitope was then performed in systems of increasing complexity, ranging from a small defined peptide to cultured human tumour cells. Real-time binding of 125I-labelled Fab-fragments was monitored on two different CD44v6-expressing human cancer cell lines as well as a CD44v6-negative control cell line. Results: A selected set of thirteen Fab-fragments was shown to specifically recognize the defined target peptide sequence. More importantly, the Fab-fragments recognized the target sequence also when it was present in the context of a full extracellular domain of CD44 expressed in and purified from mammalian cells. The binding was independent of known v6-sequence variation and post-translational modifications that commonly are found in the CD44 protein family. Furthermore, real-time interaction measurements on selected top performing Fab-fragments labelled with 125I also showed specific and high affinity binding to the antigen present on live HNSCC cells in vitro. There was no cross-reactivity towards cells that lack the target protein. Characterization of the binding of labelled Fab-fragments using the mathematical tool Interaction Map revealed more heterogeneous interactions on cells than what was obtained for data with pure proteins analysed by surface plasmon resonance. One main candidate Fab-fragment with superior affinity for all of the increasingly complex forms of the target sequence was identified. Conclusion: After careful evaluations of thirteen novel, fully human Fab-fragments in systems of increasing complexity, one of the candidates stood out, demonstrating superior kinetics and an optimal affinity for radio-immunotargeting, and may be further developed for use in diagnostics and therapy in the future. The flexible recombinant origin of the human Fab-fragments might facilitate the development of tailored molecules adapted for either targeted therapeutic- or diagnostic applications in the future.

P0340

Stereochemistry of aminoacid spacers determines the metabolic stability and pharmacokinetics of 111In-DOTA-minigastrin analogues for targeting of the gastrin receptor

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Aim To date there is no minigastrin analogue suitable for targeted molecular radiotherapy of medullary thyroid carcinoma and other gastrin receptor expressing tumors. The drawback of current targeting agents is either their metabolic instability or their high kidney retention, limiting the maximum activity that can be administered without the induction of radiation nephrotoxicity. Till now high kidney retention of minigastrin (MG) analogues has been related to the N-terminal glutamic acids and could be substantially reduced by coinjection of polyglutamic acids or the gelatin-based plasma expander gelofusine. The aim of this study was to investigate the influence of stereochemistry of amino acid spacers, namely $(L\text{-}Glu)_6$ vs. $(D\text{-}Glu)_6$ on metabolic stability and pharmacokinetics of ^{111}In-DOTA-MG analogues. ***Materials and Methods*** Both DOTA coupled peptides were synthesized manually on solid phase using Fmoc chemistry. Gastrin receptor affinities were determined by receptor autoradiography using ^{125}I-CCK as radioligand. To obtain information on secondary structure circular dichroism (CD) spectroscopy of ^{nat}In-labeled peptides was performed. Enzymatic stability was determined by incubating the ^{111}In-labelled peptides in fresh human serum. Biodistribution studies were performed in AR4-2J-tumour-bearing Lewis rats. To reduce kidney uptake gelofusine was pre-injected in a selected group of rats. ***Results*** Both peptides showed high binding affinity to the gastrin receptor with IC_{50} values in the low nM range. CD measurements revealed differences in secondary structure of both peptides, in water, random coil conformation in case of for ^{111}In-DOTA-$(L\text{-}Glu)_6$-MG vs. type II reverse turn conformation for ^{111}In-DOTA-$(D\text{-}Glu)_6$-MG. The metabolic stability was 2.5-fold higher for ^{111}In-DOTA-$(D\text{-}Glu)_6$-MG with $T_{1/2}$ of (175 ± 71)h in comparison to ^{111}In-DOTA-$(L\text{-}Glu)_6$-MG ($T_{1/2}$ = 75 ± 23 h). Biodistribution studies showed differences in tumour and kidney uptake. Tumour-to-kidney ratio was more than 10-fold better in case for ^{111}In-DOTA-$(D\text{-}Glu)_6$-MG at 4h p.i. and (1.1 vs. 0.1) and remained better also after 24h p.i. (0.72 vs. 0.05). Surprisingly, gelofusine reduced kidney retention to a different extent. In case of ^{111}In-DOTA- $(D\text{-}Glu)_6$-MG just 2-fold reduction was observed while in case of $(L\text{-}Glu)_6$ spacer analogue the kidney uptake was reduced 19-fold. ***Conclusion*** Based on our results we can conclude that metabolic stability and high kidney retention of radiolabelled ionic-spacer minigastrin analogues are not determined solely by the charge of the ligand, but rather by the stereochemistry and secondary structure of the ligand.

P0341

Site-specific radioiodination of HER2-targeting affibody molecules using iodophenetylmaleimide decreases renal uptake of radioactivity.

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Aim. Radiolabelled affibody molecules, small (7 kDa) scaffold-based targeting proteins, have demonstrated a high potential for radionuclide molecular imaging. One challenge in the use of affibody molecules is a high reabsorption in kidneys. One approach to overcome this issue is based on the fact that internalization of affibody molecules by cancer cells is slow, and advantage of residualizing labels is minimal for tumour targeting. The internalization in the kidneys upon reabsorption is rapid, and non-residualizing properties of a label would facilitate excretion of radiocatabolites and reduce renal retention. Earlier, we have shown that the use of radioiodinated 3-iodo-((4-hydroxyphenyl)ethyl)maleimide (I-HPEM) as a prosthetic group for site-specific labelling of cysteine-containing affibody molecules provides high tumour uptake, but low radioactivity retention in kidneys. We have hypothesised that the use of 3- iodophenetylmaleimide (IPEM) would further reduce renal retention of radioactivity due to increased lipophilicity of radiocatabolites. **Materials and methods.** Radioiodination of N-[(Tri-n-butylstannylphenetylamine) phenethyl]maleimido and coupling of ^{125}I-IPEM to pre-reduced anti-HER2 $Z_{HER2:2395}$ affibody molecule was optimised, and stability of labelling was tested in vitro. Binding specificity and cellular processing of ^{125}I-IPEM-$Z_{HER2:2395}$ and ^{125}I-IHPEM-$Z_{HER2:2395}$ were compared in vitro using HER2-expressing SKOV-3 cells. Biodistribution of ^{125}I-IPEM-$Z_{HER2:2395}$ and ^{125}I-IHPEM-$Z_{HER2:2395}$ were compared in NMRI mice at 1, 4 and 24 h after injection. **Results.** Radiochemical yield of ^{125}I-IPEM was 74±2%. An overall yield of radioiodination of ^{125}I-IHPEM-$Z_{HER2:2395}$ was 45±3%. The label was stable in a set of in vitro tests. ^{125}I-IPEM-$Z_{HER2:2395}$ bound specifically to HER2-expressing cells. Cellular retention profile of ^{125}I-IPEM-$Z_{HER2:2395}$ indicated more rapid excretion of radiocatabolites than ^{125}I-IHPEM-$Z_{HER2:2395}$. In vivo, the renal uptake of ^{125}I-IPEM-$Z_{HER2:2395}$ (24±2 and 5.7±0.3 %ID/g at 1 and 4 h, respectively) were significantly lower than uptake of ^{125}I-IHPEM-$Z_{HER2:2395}$ (50±8 and 12±2 %ID/g at 1 and 4 h, respectively). ^{125}I-IPEM-$Z_{HER2:2395}$ had higher uptake in liver at 1 h pi (4.1±0.7 %ID/g compared to 2.6±0.1 %ID/g for ^{125}I-IHPEM-$Z_{HER2:2395}$) but the difference disappeared by 4 h pi (1.4%ID/g for both conjugates). Radioactivity uptake in stomach and salivary gland (organs expressing Na/I symporter) was significantly lower for ^{125}I-IPEM-$Z_{HER2:2395}$. **Conclusion.** The main hypothesis has been confirmed: the use of more lipophilic linker permits to reduce renal radioactivity retention for radioiodinated affibody molecules. This can be applied for labelling of affibody molecules with ^{123}I for SPECT, ^{124}I for PET and ^{131}I for targeted radionuclide therapy. It might be also helpful for other researchers developing imaging agents based on scaffold proteins.

P0343

Application of Radiolabelled Peptides in Breast Cancer

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Introduction: Mammography is commonly applied for diagnostic imaging to localize breast cancer (BC). Several molecular characteristics reflect subtypes of this heterogeneous disease, partly overlapping with therapeutic targets, such as expression of estrogen- (ER), progesterone- (PgR) and ErbB2/HER2 receptor. Furthermore, somatostatin (SST) and gastrin releasing peptide receptors (GRP-R) have been detected, which may be targeted with specific radiolabelled peptide analogues. Scintigraphy studies in the early nineties using an ^{111}In-labelled somatostatin analogue were promising, but sensitivity was quite low. Nowadays, using stable radiopeptides with high affinity and state of the art imaging modalities, tumour-specific monitoring (SPECT/CT or PET/CT), radioguided surgery and targeted radionuclide therapy of BC should be feasible. In this study BC cell lines and primary tumour specimens were screened for SST and GRP-R and correlated with ER/PgR expression. Methods: Over 50 BC cell lines of human origin representing various BC subtypes have been extensively characterized for e.g. ER, PgR, ErbB2/HER2 and gene mutations. These were screened for SST and GRP-R expression on mRNA level using Affymetrix Array. A panel of 17 cell lines expressing mRNA for GRP-R were screened for GRP-R and SST at protein level in uptake assays for 1 h at 37^{0}C using ^{111}In-octreotide and ^{111}In-AMBA, a somatostatin and GRP analogue respectively. Human primary BC specimens from the Erasmus MC tissue bank, characterized for ER and PgR, were also screened using in vitro autoradiography on frozen sections to quantify SST and GRP-R expression. Histological hematoxylin and eosin staining was performed on serial sections to localize malignant cells. Results: Of the 17 tested BC cell lines, 9 showed GRP-R protein expression at variable levels. One of these also expressed SST, while all other cell lines were SST negative. No correlation was found between GRP-R and ER, PgR or ErbB2/HER2 expression. The majority of the malignant cells in the 51 tested BC tissue specimens displayed heterogeneous expression of GRP-R (~90%) and SST (~85%), of which 80% displayed both SST and GRP-R, ~5% single SST positive, ~10% single GRP-R positive. ER/PgR negative specimens were found among those without or low GRP-R/SST expression. Discussion and Conclusion: Radiolabelled SST and GRP peptide analogues are suited for specific targeting of the majority of primary BC. Because SST/GRP-R expression was found less frequently on BC cell lines, only few are suited for further in vitro and in vivo animal studies, of which the correlation between SST/GRP-R and ER/PgR/ErbB2/HER2 expression will be one of the topics.

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Radiopharmaceuticals & Radiochemistry: Miscellaneous

P0344

The effects of carbidopa pretreatment in 18F-DOPA PET: dosimetric analysis

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AIM: The aim of the study was to evaluate the effects of carbidopa pretreatment in absorbed dose in ^{18}F-DOPA PET studies for the most critical organs. MATERIALS AND METHODS: 21 patients were recruited by the use of ECO, MR and CT diagnostic studies and blood analysis. PET scans for assessment of NET disease were performed after administration of 4 MBq/Kg of ^{18}F-DOPA. Whole body PET studies, 5 min and 55 min post injection, were performed in all patients. 2mg/Kg of carbidopa was administered to 11 patients, 1h before the injection. PET scans were acquired by PET TF GEMINI PHILIPS system. Liver, bladder, pancreas and remainder of the body absorbed doses were investigated by the use of analysis software, provided by Philips manufacturer. Manual ROIs were drawn on two PET imaging datasets. Injected activity percentage was calculated by organs uptake and injected activity ratio. The well known and validated OLINDA software was used to calculate the absorbed dose/injected activity (mGy/MBq) in the organs. and Injected activity percentage for the critical organs was introduced in exponential model in order to obtain residence times. Urinary excretion was estimated as a difference between whole body total counts of the first and second acquisition, the latter corrected for decay. The remainder of the body absorbed dose was calculated as a difference between all body and other organs. The effective dose/injected activity (mSv/MBq)

was calculated by the use of weighting factors of ICRP 103. Kruskall-Wallis test was performed in order to find statistically significant difference in absorbed dose in critical organs between the group of patients with/without carbidopa pretreatment. RESULTS: The mean absorbed dose/injected activity (mGy/MBq) in patients with/without carbidopa pretreatment was 6.55E-03/5.21E-03 for pancreas; 9.83E-02/5.36E-02 for bladder wall; 7.34E-03/7.99E-03 for liver and 4.22E-03/5.22E-03 for remainder of the body. The K-W test showed P<0.05 for absorbed dose in remainder of the body and P=0.13 in pancreas, P=0.09 in bladder wall and P=0.24 in liver. Mean effective dose (mSv/MBq) in patients with/without carbidopa pretreatment was 4.87E-03/3.09E-03.CONCLUSION: The carbidopa pretreatment showed a slight increase of the absorbed dose in remainder of the body, most likely correlated to activity carried out by haematic processes. However, this was compensated by the decrease of the uptake in pancreas to allow better metastasis detection. The bladder wall was confirmed to be the most irradiated organ. Our study showed that carbidopa pretreatment makes possible a decrease of mean effective dose.

P0345

Performance of the IGG100 Gallium-68 Generator

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Eckert & Ziegler Isotope Products has been manufacturing the IGG100 gallium-68 generator for over four years. Detailed performance data have been collected for more than 200 generators, including germanium-68 breakthrough levels, elution efficiency, and typical elution profile. In addition, a metals screen is performed by ICP-MS on the eluate of each generator to measure levels of metal impurities which could interfere with gallium-68 labeling. These aggregate data are reasonably consistent from one generator to another, and viewed together, create a profile of "typical" performance of the IGG100 and normal range of variation. Additionally, elution efficiency and germanium-68 breakthrough have been measured over time for several individual generators to determine whether these performance characteristics are stable over the generator's recommended one-year lifetime. These data will be presented for individual generators studied over one and two years, along with performance data for generators returned to Eckert & Ziegler at end-of-life.

P0346

Impact of CT radiation in overall patient effective dose, for hybrid SPECT-CT imaging

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Aim: The last decade of development in conventional Nuclear Medicine (NM) has been marked by the introduction of hybrid imaging devices. Co-acquisition of NM and CT provides accurate attenuation correction and fusion imaging, improving disease localization. Although with these recognized advantages, the addition of CT to SPECT studies leads to an increase in patient's radiation exposure. The introduction of hybrid imaging in daily clinical practice should be carefully weighed regarding the actual benefit to each patient, as opposed to the additional exposure. Our department recently purchased a hybrid Infinia Hawkeye 4 GE® gamma-camera. One of its selling arguments is the use of a low-dose CT tube, reducing radiation exposure from the CT component. The aim of this study was to assess the impact of the CT radiation dose in effective patient dose. Material & Methods: From November/2011 to March/2012, 406 SPECT/CT studies were performed, myocardial perfusion studies representing 84%(341). They include CT acquisition for attenuation correction in both stress and rest components. The remaining study group consisted of 44 bone scans, 9 somatostatin receptor studies, 3 MIBG, 3 parathyroid, 2 brain scans and 4 infection studies. The effective dose for the NM component was calculated using effective equivalent conversion values for each radiopharmaceutical. A CT acquisition protocol was defined individually for each exam and the camera yielded dose-length product (DLP) was registered. An effective dose was estimated using the European Guidelines Criteria for Computed Tomography conversion factors, for the relative radiosensitivity of the organs within the scan range. Results: For stress/rest myocardial studies the average effective dose to the patient from the CT component was 0,73msV (7% of 10,5mSv overall patient dose). In bone scans CT represented 22%(1,69mSv) of a total 7,7mSv dose; in MIBG and somatostatin receptor studies (mainly abdominal region CT), the average effective dose from CT was 2,98mSV and in brain scans just 0,3mSv. For infection studies, an abdominal CT study yielded an average 2,68mSv dose, while in extremities a minimal (0,01 mSv) effective dose exposure was registered. Conclusions: Effective dose emission from CT varies greatly according to region and length of exposed area. For most SPECT-CT acquisitions the CT component represented a small fraction of the overall effective dose for the patient. While dose exposure to the patient should be always minimized, the resulting gain in image quality and/or localization with the addition of CT to SPECT studies far outweighs its potential risk.

P0347

Efficiency of Technetium-99m labelling of erythrocytes in patients with Malaria

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When erythrocytes are labelled for Nuclear Medicine procedures, any factor which interferes with the labelling can lead to sub-optimal studies. With the high incidence of malaria in sub-Saharan African countries including Cameroon, a high percentage of patients referred to Nuclear Medicine departments also have malaria. The question arose whether the presence of *Plasmodium* in erythrocytes or anti-malarial medication could affect the labelling of erythrocytes with technetium-99m. The aim of this study was to investigate the impact of *Plasmodium* and quinine treatment on Tc-99m red cell labelling efficiency with in vitro kits in a population with a high prevalence of malaria infection. Methods: A prospective study was carried out at Yaounde General Hospital in Cameroon where malaria is endemic, and at Tygerberg Academic Hospital in a malaria-free area of South Africa, after approval of the study by the respective ethics committees. A 3 ml heparinised blood sample was obtained from each patient or volunteer. Thick blood slides were examined microscopically to determine presence or absence of *Plasmodium falciparum*. In vitro red blood cell labelling with Tc-99m was compared in 30 proven malaria patients (group M+), 30 patients with malaria treated with quinine (group Mm), and 30 malaria-free patients (group M-) in Cameroon. In addition, blood samples of 30 healthy volunteers in Cape Town, South Africa, where malaria is not endemic were labelled as control (group C). Results: The mean labelling efficiency was 98.6% ± 2.6% in patients with malaria but not on treatment, and 98.6% ± 1.1% in patients with proven malaria on quinine treatment, 98.2% ± 2.3% in malaria-free individuals in Cameroon, and 98.6% ± 0.7% in volunteers in a malaria-free region. There was no significant difference between labelling efficiencies in the four groups with P>0.05. Conclusion: The results of this study indicate that neither the malaria parasite nor quinine therapy affect in vitro red blood cell labelling with Tc-99m and thus should not interfere with Nuclear Medicine investigations.

P34-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Cardiovascular: Basic Science

P0348

Is the normal database adequate for myocardial images acquired in different patient positions?

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Background: Gated myocardial perfusion imaging is a well-established method for defining the risk of coronary artery disease. The images are generally acquired in supine position; however, there are patients who are not able to lie due to their other diseases (skeletal problems, heart failure, claustrophobia etc.). That is the reason why cameras using sitting position have been developed recently. However, the available normal data bases were created from studies acquired in supine or prone position. Our aim was to investigate how the patients' position influences the quantitative results obtained by comparison to a normal cardiac data base. Methods: 34 patients (mean age: 58.48±8.25) were enrolled in our prospective study. Standard stress gated myocardial perfusion imaging with Tc-99m labeled SESTAMIBI was performed by two types of gamma camera, using different patient positioning: supine for the Cardio C, and sitting for the CardioDesk (both by Mediso Ltd.). The mean time between the two acquisitions was 32.5± 5.26 min. The InterviewXP package was used for reconstruction, and then the Emory Cardiac Toolbox software for quantitative evaluation by three experienced physicians not aware of the anamnestic data. The ejection fraction, end diastolic (EDV) and end systolic (ESV) left ventricular volumes, perfusion defect score (SSS) and total severity score (TSS) were calculated from each study automatically, based on the same normal data base. The results were analyzed using the IBM SPSS v19 statistical package. Results: 578 segments per camera were evaluated quantitatively. The values measured by different physicians could be averaged since they were not statistically different. While there were no significant differences between the ejection fractions obtained by the two cameras (paired t-test: p>0.1), the left ventricular volumes calculated from the studies acquired in sitting position were significantly lower (paired t-test, p<0.0001 and p=0.004 for the EDV and ESV, respectively). On the other hand, the severity scores were significantly higher (Wilcoxon signed rank test, p=0.00051 and 0.00109 for the SSS and TSS, respectively). Conclusion: Our findings indicate that the parameters

obtained in different positions are not comparable. A separate data base is necessary for each patient position.

P0349

Comparison of left ventricle ejection fraction (LVEF) measured by radionuclide ventriculography (planar and SPECT), 3T cardiac magnetic resonance and echocardiography in patients after myocardial infarct (MI) and patients with non-ischaemic cardiomyopathy - preliminary results.

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Aim: The aim of the study was to compare LVEF in patients after MI and in patients with cardiomyopathy measured with use of three different imaging modalities: radionuclide ventriculography (planar and SPECT), 3T cardiac magnetic resonance and echocardiography. Materials and methods: We examined 4 male patients (aged from 31 to 67) who had anterior wall MI in the past and 4 patients (3 male and 1 female, aged from 26 to 49) who suffered from non-ischaemic cardiomyopathy by three imaging techniques. All measurements in a patient were made within a week. Radionuclide ventriculography (RV), both planar and SPECT, was performed in nuclear medicine department, after in-vivo labelling of red blood cells by Tc99m, using double-head gammacamera (Symbia T6, Siemens), cardiac magnetic resonance (CMR) (Achieva 3.0T TX, Philips) was carried out in radiology department, with short axis EF measurement, echocardiography was done in cardiology clinic, with autoEF function based on 2-D speckle tracking (Vivid 9, GE Vingmed). All the measurements made by certain imaging modality were interpreted by same physician to avoid interobserver variability. Results: Radionuclide ventriculography EF measurements were as follows: planar: mean 22,6%, min 13%, max 37,4%; SPECT: mean 24,6%, min 18%, max 40%; cardiac magnetic resonance: mean 24,5%, min 10%, max 33%; echocardiography: mean 24,8%, min 15%, max 40%. The correlation coefficients between modalities were: RV planar vs. RV SPECT r=0,97 (p=0,0012), RV planar vs. ECHO r=0,97 (p=0,0013), RV SPECT vs. ECHO r=0,95 (p=0,031), ECHO vs. CMR r=0,82 (p=0,045), RV planar vs. CMR r=0,80 (p=0,056), RV SPECT vs. CMR r=0,69 (p=0,13). Conclusions: There was high and statistically significant correlation between: planar and SPECT radionuclide ventriculography, planar RV and Echo, RV SPECT and Echo, and Echo and CMR - in terms of EF measurements. Lower and insignificant correlation was observed between RV planar and CMR, and RV SPECT and CMR - greater groups of patients are need to achieve reliable correlations between these modalities. It's intriguing why nuclear modalities seem not to correlate with CMR. Furthermore, we plan to investigate the influence of certain conditions (state after MI, cardiomyopathy) on EF results obtained by various methods.

P35-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Cardiovascular: Perfusion

P0350

The usefulness of ordered-subset expectation maximization with resolution recovery in half-time SPECT myocardial perfusion imaging with 201Tl

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Aim: Some studies have shown the usefulness of "ordered-subset expectation maximization with resolution recovery (OSEM-RR)" for half-time 99mTc single photon emission computed tomography (SPECT) myocardial perfusion imaging. However, there is no data for 201Tl despite its frequent clinical application. This study was conducted to examine the feasibility of OSEM-RR for half-time SPECT 201Tl myocardial perfusion imaging. Materials and methods: A total of 100 patients (71 ± 9 years old) underwent rest 201Tl gated SPECT. Half-time acquisition (HT) processed with OSEM-RR (Evolution software package; GE Healthcare) was compared to full-time acquisition (FT) with filtered backprojection (FBP). FT was performed for 13 minutes. HT data (6.5 minutes) was derived from FT data using resampling software. Automated analysis on gated SPECT was used to determine left ventricular end-diastolic volume (EDV), end-systolic volume (ESV) and ejection fraction (EF). Two cardiologists - unaware of the protocols - visually assessed all reconstructed images for summed rest score (SRS) using a 17-segment model, and graded image quality as 1 (poor), 2 (good), or 3 (excellent). A clinical diagnosis was also determined. Results: Although EDV, ESV, EF and SRS showed excellent correlation between the OSEM-RR and FBP images ($p < 0.001$), there were significant differences in all measurements. EDV and ESV were significantly lower for OSEM-RR than FBP (58.3 ± 2.5 vs. 69.5 ± 2.8, 22.0 ± 1.9 vs. 28.3 ± 2.2, respectively; $p < 0.001$) EF and SRS were significantly higher for OSEM-RR than FBP (67.7 ± 1.5 vs. 63.5 ± 1.3, 8.7 ± 0.6 vs. 7.0 ± 0.6, respectively: $p < 0.001$). The concordances between the OSEM-RR and FBP images were moderate ($\kappa = 0.56$) in the image quality and good ($\kappa = 0.69$) in the clinical diagnosis. Conclusion: Our data suggests the feasibility of OSEM-RR for half-time 201Tl SPECT myocardial perfusion imaging.

P0351

Diagnostic and Prognostic Value of Myocardial Perfusion Scintigraphy and Stress Echocardiography in Renal Transplant Recipients: A Retrospective Study

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Aim: Ischaemic heart disease (IHD) is common amongst renal failure patients and remains the main cause of death following transplantation. Myocardial perfusion scintigraphy (MPS), stress echocardiography (SE) and coronary angiography (CAG) have been suggested as useful tools to identify IHD as part of pre-transplantation assessment. However the best method remains undetermined, and evidence of their predictive value for post-operative events in this population is lacking. Therefore, we investigated the role of the above tools in predicting peri-/post-operative events after transplantation. **Materials and methods:** We retrospectively studied 252 consecutive kidney-only transplant recipients between 2009 and 2011, of which 147 underwent MPS, SE or CAG as part of their pre-transplantation assessment. Baseline demographic and clinical information including cardiovascular risk factors, peri-/post-operative complications and mortality were collected and compared to evaluate pattern of referral using t-test or chi-square analysis as appropriate. The probability of event-free survival was estimated by Kaplan-Meier analysis, and differences in survival between normal and abnormal groups were further evaluated by log-rank (Mantle-Cox) method. Multivariate Cox regression analysis was performed to identify variables independently associated with events. The diagnostic value of MPS and SE for detecting IHD was evaluated using CAG as gold standard. All statistical analyses were performed using SPSS software (Version 17 for Windows, Chicago, Ill). **Results:** A total of 125 MPS, 44 SE and 50 CAG were performed. There were 8 deaths and 3 non-fatal cardiac events during a mean follow-up duration of 22.1 +/- 9.4 months following renal transplantation. Of which, 2 deaths and 2 cardiac events were perioperative (<30 days post-transplantation). The overall unadjusted event-free survival was 95.6% at 3 years post-transplantation. Univariate analysis showed patients referred for imaging or with an abnormal CAG were associated with a poorer outcome (3-year cumulative survival: Imaged vs Non-imaged - 92.1% vs 99.0%; HR 7.30, 95% CI 2.20-24.1, p=0.026; Abnormal vs Normal CAG - 68.2% vs 94.1%; HR 5.54, 95% CI 1.12 to 27.5, p=0.021). Multivariate analysis identified a history of IHD and diabetes as the only independent predictors of adverse outcome. Using CAG as gold standard, sensitivity and specificity of MPS for detecting IHD were 61.5% and 36.7% respectively (n=43), and for SE 66.7% and 71.4% (n=15). **Conclusion:** We showed that abnormalities on MPS, SE and CAG do not offer independent predictive value for cardiac events or mortality post-transplantation. Our results may have implications on how these modalities are utilised for pre-transplantation cardiac screening in the future.

P0352

Evaluation of the prognostic value of dipyridamole technetium-99m sestamibi myocardial perfusion imaging SPECT in perioperative cardiac event

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Purpose: perioperative cardiac event is one of the most important concerns and associated with many problems for the surgeon and patient. The purpose of current study was to determine the prognostic value of the myocardial perfusion imaging (MPI) using dipyridamole 99m Tc-MIBI for the prediction of perioperative cardiac events. Materials and methods: There were 253 patients contributed in this retrospective study. All of the patients were candidate for noncardiac elective surgery and underwent scanning with dipyridamole 99m Tc-MIBI. Based on the MPI, patients were divided into two normal and abnormal scan groups. All perioperative cardiac events were recorded. The risk factors including diabetes mellitus, dyslipidemia, hypertension, smoking and age ≥70 were compared between patients with normal and abnormal MPI and also in patients who had and did not have cardiac events. Results: There were 197 patients with normal and 56 patients with abnormal MPIs. In total, 14 patients had perioperative cardiac events included myocardial infarction (MI), death, hypotension and arrhythmia. Of those 14 patients with perioperative cardiac events, 12 cases had abnormal and 2 cases

had normal MPIs. There were statistically meaningful difference between two groups (p <0.001). Based on these findings, MPI has a sensitivity of 85.7% , specificity of 81.6%, accuracy of 81.8%, positive predictive value of 21.4 % and negative predictive value of 98.9%. Conclusion: The incidence of perioperative cardiac events is higher in patients with abnormal MPI. Dipyridamole 99m Tc-MIBI myocardial perfusion imaging can accurately detect the preoperative cardiac risk of patients undergoing major noncardiac surgery. Based on the findings, the occurrence of perioperative cardiac event in patients with abnormal MPI should be considered especially in older age population (age ≥70).

P0353

Value of Myocardial Perfusion Gated SPECT in Hypertensive Patients with Left ventricular Hypertrophy in the Evaluation and Prognosis of Coronary Artery Disease

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Background&aim:Left ventricular hypertrophy(LVH)is an independent risk factor for mortality in hypertensive(HTN) patients(pts).Myocardial perfusion Gated SPECT is more accurate than plain exercise ECG (ETT)in evaluating such pts for coronary artery disease (CAD) and predicting future cardiac events .Our aim was to assess the prognostic value of Gated SPECT in these pts with LVH on resting ECG. Methods: We studied 40 consecutive pts(25 men,15 women mean age 53 yrs) referred for evaluation of chest pain.Pts with a recent myocardial infarction or unstable angina were not enrolled.All 40 pts had long standing arterial HTN controlled on medications and all had evidence of LVH in their resting ECG. Gated SPECT(with treadmill or dipyridamole infusion) was done using Tc 99m tetrofosmin.Coronary angiography,when needed,was performed within 3 weeks of the nuclear test. Mean follow-up was 23 months. Results :all 40 pts developed ST segment depression in the inferolateral ECG leads during plain ETT. Following Gated SPECT study none of our pts showed reversible(ischemia) or fixed(scar) defect.and left ventricular function was within normal limits.No angina was reported during the tests although ST segment depression was recorded on the ECG, finding that was attributed to LVH and hypertensive response.18 pts agreed to undergo a diagnostic coronary angiography which revealed normal coronaries and LVH with diastolic dysfunction due to log standing HTN. during Follow-up none of our pts suffered an acute coronary syndrome or cardiac death . Conclusion : Myocardial perfusion Gated SPECT is more accurate than plain ETT in HTN pts with evidence of LVH.It also has a powerful prognostic value in the evaluation and F/U of these pts.Patients with a normal Gated SPECT do not necessarily need invasive study .

P0354

Myocardial perfusion SPECT combined with calcium score measurement improved the detection of ischemic cardiomyopathy

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Aim: To assess sensitivity and specificity of myocardial perfusion SPECT in the detection of coronary artery disease (CAD) in patients with a dilated cardiomyopathy, and to investigate the added value of the coronary artery calcium (CAC) as an adjunct to SPECT. **Methods:** The study group consisted of eighty-one prospectively recruited patients with a dilated left ventricle who were scheduled for elective coronary angiography because of suspected CAD and who underwent gated SPECT imaging (part of them in combination with a CAC score measurement). Patients with known CAD, after myocardial infarction, and coronary revascularization were excluded. The summed difference score (converted to % ischaemic myocardium using 17-segment scoring system), the left ventricular end-diastolic volume (EDV), end-systolic volume (ESV), and ejection fraction (EF) were measured by 4D-MSPECT software. CAC Agatston score >1000 was considered as an extensive CAC. **Results:** Fifty-four patients had CAD on coronary angiography (≥ 70% stenosis), and 41 of them had reversible perfusion defect (≥ 5% ischaemic myocardium). Twenty-seven patients had normal arteries or non-significant luminal irregularities, and 21 of them had no significant reversibility (< 5% ischaemia). Patients with angiographically CAD had in comparison with those without CAD significantly higher amount of ischaemic myocardium (14% ± 13% vs. 3% ± 4%, respectively, P <0.05), and not significant lower stress EF, rest EF, and stress EDV/ESV (45%, 48%, and 181/102 mL vs. 48%, 50%, and 183/99 mL, respectively, P = NS). In the detection of significant CAD, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of SPECT alone were 80%, 78%, 88%, and 66%, respectively. Combining SPECT with the CAC score (at a cutoff of 1000) markedly improved the sensitivity and NPV to 91% and 81%, respectively, *P* <0.05), in association with not significant change in specificity (78%) and PPV (89%). **Conclusion:** In patients with a dilated left ventricle, combined SPECT and CAC score can help for identifying high-risk patients with significant CAD despite of normal perfusion SPECT results.

P0355

The referral physicians of myocardial perfusion imaging underestimate the extent of ischemia and infarction reported by the physician in nuclear medicine

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Aim: It is of great importance that the treating clinician understands the report of a diagnostic examination. If the message in the report is not precisely understood, the patient might not get any treatment although a disease was found on the diagnostic test. There is also a possibility that the patient receive a potential harmful treatment, when the patient does not suffer from a disease. The aim of the study was to investigate whether referring physicians interpret the extent of the ischemic and infarcted areas of the left ventricle based on the final report of a myocardial perfusion scintigraphy (MPS) the same way as the physician in nuclear medicine intended. **Material and methods:** Six physicians in nuclear medicine and 23 referring physicians (physicians in cardiology, internal medicine, and general practitioners) independently classified 60 examinations on the presence/absence of ischemia/infarction, based on the written final report. When ischemia and/or infarction were thought to be present in the left ventricle, the physicians were asked to mark the involved segments based on the 17-segment model. The Durkalski method was used for analyzing the differences in the interpretation of the 17-segment model for presence/absence of ischemia/infarction **Results:** The physicians in nuclear medicine marked a total of 65 segments as ischemic for all 60 patients and 955 as non-ischemic. For 11 of the referring physicians, there was no statistically significant difference in the classification between the physicians in nuclear medicine and the referring physicians. 12 of the referring physicians underestimated the ischemic area, compared to the physicians in nuclear medicine. For infarction, the physicians in nuclear medicine marked a total of 75 segments as infarced and 945 as non-infarced. For 16 of the referring physicians, there was no statistically significant difference in the classification between the physicians in nuclear medicine and the referring physicians. Six referring physicians underestimated the infarcted area, and one referring physician overestimated the infarcted area. **Conclusion:** The extent of the ischemic and infarcted area was often underestimated by the referring physicians. Previous studies indicate that patients with an ischemic area of more than 10% of the left ventricle benefit from percutanous coronary intervention (Hachamovitch, Eur Heart J, 2011). If the ischemic area is underestimated by the referring physician, the patient might receive suboptimal treatment, for example a less frequent use of percutanous coronary interventions.

P0356

Value of Myocardial Perfusion Gated SPECT in Predicting the Risk for Coronary Events in Patients undergoing Non Cardiac Surgery H.Salman M. Almutairi M. Massoud M.Sayed Nuclear Cardiology unit Chest Hospital Kuwait Kuwait

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Aim:Before any major non cardiac surgery,evaluation for coronary artery disease(CAD)in patients(pts) at risk or with a previous cardiac event is crucial because of the high risk for mortality or cardiac complications in the peri or post operative period.Our aim was to evaluate such pts using myocardial perfusion Gated SPECT. Methods:Our study comprised 102 consecutive pts(67 men 35 women mean age 55 yrs) referred for clearance before a major non cardiac surgery.62 pts had multiple risk factors and 20 were known stable CAD.Pts with a recent coronary event were not enrolled.All pts underwent a 2 day stress/rest Tc 99m tetrofosmin Gated SPECT using treadmill(32 pts) or dipyridamole infusion(70 pts).On the basis of a 20 segment left ventricle (LV) model,we calculated the stress rest summed scores(SSS, SRS) and difference scores(SDS) and regional function indices.LVEF was obtained pre and post stress.SDS(0-1) was considered normal,SDS(2-6) mild to moderate ischemia and SDS>6 severe ischemia. Results : 10 pts (gr A) had severe ischemia,transient fall of LVEFpost stress: their coronaroangiography revealed severe 2 or 3 vessel CADthey had revascularization before their non cardiac surgery and no peri or post operative cardiac event was reported.16 pts(gr B) showed moderate ischemia and at angio 14 of them had sign CAD and were successfully stented and none of them suffered a cardiac event.The remaining 76 pts(gr C) had a normal GSPECT and underwent their non cardiac surgery without prior angiography. 74 pts of gr C did not suffer any cardiac event and 2 pts had a non Q wave myocardial infarction without complications. Conclusion :Tc 99m tetrofosmin GSPECT is a valuable non invasive technique for the risk stratification in high risk pts planned for a non cardiac surgery .Its powerful prognostic value lowers the risk for cardiac events.

P0357

Transient ischemic dilatation (TID) of left ventricular cavity on Gated MPI: Predictive value for CAD and impact of various managements on clinical outcome

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Background: Transient ischemic dilatation (TID) of LV cavity during stress gated myocardial perfusion imaging (GMPI) is known as a predictor of severe CAD and signifies worse prognosis. **Objectives**: To assess predictive and prognostic value of TID of LV cavity using GMPI and clinical outcome in patients treated conservatively or with revascularization. **Methods**: 189 patients out of 2689 were recruited (M:F 127/62, mean age 56 ± 9 years) whose same-day stress GMPI revealed TID ratio ([1.22) with no (sum stress score, SSS\2) or reversible perfusion defects (sum difference score, SDS[2). Coronary ngiography (CA) was performed within 3 months in 125/189 cases who were followed for mean period of 18 ± 4 months for fatal or non-fatal MI. **Results**: CA was positive in 121/125 patients with TID for significant CAD (LAD = 11, multi vessel disease = 110 patients, positive predictive value 95%) and negative for obstructive disease in 4/125 (false-positive cases). 41/121 underwent revascularization within 2 months of CA (Intervention group), and remaining 80/121 were managed conservatively (Non-Intervention group). Overall event rate was 20% (4/16%: fatal/non-fatal MIs). Kaplan-Meier survival curves revealed event-free survival in Intervention and Non-Intervention groups for fatal MI 98/96% (P =0.758), and for non-fatal MI, it was 97/58%, respectively (P = 0.042).**Conclusions:** We conclude that TID is a reliable predictor of multi vessel CAD and is associated with high incidence of non-fatal MIs than fatal MIs. Revascularization (PCI/CABG) rather than medical treatment should be considered in patients with TID for better clinical outcome. *:*

P0358

A New Approach Using Technetium-99m Sestamibi Myocardial Washout for the Evaluation of Cardiac Damage in Patients with Ischemic Hear Disease

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Aim: It has been reported that Tc-99m sestamibi(MIBI) is retained for a relatively long period of time without clearance from the heart. On the other hand, some investigators have reported that washout of MIBI observed in patients with acute myocardial infarction(AMI) after direct PTCA, dilated cardiomyopathy and mitochondrial myopathy. However, the clinical usefulness of myocardial MIBI washout is not established yet. The purpose of this study was to clarify global myocardial MIBI washout in patients with ischemic heart disease. Materials and Method: Twenty nine patients with ischemic heart disease were enrolled in this study(22 males and 7 females, maen age 67±12 yrs). We divided the patients in two groups: Group A(18 patients who underwent PCI within 6 hours of the onset of AMI) and Group B(11 patients who underwent PCI over 6 hours after the onset of AMI). Resting MIBI SPECT myocardial perfusion imaging(MPI) was obtained 45 minutes(early image) and 5 hours(delayed image) after 600 MBq of MIBI intravenous administration. We also performed resting MIBI SPECT MPI in 6 normal subjects(6 males, mean age 32±6 yrs). Myocardial MIBI washout rates(WOR) were caluculated from the early and delayed images. Results: The myocardial MIBI WOR was significantly higher in patients(27.5%±8.1%) than those in normal subjects(19.3%±4.0%)(p=0.017). The myocardial MIBI WOR in the Group A and Group B were 26.4%±8.3% and 29.2%±7.6%, respectively(p=0.18). Conclusion: The myocardial MIBI WOR is thought to be a useful indicator for evaluating the severity of myocardial damage in patients with AMI after PCI therapy.

P0359

Myocardial Abnormal Perfusion SPECT in Patients with Apical Hypertrophic Cardiomyopathy

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Aim : Apical hypertrophic cardiomyopathy (AHCM), first described by the Japanese, (SAMAKO 1976) is characterised by an asymetric myocardial hypertrophy of the left ventricular apex. This form of HCM is usualy latent and discovered by chance. We describe two patients from the french carribean whose myocardial perfusion tomography (SPECT) done in a purpose to diagnose ischemic heart disease was abnormal with normal coronary angiography. Materials and methods : A 57yr old man with type 2 diabetes, dyslipidemia, praticing a high level sport, presented with deep negative T waves on the EKG. The 2d patient is a woman, 47yr old, overweight, who had a fainting malaise in 2003 and 2004 with negative T waves detected at the EKG. In 2010 she was admitted for fainting and chest pain. These patients underwent a one day myocardial technetium 99m Sestamibi stress-rest gated SPECT study. Results and Conclusion : The first patient had an image of severe reversible ischemia at the apical and infero-apical segments (2/17) with an apical dyskinesia in the post-effort period and a left ventricular ejection fraction (LVEF) of 48% at a HR of 82 beats per minute (bpm) (stunning). At rest, the LVEF raised to a normal level of 61% at a HR of 71 bpm. The second patient showed an infero-septo-apical defect irreversible and an apical reversible hypokinesia. The LVEF, was evaluated at 56% in post-effort at a HR of 61 bpm and 69% at rest and a HR at 62 bpm. In both cases the coronary angiography did not show a significant stenosis and the MRI revealed an obvious apical and infero-apical hypertrophy with an intramyocardial late gadolinum enhancement (LGE) reflecting most probaly fibrosis. The second patient had an apical aneurysm. In the presence of abnormal SPECT in the apical region of the LV and a normal coronary angiogram, MRI is the best choice for the diagnosis of a HCM. The intramyocardial LGE or fibrosis detected at the MRI and structural abnormalities of myocardial micro vasculature may explain the severe ischemia seen at SPECT. Myocardial ischemia may be also attributable to massive hypertrophy.

P0360

Does the Presence of Diabetes Influence Referral for Coronary Revascularization after Myocardial Perfusion Imaging?

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Background: Previous data suggest diabetic patients are at greater risk for future cardiac events than non-diabetics. However, data regarding the referral pattern for cardiac catheterization or coronary revascularization after myocardial perfusion imaging (MPI) are limited. Method: 2452 patients without any prior coronary artery disease (CAD) referred for MPI during 2001 - 2010 were identified. All MPI studies were interpreted using 4-point system with 17- segment model and summed stress score (SSS) were categorized as : normal (SSS < or = 3), mild (SSS 4-8), and severe (SSS > or = 9) defects. Significant CAD by cardiac catheterization was defined as > 70% stenosis of any vessel or > 50% left main stenosis. Results: In 2452 patients, 909 (37.0 %: Diabetes 449, Non-diabetes 460) underwent cardiac catheterization within 90 days of study and 673 (27.4 %: Diabetes 363, Non-diabetes 310) patients required revascularization therapy. The referral trends for catheterization were similar between diabetic and non-diabetic patients across all perfusion categories (Normal / Mild / Severe: 4.2% / 73.4% /99.4 % in Diabetes, 3.4% / 67.3% / 99.7% in Non-Diabetes), whereas the referral for revascularization of diabetic patients was higher than non-diabetic patients in relation to imaging results (Normal / Mild / Severe: 0.8% / 38.5% / 92.6 % in Diabetes, 0.2% / 26.9% / 78.9% in Non-Diabetes). Conclusion: Referral for cardiac catheterization in diabetic patients with suspected CAD was no different from non-diabetic patients. On the other hand, diabetes was an independent predictor of revascularization based on severity of perfusion abnormalities on MPI.

P0361

An investigation of the relationship between sequential change in heart to mesiastimun ratio and washout of Tc-99m MIBI and pharmacokinetic parameters in IHD and normal.

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Aim The myocardial washout rate (WO) and heart-to mediastinum ratio (H/M) of Tc-99m sestamibi (MIBI) has been reported to be useful for evaluation of myocardial damage. These indexes change depending on time interval (TI) between the radiotracer injection and scanning. And the indexes also must correlate with MIBI kinetics. The purpose of this study was to investigate the correlation between the indexes in different TIs and rate constants of MIBI kinetics. Furthermore, MIBI kinetics in ischemic heart disease (IHD) might be different from normal, the indexes and rate constants were compared in IHD and normal subjects. Materials & methods 24 IHD patients and 29 normal subjects were studied. After an injection of Tc-99m MIBI (720MBq), a dynamic planar imaging was performed on a dual-headed digital gamma camera system for 24 minutes. ROIs were drawn over the whole heart and mediastinum to obtain H/M. Ten of 3-minute TI data (from 3-6 to 21-24) were extracted from the continuously collected data. Three hours after the injection, delayed image was acquired to calculate delayed H/M and WO. Finally, 530 of early H/M and WO data were analyzed. Time decay correction was performed with the Tc-99m half-life. By using the time-activity curve (TAC) of heart ROI as a response tissue function and the TAC of Aorta as an input function, we analyzed Tc-99m MIBI pharmacokinetics through a 2-compartment model. We defined k1 as influx rate constant, k2 as outflux rate constant and k3 as specific uptake rate constant. Results There was significant difference in WO between IHD and normal, but no statistically significant difference in H/M. Statistically significant correlations were seen between H/M and k2, and between WO and k2 in >5 minutes of TI, in IHD and normal. But H/M and WO had no significant correlation with k1 or k3, in IHD and normal. Conclusion H/M and WO both were correlated with k2 in >5 minutes of TI, and dependent on k2. The results in the present

investigation indicate that 5> minutes of TI is necessary, and the indexes represent the washout from the myocardium to the blood.

P0362

A normal Gated SPECT MPI: Stress -Only Vs Stress-Rest Protocol: Time for Paradigm Shift

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ABSTRCAT **Background**: Prognostic value of a normal rest-stress gated SPECT myocardial perfusion imaging (MPI) is well documented. A normal stress-only MPI study saves time, cost and avoids significant radiation exposure but its safety is questioned. **Aim:** Compare the prognostic value of normal stress-only and rest-stress MPIs. **Patients and Methods:** This is a prospective study conducted at Nuclear Cardiology Department of Karachi Institute of Heart Diseases (KIHD) from December 2008 till May 2009. A rest-stress (same day) protocol was used in all patients but patients with lower pre-test probability for CAD in which stress (stress-only if MPI is normal) followed by a resting study (same day) if stress study is positive or equivocal. The protocol was decided by a board certified nuclear cardiologist. A dual head dedicated (Cardio MD, Philips) camera was used to acquire data. These patients / families were questioned on telephone regarding fatal or non-fatal myocardial infarction at 12-18 month. **Results:** Study included 265 patients (104 males and 161 females, mean age of 52 - 10 years) having a normal GSPECT studies (normal LV perfusion and function parameters). The stress-only cohort included 47 patients (13 males and 34 females, mean age of 51 - 08 years) while rest-stress cohort had 218 patients (91 males and 127 females, mean age of 50 - 10 years). On follow up (12-18 months, mean 15 -3.4) only one death was reported among 265 patients (in rest-stress group due to fatal myocardial infarction). Negative predictive value (NPV) for stress-only cohort was 100% while it was 99.5% for stress-rest cohort (p =0.382). **Conclusion:** We conclude that a normal stress-only GSPECT MPI has an excellent and comparable short term prognosis with a normal rest-stress study. We recommend using this protocol as routine in low risk patients to save time, reduce cost and avoid significant radiation exposure.

P0363

Negative predictive value of a normal gated myocardial perfusion SPECT study: is it gender biased?

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Aims and objective: A normal gated myocardial perfusion imaging (GMPI) has been found to have high diagnostic and negative predictive value (NPV) in western population. The goal of the present study was to evaluate the overall and gender-based NPV of a normal GMPI in local population. P**atients and methods**: This is a prospective study conducted at Nuclear Cardiology Department of Karachi Institute of Heart Diseases (KIHD), Karachi from December 2008 till May 2009. All patients (with intermediate risk) with a normal GMPI with adequate dynamic or dipyridamole stress were included and followed up for 18 months (mean 15 ± 3 months) for fatal or non-fatal infarctions. **Results:** The mean ejection fraction (EF) of studied population was 69 ± 8% while mean end diastolic (EDV) and end systolic volume (ESV) were 71 ± 19 and 22 ± 11 ml, respectively. In studied female cohort, the mean EF (%), EDV (ml) and ESV (ml) were 71 ± 08, 64 ± 15 and 19 ± 09, respectively. In studied male cohort, the mean EF (%), EDV (ml) and ESV (ml) were 66 ± 06, 82 ± 18 and 27 ± 11, respectively. At 18 months follow-up, one fatal (male patient) and one non-fatal MI (male patient) were reported. The overall NPV was 99.4% over 18 months follow-up with an event rate of 0.6% (95% CI 0.03-1.16%) and annualized event rate of 0.3%. The NPV and annualized event in subgroup analyses, was similar for female and male (P = 0.213). **Conclusion:** We conclude that a normal GMPI with adequate stress in our population has high NPVs for major cardiac events as in western population. In addition, the prognostic utility of GMPI is similar for both men and women.

P0364

Detection and Outcome of Left Ventricular Regional Diastolic Dysfunction in Ischemic Area Evaluated by Myocardial Perfusion SPECT Imaging of Effort Angina Pectoris Patients using 2D-Speckle-Tracking-Radial-Strain-Method at Rest.

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<Background> To evaluate left ventricular (LV) regional systolic function, regional wall motion and wall thickening evaluated by gated SPECT were reported to be appropriate methods. Though it is possible to evaluate global LV diastolic function using peak filling rate of gated SPECT, it is impossible to evaluate LV regional diastolic function using gated SPECT. On the other hand, It has been reported that post ischemic myocardial diastolic stunning persists for a considerable time following the identification of transient ischemia via 2-dimensional speckle tracking echocardiography (2DST). <Purpose and Method> To assess whether the LV regional diastolic dysfunction in the ischemic area can be detected using 2D-speckle-tracking-radial-strain-method(2AST) at rest, 32 patients (age=67+/-13y, male/female=27/5) with effort angina pectoris were enrolled. The ischemic area (I) was determined in middle LV short axial view using stress and rest myocardial perfusion scintigraphy. SPECT image was divided 17 segments, regional tracer uptake was defined using 5 point scoring system of defect score (0=normal perfusion to 4=perfusion defect). Summed stress score (SSS), summed rest score (SRS) and summed difference score (SDS) were calculated. The opposite area was defined as the non-ischemic area (non-I). Radial strains were estimated using 2DST at rest in the other day. LV diastolic function was estimated by the diastolic index (DI), which was calculated as (A-B)×100/A(%) and radial strain rate (SR) in the early diastolic period. The strain values were measured at the closure of the aortic valve (A) and at the one-third point of diastole duration (B). These 2 parameters were compared between I and non-I, before and 1 month after percutaneous coronary intervention (PCI) in each area. Moreover, regional diastolic functions of each coronary vessel's ischemic area were evaluated. <Results> SSS, SRS and SDS of LAD leasions were 6.5±5.7,1.9±4.4 and 4.7±4.5, respectively. Those of LCX leasions were 6.5±6.9, 0.7±1.2 and 5.8±5.7, respectively. Those of RCA leasions were 9.5±8.4, 3.9±5.3, 5.6±5.0, respectively. Before PCI, DI(I) was lower than DI(non-I) (I: 38+/-27 vs. non-I: 55+/-27: P=0.003). SR(I) was also higher than SR(non-I) (I:-1.6+/-0.6 vs non-I:-1.9+/-0.8:p=0.007). On 1 month after PCI, DI(I) recovered to 53+/-27(p=0.008), SR(I) was also recovered to -2.1+/-0.8(p=0.006). Furthermore, DI(I) of LAD and LCX ischemic areas and SR(I) of RCA ischemic areas improved (p<0.05). <Conclusion> Left ventricular regional diastolic dysfunction at rest in the ischemic area evaluated by SPECT imaging of patients with effort angina pectoris can be detected using 2D-speckle-tracking-radial-strain method at rest, and can improve after PCI.

P0365

Predicitve values of percentage and absolute changes in post-stress ejection fraction by Gated SPECT for the result of myocardial perfusion imaging

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Introduction:Vasodilator stress may induce transient worsening of left ventricular ejection fraction (EF) observed on myocardial perfusion imaging (MPI) by electrocardiography-gated single photon emission computed tomography (GSPECT). We aimed to evaluate the predictive values of percentage and absolute changes in post-stress EF for the results of the dipyridamole stress and resting Tl-201 GSPECT. Subjects and Method:The study included 299 consecutive patients undergoing dipyridamole stress and resting Tl-201 GSPECT. Image procession was carried out using ECToolbox and EF was obtained for both post-stress and 4-hour resting imaging. Twenty-seven patients with equivocal MPI results were excluded. Changes between post-stress and resting EF were calculated in absolute value and percentage and the positive predictive values (PPV) of both for perfusion abnormalities were calculated for the highest 10%, 15%, and 20% of patients with post-stress EF decrease. Similarly, the negative predictive values (NPV) were calculated for the highest 10%, 15%, and 20% of patients with post-stress EF increase. Results:The group of 180 patients with normal MPI has an average post-stress EF of 0.72 and an average resting EF of 0.686 while those of the patients with abnormal MPI (n=92) are 0.514 and 0.53, respectively. The percentage change in EF has a PPV of 78%, 66%, and 55% respectively in the highest 10%, 15%, and 20% of patients with post-stress EF decrease. The percentage EF decrease in these three subgroups is greater than or equal to 15.7%, 11.2%, and 7.6% respectively. The NPV is 63%, 68%, 69% respectively in the highest 10%, 15%, and 20% of patients with post-stress EF increase. The absolute change in EF has a PPV of 67%, 56%, 47% respectively in the highest 10%, 15%, and 20% of patients with post-stress EF decrease. The NPV is 85%, 83%, 80% respectively in the highest 10%, 15%, and 20% of patients with post-stress EF increase. The absolute EF increase in these three subgroups is greater than or equal to 0.13, 0.1, and 0.09 respectively. Conclusion:Negative percentage change in post-stress EF has a higher PPV than does absolute change for abnormal MPI, which may reflect the lower average EF of the abnormal group. On the contrary, positive absolute change in post-stress EF has a higher NPV than percentage change for normal MPI as the absolute change in EF is not affected by the lower average EF in abnormal individuals, which may make a small absolute increase in EF displayed as a large increase by percentage.

P0366

Coronary Artery Atherosclerosis Analysis by SPECT/CT Imaging may offer Further Risk Stratification in the Management of Patients with Coronary Artery disease

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The coronary artery calcium (CAC) score and myocardial perfusion imaging can now be detected simultaneously using SPECT/CT apparatus. Coronary artery

calcification is a highly specific marker of coronary atherosclerosis, the extent of which is directly related to the atherosclerotic burden. Combining the results of CAC score with the finding of myocardial perfusion imaging (MPI) may improve risk stratification. However little is known about the relationship between stress-induced ischemia and coronary artery calcification and the prognosis of patients with atherosclerosis in an Asian population. Furthermore CAC score may help in guiding decision in the management of the patients. The aims of this study were to investigate the relationship between perfusion and atherosclerosis, and to elucidate the diagnostic value of the CAC score as an adjunct to MPI for the assessment of coronary artery disease (CAD) in an intermediate-risk population. We retrospectively analyzed 105 patients (63% men, mean age 71 years) who underwent MPI using SPECT/CT in patients with CAD or suspected CAD. CAC scanning were performed by SPECT/CT. CAC were automatically defined as lesions with attenuation greater than 130 HU. Results: There was a significant difference in CAC score between patients with ischemia (n=42) and without ischemia (n=63) (1353±1524 vs. 332±554, p <0.01). The frequency of ischemic MPI determined by summed difference score tend to be higher in patients with high CAC (CAC=0; 0.8±1.3 v.s. CAC>1000; 3.0±2.0). Higher age is related roughly with higher CAC score with no statistical significance (R2=0.1) (<60 y.o.; 200±692, v.s. 80 y.o. <; 1258±1546, ns). The location of calcification was not related with the ischemic area. There was no significant correlation found between CAC score and summed stress score, suggesting two modalities show independent aspects of CAD. In a population with predominately intermediate likelihood of CAD, a calcium score of zero have a possibility to exclude inducible ischemia on MPI. In part, ischemic MPI is associated with a high likelihood of subclinical atherosclerosis as detected by CAC. The possible indication of CT angiography was determined by CAC score, because high calcium score makes it difficult to detect the degree of stenosis by using CT angiography. In conclusion, SPECT/CT might be useful not only to improve diagnostic assessment and risk stratification and but also to make decision with regard to performing CT angiography. Coronary artery atherosclerosis analysis by SPECT/CT Imaging may offer further risk stratification in the management of patients with coronary artery disease.

P0367

Factors Affecting the Level of Apical Left Ventricular Tracer Uptake With Attenuation Corrected Myocardial Perfusion SPECT/CT in Normal Patients

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Aim: Attenuation correction (AC) of myocardial perfusion SPECT allows better quantification of cardiac tracer uptake. In normal patients, the apical left ventricular (LV) tracer uptake with SPECT-AC is variable with frequently observed reduced relative tracer uptake. The factors influencing the level of LV apical tracer uptake with SPECT-AC are not well defined. In this study, we aimed to determine in normal patients the factors potentially influencing the level of LV apical tracer uptake with SPECT-AC. Material and Methods: Our study included 154 consecutive patients with no previously known CAD addressed for myocardial perfusion scintigraphy (MPI) and having clinically and electrically negative stress tests (exercise, dipyridamole, combined) and normal filtered back-projection (FBP) stress MPI (without AC). All patients had SPECT/CT MPI acquisitions (Myoview-Tc99m, Symbia, Siemens) allowing the reconstruction of both FBP (non-AC) and SPECT-AC. These were processed with QPS software and allowed the quantification of LV apical uptake (segment 17): seg17_FBP and seg17_AC. Stepwise regression analysis was used to determine the factors influencing the level of seg17_AC uptake: age, sex, weight, height, type of stress test, LV axis angle in the sagittal plane (angle_S, in egrees), LV axis angle in the transaxial plane (angle_T, in degrees), exercise work level (watts), maximal stress heart rate expressed as percent of age-predicted maximal heart rate, presence of coronary calcification on the CT part used for attenuation correction, and seg17_FBP. Results: Seg17_AC was much lower than seg17_FBP: 68.45±7.02% minimum=49%; maximum=87%) versus 83±6.05% (minimum72%; maximum=96%) (P<0.0001). On stepwise regression analysis, seg17_AC was only correlated to angle_S (F=82) and seg17_RPF (F=74): seg17_CA = 16.301 + 0.559*seg17_FBP - 0.406*angle_S (r=0.729; P<0.0001). Conclusions: The level of apical LV tracer uptake with SPECT-AC depends on both its level on FBP and the angle of the LV in the sagittal plane.

P0368

Comparison between Fragmented QRS versus Q Wave in Diagnosis of Myocardial Scar

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Aim: Myocardial infarction (MI) diagnosis has a pivotal role in patient management and prognosis. Consequently, finding efficient and accurate methods for MI detection is very important. Q wave is not present in all patients with MI and its prevalence is declining. Recently, fQRS complex has been introduced as a marker of prior MI. In this study, we compared the value of fQRS complex and Q wave for myocardial scar diagnosis. **Method:** 500 consecutive known or suspected cases for Coronary Artery Disease (CAD), who were referred for myocardial perfusion scan (MPI), were studied. MPI was performed in two steps (rest and pharmacologic stress) with gated SPECT technique. ECGs were also evaluated for presence of fQRS and Q wave. Ventricular perfusion and function indices in patients with or without fQRS and Q wave have been compared. **Results:**207 males and 269 females (mean age±SD= 57.06 ±12) were evaluated. 30.7% of patients had fQRS, 3.8% had Q wave and 14.3% had both in ECG. Myocardial scar was reported in 22.3% of patients according to MPIs. Sensitivity, specificity, positive and negative predictive value of fQRS for myocardial scar was 78%, 65%, 39% and 91% respectively and 61%, 94%, 76% and 89% for Q wave. **Conclusion:** According to this study, although fQRS is not as specific as Q wave for myocardial scar detection, but it has better sensitivity and negative predictive value. fQRS is a valuable marker of prior MI. fQRS associated with Q wave had incremental value in detection of myocardial scar.

P0369

Is apical thinning related to obesity?

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Aim: Apical thinning is a common finding on myocardial perfusion studies that is even more pronounced on attenuation-corrected compared to non-attenuation corrected images *(Purser et. Al., Nuc Med Commun 2008, 29:382-389*). The reason for this phenomenon remains controversial. It has been suggested that this may be related to depth-dependent changes in spatial resolution resulting in distorting the appearance of the apex. Since it is known that obesity results in heart displacement and altered orientation, we hypothesized that apical thinning may be more pronounced in patients with obesity/ high body mass index (BMI). In this study, we examined the correlation between apical activity and BMI/ waist circumference in patients referred for myocardial perfusion scintigraphy at our institution. **Methods:** Apical activity was semiquantitatively determined in 148 patients (56 males and 91 females) with apparently normal non-attenuation corrected sestamibi myocardial perfusion studies using the Cedars Sinai software. The association between BMI and waist circumference and apical activity was examined using regression analysis. **Results:** Apical activity in both males and females was 77% ± 6.2 (mean±SD) with a range of 60-89%, BMI 33.1 ± 6.3 (range; 19-51) and waist circumference was 105 ± 13 cm (range; 77-142 cm) with no significant difference in all these parameters between males and females. Overall we found a significant inverse correlation between BMI and apical activity (r=-0.2, P=0.02) observed for both the anterior and inferior apical segments (P=0.02 and 0.048, respectively). The inverse correlation was more significant in males (r=-0.28, P=0.03) particularly in the anterior apical segment (r=-0.33, P=0.01). In females the correlation was significant only for the inferior apical segment (r=-0.21, P=0.04). Similar inverse correlation was seen using the waist circumference for all measurements. **Conclusion:** This is the first report of effect of body habitus (BMI/waist circumference) on apical activity/apical thinning in myocardial perfusion studies. Our data suggests that decreased apical activity is less alarming in patients with high BMI and large waist circumference.

P0370

Comparison of a fast one day vs. two day protocol for myocardial perfusion scan using tetrofosmin as the imaging agent: A clinical evaluation

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Aim: To compared the outcome of a fast one day tetrofosmin myocardial perfusion imaging (MPI) with a two day protocol to assess the effect on clinical outcome. ***Method:*** Patients were injected 400 MBq of tetrofosmin during a standard adenosine stress test on day 1. Imaging commenced 15-30 minute after the injection. Second (rest) 800 MBq tetrofosmin injection was administered at 90 minutes post stress injection and images obtained 30 minutes later. Patient returned for a repeat rest study (400 MBq tetrofosmin at rest) a second day within a week of the first study. The results for the one day study (stress/rest day one) and two day study (stress/rest day two) were compared. Images were reported using Cedars-Sinai QPS/QGS software (AutoQUANT 7, Philips Medical Systems) by two experienced NM clinicians. Mann-Whitney test and paired t-test were used as appropriate to compare the results. ***Results:*** 19 consecutive patients (12 female) were entered into this trial. Mean weight was 58.3kg (SD 12.6). There was no statistically significant difference between the quality of images, the gut activity or overlap, the visual extent of the lesion, or the final diagnosis between one and two day protocols. There was also no difference in the between one day protocol and two day protocol in the following parameters: Summed Stress Score: 6.8 ± 9.3 vs. 7.1 ± 9.4, p=0.446 Summed Rest Score: 3.5 ± 7.8 vs. 3.6 ± 6.3, p=0.863 Summed

Difference Score: 3.0 ± 1.8 vs. 3.2 ± 2.2, p=0.674 % defect at stress: 9.3 ± 12.4, 9.7 ± 12.3, p=0.702 % defect at rest: 7.3 ± 12.9, 7.1 ± 10.2,p=0.834) % reversible ischaemia: 4.4 ± 2.7, 4.5 ± 4.2, p=0.905 ***Conclusion:*** There is no difference in clinical outcome or quantification of defects between standard two day protocol and a fast one protocol day MPI study using tetrofosmin. A fast fast one day tetrofosmin MPI protocol has the added patient convenience (one visit), and faster turnaround of results.

P0371

Repeating myocardial perfusion scintigraphy studies when high extra-cardiac uptake is found reduces the number of equivocal interpretations - A multicenter study

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Aim: Stress myocardial perfusion scintigraphy (MPS) is widely regarded as a clinically useful non-invasive imaging modality for diagnosing patients with suspected coronary artery disease. However, since Technetium-labelled myocardial perfusion agents are cleared by the liver and excreted by the biliary system, increased liver or intestinal activity may create a problem in the visual and quantitative interpretation of the inferior wall. When high extra-cardiac uptake is found, the study is often repeated. The aim of the study was to investigate whether a more definite interpretation can be made if a first examination with extra-cardiac uptake is followed by a re-examination. **Methods and material:** The study population included patients who underwent MPS at Skåne University Hospital, Malmö, Sweden, Sahlgrenska University Hospital, Göteborg, Sweden, and Odense University Hospital, Odense, Denmark. Only patients who had a re-examination due to high extra-cardiac uptake were considered. In total, 130 patients were included. Three physicians, one from each study centre, independently classified all the studies (130 patients x 2 studies) with regard to the presence/absence of ischemia/infarction in grades from 1-5 (1 = No ischemia/infarction, 2 = Probably no ischemia/infarction 3 = Equivocal, 4 = Probable ischemia/infarction, and 5 = Certain ischemia/infarction). The physicians were blinded to any patient data, including which studies belonged to the same patient and if the study was the first examination or the re-examination. It was not known if the extra-cardiac uptake decreased at the re-examination. **Results:** The number of equivocal studies decreased for all physicians, both for ischemia and infarction. For the first physician, the number of equivocal studies decreased from 16 at the first examination to 8 at the re-examination for ischemia (P = 0.10) and from 9 to 8 for infarction (P = 0.76). For the second physician, the number of equivocal studies decreased from 50 to 21 for ischemia (P < 0.0001) and from 24 to 11 for infarction (P = 0.007). For the third physician, the numbers decreased from 40 to 21 for ischemia (P = 0.002) and from 21 to 17 for infarction (P = 0.59). **Conclusion:** The number of equivocal studies decreased between first examination and the re-examination, especially for the interpretation of ischemia. We conclude that it is important to repeat examinations when high extra-cardiac uptake is present in order to reduce the number of equivocal studies.

P0372

The Value of Diffuse Slow Washout Rate of TL-201 in Type 2 Diabetes Mellitus Patients with and without Perfusion Defects in Myocardial Perfusion Scintigraphy

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Purpose/introduction: The aim of this retrospective study was to examine diffuse slow washout (DSW) rate of Tl-201 in exercise stress myocardial perfusion scintigraphy (MPS) in type 2 diabetes mellitus (DM). We also aimed to investigate DSW in relation to the presence of myocardial perfusion defects (PD) and severity of disease in comparison with coronary angiography. Subjects & methods: Sixty patients with type 2 DM and 60 non-diabetic control patients were selected for the study. All patients underwent stress-rest Tl-201 myocardial perfusion scintigraphy. Diabetic patients and nondiabetic control groups of patients were classified according to MPS as with and without PD. 30 patients with PD had coronary angiography results (Group 1) and 30 patients without PD in MPS (Group 2) were included. The control groups were included 30 nondiabetic patients without PD (Group 3) and 30 nondiabetic patients with PD (Group 4) . Standard protocol of gamma camera was used for processing raw myocardial tomographic data and "Johns Hopkins/Frankfurt Sectorial Profile Analysis" protocol for Tl-201 washout analysis. This analysis protocol quantified of short axis and four vertical long axis slices. From each slice, sectorial profiles were created based on the average pixel counts from thirty-six pie-shaped segments. The profiles obtained from each slice were compared to ones from a normal patient population. The myocardial washout rate is defined as the percent change in activity from the initial to the delayed images within the left ventricle, and normal Tl-201washout is about 30 % of activity. DSWR was defined as less than 30 % of thallium-201 activity per 3 hours in all segments. Results: DSW was detected in 12 of 30 diabetic patients (40%) without PD and in 19 of 30 patients (63%) with PD. Thus DSW was identified in 31 of 60 diabetic patients (51%) with and without PD. Coronary angiography was normal in 3 of 19 patients with PD, 6 patients had one vessel disease, 7 patients had two-vessel and 3 patients had three-vessel disease. DSW rates of nondiabetic control patients with and without perfusion defect were 26% (8/30) and 6,6% (2/30) respectively.

Discussion/conclusion: The diabetic patients had significantly slower washout rate of Tl-201 than nondiabetic patients. In patients with PD, DSW was more common than in patients without PD. It is concluded that the assessment of DSW rate may be a helpful approach in the evaluation of diabetic patients with multivesel coronary disease.

P0373

Effect of CT Realignment on Attenuation Corrected SPECT/CT Myocardial Perfusion Studies

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The aim of the study was to determine a frequency of SPECT/CT misalignment and the effect of manual CT realignment on attenuation corrected (AC) myocardial perfusion studies (MPS), in patients verified with coronary angiography (CA). Material and methods MPS of 67 pts (43M), mean BMI - 27.6, referred for this study for diagnosis of CAD, were assessed. Stress (S) and rest (R) studies were acquired after administration of 99mTc-MIBI in dose of 11MBq per 1kg of body mass, with Hawkeye gamma camera. Study reconstruction was made with iterative method applying AC. Alignment of CT and SPECT studies was checked visually in every study; in case of misalignment CT study was shifted manually and a study was reprocessed. Slices were assessed with semiquantitative method, dividing myocardium into 17 segments and applying a 5-point segmental scoring, with subsequent summing of segmental scores (SSS and SRS). SSS range was subdivided into 4 classes: 0-2 - normal, 3-7 - mildly, 8-12 - moderately and >12 - severely abnormal. Length of a shift vector (s) was calculated as root mean square of shifts along 3 axes. Perfusion defects were considered reversible if (SSS-SRS)≥3. Results of MPS (normal/abnormal) were compared with coronary angiography, which was considered abnormal when at least 1 of 3 main coronary arteries was narrowed by 70% or more. Results Studies of 42 pts were properly aligned and studies of 25 (37%) pts needed realignment of CT in S only (3), R only (5), and both studies (17). Altogether 42 studies (S+R) needed CT realignment. Shifts along all 3 axes were observed. In 21/42 (50%) studies s<1 pixel (6.9mm), in 19/42 (45%) 1pixel<s<2 pixels, in 1/42 (2%) 2 pixels<s<3 pixels and in 1/42 (2%) s>3 pixels. Before CT realignment SSS values were consistent with CA in 15 (60%) patients (in 10 - negative, in 5 -positive), inconsistent- in 10. CT realignment changed 6 results of MPSs and in effect a much high agreement with CA was attained - in 21 (84%) patients (p=0.04). In 10 (40%) pts CT realignment shifted SSS values to adjacent classes. In 5 (20%) pts reversibility of stress perfusion defects was changed. Conclusions: 1. Misalignment of CT and SPECT in at least one of S or R studies can be observed in more than one third of patients. 2. CT misalignment negatively affects agreement between MPS and CA results. 3. CT misalignment significantly affects intensity as well as reversibility of stress perfusion defects.

P0374

Comparison of Diastolic Functions Between the Patients with Normal and Positive Gated Myocardial Perfusion Imaging

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Introduction The diastole is a time period starting with closing of the aortic and pulmonary valves to the beginning of ventricular contraction. If the diastole part of the two-part pumping phase is abnormal, this is called diastolic dysfunction. If the ventricles are not relaxed, the pressure inside of them will increase as blood from the next heartbeat tries to enter. This can lead to extra pressure and fluid in the blood vessels of the lungs called pulmonary congestion or in the blood vessels leading back to the heart called systemic congestion. The aim of this study was to compare the diastolic functions of patients with normal and positive gated myocardial perfusion imaging (gMPI) results, and therefore to evaluate the relation between the diastolic functions and coronary artery disease detected by gMPI. Materials and Methods 120 patients (40 women, 80 men; 65±9 years) were

included in the study. gMPI was performed with Tc-99m MIBI in all patients and exercise test was performed with treadmill exercise stress test according to Bruce protocol to all patients in a gamma camera (Discovery 530 NC, GE, USA) equipped with multiple pinhole collimators. According to gMPI results, patients were categorized as normal, ischemia and infarct. The relationship between measurements was evaluated by one-way ANOVA test. Results The systolic function parameters of the left ventricle were significantly different among the study groups. While the volumes of the left ventricle were increased in the ischemia and the infarct groups compared to the normal group, the ejection fraction of the left ventricle was decreased in the ischemia and the infarct groups and this difference was more prominent in the infarct group. Similarly, the diastolic function parameters of the left ventricle were significantly decreased in both the ischemia and the infarct groups and this decrease was more prominent in the infarct group. After post hoc tests, the parameters of the systolic and the diastolic functions of the left ventricle were significantly reduced in only the infarct group. **Conclusion** The diastolic parameters are important as much as the systolic parameters of the left ventricle and these both parameters can easily be calculated in new generation gamma cameras. As in our study, both systolic and diastolic functions of the left ventricle depressed in the presence of the coronary artery disease and this depression is more prominent in the myocardium showing structural changes after infarct.

P0375

Vitamin D3 and coronary microvascular function. A study by quantitative G-SPECT myocardial perfusion imaging.

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Aim: Disorders of mineral metabolism are frequently associated with an increased risk for cardiovascular events. Recently, it has been proposed that this association might be at least partially explained by alterations in vitamin D metabolism. In particular, several studies documented that the active form 1,25-dihydroxyvitamin D3 (vitamin D3) actually facilitates shear stress-mediated vasodilation and post-ischemic reactive hyperemia in skeletal muscles. According to these observations, reduced availability of this hormone might impair endothelial function. In the present study, we tested the hypothesis that serum levels of vitamin D3 influence the regulation of coronary vascular tone. Materials and methods: This study included 22 patients (59±6 years) without history of coronary artery disease in whom vitamin D3 was assayed because of suspected primary hyperparathyroidism. These patients were submitted to myocardial perfusion imaging because of the presence of at least one cardiovascular risk factor. Data were compared with corresponding findings in a group of 8 age matched control subjects. Dipyridamole myocardial blood flow (MBF) was assessed at G-SPECT imaging by measuring myocardial 99mTc-sestamibi count rate normalized for the first-transit counts in the pulmonary artery. Baseline MBF was estimated 2 hours later according to the same procedure. Regional coronary flow reserve (CFR) was defined as the ratio between dipyridamole and baseline MBF using a 17-segment left ventricular model. In all these patients parathyroid hormone (PTH), 25-hydroxyvitamin D and vitamin D3 serum levels were determined. Results: Elevated levels of PTH were documented in 14/22 patients, and average PTH concentration was 193±138 ng/L. Insufficient levels of 25-hydroxyvitamin D values were observed in 18/22 patients for an average value of 26±9 ng/mL. By contrast, vitamin D3 concentration was within the normal range in all patients (83±20 pMol/L). No patient showed reversible perfusion defects at G-SPECT. CFR was not correlated with serum concentration of 25-hydroxyvitamin D (r=-.09, p=ns). On the contrary, a close direct correlation was observed between CFR and serum levels of vitamin D3 (R=0.69, p<0.05). Moreover, patients with vitamin D3 concentration below the median value (83 pMol/L) had markedly lower CFR with respect to the remaining ones (1.52±0.40 vs 2.38±0.66, respectively, p<0.001). Conclusion: CFR is correlated with serum levels of vitamin D3. This finding indicates that this hormone is not involved only in calcium homeostasis but can also affect coronary microvascular function.

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Cardiovascular: Metabolism

P0376

Cardiac FDG PET/CT to Assess the Culprit Lesion during Acute Infarction

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Objectives : NSTEMI is an heterogeneous syndrome.Since pts often disclose a multivessel disease, identification of culprit lesion may be challenging. FDG is a glucose analogue whose uptake is increased during anaerobic glycolysis. Aim of this study was to evaluate the feasibility of cardiac FDG PET/CT during NSTEMI to identify the culprit lesion. **Methods :** We performed a FDG PET/CT in 3pts with NSTEMI scheduled for coronary angiography(CA).To switch off the normal myocardial glucose consumption, pts were fasted for at least 12h and were administrated with fatty acids per os 1to2 h before FDG injection.Uptake time was 45 to 60'.Before CA pts1 and 2 underwent CT-CA and pt3 cardiac MR before discharge. During CA pts 1and2 underwent coronary optical coherence tomography(OCT). **Results :** PET scans demonstrated an optimal image quality and FDG distribution in the left ventricle was consistent with the most severe lesions at CA.Pt1 had a significantly increased FDG uptake only in the anterior-apical wall and septal-apical wall.CT-CA and CA showed a severe lesion in the mid left anterior descendent(LAD).OCT clearly showed a plaque rupture with residual endoluminal thrombi.Pt2 had an increased FDG uptake in the laterobasal wall and CT-CA and CA demonstrated a severe lesion in the mid circumflex artery.OCT imaging showed the presence of thrombi without plaque rupture suggesting a plaque erosion as underlying mechanism.Pt3 had an increased FDG uptake in the lateral and antero-basal wall, however CA demonstrated a diffuse and severe 3vessel disease.Cardiac MRwas normal.Mean SUVmax was 7.2 in the pathological areas and the normal left ventricle myocardium was cold,comparable to the blood pool. **Conclusions :** This preliminary feasibility study demonstrates that the enhanced uptake of FDG during anaerobic glycolysis subsequent to an acute myocardial ischemia can be used as a positive indicator to identify the culprit lesion in pts with NSTEMI.

P0377

The performance of nicotinic acid in shifting myocardial metabolism to glucose in 18F-labeled 2-deoxyglucose (FDG) PET-CT myocardial viability assessment

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Introduction In myocardial viability assessment using PET-CT special protocol is assigned to ensure the myocardium utilizes primarily glucose to meet its energy needs by stimulating a natural insulin response. In a typical fasting state, the uptake of FDG by myocardium are distributed inhomogenously. Hypolipidemic agents like acipimox have been proven to shift myocardial metabolism to glucose but not widely dispensable . We highlight the potential use of nicotinic acid as an alternative hypolipidemic agent during myocardial PET-CT for viability assessment. The image quality produced by this technique is assessed by the myocardium to blood pool activity ratio (rM/B) and semiquantitative FDG uptake of the myocardium. Methodology This study was conducted upon local ethic approval. The myocardial FDG uptake were compared amongst 3 groups of patient. In group A, 15 normal volunteers were recruited for PET-CT myocardial viability study with premedication using 200mg of nicotinic acid. In group B, 15 controls were randomly selected from a list of patients who underwent whole body FDG PET-CT for various oncology reasons with intense FDG activity within myocardium. In both groups, the images were analyzed deriving rM:B and percentage of FDG distribution using 20-segment polar map, per patient and per segment basis. Images were considered good, adequate or poor with rM/B of >1.5, 1.1-1.5 or < 1.1 respectively. In addition, the normalized percentage of FDG distribution from 20-segment polar map were tabulated per patient and per segment basis. In group C, 20 ischaemic heart disease patients underwent myocardial viability study using nicotinic acid and glucose loading protocol as described above. Results were compared with 99mTc MIBI for discrepancies. Results Normal subjects in group A demonstrate rM/B of 1.5,1.6 and 1.4 at the apex, mid and base regions. In group B, the rM/B are 1.7, 2.1 and 1.7. The mean FDG uptake distribution from polar map for group B was lower (67.7% vs 71.26%). Per patient basis, the prevalence of normalized FDG perfusion of less than 70% was higher in group B (55%) in comparison to group A (35%) with a ratio of 12:3 patients indicating improved FDG concentration in pre medication group with nicotinic acid. There were no hypersensitivity reactions seen in our patients. Symptoms of 'hot-flushes' was tolerable and negligible. All patients in group C demonstrate territorial abnormalities in concordant areas. Conclusion Nicotinic acid can be a reliable hypolipidemic agent in shifting myocardial metabolism to glucose in 18F-FDG PET-CT myocardial viability assessment.

P0378

Reverse mismatch pattern on 18F-FDG myocardial PET

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Aim. In PET-SPECT myocardiac viability studies reverse flow-metabolism mismatch (RMM) pattern (reduced 18F-FDG uptake in preserved perfusion areas) has been described since 1999 even if pathophysiology remains uncertain and clinical impact is not well known. Aim of this preliminary work is to determine how frequently RMM occurs and if it correlates with clinical data. Materials and methods. 20

patients (16 males, 66±11 yrs) with known CAD (8 double vessel disease, 8 triple vessel), recent (8) and non-recent (12) AMI (13 anterior) and impaired LV function were studied looking for myocardial viability. In consecutive days, they were submitted to 99mTc-MIBI gated-SPECT and 18F-FDG PET (11 pts after glucose-load alone, 5 with glucose and insuline, 4 after acipimox). Normalized polar maps (from short axis slices) were divided into 17 segments, visually scored with a 5 degrees scale. In each segment flow-metabolist mismatch (MM) and RMM were defined as a score difference > 2 degrees (positive and negative, respectively). Results. In 12 pts we found MM in at least 2 segments (ant-sep-apex=21/340 segments, lat=15, inf=16) and RMM was detected in 12 pts (ant-sep-apex=32, lat=20, inf=8) No correlation was found between LVEF (from gated-MIBI: 27%±9) and summed MIBI-score, FDG-score, MM-score and RMM-score, while a poor correlation (r=0.55) exists with summed vitality-score (defined as the best segmental score between MIBI and FDG). Neither myocardial SUVmax (11±4) nor myocardial/blood-pool ratio (5.3±2.6), showed correlation with FEVS, while poor correlation was observed between summed-FDG score and SUVmax (r=0.48). RMM pattern was observed both in diabetic(6) and non-diabetic pts(14) regardless of protocol (glc load, insuline, acipimox) and time from AMI, but data are statistically poor. Conclusion. These preliminary results suggest that RMM is frequent pattern (60%) also in non recent AMI. As a consequence viability assessment can't be performed without a perfusion study. Further studies are required to determine the potential clinical value of RMM.

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Cardiovascular: Stem Cells & Plaque Imaging

P0379

Evaluation of labelling of CD34+ haematopoietic progenitor cells with 99mTc-HMPAO

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AIM Several clinical studies showed the potential of the treatment with progenitor cells (PCs) when delivered to myocardium. Monitoring and evaluation of the therapy "in-vivo" is difficult and optimal method remains to be developed. To evaluate homing of transplanted haematopoietic PCs (HPCs), different methods of cell labelling can be used. The aim of our study was to evaluate radiolabelling of CD34+ HPCs with 99mTc-HMPAO during time period suitable for SPECT "in-vivo" monitoring of radiolabelled cells myocardial homing. MATERIALS Human HPCs were mobilized with granulocyte-colony stimulating factor and collected by aphaeresis. CD34+ cells were enriched with an immunomagnetic separation device (Isolex 300i, MACS®). Amount of collected CD34+ cells per patient varied between 78 to 285 million. A fraction of of the cells (25%) was radiolabelled with 600 MBq of 99mTc-HMPAO and incubated for 20 min at room temperature. Unbound radioactivity was removed by washing the cells with cell free media. Cell viability was assessed by Trypan Blue exclusion assay at different time points before and after radiolabelling. Labelling stability of HPCs was assessed 150 min after cell labelling. Radiolabelled cells (48-343 MBq) were injected into open coronary vessel supplying the most affected wall of the myocardium according to myocardium perfusion imaging, or directly intramuscularly in the most affected wall of the myocardium, through a micro catheter during coronarographic procedure together with unlabelled HPCs. SPECT images were obtained 2 and 18 hours after HPC injection. RESULTS Labelling efficiency of HPCs was up to 65.7% depending on the amount of cells available for radiolabelling. Viability of HPCs before and immediately after the labelling was 91,3% and 90.6% , whereas viabilities 150 min and 18 hours after labelling were 95,8% and 84% for unlabelled HPCs and 92,7% and 83,4% for labelled ones. Labelling stability of HPCs 150 min after cell labelling was 75%. SPECT images obtained 2 and 18 hours after HPCs injection enabled evaluation of the arrangement and percentage of transplanted HPCs accumulated in the heart muscle. Additionally it was possible to evaluate their migration and physiological accumulation in liver, spleen and bone marrow. CONCLUSIONS Radiolabelling procedure of HPCs with 99mTc-HMPAO is feasible resulting in high cell viability, labelling stability and efficiency. Cell viability of radiolabelled cells is comparable with viability of non labelled even after 18 hours, good labelling stability enables imaging with SPECT, which proves to be a suitable non-invasive method for "in-vivo" monitoring of cell trafficking with good spatial resolution.

P0380

Assessment of the specific somatostatin receptor-2 expression in murine (coronary) arterial plaque by 68Ga-DOTATATE

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Background: The rupture of atherosclerotic plaques is triggered by inflammatory activities. Target detection of inflammatory biomarkers has become more useful than morphological measurement to identify unstable plaque. Objective: In the present study, we aim to develop and examine the validated ^{68}Ga-labeled somatostatin receptor subtype 2 affinity radiotracer and demonstrate the feasibility of macrophage imaging by positron emission tomography-computed tomography (PET-CT) in atherosclerotic arteries. Method: Fresh sections of apolipoprotein E (ApoE)-/- mice, which had age of 50 weeks and were on a high-cholesterol diet were examined by ^{68}Ga-DOTATATE autoradiography; and compared with histological and immunochemical results. The specific distribution of somatostatin receptor subtype2 on the macrophage was analyzed by flow cytometry. Result: Receptors Inhibition experiment with monoclonal antibody against SSTR-2 resulted in a significant activity decrease Autoradiography showed a high correlation with the immunohistochemical result. The somatostain receptors-2 also found express on the macrophage greatly by flow cytometry. Conclusion: This study demonstrated that the ^{68}Ga-DOTATATE has a potential to specific imaging the inflammatory lesions of atherosclerotic arteries.

P0381

18F-FDG PET-CT assessment of atherosclerotic carotid plaques unstability and histopathology correlation

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18F-FDG PET-CT ASSESMENT OF CAROTID ATHEROSCLEROTIC PLAQUES UNSTABILITY Clinical Statement Unnecessary endarterectomies or carotid artery stenting could be reduced by choosing only those patients with vulnerable carotid plaques pottencially responsible of secondary ictus. **PURPOSE** Evaluate the PET-CT accuracy in detecting vulnerable carotid plaques in patients with high risk of thrombotic ictus and the concordance it might exist between carotid FDG hypermetabolism, symptoms, inflammation parameters and histopathological findings. **METHOD AND MATERIALS** 15 patients (12 men, mean age 68±9) with severe carotid arteries atherosclerotic stenosis candidates for endarterectomy, prospectively underwent a 18F-FDG PET-CT, immunohistochemical analysis and, some of them, surgery and biopsy of the plaque. A carotid/cerebellum (CI) ratio was valued in the 18F-FDG PET-CT, with cerebelar metabolism taken as a reference. Unstability of the plaque was characterized by: CD68 (as macrophages inflammatory parameter of the vascular wall), the core lipidic, calcium and presence of thrombus intraplaque. **RESULTS** From all the PET-CT studies, in 6 patients there was not an increased glucose metabolism (negative), opposite to 9 hypermetabolic studies (positive). Quantitatively evaluation of PET-CT obtained a mean CI of 0.39±0.13 in positive studies and mean CI of 0.18±0.07 in negative studies, with significantly difference (p=0.02). 10 patients underwent an endarterectomy and histopathologist analysis plaques were subsequently analized, from which up to 66.66 % were unstable. 100% of vulnerable plaques were positive, and 33.33% of nonvulnerable plaques were also positives in PET-CT. Taking into account hypermetabolic carotids, up to 55.55% of patients had had symptoms and 83.32% of the patients had an increased serum macrophages activation (CD68), 50% of plaques had great amount calcium, 83.33% had more than 40% of lipidic core and 33.33% had intraplaque thrombus. **CONCLUSION** In this preliminary study, PET-CT has demonstrated to be a good technique to correctly detect vulnerable carotid plaques. There is a tendency for inflammatory serum parameters (CD68) to be concordant with PET-CT positive studies.

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Cardiovascular: New & Innovative

P0382

Evaluation of coronary fraction and myocardial blood flow by 99mTc-MIBI imaging

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Myocardial perfusion imaging has been widely used for the diagnosis and evaluation of coronary artery disease (CAD). However, since perfusion imaging documents relative myocardial perfusion, it has limited utility, particularly in patients with multivessel disease or diffuse CAD. Quantitative assessment of coronary fraction (CF) and myocardial blood flow (MBF) is valuable for early detection of diffuse CAD. The aims of this study were to develop a radionuclide method for quantitative estimation of the CF and MBF. Methods: This study included 12 patients with angiographically documented multivessel CAD (11 males, 1 females; 65.3±9.6 years old). All radionuclide images were performed with a dual-head gamma camera Philips Forte. All patients underwent an total body imaging

with 150 MBq ^{99m}Tc-macroaggregated albumin (MAA) as the gold standard, after injection in the left ventricle at rest during catheterization before performing coronary angiography. After 4-5 days all patients underwent dynamic planar images (first pass) after a bolus injection of 370 MBq ^{99m}Tc-methoxyisobutylisonitrile (MIBI) were acquired for 180 s (4 frames/s). In the anterior view to measure the first transit counts in the pulmonary artery and in the left ventricle (LV) chamber. Total body imaging was performed 10 min later. For Quantitative analysis of CF and MBF with ^{99m}Tc-MIBI and ^{99m}Tc-MAA we use the following formula: **CF=ROI counts (cor)/ROI total bodyX100%; MBF=CO (cardiac output obtained by first pass)XCF/100%.** Results: The myocardial CF and MBF measured by ^{99m}Tc-MIBI imaging showed a good linear correlation with the myocardial uptake and MBF measured by ^{99m}Tc-MAA. Estimated CFR was 2,27±0,21% by ^{99m}Tc-MIBI and 2,26±0,27% by ^{99m}Tc-MAA (r=0,85, p<0,01). Estimated MBF was 92,23±16,14 by ^{99m}Tc-MIBI and 93,94±12,22 by ^{99m}Tc-MAA (r=0,91, p<0,01). Conclusion: We have developed a noninvasive method to quantitatively estimate CF and MBF using ^{99m}Tc-MIBI. The MBF and CF measured with ^{99m}Tc-MIBI showed a good linear correlation with those obtained by ^{99m}Tc-MAA.

P0383

Radionuclide assessment of cardiac sympathetic activity in patients with atrial fibrillation

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Introduction. The mechanisms underlying the majority of cardiac arrhythmias are unclear. The disturbance sympathetic innervation of the heart may be the cause of atrial fibrillation (AF), but also reason of myocardial dysfunction of the left ventricle (LV). The aim of this study was assessment of cardiac sympathetic activity in patients with atrial fibrillation by planar scintigraphy with ^{123}I-metaiodbenzilguanidine (^{123}I-MIBG). Materials and Methods. The study included 20 (17 men and 3 women, average age 57,4 ± 11,6 years) patients with suspected coronary artery disease, hypertension 2-3 class. All patients to divide 3 groups: 8 patients (group 1) with paroxysmal AF (PFFP), 5 patients (group 2) with chronic atrial fibrillation (CFFP) and 7 patients with no signs of AF (group 3). Planar imaging was performed to study initial (imaging started 10 minutes after MIBG injection 148 MBq ^{123}I-MIBG) and delayed (imaging started 4 hours after ^{123}I-MIBG injection). For the anterior planar ^{123}I-MIBG images, regions of interest were constructed for the heart and upper mediastinum, and the heart-mediastinal ratio (HMR) and corrected ^{123}I -MIBG washout were calculated. Results. The delayed HMR in patients with PFFP and CFFP was significantly lower compared that in patients third group (1,56 ± 0,16, 1,58 ± 0,17 and 1,82 ± 0 19, respectively, p <0,05). There were statistically significant differences in the washout rate of ^{123}I-MIBG between all treatment groups (44,8 ± 4,9, 38,9 ± 11,81 and 27,8 ± 7,8, respectively, p <0,05). In this study, the highest washout rate was observed in the group with paroxysmal AF.Conclusion. Results of this study indicated, that the patients with atrial fibrillation has of regional LV myocardial, according with ^{123}I-MIBG imaging. More sympathetic innervation abnormality was observed in the group with paroxysmal AF.

P0384

18F-FDOPA PET in evaluating cardiac sympathetic innervation for male patients with spinal cord injury

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Purpose: ^{18}F-FDOPA is a substrate of neuronal and extraneuronal processes of catecholamine uptake, vesicular translocation, release, metabolism and excretion, which could evaluate tissue sympathetic innervation, especially in the heart. The purpose of this study is to evaluate sympatheltic innervation/denervation of myocardium for patients with Spinal cord injury (SCI), who are prone to have autonomic dysfunction, including unstable blood pressure control and orthostatic hypotesion (OH). **Methods**: 20 right handed male chronic complete SCI patients: 10 parplegia (age 51.4 ± 8.4, range 39-64 years) and 10 tetraplegia (age 39.5 ± 9.4, range 25-53 years) at 17.6 ± 8.8 years and 15.2 ± 7.2 years after their injuries, were consecutively recruited. Ten age-matched male healthy volunteers (age 41.1 ± 7.9, range 28-54 years) without history of previous neurologic, psychiatric and cardiac illnesses were included as controls. We recorded their heart rate (HR), ECG, systolic blood pressure (SBP) and diastolic blood pressure (DBP) during supine and upright positions. Plasma catecholamines (adrenaline and noradrenaline) were also measured. In addition, chest ^{18}F-FDOPA PET imaging (with heart in the middle of field of view) was performed for each patient and control subject. For each patient or control subject, SUVmax was measured for septum, anterior wall and lateral wall of myocardium and SUVmean at mediastinum (aorta/pulmonary level) was recorded as background. Specific binding affinity (SBA) of ^{18}F-FDOPA for each wall of myocardium was calculated according to the equation: SBA = (SUVmax of myocardium - SUVmean of background)/SUVmean of mediastinum. **Results**: The SBP and DBP during upright position for tetraplegic patients are significantly lower than those for paraplegic patients and normal control subjects. SBAs of myocardium for paraplegic patients are the highest, followed by SBAs for tetaplegic patients, and SBAs for control subjects are the lowest. **Conclusion**: Our study demonstrates that ^{18}F-FDOPA uptake of myocardium in paraplegic patients was significantly higher than those in tetraplegic SCI patients and those in control subjects. ^{18}F-FDOPA uptake of myocardium in tetraplegic SCI patients was slightly higher than those in control subjects but without statistical significance.

P0385

Estimation of myocardial contraction work in patients with coronary artery disease before and after revascularization using ECG-gated myocardial perfusion SPECT

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Purpose: Wall motion is the change in distance between the center and inner surfaces of the cardiac wall and is the sum of the vectors of surrounding myocardial contractions. Therefore, quantitative measurements of myocardial contraction and work tangential to the cardiac wall are required for a more accurate prediction of functional recovery after revascularization in patients with coronary artery disease (CAD). The aim of this study was to quantify regional contraction work in addition to the amplitude and synchronicity of contraction in patients with CAD through quantification of the segmental function by solving the Poisson equation (QSFP). **Methods and Materials:** We evaluated 23 patients, of whom 12 had CAD and 11 were healthy (controls), using ECG-gated ^{99m}Tc-methoxyisobutylisonitrile or ^{99m}Tc-tetrofosmin SPECT. The amplitude, synchronous contraction index (SCI), and contraction work were estimated using the QSFP. The amplitude of left ventricular (LV) wall motion was calculated as the difference between the maximum and minimum values of each area defined by meshes drawn on the cardiac wall, that is, for each pixel of the image. SCI was defined as the temporal correlation coefficient between the LV volume and myocardial contraction. Contraction work was estimated as the product of force and displaced distance. The cardiac wall was divided into 17 segments, and the accumulation of perfusion agents, amplitudes, SCI, and contraction work for each segment were calculated and plotted on polar maps. **Results:** In the healthy patients, the mean amplitude, SCI, and contraction work values in 17 segments were 36.0% ± 3.5%, 94.9% ± 3.0%, and 7.67 ± 1.10 $mJ\cdot cm^{-2}$/beat, respectively; the corresponding values in patients with CAD before revascularization were 24.6% ± 5.1%, 62.9% ± 17.7%, and 4.30 ± 1.70 $mJ\cdot cm^{-2}$/beat, respectively. The amplitude, SCI, and contraction work values were significantly lower in the patients with CAD than in the controls ($p < 0.05$). However, no correlation between each factor was observed. The improvement in the contraction work in the patients before and after revascularization ranged from 0 to 3.06 $mJ\cdot cm^{-2}$/beat. From a viewpoint unlike amplitude and SCI, contraction work could indicate the recovery of cardiac function. Moreover, areas of improved LV function could be delineated by visual inspection on polar maps. **Conclusion:** Contraction work was thought to be a useful index for mechanically evaluating abnormal cardiac function. Along with amplitude and SCI, it may prove useful for the prediction of functional recovery after revascularization.

P39-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Cardiovascular: Miscellaneous

P0386

Brain perfusion and cognitive function in metabolic syndrome patients: correlation with indices of ambulatory blood pressure monitoring

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Aim: to estimate role of ambulatory blood pressure monitoring (ABPM) indices in development cerebral perfusion disturbance and cognitive disorders in patients (pts) with metabolic syndrome (MetS). Material and methods: The study involved 52 pts (8 males and 44 females, mean age 52±5) with MetS. Fifteen healthy volunteer were investigated as control group. All pts were investigated by perfusion brain SPECT with ^{99m}Tc-HMPAO, comprehensive neuropsychological testing and ABPM. Brain SPECT slices were divided into 14 symmetrical (right and left) regions of interest per patients: inferior and superior frontal lobes, temporal, anterior and posterior parietal, occipital lobes and cerebellar hemispheres. Regional cerebral blood flow (rCBF) (ml/100g/min) in these regions was calculated. Results: The results of brain SPECT showed that cerebral perfusion was significantly

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decreased in regions of MetS patients in comparison with control group. The regional cerebral blood flow in patients with metabolic syndrome in decrease on 7.3% (p=0.003), 6% (p=0.028), 5.9% (p=0.024) was revealed in right and left anterior parietal cortex, in right posterior parietal region correspondingly, as well as with decrease on 8.3% (p=0.007), 6.6% (p=0.009) and 5% (p=0.041) in right superior frontal cortex, in right temporal and occipital regions, correspondingly, in comparison with control patients. Cognitive dysfunction was detected in 90% MetS patients. By results of ABPM 20 pts (38.4%) were “dippers”, 24 pts (46.2%) were “non-dippers”, 2 pts (3.8%) were “over-dippers” and 6 pts (11.5%) were “night-peakers”. “Night-peakers had a decrease in visual short-term memory on 30.4% (p=0.017) as compared with group “dippers“. In addition in “non-dippers” had reduction in attention on 13.8% (p=0.037) and psychomotor speed on 17% (p=0.036) in relation to “dippers”. Relationship between indices of ABPM, cerebral perfusion and cognitive function was found. Inverse correlation was shown between mean values for daytime diastolic blood pressure in MetS patients and rCBF in left occipital lobe (R^2=0.10, p=0.033). Diastolic blood pressure "loads" for night-time period was negative correlated with rCBF in right anterior and posterior parietal regions, in right and left temporal cortex (R^2=0.12, p=0.011; R^2=0.10, p=0.027; R^2=0.08, p=0.04; R^2=0.11, p=0,016, correspondingly), as well as with mentation, psychomotor speed and attention (R^2=0.08, p=0.046; R^2=0.10, p=0.032; R^2=0.14, p=0.008, correspondingly). Conclusion: Our results suggest that brain SPECT is useful technique for evaluation the cerebral perfusion and understanding of cognitive dysfunction mechanisms in MetS patients, one of pathogenetic factor of which is the decrease in brain perfusion connected with circadian rhythm blood pressure disorders and high diastolic blood pressure.

P0387

WBR/XPRESS3 for Cardiac 123I-MIBG - Algorithm Validation

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Introduction The methodology of iterative tomographic reconstruction WBR with the already well-publicized advantages of cardiac.Xpress over the conventional method of filtered back projection (FBP) has been improved with the implementation of a second algorithm (cardiac.Xpress3) so the acquisition times were even shorter or the administered activity further reduced. The aim of this study was to analyze now the latest Xpress3 algorithm, which allows a reduction of the administered activity to a quarter. **Material and methods** 51 patients were randomly studied (25 men and 26 women) with amyloidosis (FAP) or arterial hypertension (HBP). After i.v. administration of 185-222MBq of ^{123}I-MIBG, SPECT studies were acquired at 30 minutes (HBP) or at 3 hours (FAP). Patients underwent two sequential acquisitions: A1 (30s/view/60views) and A2 (8s/vista/60views). A1 was reconstructed by FBP and A2 by Xpress3 (XP3). 2 independent observers analyzed the 102 studies: all images were considered of good quality. All sections were qualitatively compared (A1 vs. A2), as better, same or worse. In order to quantitatively evaluate the distribution of the radiopharmaceutical, the lesion’s extent was determined by percentage and summed score (SS), using Germano’s QPS. We analyzed all the studies together, and separately: the normal (group I, SS ≤4) and the injured (group II, SS> 4). We determined the mean (m), standard deviations (SD), Student t test (p) and Pearson’s correlation coefficient (CC) for statistical purposes. **Results** The 51 pairs of studies provided a power of 81% (ES = 0.5, α-level = 0.05). Visual analysis never altered the final report. On the qualitative analysis of the SPECT scans, the two observers attributed to A2 images better or similar quality in 97% of cases. The quantitative analysis revealed areas and slightly higher scores with A2 (p <0.0005), with good correlation (CC = 0.87). The separate analysis of group II showed no statistically significant difference. So group I is the responsible for the (harmless) differences observed in the joint analysis. **Conclusion** The WBR cardiac.Xpress3 applied to cardiac CT studies with ^{123}I-MIBG does not affect the results, with the advantage of allowing a significant reduction of the activity administered to patients.

P0388

Brain SPECT with ^{99m}TC-HMPAO in Estimate of Cerebral Disorders in Patients with Arterial Hypertension and Metabolic Syndrome

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Purpose: Study of brain perfusion (BP) and cognitive function (CF) in pts with arterial hypertension (AH) and metabolic syndrome (MS). Methods: Fifty MS pts and 23 AH pts without carbohydrate metabolism disorders (CMD) were underwent brain SPECT scanning with ^{99m}Tc-HMPAO and comprechensive neuropsychological testing. Regional cerebral blood flow (rCBF) (ml/100g/min) was calculated. All patients had no focal neurological symptoms. Results: Cerebral perfusion disorders in pts with MS were more pronounced in comparison with AH pts. Thus, the rCBF was decreased by 6% (p=0,004) in the left posterior parietal, by 6% (p=0,009) and 7% (p=0,001) in the left and right temporal and by 9% (p=0,00001) and 8% (p=0,00007) in the occipital cortex in MS pts as compared with the AH pts without CMD. The results of neuropsychological testing showed the more pronounced immediate verbal memory (IVM) disturbance in MS pts as compared with the AH pts without CMD. There was a direct correlation between rCBF and CF parameters in the patient groups. Thus, a positive correlation was revealed between IVM parameters and BP in the left posterior parietal (R^2=0,224; p=0,002), right and left temporal (R^2=0,124; p=0,022 and R^2=0,214; p=0,002, respectively) and left occipital (R^2=0,968; p=0,047) regions in all pts. Moreover, the decrease in IVM parameters was associated with perfusion impairment in the anterior parietal (R^2=0,216, p=0,002) and right occipital (R^2=0,125, p=0,021) lobes in MS pts. Conclusions: Our results suggest that brain SPECT with ^{99m}Tc-HMPAO permit to detect of the cerebral circulation disturbances in patients with AH and MS it even if they have no focal neurological symptoms. The most pronounced BP and CF disorders are revealed in patients with MS in comparison with AH patients without CMD.

P0389

Standardization of I-123-MIBG heart-to-mediastimun (H/M) ratio for the semi- quantification of cardiac sympathetic nerve degeneration

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the aim I-123-MIBG cardiac scintigraphy is known to be important in evaluation of neurodegenerative disease such as dementia with Lewy bodies. The heart-to-mediastinum (H/M) ratio is used for quantifying the cardiac I-123-MIBG uptake. However the index is sometimes influenced by the camera types, collimators, and the ROIs onto the mediastinum and heart. So the inter-institutional or inter-equipment comparison is difficult. This time we applied the correction formula proposed by Japanese Society of Nuclear Medicine working group to the H/M ratios obtained by two equipments of our institution, and assessed the possibility of standardization of the H/M ratio. materials and methods 1) phantom study: Calibration phantom consisted of multiple slices of heart, lung, mediastinum and liver part was employed. According to the procedure developed by Nakajima et al (1), four sets of H/M ratios were calculated by E.CAM Signature (Siemens, Tokyo) with the low-medium-energy high-resolution (LMEHR) collimator and Prism 2000 (Picker, Tokyo) by the I-123 dual -window (IDW) acquisition with low-energy high resolution (LEHR) collimator. The IDW acquisition is multi-window correction method to exclude the affect of 529-keV scatter component, in which wide upper window (176-294 Kev) was applied. The same ROIs were set onto the heart and upper third of the mediastimun. The H/M ratios were calculated by average heart count devided by average mediastinal count. 2) Clinical study: Twelve cases were administered 111 MBq of I-123-MIBG. Imaging acquisition was performed by E.CAM at 20 (early phase) and 180 min (delayed phase) after the administration, continuously by prism 2000 at 40 (early phase) and 200 min (delayed phase) were acquired. The same ROIs as phantom study were described. The H/M ratios of delayed phase were calculated in each equipment. results By phantom study, H/M ratio by Prism 2000 (x) showed a linear relationship with H/M ratio by ECAM (y); y = 1.2618x - 0.3808 (R2 = 0.9994). According to this formula, corrected H/M ratio of 12 patients by Prism 2000 was calculated, which correlated significantly to the H/M ratio by E.CAM (R2=0.9687). conclusion The corrected H/M ratio by the IDW with LEHR significantly correlated to the H/M ratio with the LMEHR. Standardization of I-123-MIBG H/M ratio could be achieved. (reference) (1) Standardization of metaiodobenzylguanidine heart to mediastinum ratio using a calibration phantom: effects of correction on normal databases and a multicentre study. J Nucl Cardiol. 14(6): 843-51. 2007.

P0390

Hybrid Cardiac Imaging: Insights in the Dilemma of the Appropriate Clinical Management of Patients with Suspected Coronary Artery Disease

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Departments of Nuclear Medicine[1] Radiology[2] and Medical Physics,[3] Faculty of Medicine, University of Crete **Aim:** To evaluate the potential of SPECT myocardial perfusion imaging (MPI) -computed tomography coronary angiography (CTCA) hybrid fusion imaging to improve the diagnostic performance of cardiac SPECT/MPI and CTCA alone in order to act as more accurate gate keeper to further investigation invasive or not. **Materials -Methods :** Twenty five patients were subjected to SPECT /MPI and CTCA within a period of one month without any medical treatment modification. Cardiac SPECT studies were performed on a dual-head cardiologic gamma-camera and CTCA studies on a 64-slice CT scanner. A fusion software package was used for cardiac SPECT-CTCA image fusion. Semiquantitative analysis was performed for cardiac SPECT, CTCA and SPECT/MPI-CTCA fusion images. Patients were classified in 2 groups according to the clinical decision for further investigation: group A: clear decision for further investigation,

group B: no further investigation. **Results:** In classifying patients to groups A and B, statistically significant differences were observed when SPECT/MPI-CTCA fusion images were used instead of cardiac SPECT alone (p<0.05). No statistically significant differences were observed comparing CTCA alone to SPECT/MPI-CTCA fusion images (p=0.25) **Conclusion:** In patients suspected for coronary artery disease, cardiac SPECT/MPI-CTCA fusion imaging was found to considerably alter the clinical decision for referral to further investigation derived from SPECT/MPI.

P0391

Comparison Between Tc99m-Sestamibi Gated Myocardial Perfusion SPECT and echocardiography in assessment of ventricular functional indices

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Background: Left ventricular systolic functional indices influence the management of coronary artery disease. Gated myocardial perfusion SPECT(GMPS) allows the computation of left ventricular volumes (ESV & EDV) and ejection fraction (LVEF). Echocardiography is considered to be a routine method for the quantification of these indices. We sought to compare GMPS with 2D echocardiography in the evaluation of LV functional indices. **Methods:** In a prospective study, fifty patients (22 men and 28 women) underwent rest Tc99m-Sestamibi ECG-GMPS and 2D echocardiography within 1 days of each other. Quantitative gated single-photon emission computed tomography algorithm (QGS; Cedars-Sinai Medical Center, Los Angeles) was used for computation of LV volumes and LVEF in GMPS images. **Results:** 25 patients had normal while 25 patients had abnormal myocardial perfusion SPECT. The mean ESV, EDV and LVEF measured by QGS GMPS were 39.5±52.04, 77.6±55.10 and 62.2%±26.79% respectively while using 2D echocardiography, mean ESV, EDV and LVEF were 50.70±34.89, 87.3±39.05 and 50.40%± 16.06 respectively. There was good correlation between GMPS and echocardiography in ESV, EDV and LVEF (all p<0.001 and r≥0.746). Although there was good correlation between GMPS and echocardiography in patients with normal or abnormal scans, no significant difference was noticed between GMPS and echocardiograph in patients with abnormal scan while significant differences were noticed in calculated ESV, EDV and LVEF between GMPS and echocardiography in patients with normal scans. In patients with ESV≤ 25 ml in GMPS (small hearts) significant difference was noticed between GMPS and echocardiography. In these patients, calculated LVEF using GMPS(62.20±26.79) was higher than echocardiography(50.40±16.06) (p<0.001). **Conclusion:** In patients undergoing diagnostic work-up for CAD, the measurement of LV functional indices GMPS (using QGS algorithm) provides high correlation and satisfactory agreement with the results of echocardiography specially in larger LV cavities. The largest discrepancies were observed in patients with small ventricular volumes.

P0392

Cardiac Sympathetic Nerve Activity Can Predict The Inducibility of Ventricular Tachyarrhythmias after Implantable Cardioventricular Defibrillator Implantation

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Background: Disturbance of autonomic function after myocardial infarction are associated with both total mortality and sudden death. But, in other diseases, dilated cardiomyopathy, Brugada syndrome, etc, it is unknown whether the disturbances of autonomic function is associated with cardiac sudden death. **Purpose and Methods:** In patients after implantation of defibrillator, disturbances of antonomic function are associated with sudden death. To evaluate whether cardiac sympathetic nerve activity can predict the inducibility of Ventricular Tachyarrethmia (VT) after Implantable Cardioventricular Defibrillator (ICD) Implantation, forty-nine consecutive patients (36 males / 13 females, 63±14y.o) including Ischemic cardiomyopathy (ICM), Dialated cardiomyopathy (DCM), Brugada syndrome etc were enrolled. Cardiac sympathetic nerve activity was assessed as the heart/mediasitinum activity ratio (H/M) from anterior planar image of cardiac I-123 MIBG uptake which was acquired in 4 hours after tracer injection. Patients were divided into higher H/M (>=1.5) (H-H/M) group (n=35), and lower H/M (<1.5) (L-H/M) group (n=14). VT event was defined as the memory of VT termination by antitachycardia pacing (ATP) or defibrillation and researched for 11±9 months. **results:** VT events were found in 11 patients (ATP: 5, defibrillation: 6). VT event rate of L-H/M group was significantly higher than H-H/M group (64%(9/14) vs. 5.7% (2/35): p<0.001). Kaplan-Meier curve showed worse prognosis in L-H/M group than H-H/M group (Log-Rank p=0.008).**Conclusion:** Cardiac sympathetic nerve activity can predict the inducibility of VT after ICD implantation.

P0393

Correlation between Transient Ischemic Dilatation and Coronary Angiography

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Objective: A high Transient Ischemic Dilatation (TID) value for the left ventricle (LV) is widely believed to be associated with significant coronary artery (CAD) disease. We have studied the relationship between TID from gated myocardial perfusion studies (G-MPI) and CAD from coronary angiography for our male patient population. **Methods:** In this retrospective study, all male patients who underwent a two day G-MPI study using Tc99m MIBI between Jan 2010 and Dec 2011 and having a TID ≥ 1.20 were included in the analysis. Perfusion and gated parameters were analyzed using Cedar Sinai's AutoQuant software version 3.0. Means of summed stress, rest and difference perfusion scores (SSS, SRS, SDS respectively), stress and rest ejection fraction (EF) were calculated. Visual assessment was made to assess perfusion as normal, fixed defects, fixed and reversible defects, single reversible defect or multiple reversible defects. Coronary angiograms were assessed as normal with no CAD, single vessel disease, two vessel disease or three vessel disease. Correlations between the TID and other parameters were studied using analysis of variance (ANOVA) in SPSS version 20. **Results:** A total of 53 male patients had a high TID of ≥ 1.20 (mean 1.30 ± 0.13). Ten patients had a SSS of zero and 17 were classified as normal by visual assessment. Mean stress EF (mean 50.4% +/-12 %) was lower than the rest (mean 56.6% +/-12.8%) and the differences were highly statistically significant (Students paired t-test p = 0.00). Angiography results were available for 38 patients, 2 having a normal angiogram. 23 having 3 vessel disease, 6 having two vessel disease and 7 having one vessel disease. Five patients with normal perfusion and SSS=0 had CAD, as seen on coronary angiography. CAD on coronary angiography showed significant correlation with perfusion abnormalities (p = 0.002) as assessed by visual interpretation. TID was significantly correlated with perfusion abnormalities (p = 0.009) as assessed by visual interpretation, and with SDS (p = 0.000) **Conclusion** A high TID on G-MPI is a very sensitive indicator of significant CAD. In patients with normal perfusion and high TID further workup for CAD with angiography is warranted.

P0394

Suspect Infection of Cardio-Vascular Native and Artificial Tissue: If Endocarditis is Detected at FDG PET/CT, What do you expect on the Whole Body Scan?

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PURPOSE: Acute infective endocarditis is a potentially life-threatening disease. Its prognosis and therapeutic strategy depends on the presence of septic embolism. The PET/CT scan could help to assess cardiac and extra-cardiac complications and to detect septic embolism from different potential infective focuses. Our study aims is to clarify if septic systemic embolism is more frequently associated to infection of native valve or of artificial surfaces (prosthetic valve or cardiac device). METHODS: We enrolled 35 patients with proved endocarditis. Group1 included 29 pts with native (15) or prosthetic valve (14) . Group2 included 6 pts with cardiac device (PM or ICD). Patients underwent 18F-FDG PET/CT with standard procedure on a dedicated PET/CT scanner. Extra-cardiac findings were subsequently evaluated with other imaging procedures (CT, RM, etc). RESULTS: Group1: 19/29 (66%) presented focal tracer uptake on the valve while 1 presented an equivocal PET result. 14/29 (48%; 9 native valve, 5 prosthetic valve) had unexpected extra-cardiac PET signs of infection (6 lung embolism, 4 spondylodiscitis , 1 spondylodiscitis and lung embolism, 1 infection of vertebral implants, 1 osteomyelitis and 1 osteochondritis with abscess) . Group2: all the patients presented a pathologic tracer uptake on the catheter. Only 1/6 had a PET scan indicating septic lung embolism. CONCLUSION: According to our preliminary results, septic systemic embolism is more frequently associated to endocarditis of a native valve (31%) rather than of prosthetic one (17%). Endocarditis of cardiac device is very seldom associated to septic embolism (16%). This behaviour suggests that artificial surfaces may offer a higher adhesion capacity to bacteria than native tissues. Only patients affected by native valve endocarditis may benefit from a whole body imaging procedure such as FDG PET/CT.

P0395

Radionuclide assessment of pulmonary blood flow and right ventricular contractility parameters in patients with mitral stenosis

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Background. Important aspect of hemodynamic disorders in stenosis of the mitral valve (MS) are the functional and structural changes of pulmonary vessels, as well

as dysfunction and failure of the right ventricle (RV). Aim. To identify opportunities of radionuclide angiography (RNA) and blood pool SPECT (RBPS) in the evaluation of pulmonary hemodynamics and functional status of the right heart in patients with mitral stenosis. Material and methods. The study included 26 patients with MS. Mean pulmonary artery pressure (on echocardiography data) was 50,66 ± 10,76 mmHg. In all patients was recorded atrial fibrillation and heart failure. Nineteen patients were examined before and after surgical correction of MS. The control group consisted of 15 patients. In these patients the results of a complete clinical and instrumental studies were excluded diseases and pathological processes leading to the phenomena of right heart failure. All patients performed radionuclide angiography and blood pool SPECT. Results. According to the RNA in patients with MS we observed low rate of pulmonary blood flow and severe RV dysfunction, as indicated by significantly reduced the magnitude of his ejection fraction, maximum and mean ejection rate, stroke volume and the increase of the end systolic volume in relation to the patients in the comparison group. After MS correction there was a significant acceleration of pulmonary blood flow, reflecting the decrease in pulmonary artery pressure. Also, there was a statistically significant reduction of finite-systolic volume and an increase in peak ejection rate and ejection fraction of right ventricle. As a result of multivariate regression analysis, developed a model predicting recovery of contractile function after correction of the right ventricle of vice. Conclusion. Caused by mitral valve stenosis, right ventricular hemodynamic changes are most apparent decrease in stroke volume, ejection fraction, peak ejection and filing rate, as well as an increase in the end-systolic volume. Implementation of the RBPS in patients with MS allow to predict the state of the RV contractility after surgical correction of mitral stenosis.

P0396

Cardiac sympathetic function in haemodialysed patients

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The aim of this study was to evaluate the cardiac sympathetic nervous system (CSNS) function, in haemodialysed (HD), non-diabetic patients, by iodine-123 meta-iodo-benzylguanidine (123I-mIBG) cardiac uptake. Materials and methods: Planar scintigraphy of the chest was performed in 36 HD, male patients; 15 minutes and 4 hours post injection of 370 MBq of 123I-mIBG. The semiquantitative analysis of myocardial tracer uptake was expressed as routine heart to mediastinum (H/M) ratio: 15 minutes (early H/M) and 4 hour (late H/M) post administration as well as washout of the tracer from myocardium (WR). 24-hour Holter studies were recorded and heart rate variability (HRV) was evaluated. Patients were divided into two groups according to the H/M value: group A patients with H/M >1.8 which has been accepted as a norm, and group B patients with H/M <1.8. Results: In 21/36 patients H/M ratio was below normal values. Significant differences between groups A and B were found among the following parameters: early H/M and late H/M ratios, WR and duration of haemodialysis therapy. Conclusions: In patients with abnormal function of CSNS, expressed by means of H/M ratio below 1.8, duration of haemodialysis treatment was longer. Duration of HD appears to be an important factor influencing cardiac sympathetic nervous system. The H/M ratios and WR are more sensitive indices of CSNS damage than HRV.

P40-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Neurosciences: Clinical Science Neurology

P0397

Synthesis of 11C-Chal-OMe as PET Agent for Imaging β Amyloids Plaques and its Preclinical Evaluation

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Aim: Alzheimer disease (AD) is a progressive neurodegenerative disorder and a leading cause of dementia. Accumulation of β-amyloid plaques in the brain is strongly associated with the pathogenesis of AD. *In vivo*, imaging of these accumulated β-amyloid plaques in the living brain may lead to the early detection of AD which in turn will be beneficial for the monitoring of the progression and effectiveness of novel treatments that are currently being investigated. Non invasive technique, Positron Emission Tomography (PET) may serve as a helpful tool in the diagnosis of AD in pre-symptomatic stages. So far many radiolabeled flavones have been reported for their high binding affinity to the Aβ- aggregates in in vitro studies. Towards the same direction, we have synthesised chalcone derivative (**Chal-OH**) as a PET agent for the diagnosis of β-amyloid plaques in the brain. Chalcone is a member of the class of flavonoids containing flavone. It also contains structurally similar moiety Curcumin which has been reported to have sufficient brain permeability and favourable binding affinity to Aβ- aggregates. In addition, this derivative contains electron donating groups like dimethylamino, methoxy groups which play a critical role in the binding affinity to the Aβ-aggregates. The objective is to develop agent for amyloid plaques imaging (**Chal-OH**) for PET application after labeling with C-11. Thus, the final compound, **^{11}C-Chal-OMe** will have capability of binding with high affinity to the Aβ- aggregates and have sufficient brain permeability. **Method**: **Chal-OH** was synthesized by reacting acetophenone with benzaldehyde derivatives in the presence of 40% NaOH in ethanol at room temperature to form (E)-3-(4-(dimethylamino)phenyl)-1-(4-hydroxyphenyl)prop-2-en-1-one. The methylation procedure of **Chal-OH** was optimized with cold CH_3I in acetonitrile to give (E)-3-(4-(dimethylamino)phenyl)-1-(4-methoxyphenyl)prop-2-en-1-one (**Chal-OMe**). Finally, the radiolabeling of Chal-OH with ^{11}C to give **^{11}C-Chal-OMe** is in progress. Radiochemical yield with radiochemical purities will be determined after purification by HPLC. Binding affinity to the Aβ-aggregates will be studied along with scatchard analysis of binding. **Results**: Synthesized compounds were characterized by NMR and mass spectroscopy. The various parameters for the labelling with cold CH_3I have been optimized and the final labelling strategy was decided on the analysis of HPLC, MS and NMR data. **Conclusion**: On the basis of the facile synthesis of **Chal-OMe**, it is being envisioned to synthesize **^{11}C-Chal-OMe** with the capability of binding with high affinity to the Aβ- aggregates and have sufficient brain permeability.

P0398

Investigating the striatal Dopamine transporter in ADHD rat model using [99mTc]TRODAT-1/micro-SPECT

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Background: Attention-Deficit/Hyperactivity Disorder (ADHD) is characterized by excessive inattention, hyperactivity, and impulsivity. It is estimated that 3-9% of school children had ADHD in USA. The abnormalities of dopamine transporter levels are often found in the striatum of ADHD patients. Aims: This study is to establish an in vivo imaging technique in rat ADHD model and to investigate the status of dopamine transporter in the model. Methods: The ADHD model was created by injecting the 6-OHDA into the brain of neonatal rats (P3). The radioligand, [99mTc]TRODAT-1 (targeting to dopamine transporters (DAT)), coupled with single photon emission topography (SPECT) were used to imaging the ADHD rat. Previous data indicated that [99mTc]TRODAT-1 hardly penetrate rat blood brain barrier(BBB) resulting in poorly striatial uptakes. Therefore, we used mannitol to induce a temporary BBB disruption to observe the [99mTc]TRODAT-1 uptakes in rat brains. Results: Our data show that the striaral specific uptake ratio (SUR) of [99mTc]TRODAT-1 in the rat which pretreated mannitol is higher than that of control value. According to the dynamic study, the maximum binding time of [99mTc]TRODAT-1 is between 1.25-1.75 hours. The results of behavior test show that the ADHD rat had higher activity than control value. The SUR of [99mTc]TRODAT-1 in striatum of ADHD rat was significantly lower than control value. Conclusions: Our results suggest that the [99mTc]TRODAT-1/micro-SPECT with mannitol pretreatment may be a useful imaging method in evaluating the change of DAT in ADHD rat.

P0399

Acetyl-L-Carnitine Improves Cell Bioenergetics

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Introduction: Acetyl-L-Carnitine (ALC), a natural occurring compound in all mammalian species, plays a variety of vital functions in the body. The most important are related to mitochondria, namely the transport of fatty acids for energy production through β oxidation and the control of acyl-CoA/CoA ratio. Due to this close interaction with cell bioenergetics, it plays a role in many diseases, especially those related to the mitochondria. We propose to characterize the action of ALC in mitochondrial bioenergetics and functional integrity. Material and Methods: Rat pheochromocytoma cells (PC12) were exposed to the toxic effects of methamphetamine (METH 1 and 100 μM) and pretreated with different doses of ALC (0.01, 0.1 and 1.0 mM). After 24 or 72h of incubation, mitochondrial function, ATP production, intracellular reactive oxygen species (ROS) and mitochondrial membrane potential were assessed by using, respectively, Mitotracker CMXRos, CellTiter-Glo® kit, dichlorofluorescein diacetate probe (DCF-DA) and 99mTc-sestamibi uptake. Mitochondrial function and intracellular ROS were assessed by flow cytometry and fluorescence microscopy, ATP production was assessed by luminescence and mitochondrial membrane potential was assessed through the quantification of 99mTc-sestamibi uptake by the cells after a period of 45 minutes of incubation with 740 kBq/mL. Results: ALC was effective in preventing the deleterious effects of METH on mitochondrial function caused by a 72h exposure,

particularly significant when cells were treated with 1.0 µM of METH (p<0.01). Cells treated with ALC alone or in combination with METH exhibited consistently lower ATP levels comparing to control cells, with higher significance for 72h exposure. METH enhanced the production of intracellular ROS which was reduced by pre-treating cells with ALC, particularly when cells were treated with the ALC 0.01 mM. Although not enough to reach significance, exposure to METH 100 µM for 72h increases 99mTc-sestamibi uptake, indicating mitochondrial membrane potential augmentation. This may represent mitochondrial metabolism hyperactivation in order to counteract the damaging effect of METH. Lower doses of ALC decreases slightly 99mTc-sestamibi utpake for the 72h exposure to METH 100 µM. Conclusion: ALC exert its protective role by acting at the mitochondrial level, being able not only to improve mitochondrial function but also to improve cell bioenergetics, being effective in protecting cells against a variety of drugs known to cause oxidative stress, such as METH.

P41-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Neurosciences: Clinical Science Neurology

P0400

Use of body-CT and PET-CT in the investigation of paraneoplastic neurological syndromes: Retrospective audit of practice in a regional neuroscience unit in the UK

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Background: Paraneoplastic neurological syndromes (PNS) are characterised by progressive neurological dysfunction resulting from non-metastatic effects of cancer. Positron emission tomography (PET) has emerged as an effective tool for diagnosis and staging of malignancy. An advantage of PET over conventional imaging modalities such as body-CT includes demonstration of metabolically active disease in anatomically normal appearing structures. Aims: To analyse and improve use of whole-body CT and PET-CT in the investigation of PNS in a regional neuroscience unit Methods: Retrospective review of 42 patients with suspected PNS referred for imaging between April 2007-March 2008 was conducted. The data was presented locally followed by recommendations that a consultant neurologist with interest in PNS reviews each case before referral and PET-CT is considered in cases where body-CT is negative. We re-audited 44 patients referred between July 2008-June 2009 and identified each patient's final diagnosis along with any additional investigations undertaken. Results: In the first cycle, 42 patients underwent whole-body CT for investigation of PNS. 4 scans were positive for malignancy and 38 were negative, of which only one was followed up with PET-CT. In the second cycle, whole-body CT was performed in 44 patients, of which 11 subsequently proceeded to PET-CT. 5/44 patients had a final diagnosis of PNS, of which only 3 had undergone PET-CT. Conclusion: Early PET scanning in clinically suspected PNS may prevent expensive, extensive and often unnecessary investigations. Trust guidelines now advise use of PET-CT rather than conventional body-CT in clinically suspected PNS. We aim to re-audit our practice in due course.

P0401

Acetazolamide-challenged HMPAO-SPECT is useful in selecting suitable patients for extracrainal-intracranial bypass for severe intracranial steno-occlusive disease of internal carotid and middle cerebral artery among Asians.

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Background- Patients with intracranial stenoses are at considerable risk for recurrent ischemic events. Recently published trials on intracranial stenting and external carotid-internal carotid (EC/IC) bypass in carotid occlusions failed to show benefit over best medical therapy despite improving cerebral hemodynamics. We evaluated cerebral vasodilatory reserve (CVR) in patients with symptomatic & severe steno-occlusive disease of intracranial carotid (ICA) or MCA to select patients who could benefit from EC/IC bypass surgery. **Methods-** Patients with severe steno-occlusive disease of intracranial ICA or MCA were screened with transcranial Doppler (TCD) for their CVR by using breath-holding index (BHI). Patients with impaired BHI were further evaluated with acetazolamide-challenged HMPAO-SPECT. Artery-to-artery embolization was excluded by extended TCD monitoring for spontaneous emboli. Patients with significantly impaired CVR on SPECT imaging were offered EC/IC bypass surgery. All patients were followed up for ischemic events and CVR reevaluated with TCD and SPECT at 4-6months. **Results-** Of the 112 patients with severe intracranial ICA/MCA stenosis, 77 (69%) showed impaired CVR and 46 (41%) underwent STA-MCA bypass. Significant improvements were noted in CVR- TCD-BHI in affected MCA improved from a median 0 (IQR 0.45) to 1.10 (IQR 0.73), p< 0.001 and as well as SPECT (P< 0.001). There were no perioperative complications. TCD and acetazolamide-challenged HMPAO-SPECT repeated after surgery showed significant improvement in CVR in patients who underwent STA-MCA bypass surgery. All cases were followed up (median 21months; range 3 to 39months) for stroke recurrence. Significant lesser ischemic events were observed in the surgical group (11% vs 45% in medical group;p<0.005) during 21months follow up. Significant benefit was noted in early morning headache and lethargy in the STA-MCA bypass patients (80% versus 12%; p <0.0001). **Conclusion-** Symptomatic severe intracranial steno-occlusive disease with impaired CVR carries a high risk of cerebral ischemic events. Acetazolamide-challenged HMPAO-SPECT is helpful in selecting suitable patients for EC-IC bypass and aid in significant reduction in stroke recurrence.

P0402

Can SPM analysis optimize the performance of readers in lateralization and localization of epileptic foci with different experience levels?

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Purpose:The purpose of the present study was to test and optimize the performance (lateralization and lobar localization value of epileptic foci of SPM analysis of 18F-FDG PET scans with various statistical thresholds for adult epilepsy studies. We also analyzed whether SPM provided any benefit over visual assessment in this patient population. Methods: We used a selected group of 50 epilepsy patients who underwent detailed presurgical evaluation, followed by epilepsy surgery, and were seizure-free after at least 2y of postsurgical follow-up. The advantage of such selectivity was to ensure the identification of epileptogenic regions (lobes) with high certainty. Performance of Visual and Visual+SPM Analyses of 18F-FDG PET scans (single subject-age matched control group-with threshold-p levels of 0.001 and 0.01) were compared for three levels of independent readers (1 yr and 4 yr and 14 yr of experience). Results: SPM analysis carried out with this particular institutional control group could correctly lateralize/localize the side of the epileptic focus in all patients using the location of the highest z value (i.e., the voxel with most severe hypometabolism), even in patients with bilateral MRI or PET abnormalities. In addition, SPM performed equally well in both left and right hemispheres and increased confidence levels for the interpretation for all of the observers with different experience levels. Conclusion: The computer-assisted lateralization of TLE using SPM provides an accurate, fast and objective way of seizure evaluation and seems to be a valid methodology during training of professionals with added accuracy to visual evaluation method during the learning period.

P0403

The significance of brain 18F-FDG PET/CT in the diagnosis of limbic encephalitis

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Whole-body FDG-PET/CT has proven to be very effective in the diagnosis of primary tumors in patients developing associated paraneoplastic limbic encephalitis (LE). The aim of this study was to analyze Brain FDG PET/CT scans in patients suspected to have LE in order to evaluate whether FDG PET findings of the brain support the diagnosis of LE. Methods : 81 patients (47 men, median age: 54 y) with suspected LE were referred for whole body PET/CT to asses the paraneoplastic origin of LE. Additional FDG-PET scans of the brain was performed to evaluate the pathologic changes. Brain PET images were evaluated visually as well as with SPM 2. According to the diagnostic criteria used in our institution patients were classified as (definite LE), (possible LE), (suspected LE), and (no LE). Results : 13, 8 and 19 patients were classified as definite, possible, and suspected LE respectively. All patients with "definite LE" showed significant metabolic changes in limbic areas, with relative hypo- or hypermetabolism in 55 % and 45 % of cases, respectively. Furthermore, FDG-PET detected significant metabolic changes in limbic regions of 56 % and 63 % of cases with (suspected) LE and (possible LE), respectively. 17 patients were diagnosed with cryptogenic temporal lobe epilepsy (CTLE) and 78 % of these patients showed significant metabolic changes in the temporal lobe, 39 % in limbic regions. Conclusions : In "definite LE", interindividually consistent metabolic changes can be detected in limbic areas, which manifest either as relative hypo- or hypermetabolism. FDG PET is particularly promising in cases with (suspected) and (possible) LE, as the demonstration of limbic metabolic alterations can substantiate the diagnosis. It is also of clinical value in patients with CTLE with normal MRI. Thus, we recommend to include Brain FDG PET in the routine work up of LE patients.

P0404

Regional cerebral metabolic rates of glucose correlate with clinical impairment in comatose patients

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AIM Probability of recovery of conscious function in comatose patients is dependent on the extent of brain damage, which is difficult to assess only by clinical, laboratory, functional tests or by anatomical neuroimaging techniques. Measurements of cerebral metabolism with 18F-FDG PET provide useful information on the presence, degree and location of any residual brain function in patients with severe brain damage. However, the use of this technique in comatose patients is methodologically complex and needs careful quantitative analysis and interpretation. The aim of this study is two-folded: 1) to investigate the relationship between brain metabolism in critical regions and clinical scales in a group of comatose patients; 2) to optimize 18F-FDG PET procedure in order to obtain the most accurate and clinically feasible protocol for comatose patients. MATERIALS AND METHODS 18F-FDG PET was performed in 7 comatose patients (median Glasgow Coma Scale -GCS- score, 3) within 10 days after injury (5 post-anoxic coma, 2 post-traumatic coma). Absolute cerebral metabolic rate of glucose (CMRGlu), using image derived input function, was measured in 27 discrete cortical and subcortical brain regions. Normalized uptake values in the same regions were also calculated using white matter (WMnorm) and brainstem (BSnorm) as reference regions. RESULTS All comatose patients showed consistent and widespread cerebral metabolic impairment, mostly involving associative frontal, parietal and temporal regions, posterior cingulate and precuneus cortices. The less impaired brain regions were brainstem and white matter. As compared to post-traumatic patients, post-anoxic comatose patients showed significantly lower CMRGlu values and lower WMnorm and BSnorm in several brain regions (associative frontal, parietal, temporal cortices, posterior cingulate cortex/precuneus, striatum, thalamus). In all comatose patients, significant correlation between CMRGlu and GCS score was found in all cortical regions and in striatum and thalamus. Significant correlations between WMnorm values and GCS was found only in parietal associative cortex, and between BSnorm values and GCS only in parietal associative and posterior cingulate/precuneus cortices. CONCLUSION Our findings show a widespread cortical metabolic dysfunction in comatose patients, which is more prominent in post-anoxic than in post-traumatic patients. Metabolic impairment measured with CMRGlu significantly correlates with clinical scales, such as GCS, extending to cortical and subcortical regions typically involved in thalamo-cortical and cortico-cortical fronto-parietal connections of the default mode network. Neither WMnorm nor BSnorm values performed as well as absolute quantification of CMRGlu in the correlation with clinical impairment.

P0405

Clinical usefulness of ^{123}I-FP-CIT SPECT imaging in vascular parkinsonism

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Aim.- To evaluate the qualitative and semi-quantitative results of 123I-FP-CIT SPECT imaging to differentiate between vascular parkinsonism (VP) and Parkinson disease (PD) and to search for clinical features related to the SPECT pattern among patients with VP. Material and Methods.- We retrospectively evaluated several clinical features in 106 VP patients (Zijlmans criteria) and 280 PD patients (UKPDSSBB criteria). 80 patients in the VP group and 171 in the PD group underwent a brain SPECT scan with a dual-head rotating gammacamera fitted with LEHR fan-beam collimators after i.v. injection of 185 MBq of 123I -FP-CIT. The image results were classified as normal/abnormal. Furthermore, the following visual score system was used: 0. Bilateral normal uptake. 1. Mild or moderate homogeneous and bilateral decreased striatal uptake. 2. Focal deficit of tracer accumulation on any striatal region or homogeneous unilateral striatal diminished uptake. 3. Symmetric or asymmetric striatal reduced uptake, more pronounced in putamen than in caudate, showing a rostrocaudal gradient. Visual score results were categorised into 2 patterns [VP pattern (0,1,2)/PD pattern (3)]. In addition, we performed cluster analyses using the specific/non-specific 123I-FP-CIT uptake ratios provided by an automated semi-quantitative analysis (Hermes -Brass software). Results. - Gait disorder, postural instability and falls were more frequent in VP. Rest and mixed tremor was more prevalent in patients with PD. Of the patients who received levodopa treatment in VP group, only 47.9 % had a good response. Among patients with VP, falls was the only clinical feature that demonstrated a correlation with the SPECT visual pattern. Qualitatively, ^{123}I-FP-CIT SPECT images were normal in 32.5% of patients with VP and abnormal in all patients with PD. The use of different visual score patterns showed higher accuracy in differentiating VP from PD (sensitivity=83.7%, specificity=99.4%, PPV=98.5% and NPV=92.9%). Semi-quantitative analysis showed significantly higher uptake ratios in the striatum, caudate and putamen in patients with VP. Asymmetry index was higher in PD patients. Conclusions.- The diagnosis of VP cannot be accurately made on the basis of clinical features alone. Our data contribute to confirm that ^{123}I-FP-CIT SPECT imaging is a useful and reliable diagnostic tool that improve the differential diagnosis between VP and PD. Qualitative analyses using visual score patterns showed a higher accuracy in differentiating VP and PD compared to qualitative analyses expressed as normal/abnormal imaging and semiquantitative analysis.

P0406

The usefulness of radionuclide cisternography for detecting cerebrospinal fluid leakage and the effect of epidural blood patch for the patients with orthostatic headache

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Aim: We investigated the usefulness of radionuclide cisternography (RICG) for detecting cerebrospinal fluid (CSF) leakage and the effect of epidural blood patch (EBP) for the patients with orthostatic headache. Materials and Methods: From 2004 to 2011, quantitative analysis of RICG was performed in 199 patients with orthostatic headache and CSF leakage was evaluated. Typical positive findings suggesting CSF leakage were parathecal activity of the radioisotope (RI) and/or early bladder filling of the RI. The latter cases were, however, excluded when the SPECT images revealed CSF leakage from the puncture site or the RI reached the top of the skull. When CSF leakage was proven, the patients underwent EBP therapy with informed consent for closure of the leakage site. Results: CSF leakage was detected in 120 of 199 patients who underwent RICG. The site of leakage was the cervicothoracic spine junction in six cases, thoracic level in three, thoracolumbar level in six, thoracolumbar sacral level in 11, lumbar level in 43, lumbosacral level in 29, and sacral vertebrae in nine. Early bladder filling was observed in the remaining 13 cases. EBP was performed in 116 patients who gave informed consent. Mild improvement of symptoms was obtained in 51 cases (42.5%), and apparent improvement was seen in 63 (52.5%). The symptoms did not change in two (1.7%), but none complained of symptom exacerbation. In the other four cases (3.3%), the efficacy was not evaluable. Conclusion: EBP therapy was effective in improving symptoms for patients with orthostatic headache showing CSF leakage upon RICG.

P43-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Neurosciences: Neurodegeneration

P0407

Combination of FDG-PET and hippocampal volumetry for prediction of conversion to Alzheimer disease in subjects with mild cognitive impairments: Study on diagnosis of early Alzheimer disease-Japan (SEAD-J)

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Purpose: To evaluate combination inspection of FDG-PET and hippocampal volumetry for the prediction of conversion to Alzheimer disease (AD) in subjects with mild cognitive impairments (MCI). Methods: Seventy-three subjects with anmestic MCI, who were registered for the study on diagnosis of early Alzheimer's disease-Japan (SEAD-J), were followed up for four years after baseline fluorodeoxyglucose and positron emission tomography (FDG-PET) and 3D-MR imaging study. Brain FDG-PET images were evaluated with visual inspection and three dimensional stereotactic surface projections (3D-SSP) z-score maps by three experienced nuclear medicine physicians and hippocampal volumetry was performed with automatic volume measuring software: AVSIS (Radiat Med. 2006;24:422). The prediction performance of conversion to AD was compared between the two methods and the performance of combination of both methods was evaluated. Results: For three years 29 of 73 MCI subjects converted to AD and for 4 years 20 of 43 subjects converted to AD. For 3 years follow-up, FDG-PET demonstrated a sensitivity of 100%, specificity of 48% and accuracy of 68%,

volumetry demonstrated a sensitivity of 90%, specificity of 45 % and accuracy of 63%, and the combination demonstrated a sensitivity of 90%, specificity of 64% and accuracy of 74% for AD conversion of MCI subjects. For 4 years follow-up, FDG-PET demonstrated a sensitivity of 100%, specificity of 43% and accuracy of 70%, volumetry demonstrated a sensitivity of 95%, specificity of 61 % and accuracy of 77%, and the combination demonstrated a sensitivity of 95%, specificity of 70% and accuracy of 81% for AD conversion of MCI subjects. Conclusion: FDG-PET and hippocampal volumetry methods demonstrated a high sensitivity and a low specificity for the prediction of conversion to AD in subjects with MCI. Our results indicate that combination of these methods improves the specificity and produce a high accuracy. This functional and morphological combination will be applied to predicting AD conversion of MCI subjects.

P0408

Age modeling in brain FDG-PET normal controls: Impact on voxel-wise statistical testing

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Aim Voxel-wise statistical testing of FDG-PET brain scans is increasingly used in routine patient care. A set of normal controls is required in order to detect metabolic abnormalities on voxel level. It is known that cerebral metabolism generally declines with age. In this study, different approaches for modeling effects related to age are compared using quantitive measures to discriminate between healthy subjects and subjects suffering from Alzheimer Disease. Material and Methods Two groups of normal controls NC1 (n=23; age 50 ~ 69) and NC2 (n=12; age 75 ~ 85) as well as subjects suffering from Alzheimer's Disease (AD; n=19; age 51 ~ 83) were scanned on a Philips Gemini TF scanner. Scans were stereotactically registered to MNI space, and intensities were scaled with respect to the median intensity in a gray and white matter mask. Each scan of NC1, NC2, and AD (n=54) was tested against a subset of the remaining NC scans. The subsets included images that were chosen according to 4 different approaches of age modeling (i) all scans; (ii) The NC group corresponding to the subject's age; (iii) the 25 normal scans closest in age; (iv) all scans, but using age as co-variate. The Hypo-metabolic convergence index (HCI) and the volume of the largest hypo-metabolic cluster (HMC) was used as discriminative score and assessed with respect to indicators of their discriminative power (classification accuracy, area under the ROC, squared correlation coefficient). Results Classification accuracy was 100% for HCI in approaches (i), (ii), (iv), and 98% for (iii). For HMC, accuracy was (i): 90%, (ii): 92%, (iii): 89%, (iv): 87%. Here, the area under the ROC for (i) - (iv) was 0.92, 0.97, 0.95, and 0.94, and the corresponding squared correlation coefficient was 0.64, 0.70, 0.57 and 0.56. Conclusion Age has an effect on voxel-wise statistical testing. In the present study, perfect discrimination between normals and AD subjects could be achieved with three out of four approaches. Splitting into two age groups indicated a slightly better performance in automated classification. The results indicate that the effect of age is more subtle than variations across subjects. These observations need to be confirmed by testing more challenging subjects such as early-stage dementia cases.

P0409

Clinical validation of a Grid-based SPM web tool for the automatic assessment of [18F]FDG-PET brain metabolic abnormalities in single subjects.

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Background: [^{18}F]FDG - PET imaging has been recently suggested to increase diagnostic accuracy in neurodegenerative disorders since the very early stages (Dubois et al., 2010; Jack et al., 2011; Albert et al., 2011; Sperling et al., 2011; Ravskowski et al., 2011). At present, however, glucose metabolism for diagnostic purposes is mostly evaluated through visual inspection of [^{18}F]FDG-PET brain images in single subjects, thus resulting in low sensitivity and specificity. **Aim:** A clinical validation of objective voxel-based maps of hypometabolism generated through statistical parametric mapping (SPM) using [^{18}F]FDG-PET scans in a large series of patients with neurodegenerative disorders (e.g. Mild Cognitive Impairment-MCI, probable Alzheimer's disease-AD and Frontotemporal Lobar Degeneration-FTLD) by comparing single-subject [^{18}F]FDG-PET scans to a large population of normal subjects. We aimed at providing a tool with high statistical power and high sensitivity and specificity for early and differential diagnosis of neurodegenerative disorders. **Materials and Methods:** 112 normal scans controls were included in a database for single-patient analysis. All included images underwent quality control procedures, including two-pass masked-normalization, smoothing, intensity rescaling, global count intensity normalization and distance analysis. The influence of scanner effects and demographic variables was measured as well. Glucose metabolism was then investigated in 95 patients with a clinical diagnosis of neurodegenerative disease. Visual ratings of resulting SPM maps of glucose hypometabolism were provided by a team of experienced neurologists. **Results:** The comparison of a single case against a large group of controls yielded SPM Maps of hypometabolism with high t-values corrected for multiple comparisons (FWE) at the voxel level. Analysis of raters' performance for diagnostic accuracy of FDG-PET provided very high sensitivity values (higher than 95%) significantly increasing the level of diagnostic confidence with respect to the FDG visual inspection. In particular, AD and FTLD patterns were differentiated and in the case of amnestic MCI, the results were either negative or showed and AD pattern. **Conclusions:** This voxel-based FDG-PET tool can increase both statistical significance and diagnostic confidence when evaluating specific hypometabolic patterns in single subjects for earlier and more accurate disease detection. Furthermore, this tool may be easily implemented as a Grid-web service (Castiglioni et al., 2009) representing an extremely powerful toll for clinicians on standard workstations in order to obtain a disease confirmatory or exclusionary tests.

P0410

F18- FDG PET/CT, magnetic resonance imaging and software image fusion in the diagnosis of dementia

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Introduction: The number of people over 65 years is growing rapidly over the past few decades. Age is the greatest risk factor for developing dementia and the number of patients suffering from it is expected to increase. Dementia affects a large number of people worldwide and with increasing life expectancy the prevalence of dementia, particularly Alzheimer's dementia (AD) is also increasing. AD accounts for around 65% of cases of dementia. The clinical identification and differential diagnosis of dementias is especially significant in the early stages, but the need for early diagnosis has become more important now that pharmacotherapy of mild to moderate AD is possible. Cholinesterase inhibitors have successfully been used to delay cognitive impairment associated with mild to moderate AD disease, and memantine for treating patients with more advanced AD. Aim of the study: To evaluate the role of F18- FDG PET/CT, magnetic resonance imaging (MRI) and effects of image fusion in the diagnostic procedure of early dementia. Material and methods: 35 patients with clinically suspected dementia underwent F18- FDG PET/CT and MR imaging. The data collected was evaluated separately and also compared to fused images. Software image fusion was used in order to evaluate the added clinical value of fused images. Results: The examined group was made of 35 pateints with clinically suspected dementia, 20 women (57.15%) and 15 male (42.85%) and the average age of the group was 64.33± 10.33 years. Major compalins were: cognitive decline, mood disturbances, behavioral changes like depression and functional impairment in daily activities. F-18 FDG PET/ CT showed regional glucose deficit bilaterally in the parietotemporal cortex in 12 patients (34.29%), 5 patients in the right parietotemporal region (14.29%), 5 pateints in the left parietotemporal region (14.29%), 3 patients in the left frontoinsular region (8.57%) and in 10 patients the brain glucose utilisation was found normal (28.57%). MR imaging showed in 20 patients (57.15%) mild global cortical atrophy, 10 patients had normal findings (28.57%) and 5 patients had cortical atrophy with temporoinsular predomination (14.29%). F18- FDG PET/ CT was found positive for dementia in 25 pacijenta (71.42%), and the results of MR imaging were positive in 5 patients (14.29%). Conclusion: The role of functional imaging is of great significance in the early diagnosis of dementia and differential diagnosis between various types of dementia. Fused images are expected to have added diagnostic value.

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Neurosciences: Dopamine Imaging

P0411

Differential diagnosis of parkinsonism using dual-phase F-18 FP-CIT PET imaging

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Purpose: Dopamine transporter (DAT) imaging is useful to demonstrate the loss of presynaptic dopaminergic neuron in Parkinson's disease (PD), but it is often difficult to differentiate atypical parkinsonism such as multiple system atrophy (MSA), progressive supranuclear palsy (PSP), dementia with Lewy bodies (DLB) from PD. We investigated whether dual-phase F-18 FP-CIT PET imaging is useful in the differential diagnosis of parkinsonism. Methods Ninety-eight subjects [5 normal

(63.2 ± 18.6y), 7 drug-induced parkinsonism (DIP, 75.7 ± 6.8y), 5 essential tremor (ET, 54.8 ± 14.6y), 24 PD (60.7 ± 12.8y), 20 MSA-parkinson type (MSA-P, 61.9 ± 9.1y), 13 MSA-cerebellar type (MSA-C, 57.2 ± 7.7y), 13 PSP (68.9 ± 5.6y) and 11 DLB (73.7 ± 6.7y)] underwent dual phase F-18 FP-CIT PET. PET images were acquired at 5 min (perfusion phase) and 3 hr (equilibrium phase) after administration of F-18 FP-CIT (185 MBq). Striatal DAT binding was assessed on the equilibrium phase images and the regional perfusion of cerebrum, brain stem and cerebellum was assessed on the perfusion phase images by visual, quantitative and SPM analyses. Results Striatal DAT binding was visually and quantitatively similar to normal in ET, DIP and MSA-C groups, but abnormal in PD, MSA-P, PSP and DLB groups. There was no difference of regional perfusion among normal DAT binding groups, except MSA-C which showed decreased perfusion in cerebellar cortex. Abnormal DAT binding groups showed different regional perfusion compared with PD in SPM analysis (FDR<0.05): posterior putamen, cerebellar cortex and occipitotemporal cortex in MSA-P; medial frontal & parietooccipital cortex, hypothalamus and mid-brain in PSP; fronto-parieto-occipital cortex in DLB. When discriminating atypical parkinsonism from PD, visual interpretation of the perfusion phase image showed high diagnostic sensitivity and specificity of 75.4% and 100%, respectively. Regarding the ability to distinguish specific atypical parkinsonism, sensitivities were 81% for MSA-P, 77% for MSA-C, 23% for PSP and 54.5 % for DLB. Conclusions Dual phase F-18 FP-CIT PET imaging is useful to not only demonstrate striatal DAT loss in neurodegenerative parkinsonism but also differentiate atypical parkinsonism, especially MSA from PD.

P0412

Application of visual assessment and three semi-quantification methods in a series of 123I-FPCIT SPECT studies performed in our department: sensitivity and specificity

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Aim. A few years after the introduction of semi-quantification methods to support visual assessment of the 123I-FPCIT SPECT studies performed in our department, we report on the sensitivity and specificity we obtained. Materials and methods. During the last years we applied 123I-FPCIT SPECT in more than 100 patients referred to our department for confirming or excluding Parkinsonism. For 57 of them (as most of the patients came on an outpatient basis) we were able to have their final diagnosis in collaboration with their referring neurologists. These 57 patients (35 men and 22 women) aged 67±9.6 years were imaged in our dual-head ADAC Vertex Plus γ-camera system with the standard protocol. For semi-quantification, the manually positioned ROIs method and the “crescent” and “two box” semi-automated methods of the QuantiSPECTTM software package were used. For the manual method, standard filtered backprojection reconstruction and semi-quantification were done on the ADAC PEGASYS workstation by an experienced nuclear medicine physician using the Eurocustom menu. For the two semi-automated methods, filtered backprojection reconstruction, Chang attenuation correction and semi-quantification were done with the QuantiSPECT package by an experienced medical physicist. Final diagnosis was based on the overall clinical status of the patients, various tests performed (e.g. UPDRS) and the response to the medical treatment where applied. Sensitivity and specificity for each method were calculated. Results. From the 57 patients with known final diagnosis, 18 were free of Parkinson’s disease or other parkinsonian syndrome (suffering mainly from essential tremor and pharmacologic parkinsonism or Lewy body dementia in a few cases) while 39 were suffering from Parkinson’s disease or other parkinsonian syndrome. As a result from the nuclear medicine studies, sensitivity for the visual assessment, the manual method and the “crescent” and “two box” methods was found to be 92.3%, 89.4%, 61.5% and, 82.1% respectively. Specificity for the visual assessment, the manual method and the “crescent” and “two box” methods was found to be 94.4%, 88.9%, 77.8% and, 83.3% respectively. Conclusion. Visual assessment is well considered the method of choice for diagnosing 123I-FPCIT SPECT studies followed by the manual semi-quantification method, both showing very good sensitivity and specificity. In comparison, the “crescent” method with the predefined ROIs gave poorer results. Finally, the resolution independent “two box” method, based on the “Southampton” idea which avoids the partial volume effect, achieved fairly good results, especially when taking in mind the short time needed for processing and its ease of use.

P0413

Decreased Dopamine Transporter Occupancy by Methylphenidate in Male Adult ADHD Patients with Comorbid Cocaine Dependence

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BACKGROUND Methylphenidate (MPH) treatment blocks the dopamine transporter (DAT) and has proven to be effective in reducing symptoms of attention deficit/hyperactivity disorder (ADHD). However, MPH treatment is less effective in ADHD patients with comorbid cocaine dependence and little is known about the effects of MPH on dopamine transporter occupancy in cocaine-dependent ADHD patients. *OBJECTIVE* The objective is to assess DAT occupancy by MPH after two-week MPH treatment in adult male ADHD patients with (n = 8) and without (n = 16) comorbid cocaine dependence (while abstinent for cocaine). *METHODS* DAT availability and ASRS scores (self-report scale for ADHD symptoms) were determined at baseline and following two week fixed-dose MPH treatment (54 mg Concerta/day) to evaluate DAT occupancy by MPH and self-reported ADHD symptom improvement. We used [^{123}I]FP-CIT SPECT to assess striatal DAT availability. SPECT imaging was performed using a brain-dedicated system (Neurofocus) and all patients were scanned 3 h post-injection. Attenuation correction was performed on all SPECT images and images were reconstructed in 3D mode. For the analysis of images, the program Worldmatch was used and regions of interest (ROIs) were drawn for the striatum and occipital cortex (representing non-displaceable activity). Specific to non-specific binding ratios (BP_{ND}) were calculated as follows: [(activity in striatum) - (activity in occipital cortex)/(activity in occipital cortex)] Subsequently, DAT occupancy by MPH was calculated relative to untreated baseline scan using the following equation: OCC = [$BP_{ND(baseline)}$ - $BP_{ND(MPH\ scan)}$ / $BP_{ND(baseline)}$] * 100% *RESULTS* At baseline, striatal DAT availability was significantly lower in the ADHD patients with comorbid cocaine dependence than in the ADHD group (p = 0.002). Also, the occupancy of striatal DATs by MPH was significantly lower in the ADHD patients with cocaine dependence than in ADHD patients without cocaine dependence (p = 0.008). However, no correlation between reductions in self-reported ADHD symptoms and DAT occupancy by MPH was found (r = 0.109; p = 0.61). *CONCLUSIONS* This study shows a significant reduction in striatal DAT occupancy by MPH in cocaine-dependent ADHD patients. Unexpectedly, symptom reduction was not significantly correlated with DAT occupancy by MPH, such that higher doses of MPH might not be effective in treating ADHD patients with comorbid cocaine dependence.

P0414

Dopamine Transporter and Receptor SPECT in Patients with Parkinsonism with or without Dementia

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Aim: Disentangling the cause of cognitive impairment and parkinsonism is often difficult based on clinical criteria alone. Purpose of this investigation was to analyze whether dopamine transporter (DAT) and dopamine D2 receptor (D2R) SPECT are able to provide a more reliable diagnosis in patients with Parkinson's disease without dementia (PD), with dementia (PDD), dementia with Lewy bodies (DLB), and Alzheimer’s disease (AD). **Material & Methods***:* Region-of-interest analysis was applied to quantify the striatal [^{123}I]FP-CIT and [^{123}I]IBZM binding coefficients and thus, to determine DAT and D2R availability in newly diagnosed patients with PD (n = 10), PDD (n = 6), DLB (n = 15), and AD (n = 7) matched for age, gender, and symptom duration. **Results:** Across LB diseases (PD, PDD, DLB), specific-to-non-displaceable [^{123}I]FP-CIT binding were significantly lower compared to AD (p<0.001). Comparing DLB with PDD, we found significantly lower[^{123}I]FP-CIT binding coefficients in all investigated brain regions in the latter (p<0.05). Furthermore, there was a trend toward lower values in PDD versus PD, which reached significance in the head of the left caudate (p<0.05) whereas PD and DLB showed no significant differences. Inversely, striatal [^{123}I]IBZM binding coefficient was lowest in AD and highest in PD differing significantly when compared with each other (p < 0.05). PD showed also higher [^{123}I]IBZM binding values compared with DLB (p<0.05). Neither putamen/caudate (P/C) ratios nor side prevalence differed between the patient groups except for significantly different P/C ratios between PD (P/C ~0.7) and AD (P/C ~1) (p<0.05). **Conclusions:** DAT imaging is a reliable method to differentiate AD with parkinsonism and dementias associated with LB. Furthermore, a differentiation between patients with PD, PDD, and DLB seems to be possible when taking the distribution of DAT reduction and also the D2R availability into account. Wether imaging of the dopaminergic system could be one principle component in a multi-tracer approach with the objective to accurately diagnose dementia subtypes has to be proven prospectively and with larger study cohorts. The authors acknowledge GE Healthcare for supporting this study with a regular industry sponsorship.

P0415

Datscan intensity normalization: cerebellar or occipital region of interest?

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Introduction. Activity normalization in single photon emission tomography (SPECT) and positron emission tomography brain images is a well-established procedure, and is a primary step in statistical parametric mapping analysis; an important step is the selection of areas which by the use of regions of interest (ROIs) can safely represent nonspecific binding and free radioactivity. In 123I-ioflupane SPECT imaging it is consolidated to use occipital ROIs in clinical practice, whereas in several neuroimaging studies the cerebellar areas are preferred. The aim of this study was to establish whether significant differences between the two methods exist and if so, what differences in sensitivity they determine. Materials and methods. We studied the brain 123I-ioflupane SPECT images of 210 adult patients (mean age: 65 ±12 years; 104 females and 106 males) referred to our institution for Parkinson's disease (PD) between 2010 and 2011, and defined as negative for PD both by visual and semi-quantitative analysis by an experienced operator. All images were spatially normalized and smoothed using statistical parametric mapping (SPM8). By using MRIcro tools all ROIs were hand drawn and placed in areas corresponding respectively to the left and right occipital regions and both cerebellar hemispheres with the help of a brain atlas using Mango software (Tailarach space). All images were activity normalized with both ROI types and finally comparative statistical analyses were performed in order to evaluate gender differences corrected for age using SPM8. Results. In all patients activity in the occipital ROI is significantly lower than in the cerebellar one ($p<0.001$). Using cerebellar normalized images, we found a significantly higher 123I-ioflupane uptake in right and left striatum ($p<0.001$) in women versus men. Moreover, we observed a significant increase in I123-ioflupane uptake in a region of pons ($p<0.001$) in men. The choice of occipital normalized images confirmed increased uptake ($p<0.001$) in the right and left caudate (with no significant differences in putamina) in women, though less significant; in men a significant increase in uptake in the limbic lobes (parahippocampus) and the pons ($p<0.001$). Conclusions. The use of occipital rather than cerebellar ROIs for intensity normalization determines differences in statistical analysis, probably related to lower activity in the occipital regions. Choosing cerebellar ROIs increases sensitivity in striatal regions. Occipital ROIs yield higher sensitivity when evaluating the cortex and brainstem. Our data suggest that the choice of different ROI types could be key in the evaluation of different cerebral areas

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Neurosciences: Miscellaneous

P0416

^{99m}Tc -Hexamethyl -Propylene - Amine-Oxime (HMPAO) SPECT Evaluation in Alzheimer's, Idiopathic Parkinson's Disease and Lewy Bodies' Dementia

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Purpose: To compare and evaluate the regional cerebral blood flow measurements investigated by SPECT in Alzheimer's disease (AD), Idiopathic Parkinson's Disease (IPD) and Lewy Bodies Dementia (LBD); furthermore to estimate the 99mTcHMPAO SPECT contribution to the differential diagnosis among these three diseases. Patients and Methods: SPECT with 99mTc-hexamethyl propylene-amine oxime (HMPAO) was performed in a cohort of 130 patients with clinical evidence for AD, IPD and LBD. Four pairs of regions of interest (frontal, parietal, temporal, occipital) were analyzed. Tracer uptake was expressed as a cortico-cerebellar activity ratio after semi-quantitative analysis [Specific Binding Index (SBI), normal values ≥ 2.0]. The findings of all 130 subjects were ultimately compared with corresponding CT and/ or MRI studies. Comparison with the Mini-Mental State Examination (MMSE) was performed. Results: IPD and LBD groups showed a global cortical HMPAO uptake decrease, except in the posterior frontal and occipital regions. In the AD group a limited left temporal and parietal hypo-perfusion was observed. AD and LBD cases showed a significantly lower ($p< 0.05$) frontal HMPAO uptake; CT or MRI depicted a hippo-campal volume loss and a diffused cerebral atrophy for LBD and AD group with a frontal predominance in LBD and a parieto-temporal one in AD. Comparing the scintigraphic findings with the MMSE, the later correctly classified 113 of 130 patients (86.9%) as follows: LBD, 38 of 43; AD, 34 of 44; IPD, 41 of 43. Conclusion: According to our findings, being in accordance to the world-wide references, 99mTc-HMPAO SPECT cannot be patho-gnomonic, used as a screening method for the differential diagnosis of the mentioned three diseases. However, it serves as a valuable radio-molecular procedure which confirms the MMSE and useful in discriminating in vivo the characteristic frontal hypo-perfusion of LBD from the parieto-temporal one, revealed in the AD group, excluding somehow the normal flow observed in PD.

P0417

PET-FDG/EEG co-registration on the study of patients with refractory epilepsy and surgical candidates

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AIM: To evaluate the feasibility and utility of brain FDG-PET and EEG co-registration for the interpretation of metabolic changes, considering the cerebral bioelectrical activity at the time of scanning. MATERIAL AND METHODS: Eight patients (3 women and 5 men), 6 pediatric (1-14 y.o.) and 2 adult (24 and 46 y.o.). All of them with refractory epileptic drug treatment, lack of voluntary cooperation, subtly recognizable crisis by caregivers and/or high frequency. PET brain scan has been done on a Siemens Biograph 16 device, acquiring images 30 minutes after administration of F-18-FDG in sensory and motor resting conditions. Electroencephalographic study was obtained simultaneously using subdermal needle electrodes according to international 10-20 system and registry in two steps: 1) during the uptake of tracer and 2) at the image acquisition in PET scanner. RESULTS: We found metabolic abnormalities in all patients: 5 with hypometabolic areas, in 2 coexisting hyper-and hypometabolic regions and one with hypermetabolic findings. From the EEG records 4 had graphoelements suggesting intercritical activity and other 4 with epileptiform critical activity during the scanning. Confronting both explorations the EEG changed the interpretation of findings in five patients: one of them showing a doubtful hypometabolic area and after co-registration we observed a hypermetabolic focus initially undetected. In two patients coexisting both hyper-and hypometabolics areas, there was only considerable significance in the second one by not registering critical activity. In the last two cases, although it was evident metabolics decreased areas were not significant because of the existence of multiple seizure activity during the scan. In the other cases: two patients with intercritical activity coincided with hypometabolic results exclusively and one patient with ictal activity was consistent with hypermetabolic findings. CONCLUSIONS: In our experience, in selected patients the simultaneous co-registration FDG-PET and EEG may facilitate the interpretation of metabolic changes on PET-FDG, helping to distinguish between hypermetabolic areas on ictal phases and hypometabolic zones on interictal phases.

P0418

Efficacy of Template Therapy in Patients with Concurrent Temporomandibular Disorder and Headache; Cerebellar Pyramis as a Major Key Region of Improved Perfusion using SPM Analysis

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This study prospectively analyzed the brain perfusion SPECT in patients with concurrent symptoms of temporomadibular disorder (TMD) and headaches. Among the patients with TMD who visited our dental clinics in 2008, some of them had headaches with no response to medication. They were all examined by neurologic specialists (one neurosurgeon, one neurologist) to exclude headaches caused by specific disorders (stroke, vascular headache, migraine, etc.). Nine patients were classified into non-specific type of headaches and underwent brain perfusion SPECT using Tc-99m ECD. We analyzed the range of mouth opening, pain or noise on TM joint, and postural change. A template in oral cavity was applied for preventing locking TM joint, promoting mobilization, relaxing muscular tension in each patient for at least 10 hrs per day. Seven patients were followed with brain perfusion SPECT. The TMD symptoms were improved and headache was clearly removed in 6 responders to whom template therapy applied for at least 3 months. Voxel by voxel analysis using SPM and paired t-test were used on significance of the uncorrected $p<0.01$, $k\geq50$ voxels to identify significantly increased region of cerebral blood flow (rCBF) in 6 responders after the template therapy kept for at least 3 months. The increased rCBF was observed in both cerebellar pyramis, tonsil, precuneus, posterior cingulate gyrus in responder group. These results suggest that cerebellar pyramis and tonsil were the key regions associated with perfusion and headache in patients with TMD. This report first proved treatment efficiency of the template therapy in patients with TMD and headache using brain perfusion SPECT and SPM analysis. This template therapy is a useful treatment modality for the patients with TMD and headache.

P0419

Relationalship between 18F-FDG PET/CT Hypometabolism and Epileptogenic Zone defined by intracranial EEG

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The correlations between abnormalities on PET/CT-investigation and the epileptogenic zone in patients with focal refractory epilepsy is not always clear. The aim of our study was to compare the zone of hypometabolism determined by ^{18}F-FDG-PET/CT with the epileptogenic zone detected by intracranial EEG monitoring. We have studied 2 patients who had underwent ^{18}F- FDG PET/CT scan / with injected activity of 200 MBq /, chronic intracranial EEG monitoring and subsequent cortical resection for intractable epilepsy. PET-defined areas of hypometabolism, coregistered with the MRI and transferred on the brain surface. The epileptogenic zone was proved using 72 intracranial electrodes (56 subdural and16 depth electrodes) in patient 1 and 52 subdural electrodes in patient 2. The hypometabolitic zones and the epileptogenic zones were then compared. We have found in patient 1 two hypometabolitic zones (left temporomesial and left temporo-parietooccipital) which were larger but included the ictal onset zone. Patient 2 demonstrated a hypometabolitic zone in the supplementary motor area (SMA) on the right hemisphere. In this patient, the epileptogenic zone defined by invasive EEG was in the posterior part of the SMA but also the anterior part of the paracentral lobule. Thus, we found partial overlapping between the PET/CT hypometabolism and the epileptogenic zone in patient 2. We conclude, that PET FDG is a very useful tool for initial information in patients with drug-resistant epilepsy. There are close relationships between the areas of hypometabolism and the ictal onset zone. However, chronic invasive EEG remains mandatory for the precise location of the epileptogenic zone before performing cortical resections.

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Neurosciences: Data Analysis & Quantification

P0420

Assessment of the accuracy of 3D-PET/CT for the quantitative brain study

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Positron emission tomography has a great reputation in accurate quantification of cerebral blood flow, metabolism and neurotransmission. Recently, neurology PET has become an issue of our interest again. However, commercially available PET at present are 3D-PET/CT scanners, designed mainly for oncology PET. Most of them have no capability of conventional 2D data acquisition. In this paper, we assessed the accuracy of 3D-PET/CT by several phantom experiments, considering the usage for quantitative brain study. 1. Effect of direct photons from radioactivity outside FOV: Radioactivity outside FOV may deteriorate the image quality, particularly in 3D PET without interplane septa. For assessment of the effect of external activity, phantom studies using both LSO-PET and BGO-PET were performed. We put a radioactive source outside FOV, and compared with standard scan without external activity. In LSO-PET, slightly (3%) elevated events were measured with 185MBq of F-18 as an external source at 30cm apart. On the other hand, BGO-PET showed 19% elevation with only 44MBq. Such a huge error in 3D-BGO-PET is not acceptable for the quantitative brain scans. 2. Effect of the density of organ: We performed a phantom study with high density objects. A phantom with 6 inserts containing contrast media of different density and same radioactivity was scanned. With the increase of density, measured events increased. In clinical PET studies, overestimation may occur in the region with high attenuation. 3. Effect of attenuation by skull: We put attenuation material around the phantom to simulate skull. We scanned the phantom with or without attenuator. Ideally measured events should be identical, whereas the mean counts of the phantom was higher by 6 % with attenuator than without it. 4. Effect of the number of mAs: We tested three different mAs of CT; 220, 100 and 40 mAs. Three dimensional brain phantom was used, and no significant difference was found among three conditions. Lowest, 40 mAs, is recommended if the brain CT is used only for the attenuation correction and registration. Discussion: 3D-PET/CT may not be an ideal system for the quantitative brain study. We should be careful for above problematic issues, and required an effort to improve accuracy. The effect of external activity might be reduced by some protective devices or by change of scan protocols. Problems of tissue density and skull might be improved by more careful calibration.

P0421

Impact of 3D ROI analysis in FET-PET/CTs for the assessment of the course of patients with gliomas

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Aim: The aim of our study was to assess the impact and benefit of the new analytic method of automatic 3D ROI calculation based on iso-SUV and to figure out the limitations of this method by comparing 3D FET-PET/CT findings with visually analysed FET-PET/CTs and MRI. Materials and methods: We retrospectively analysed FET-PET/CTs of 14 glioma patients (10 male / 4 female) with a mean age of 47 years (range: 35 to 64 years). Due to technical limits 10 patients were feasible for quantitative analysis (7 male / 3 female). The histological subtypes were: glioblastoma (n=2), astrocytoma (n=3), anaplastic astrocytoma (n=1), oligoastrocytoma (n=1), anaplastic oligoastrocytoma (n=1), oligodendroglioma (n=1) and anaplastic oligodendroglioma (n=1). All of these patients had at least two FET-PET/CTs in the course of their disease process. Patients with surgery between the two FET-PET/CTs were excluded from the study. The mean interval between the two examinations was 8 months (range from 1.5 to 35 months). These 10 patients had 22 observation periods (OPD - time between two FET-PET/CTs) (range from 1 to 4). In 11 OPDs (50%) the patients had a wait and see strategy, while in 11 OPDs (50%) the patients had conservative therapy including radiation (3 patients), chemotherapy (6 patients), radiochemotherapy (1 patient) and alternative therapy (1 patient). Results: In 13 observation periods (59%) 3D ROI analysis was concordant to visual FET-PET analysis and MRI. In 1 OPD 3D ROI analysis supported MRI and detected regression earlier. In 2 OPDs progression was detected earlier than in visually analysed PET and MR, in 4 OPDs visual PET interpretation was backed against MRI (PET showed 2 regressions, 1 progression and 1 stable disease). In 1 OPD the visual interpretation of PET and MRI showed a slight progress but 3D ROI analysis revealed a doubling of the gross tumour volume and in 1 OPD 3D analysis showed a 50% tumour growth in contrast to visual PET and MRI describing the tumour as being stable. Several limitations occurred including technical limitations (SUV calculation in prior FET-PET/CTs is not feasible), influence of neighbouring structures (a manual delineation is not available at the moment) and different SUV values in the two PETs necessary for the inclusion of the whole tumour. Conclusion: We summarize, that 3D PET/CT analysis can add valuable supplementary information to the monitoring and thereby the management of conservative treated patients with gliomas if some methodological limitations are taken into account.

P0422

Feasibility of an automatic ^{99m}Tc-ECD non-invasive quantitative measurement method for evaluation of regional cerebrovascular reactivity

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Evaluation of the regional cerebrovascular reactivity (rCVR) to a cerebral vasodilatory stimulus after acetazolamide (ACZ) loading is important in the investigation of patients with ischemic cerebrovascular disease. Qualitative measurement of regional cerebral blood flow (rCBF) using SPECT has been widely used for assessing rCVR. The improved brain uptake ratio (IBUR) method for the ^{99m}Tc-ECD SPECT, an automatic non-invasive quantitative measurement method of rCBF, was developed by reconstructing the theory, determination process of the input function and regression equation based on measurement of the rCBF by $H_2{}^{15}O$ PET. A good correlation was obtained while the subjects were in the resting state. However, the feasibility of the IBUR method in the high flow range after ACZ loading is not clarified. The purpose of this study is to confirm the feasibility of use of the IBUR method for determinations in the high flow range after ACZ loading. The rCVR values were obtained by the IBUR using an equal-volume-split dual-injection single-day protocol (resting and vascular reserve (RVR) method (IBUR-RVR method) in 9 patients. The rCVR values were compared with those by the ^{123}I-IMP-autoradiography (ARG) using split dose method of microsphere model (IMP-ARG-Split method). All SPECT images were analyzed using a 3-dimensional stereotaxic ROI template (3DSRT) on anatomically standardized CBF SPECT images to objectively estimate the rCBF. The 3DSRT was composed of 636 ROIs in 24 segments. The 12 segments located in brain surface were selected in this study. The rCBF values were defined as mean values of each segment. rCVR to ACZ was calculated as follows: rCVR(%)= ((ACZ rCBF - resting rCBF)/ resting rCBF)×100. Both ^{99m}Tc-ECD SPECT and ^{123}I-IMP SPECT were performed within one month. Each patient's condition did not change in this period. The rCVR values obtained by the IBUR-RVR method increased linearly as those obtained by the IMP-ARG-Split

method increased. Values obtained by the IBUR-RVR method were approximately 38% lower than those obtained by the IMP-ARG-Split method. A good correlation was observed between the rCVR values obtained by the IBUR-RVR method and those obtained by the IMP-ARG-Split method (r=0.77, p<0.0001). This finding indicates the potential clinical usefulness of the IBUR-RVR method for evaluation of rCVR. Therefore, the IBUR method is useful for study in the high flow range after ACZ loading.

P0423

Use of statistical parametric mapping in objective quantification of SPECT-I-123-ioflupane in parkinsonism

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AIM: Statistical Parametrical Mapping (SPM) has been proposed as objective tool to assess multimodality of neuroimaging. The aim of this work is to explore the utility of SPM procedures for quantification of brain SPECT with I-123-Ioflupane in the diagnosis of parkinsonism (SPECT-IOF). SUBJECTS AND METHODS: This pilot study includes the retrospective analysis of 46 patients studied under clinically uncertain parkinsonian syndromes (PS), 24 men (mean age:74,4y.[43-85]) and 22 women (mean age:73,2y.[36-90]); and an optimized control group composed by 16 voluntary subjects 7 men (mean age:76,7y.[55-83]) and 9 women (mean age:60,7y.[52-93]). According clinical final diagnosis after follow-up (>12 m) patients were classified as: 1) Controls (n=16); 2) Parkinson Disease (PD) (n=25); 3) No PD-Normal: essential tremor, pharmacology parkinsonism (n=15); and 4) No PD-No Normal: Parkinson Plus Syndromes (n=6). Protocol: Clinical History to avoid drugs influence; thyroid blockade (Lugol short protocol); single intravenous injection of I-123-Ioflupane (111-185 MBq). Image acquisition 3h after injection using triple head Picker 3000, ultra-high resolution neurofan; radius: [12.9-13.2 cm]; step&shot mode: 3º, 45 sec/step, 15-20 kcts/step, 128x128 matrix. Pre-filtered (Metz filter 75%max) data were reconstructed by Iterative OS ML-EM (4it.) and corrected for attenuation by Chang method (att. coef: 0.11cm-1). Final images are exposed according transoblique OM reformatted in the 3 standardized planes. Analysis: Previously all the images were normalized to a SPECT-template constructed from control group and after this template was transformed to Talairach Space (avoiding normalization for all the other images). The voxels-of-interest (VOIs) were defined using anatomical references: whole Striatum and anterior, medial and posterior striatum (for each hemisphere), and two reference areas: midbrain and occipital region. Uptake ratios of VOIs were calculated in order to see two main effects: a) difference between complete Striatum/reference areas; and b) gradient of activation inside the striatum, comparing each part to the complete Striatum, and also the different parts with each other. RESULTS: The quantification shows that the PD group has the lower ratio of activation between Striatum and Midbrain, and also between Striatum and Occipital region than the other three groups. All groups show a relevant decrease of uptake between Head and Body, and Body and Tail for both Striatum, higher in PD. Finally, Control group has the higher ratio between head and tail of the Striatum for both hemispheres. DISCUSSION: In our opinion SPM provide an objective procedure to evaluate quantitatively SPCT-IOF scans assessing diagnosis in parkinsonism patients.

P0424

I-123-Ioflupane brain SPECT imaging analysis for computer aided parkinsonian syndromes diagnosis

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AIM: In order to decrease the interobserver variability in SPECT imaging, several semiautomatic analysis procedures have been proposed in the context of computer-aided diagnosis systems. The aim of this work is to evaluate the use of the Partial Least Squares (PLS) or Principal Component Analysis (PCA) in the diagnosis of parkinsonism using SPECT with I-123-Ioflupane. **SUBJECTS AND METHODS:** This pilot study includes the retrospective analysis of 46 patients studied under clinically uncertain parkinsonian syndromes (PS), 24 men (mean age: 74,4 y. [43-85]) and 22 women (mean age: 73,2 y. [36-90]); and an optimized control group composed by 16 voluntary subjects: 7 men (mean age: 76,7 y. [55-83]) and 9 women (mean age: 60,7 y. [52-93]). Protocol: Clinical History to avoid drugs influence; thyroid blockade (Lugol short protocol); single intravenous injection of I-123-Ioflupane (111-185 MBq). Image acquisition 3h after injection using triple head Picker 3000, ultra-high resolution neurofan; radius: [12.9-13.2 cm]; step&shot mode: 3º, 45 sec/step, 15-20 kcts/step, 128x128 matrix. Pre-filtered (Metz filter 75%max) data were reconstructed by Iterative OS ML-EM (4it.) and corrected for attenuation by Chang method (att. coef: 0.11cm-1). Final images were exposed according transoblique OM reformatted in the 3 standardized planes. Analysis: PLS or PCA as feature extraction methods provide a framework in which brain images are projected into a low dimensional feature space, i.e. $\Re K$, where K<<number of scan voxels, but retaining the relevant information of them in terms of statistical measures. According to clinical final diagnosis after follow-up (>12 m) patients were classified as: 1) Controls (n=16); 2) Parkinson Disease (PD)(n=25); 3) No PD-Normal: essential tremor, pharmacology parkinsonism (n=15); and 4) No PD-No Normal: Parkinson Plus Syndromes (n=6). **RESULTS and COMMENTS:** Control and PD subjects are represented in separable subspaces, C and P $\subset \Re K$, respectively, where $N \cap P \neq \varnothing$, which define "membership". A subset of unknown subjects could also be represented in $\Re K$ by projecting their brain scans into the space spanned by the first two PLS components, i.e. k=1,2.The benefits of PLS are clear since the unknown scans with rare PD patterns (group 4) and represented by vectors xi $\subset \Re K$, are mostly classified as PD (group 2), that is xi $\subset P \subset \Re K$. In addition, subjects from group 3 are projected into the N subspace (group 1). Finally, a ROC analysis using the proposed method reveals an AUC of 99,2 outperforming previous approaches (AUC=91,4) [Towey et. al 2011].

P0425

Whole Brain Based Functional Network Analyzing by 18F-FDG PET Imaging

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Objectives: To establish the methodology of whole brain based functional network analyzing using 18F-FDG PET imaging, and to evaluate the cost/efficiency properties of this functional network in different ages. Methods: 195 healthy volunteers (30-59 years, n=195) divided into 3 groups by age were performed FDG-PET scans. Imaging data was analyzed by using the statistical parametric mapping 5 (SPM 5) software. The functional connectivity between 90 cortical and sub-cortical regions was estimated by correlation analysis. Results: Small-world behavior properties were observed in all 3 groups. The global efficiency of the whole brain based functional network was greater than the lattice but less than the random graph, and the local efficiency was greater than the random but less than the lattice. The cost efficiency of the networks typically had a maximum positive value when the cost was 0.26. Conclusions: Whole brain based functional network showed small-world properties in 18F-FDG PET imaging. It is feasible to study brain function by glucose metabolism using FDG PET.

P0426

Comparison between methods used for evaluation of brain perfusion 99mTc-ECD SPECT

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Aim was to compare 4 methods of brain perfusion SPECT evaluation: conventional visual analysis, regions of interest (ROIs), voxel based calculation of interhemispheric asymmetry index (AI) and voxel based calculation of deviation from norm. **Materials and methods** Brain perfusion SPECT with 99mTc-ECD and morphological studies (computed tomography or magnetic resonance imaging) were performed in 71 patients 12-78 years old with the diagnosis: vascular lesions (n=50), hydrocephalus (n=3), transient ischemic attacks (n=12), epilepsy (n=6). SPECT evaluation included 4 methods (M1-M4). In visual side-by-side assessment (M1), perfusion defects were divided into small, medium and large. M2-M4 were performed with Brain SPECT Quantification software (Compart, Poland). In 18 ROIs (M2) drawn over the transverse slices, interhemispheric asymmetry greater than 10% was considered abnormal. M3 and M4 were carried out by the software, in which individual SPECT is automatically matched with the template and voxel-based analysis is performed. In M3 AI was calculated using the formula (A-B)/[(A+B)/2]}x100, where A and B represent counts in the symmetrical voxels. In M4 the patient studies were compared with the normal database. A Zscore was computed for each voxel. These steps were followed by cluster analysis The cut-off values of abnormal perfusion were set as: AI higher than 10%, Zscore higher than 2 in a cluster volume greater than 10 ml. **Results.** The total of 210 perfusion defects were found: 103 (49.0%) in M1, 95 (45.2%) in M2, 179 (85.2%) in M3, 89 (42.4%) in M4. Only 48 (22.9%) defects were visualized in all 4 methods, including all medium (n=14) and large (n=12) lesions, yet only 22 out of 77 (28.5%) small abnormalities. As many as 82 defects were seen in only one method (most. of them in M3- 56). Out of 210 defects, 53 (25.2%) were seen in morphological studies. Three lesions were detected in morphological but not scintigraphic examinations. The chi-squared test revealed statistically significant association between morphological study results and.M1, M2 , M4, but not M3. **Conclusion** The comparison of presented methods revealed full concordance only in medium and large perfusion defects. Lack of the golden standard makes it impossible to verify the sensitivity and specificity of the interhemispheric asymmetry in vovel based analysis, which visualized the most numerous perfusion abnormalities.

P0427

Differences in brain glucose metabolism in bipolar II disorder and borderline personality disorder

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Aim: The relationship between bipolar II disorder (BIP-II) and borderline personality disorder (BPD) has been debated. Some believe they both represent variations of bipolar disorder, others consider them as two different categories. No study has compared these disorders on a neurobiological level. Most studies of BIP-II have showed a decrease in glucose metabolism in the dorsolateral prefrontal cortex and an increase in the anterior part of gyrus cinguli. Studies of BPD have shown decreased metabolism in medial prefrontal regions. The aim of this work was to compare the glucose metabolism in BIP-II and BPD using 18FDG-PET/CT. This work is a part of a bigger project about the actual patients groups. **Materials and methods:** 22 patients (mean age 35,4 years, 77,3% females) with BIP-II and 22 (mean age 29,2 years, 86,4% females) with BPD were included. All patients were euthymic to moderately depressed. Clinical psychiatric assessment included diagnostic evaluation using the MINI neuropsychiatric interview and the SCID-II interview and was carried out within 2 days of the PET-scan. PET/CT was performed according to standard procedure for PET-brain study with a dose of 200MBq 18F-FDG using a Siemens 64 Biograph PET/CT. Statistical analysis was performed with SPM8 (**Wellcome Department of Cognitive Neurology, Institute of Neurology, London, UK), after spatial normalization to a MRI template. All images were smoothed with a 8 mm FWHM Gaussian kernel before group analysis was conducted (2-sample t-test,** BIP-II vs. BPD). Statistical inference was tested both with (p=0.05) and without (p=0.001) "Family wise error (FWE)" correction for multiple comparisons. Only significant clusters larger than 50 voxels were taken into consideration. **Results:** The group analysis (BIP-II vs. BPD) revealed regions of statistical significant (p_{uncor}<0.001) higher metabolism bilaterally in cerebellum, left gyrus inferior temporalis and right gyrus postcentralis for the BIP-II compared to the BPD pasients. In addition, higher metabolism was also observed in the BDP group bilaterally in the pedunculus cerebellaris. No significant results were found after FWE correction. **Conclusion**: Our results indicate that BIP-II and BPD patients have differences in resting state glucose metabolism. The finding supports the notion that the disorders have different biological underpinnings and represent separate diagnostic categories. Further work will be to compare these two patient groups with healthy control subjects.

P47-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Neurosciences: Movement Disorders

P0428

Impact of 18F-DOPA qualitative brain PET/CT on clinical management of patients affected by movement disorders: initial experiences

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Objective: ^{18}F-deoxiphenilalanine (DOPA), as a radiolabelled amino acid precursor of dopamin, can be used to evaluate striatal activity. We present our preliminary data on the clinical impact of ^{18}F-DOPA qualitative brain PET/CT in differential diagnosis of movement disorders. **Methods:** Twenty-eight patients (13 females and 15 males, age 74,9±7,1 range 60-88 years), who underwent ^{18}F-DOPA PET/CT over a time period of twelve months (February 2011-Febbruary 2012), were reviewed. On the first clinical evaluation, diagnosis was suggested to be essential tremor in 6 patients, Lewy body dementia in 2 patients, Parkinson disease in 19 patients and vascular origin Parkinsonism in 1 patient. PET/CT scans were interpreted by an experienced nuclear medicine physician based on visual analysis. Patients underwent one or more clinical controls following PET/CT imaging and diagnosis and modifications of the therapeutic approach were evaluated in all cases. **Results and Conclusions:** In 13 patients (46%) the striatal activity was normal, while the uptake of ^{18}F-DOPA was reduced in 15 cases (54%). In 18/28 patients (64%) the initial clinical diagnosis was confirmed by PET/CT. In 9/28 patients (32%) the diagnosis was modified after PET/CT results; 8 patients had normal striatal uptake and Parkinsonism was excluded in 5 of 8 cases, while in 2 of 8 patients the diagnosis was driven versus iatrogenic Parkinsonism and in one of eight subjects versus myoclonic tremor; in one patient the pathological results of the PET/CT excluded essential tremor diagnosis and suggested a Parkinsonism. In one case there was a disagreement between clinical evaluation and PET/CT results. In 12 cases (43%), on the control after PET/CT, there was a change in therapy management. Our initial experiences confirm brain qualitative PET/CT with ^{18}F-DOPA as a useful diagnostic tool in management of patients with movement disorders, both for diagnosis definition and for therapeutical decision. Quantitative approach is under evaluation and will be assessed as a possible tool to increase accuracy of the test.

P0429

Metabolic brain networks in the Chinese patients with Parkinson's disease based on 18F-FDG PET imaging

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Objective To validate Parkinson's disease-related pattern (PDRP) network as a measure of PD in Chinese population by functional imaging. Methods 32 PD patients with different severities and 32 healthy controls matched by age and sex were recruited to perform resting-state brain 18F-FDG PET imaging. Principal component analysis (PCA) was used to get the PDRP. The correlations between PDRP expressions and the severities of PD were investigated. Paired t test and Pearson correlation coefficient were used for statistical analysis. Results PDRP was characterized by relative metabolic increases in the putamen, globus pallidus (GP), thalamus, pons, cerebellum and primary motor cortex, and was associated with decreases in the premotor and posterior parietal areas. PDRP expression in PD group (1.605±0.655) was significantly different from that of healthy controls (0.000±0.523;t=10.829,P=0.000). PDRP expression correlated significantly with Unified Parkinson's Disease Rating Scale (UPDRS) motor scores (r=0.760,P=0.000) and Hoehn and Yahr stages in PD group (r=0.736,P=0.000). Conclusion PDRP based on 18F-FDG PET imaging can differentiate PD patients from healthy controls in Chinese and correlates with the severities of the disease.

P0431

Influence of dopaminergic striatal innervation on upper limb locomotor synergies

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AIM: A reduced arm swing while walking is a clinical hallmark of Parkinson disease (PD) suggesting the involvement of the basal ganglia in the control of locomotor automatism. The aim of this study is to investigate a putative role of dopamine and the striatum in locomotor upper limb automatism. METHODS: We tested 13 consecutive subjects with idiopathic PD (six males; mean age: 64 years; disease duration mean: 5 years) and a control group (HC) of 10 neurologically intact adults (seven males; mean age: 64 years). Kinematics of body segments were measured during walking, using an optoelectronic system, which computed the 3D coordinates of spherical markers attached on bony fixed landmarks. We calculated the range of motion (ROM) of absolute arm angle and arm swing asymmetry (ASA). The PD subjects and age-matched healthy subjects underwent I123-FP-CIT SPECT. Caudate and putamen binding uptake of both PD patients and healthy subjects were calculated using VOI analysis of Basal Ganglia Matching Tool software. FP-CIT striatal uptake values were used also to calculate an asymmetry index (AI). RESULTS: All patients showed a reduction of gait-associated arms movements. In comparison to HC, patients showed reduced DAT binding values in the putamen (PD, median: 2.3; HC, median: 4.9) and caudate nucleus (PD, median: 4.1; HC, median: 5.1), thus further confirming the clinical diagnosis of PD. Average AI value for the putamen of PD patients was 30; all HC had a putamen AI score below 5 (putamen AI score average 2.1). All PD subjects showed reduced ROM at one arm and four bilaterally (ROM<18°). In PD patients, oscillations of the most affected were significantly reduced compared to the contralateral side and to HC (p<0.01). Average ASA value was 29 for PD and 6 for HC. No statistical difference was described when comparing right and left arm ROM in HC. Arm range of motion while walking did not correlate with the contralateral striatal dopaminergic innervation. ASA and AI indices of both the caudate nucleus (p<0.005) and the putamen (p<0.001) were strongly correlated. This correlation proved to be statistically significant also when weighted for UPDRSrb and UPDRS-III scores. CONCLUSION: This study showed that the imbalance of dopaminergic striatal tone between the two hemispheres was predictive of the asymmetry of bilateral arm swing. These results suggest an active role of dopaminergic striatal innervation on the coordination of inter-arm locomotor synergies, rather than arm ROM amplitude per se.

P0432

Value of myocardial 131 I-meta-iodobenzylguanidine (MIBG) scintigraphy in the differential diagnosis of Parkinson's disease, multiple system atrophy and pure autonomic failure

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The aim: Parkinson's disease (PD), multiple system atrophy (MSA) and pure autonomic failure (PAF) are three neurodegenerative diseases causing primary autonomic failure. The differential diagnosis, particularly in the early stages, may be difficult and, because of that, aim of our investigation is to evaluate how myocardial 131 I-metaiodobenzylguanidin (MIBG) scintigraphy may assist in the establishing of final diagnosis and characterization of akinetic rigid syndromes, especially PD. Materials and methods: Eighteen patients clinically diagnosed to have idiopathic PD (IPD), four patients with suspected MSA, one patient with PAF, and fourteen patients with extrapyramidal symptoms (EPS) (totaling group of 37 patients) underwent MIBG scintigraphy. Planar chest MIBG imaging was performed 15 min, 2, 3, 4 and 24 hours after tracer injection. Myocardial MIBG activity was quantified by means of a heart to mediastinum ratio (H/M ratio). Ratio over 1.8 was considered normal, between 1.31 -1.79 decreased, and less than 1.3 severely decreased. None of the patients in this study had clinical findings that suggested heart disease. Also, any drugs with known effect on the uptake of MIBG had not been administered to our patients. Results showed that H/M ratio from early and delayed MIBG scintigraphy was pathologically decreased (<1.3) in fourteen patients diagnosed as IPD and in six patients with extrapyramidal symptoms. One patient with IPD and one with EST have decreased H/M ratio (1.3-1.79). Three patients initially diagnosed as IPD had normal H/M ratios, as seven patients with EPS. In total, we confirmed initially established clinical diagnose of IPD in 14 of 18 patients and changed final diagnosis from EPS to PD in 7 of 14 patients. All patients with MSA and one suspected to have PAF had normal H/M ratios. Conclusions: According to our findings, it can be concluded that cardiac dysautonomia is common in IPD, but not in MSA, confirming that myocardial MIBG imaging can be powerful, yet very simple and affordable method in differential diagnosis of PD, MSA and PAF, thus greatly assisting in diagnosing impaired adrenergic activity present in PD. Also, myocardial MIBG imaging can be of great help in establishing final diagnosis in patients with EPS, especially when DaTSCAN is not available. Additional studies with longitudinal follow-up are needed to clarify those findings and evaluate effects and results of myocardial MIBG imaging as essential parameters of prognostic value in routine clinical practice in patients with those diseases.

P48-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Basic Science: Preclinical Imaging

P0433

Design and Development of a High Resolution Small Animal Imaging System for Mice and Rat

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Small animal imaging is an emerging filed which has an impact on various biomedical research areas such as neurology, oncology, cardiology and immunology and infection biology. It is well known that the pharmaceutical industries and research centers profit from SPECT system as they accelerate drug and biomarker development by yielding more reliable in vivo results and cost effective study design. We have designed and constructed a dual head high resolution small animal SPECT system (HiReSPECT^{TM}) based on pixelated and high resolution detectors. Each detector comprises a pixilated CsI(Na) crystal array with detector pitch of 1.2 mm, two 52 mm square position-sensitive photomultiplier tubes (Hamamatsu H8500) and a ultra high resolution parallel-hole collimator. HiReSPECT uses high performance and reliable dual head configuration that can be upgrade to four heads configuration with the possibility of head rotation for imaging of bigger animals such as rat and rabbits. The raw projections data are registered in 40 × 80 matrix, determined by the number of the crystal elements. In this study, phantom experiments were performed to characterize the planar and tomographic performance of the scanner. Beside phantom experiments, whole-body animal scan was conducted to evaluate the quality of in vivo images of small animals. The planar resolution measured with 1.1 mm capillary rods filled with Tc99 placed at the surface of the collimator was 1.6±0.1 mm FWHM. An in-house phantom including 1.6 mm to 2.6 mm hot rods (similar to Micro Deluxe) was built for evaluation of tomographic resolution. A dedicated iterative image reconstruction with the capability of resolution recovery was developed for 3D image reconstruction. In the reconstructed image of the phantom with applied resolution recovery, the 1.8 mm hot rods were distinguishable, that defines the SPECT resolution of the system 1.8±0.1 mm at minimum radius of rotation. The whole-body mice studies were done by injection of Tc99 (MDP) for skeletal scan and Tc99 (DMSA) for renal scintigraphy. The results of phantom experiments and also mice whole-body scans proved that the performance characteristics of the HiReSPECT are suitable for high resolution imaging of preclinical studies and small animal laboratories.

P0434

Use of Radioiodinated Peptide Arg-Arg-Leu Targeted to Neovascularization as well as Tumor Cells in Molecular Tumor Imaging

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Objective: The importance of angiogenesis in tumor growth and metastasis has led to research new imaging tracers to understand angiogenic vasculature. We aimed to explore a tumor peptide imaging agent Arginine-Arginine-Leucine (Tyr-Cys-Gly-Gly-Arg-Arg-Leu-Gly-Gly-Cys, tripeptide RRL [tRRL]) that targeted to tumor cells and tumor derived endothelial cells (TDECs) and primarily investigate the possible relationship between tRRL and vascular endothelial growth factor receptor 2 (VEGFR-2). **Methods:** The tRRL sequence motif was identified as a tumor molecular marker specifically binding to tumor derived endothelial cells. Tyrosine was conjugated to the amino terminal of RRL (Cys-Gly-Gly-Arg-Arg-Leu-Gly-Gly-Cys) for labeling with radionuclide iodine-131 (^{131}I-tRRL). *In vitro* experiments, we studied the uptake ability and molecular binding mechanism of tRRL to tumor cells and angiogenic endothelium using Flow Cytometry and Radioactivity counter. Then we investigated whether VEGFR-2 is the binging site of tRRL. Biodistribution and SPECT imaging of ^{131}I-tRRL was used to evaluate the effectiveness of this new imaging agent to visualize varied tumor xenografts in nude mice *in vivo*. **Results:** *In vitro* cellular uptake experiments revealed that tRRL could not only adhere to tumor angiogenic endothelial cells but also largely accumulate in malignant tumor cells. VEGFR-2 which is highly expressed on tumor derived endothelial cells was probably not the solely binding ligand for tRRL targeted to tumor angiogenic endothelium. ^{131}I-tRRL mainly accumulated in tumors *in vivo*, not other organs at 24 hr after injection. SPECT imaging with ^{131}I-tRRL clearly visualized tumors in nude mice, especially at 24 hr. **Conclusion:** Radioiodinated tRRL offers a noninvasive nuclear imaging method for functional molecular imaging of tumors targeted to neovascularization and also tumor cells, and may be a promising candidate for tumor radioimmunotherapeutic carrier. **Key words:** iodine-131; peptide Arg-Arg-Leu (tRRL); uptake ability; molecular tumor imaging

P0435

Comparison of 18F-FDG Micro-PET Response to Glucose Metabolism of Lymphoma in Mice with Two Different Levels of Immunity

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Objective: Our objective was to compare the changes of the (area under time-activity curve,AUC) and (standard uptake value, SUV) measurements in metabolic activity by ^{18}F-fluorodeoxyglucose (^{18}F-FDG) Micro-PET across two different types of immune deficient mice to provide a theoretical basis for PET/CT clinical applications. **Methods**: Twelve NOD/SCID mice with T, B, NK combined immune deficiency and twelve BALB/C nude mice without T-cell immunity were injected with A20 lymphoma cells. After the formation of the tumors, each group was injected with ^{18}F-FDG 8.32MBq~12.0MBq in 0.1ml of saline and underwent whole body dynamic and static scan by Philips Micro-PET (MOSAIC HP) to observe the effects of B cells and NK cells on the uptake of ^{18}F-FDG in lymphoma and to analyze the role of immune factors on the tumor uptake of ^{18}F-FDG. **Results**: AUCof NOD / SCID and BABL / C mice after 60 minof PET acquisition was 1,287.6 counts and 883.7 counts and the highest rate of change was 95% and 97% from 1 to 10 min, respectively. NOD/SCID mice's SUVmax is higher (18.45 3.31) compared with BALB/C nude mice (8.68 3.81) and there is a statistically significant difference (P <0.01). NOD/SCID mice's SUVmean is also higher (10.85 1.42) than that of the BALB/C nude mice (4.44 2. 66) witha statistically significant difference (P <0.01). **Conclusion**: This study demonstrates that large differences of AUC and SUV may exist in the two different types of lymphoma mice, confirming that these differences depend strongly on the difference of immunity. **Key words:** Area under time-activity curve (AUC), Standardized uptake value(SUV), Immune factor, Lymphoma, Micro-positron emission tomography (Micor-PET).

P0436

Study on Differential Uptake of 18F-FDG in Epithelial Tissue and Mesenchymal Tissue-Derived Malignant Tumor

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Objective: The aim of this study was to compare the difference of the glucose metabolism of tumor tissue from different origins, and how to resolve false positive and false negative problem to provide a theoretical basis for PET/CT applications. **Methods:** A total of twenty four BALB/c nude mice were randomly divided into four groups, and then were subcutaneously inoculated with 1×10^6/0.2ml of cervical cancer cells HeLa, bladder cancer EJ cells, melanoma cells B16, and lymphoma cells A20 respectively. Growth characteristics of each tumor were observed. After tumor formation, five or six animals were taken from each tumor group and scanned by PET to obtain glucose standardized uptake values. SUVmax and SUVmean were measured to assess glucose metabolism in tumor tissues. **Result**: The melanoma SUVmax and SUVmean is 21.06±6.08 and 8.14±3.38, respectively; lymphoma 10.56±4.02, 5.40±3.39; cervical cancer 6.18±0.23, 2.40±0.57; and bladder cancer 4.22±0.39, 2.60±0.43. According to one-way ANOVA test, the four groups were statistically different ($P<0.05$). Furthermore Student *t*-tests were conducted. The values of SUVmax between bladder cancer and cervical cancer and between melanoma and lymphoma were statistically different ($P<0.05$). The values of SUVmax between melanoma and lymphoma and between melanoma and cervical cancer were statistically different ($P<0.05$), while no significant difference between cervical cancer and lymphoma was observed. According to two Student *t*-tests of SUVmean, the values of SUVmean between melanoma and cervical cancer and between melanoma and bladder cancer were statistically different ($P<0.05$). The other groups were not statistically different. **Conclusion:** ^{18}F-fluorodeoxyglucose positron emission tomography (^{18}F-FDG-PET), which assesses glucose metabolism in tumor tissues, shows that mesenchymal tissue-derived malignant tumor has higher glucose metabolism than does Epithelial tissue-derived malignant tumor,which are different not only pathologically, but also functionally. **Key words:** Epithelial tissue-derived malignant tumor; Mesenchymal tissue-derived malignant tumor; 2-[^{18}F]fluoro-2-deoxy-D-glucose (^{18}F-FDG); Micro positron emission tomography (Micro-PET); Standardized uptake value (SUV)

P0437

The influence of crystal material and size on the performance of partial-rotating dual head small animal PET scanners: Quantitative evaluation using Monte Carlo modeling

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Small animal Positron Emission Tomography (PET) is becoming an essential modality for preclinical research and any developing on it, could be used in designing of new clinical systems. So, achieve to an optimum dimension in order to have high sensitivity and high resolution is the aim of most studies. Among different proposed designs of small animal PET scanners, in this study, dual-head coincidence with pixilated crystal is considered. In this evaluation it is tried to determine the effect of difference parameters and incorporating effect of them on the performance of the DHC small animal PET scanner. We took advantages of Monte Carlo Simulation GATE package in order to assess the influence of pixel dimension, crystal length and inter material space on system performance by modeling numerous pixel size, ranging between 0.5×0.5 to 3.0×3.0 mm by increment of 0.5 mm and inter material space (0.1, 0.2 and 0.3 mm) of Epoxy and two difference crystal length (10 and 15 mm) of crystal materials BGO, LSO, and GSO. For all measurements a point source with the activity 1 MBq was placed at the center of FOV. The simulation revealed that by increasing pixel size and crystal length in scintillator material of a pixellated array, sensitivity will be raised, despite spatial resolution will become worse by this increment and also registration of the events in the wrong place be less. Although photon registration in the wrong position be less by scale up the pixel dimension but increase crystal length significantly decreased mispositioned events. Evaluation of numerous parameters demonstrate to achieve proper dimension of crystal size, can be said, considering pixel size 2 mm, crystal thickness 10 mm could provide the best situation to get better system performance**.**

P49-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Basic Science: Tumour Biology, Animal Models, New & Innovative

P0438

Time dependent longitudinal effects of radiation-induced suppression of multidrug resistance and cell proliferation potency in a non-small lung cancer cell line

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Porpouse: To investigate the time-dependent effects of irradiation on multidrug resistance (MDR) and cell proliferation potency in non small cancer cells via in-vitro Tc-99m MIBI accumulation and cell multiplication rate (RR), respectively. Materials and Methods: A non-small-cell lung cancer cell strain (H1299), smears stained by Pgp and MRP immunocytochemistry, was cultured in flasks for 1, 2, 4, 7 and 14 days after irradiation (3, 6, 9, 12 Gy: I-group) and without irradiation (C-group). (1) The RR was calculated by Tripan blue stained cell counting. (2) A single-cell suspension in fresh medium (1.0 × 10^6 cells/ml) was prepared. We measured MIBI accumulation, via cell radioactivity, in a gamma well counter. Using the C-in/C-out ratio, we evaluated the time dependent longitudinal effects of radiation-induced suppression of MDR. (3) The correlation between MIBI accumulation and RR was evaluated. Results: (1) Cells of all groups continued to proliferate for 1 to 4 days, despite dose dependent RR inhibition. At 7 days after irradiation, 12Gy I-group RR was less than 1.0 (at 7 days, n=4, RR: average ±SD, C-group: 23.8±3.5, I-groups; 3 Gy: 15.6±1.9, 6 Gy: 10.4±3.0, 9 Gy: 3.0±0.7, 12 Gy: 0.9±0.4). (2) In the cells of both C-group and 3Gy I-group (low dose), no significant difference of MIBI accumulation was observed over time. A higher C-in/C-out ratio in the 9 and 12Gy I-groups (high dose) with a statistically significant difference (P<0.05) from the C-group was observed at 4 to 14 days after irradiation (4 days after, n=4, C-in/C-out ratio: average ±SE, I-groups; 3 Gy: 16±3.0, 6 Gy: 22±3.4, 9 Gy: 27±2.5, 12 Gy: 31±2.2; C-group: 13±1.6). In the 6Gy I-group (middle dose), a higher C-in/C-out ratio was observed at only 4 to 7 days after irradiation relative to the C-group. At 4 days, the dependence of MIBI accumulation on dose was observed in all I-groups. We note the tendencies of MIBI accumulation to increase and plateau in the high dose I-groups and to decrease in the low dose I-group over 4 to 14 days. (3) The correlation between MIBI accumulation and RR was statistically significant. Conclusion: High dose irradiation, of more than 9 Gy, decreased MDR in non-small lung cancers cells with the suppression continuing 4 to 14 days after irradiation. Middle dose irradiation, 6Gy, decreases MDR only 4 to 7 days after irradiation. Low dose irradiation does not decrease MDR. These results suggest a potential synergistic effect of concurrent chemoradiation in treatment.

P0439

Formulation of Resveratrol Encapsulated PEG-PLA Nanoparticles and Effects of Resveratrol on Lewis lung carcinoma Cell Survival and Glucose Metabolism

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Department of Nuclear Medicine, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea **Objective**: Resveratrol is a natural phenol that exhibits anti-cancer activities including calorie-restriction mimetic effects, but its therapeutic use is limited by poor aqueous solubility. This could be overcome by nanoparticle carriers that improve stability and allow controlled drug delivery. In this study, we prepared polymer nanoparticles loaded with resveratrol and investigated the effects on cancer cell survival and glucose metabolism. **Methods:** Resveratrol was loaded into PEG-PLA (M.W. 5000-5000) by the solvent evaporation method. Lewis lung carcinoma (LLC) cells were treated with graded concentrations of native or nanoparticle-loaded resveratrol. ^{18}F-FDG uptake was measured by 40 min incubation with 370 kBq, and cell survival was evaluated by sulforhodamine B assays and FACS analysis of apoptosis. Reactive oxygen species (ROS) was measured by fluorescent intensity measurements of 5-(and-6)-chloromethyl-2',7'-dichlorodihydro-fluorescein diacetate acetyl ester. Involvement of signaling pathways was evaluated with specific kinase inhibitors and western blots. **Results:** Resveratrol treatment suppressed 24 h LLC cell ^{18}F-FDG uptake in a dose-dependent manner, decreasing it to 57.4% ± 2.0% of untreated level with 50 μM. Time course experiments showed the effect on ^{18}F-FDG uptake to begin from 12 h of treatment. Proliferation assays showed resveratrol to significantly decrease surviving cell number to 20.9% ± 1.9% of controls by 48 h. Nanoparticle encapsulated resveratrol displayed similar potencies in suppressing ^{18}F-FDG uptake and cancer cell survival. The biologic effects of resveratrol were indicated to be mediated by down-regulation of HIF-1α levels via reduced ROS production, which was decreased 57.4% ± 3.7%. In addition, inhibition experiments indicated that the PI-3 kinase/AKT pathway to be involved in the process. **Conclusion:** Polymer

nanoparticle encapsulated and native forms of resveratrol exert similar suppressive effects on cancer cell survival and glucose metabolism. These anti-cancer effects appear to be mediated by down-regulation of HIF-1α expression through inhibition of ROS production in a manner that involves the PI-3 kinase/AKT pathway.

P0440

The potential of 99mTc-PEI-MP for diagnosis and 188Re-PEI-MP for therapy of bladder carcinoma

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Introduction: The water-soluble polymer PEI-MP (polyethyleneimine, functionalised with methylphosphonate groups) that might be labeled with 188Re and 99mTc presents a strong potential for metabolic radiotherapy and diagnosis, respectively. The aim of this study was to evaluate in vivo the potential of 188Re-PEI-MP as therapeutic agent for bladder carcinoma and 99mTc-PEI-MP for its diagnosis and follow up. Material and Methods: Cytotoxicity of PEI-MP was investigated in bladder carcinoma cell line (CRL-1472) using the MTT test for different concentrations of PEI-MP (1 µM to 1000 µM) and incubation times (24h, 48h, 72h and 96h). Radiochemical purity of 99mTc-PEI-MP and 188Re-PEI-MP was achieved using ascending microchromatography. For the in vivo studies six groups of Balb/c nu/nu mice were used: four normal groups injected with Na99mTcO4 (n=10), 99mTc-PEI-MP (n=10), Na188ReO4 (n=18) and 188Re-PEI-MP (n=17), respectively; two with bladder carcinoma xenotransplants injected with Na188ReO4 (n=8) and 188Re-PEI-MP (n=12), respectively. When the tumors reached the appropriate volume, radiopharmaceuticals were administered by an intravenous injection in the tail vein (22-37MBq), with the animal anesthetized and previously placed on the gamma camera detector. Immediately, a dynamic acquisition followed, with a 128x128 matrix for 10 min (20 frames, 30 seconds). Static images (2 min) were performed with a 256x256 matrix, where each of the six groups was divided into two groups, of which one was imaged at 120 minutes, and the other at 240 minutes. For biodistribution proposes, mice were euthanized 2 and 4 hours after injection and organ samples were weighted and counted in a well-counter to obtain percentage injected activity per gram of organ (%ID/g). Results and Discussion: The MTT assay showed that PEI-MP is not cytotoxic. The radiochemical purity of 188Re-PEI-MP and 99mTc-PEI-MP was 85%. Biodistribution results, with Na188ReO4 and Na99mTcO4, showed a higher≥ uptake by the thyroid, bladder and stomach, following a normal biodistribution. The biodistribution with 188Re-PEI-MP and 99mTc-PEI-MP showed that the excretion of these complexes occurs primarily through the renal system, with a small fraction being eliminated by the hepatobiliary system. Tumor/muscle ratio for 188Re-PEI-MP was greater than 1.5. Conclusions: Given its biodistribution and tumor/muscle ratio, 188Re-PEI-MP seems to be promising in the treatment of bladder cancer. Following the same biodistribution as 188Re-PEI-MP, 99mTc-PEI-MP seems to be optimal for diagnosis and follow up of therapy.

P0441

Monitoring of functional sodium iodide symporter effected by regulation of glycosylation

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Purpose: Sodium iodide symporter (NIS) is transmembrane protein that functions to uptake iodide in the thyroid cells. Loss of functional NIS renders some thyroid cancer patients unresponsive to radioiodine therapy. In this study, we investigated the effects on NIS glycosylation to change the amount and translocation to cell membrane of NIS using molecular imaging. **Methods:** HeLa cells were stably transfected with NIS-tdTomato fusion gene (HeLa/NIS-Tom) to monitor the expression of NIS by conjugated red fluorescence. HeLa/NIS-Tom cells were treated with Tunicamycin to inhibit NIS glycosylation and cyclic adenosine monophosphate (cAMP) to stimulate NIS glycosylation. The expression of NIS was evaluated by immunoblotting and immunofluorescent staining, and the membrane localization of NIS was examined by confocal microscopy. Functional activity of NIS in HeLa/NIS-Tom was estimated by radioiodine uptake. The expression and activity of NIS in xenograft models were estimated by fluorescent and Tc-99m scintigraphic imaging. **Results:** After the treatment with Tunicamycin in HeLa/NIS-Tom cells, the glycosylated NIS was 0.57-fold decreased and radioiodine uptake was also 0.29-fold decreased. After the treatment with cAMP in HeLa/NIS-Tom cells, the glycosylated NIS was 1.99-fold increased and radioiodine uptake was 4.12-fold increased. Using confocal microscopy, the expression of NIS localized to cell membrane was observed to be increased after cAMP treatment and to be decreased after Tunicamycin treatment. Additionally, xenograft mice models treated with cAMP showed 4.15-fold increase in fluorescent signals and increases of ^{99m}Tc uptake. Our results indicate that the expression amount and membrane translocation of NIS protein were related to NIS glycosylation. **Conclusion:** We could successfully monitor localization to membrane and change of functional NIS by regulation of NIS glycosylation. Therefore, the strategy to enhance functional NIS by the regulation of glycosylation could be applicable to thyroid cancer patients who show refractory response to the conventional radioiodine treatment.

P0442

Quantification of Boron-10 concentration in normal rats after 4-borono-2-18F-fluoro-phenylalanine injection using PET/MRI

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Objectives : In the boron neutron capture therapy (BNCT) for cancer treatment, boron-10 concentration in tumor and normal tissue is critical. Borono-phenylalanine is utilized to deliver boron-10 to tumors. In order to predict relative boron-10 concentration in tumor, 4-borono-2-18F-fluoro-phenylalanine (FBPA) PET has been employed (Imahori, et al., J Nucl Med, 1998). We aimed to quantify absolute boron-10 concentration in normal organs of rats by PET/MRI. Methods : FBPA solution (10.23±0.50MBq, 16.92±4.72GBq/mmol, radiochemical purity 98.8 %, molecular mass 226) was injected into 3 male SD rats (8-week-old, 257.7±3.5g) via the tail vein. Whole body scan using PET/MRI (Hitachi Metals / NEOMAX Company) was performed at 1 hour after injection. Radioactivities were measured in the brain, lung, heart, liver, pancreas, kidney, and intestines on PET images by referring to MRI images to get the best match with organ contour. To confirm the uptake of FBPA observed by PET/MRI, the rats were dissected after scanning. Radioactivities of organs were measured by a well-type counter. Results : There was a statistically significant correlation between the values by PET/MRI and well-type counter (r=0.91, p<0.01). The estimated concentration of FBPA using PET/MRI on brain, lung, heart, liver, pancreas, kidney, and intestines at 1 hour after injection of FBPA (0.564±0.176µg/g body weight) were 0.341±0.063, 0.356±0.008, 0.583±0.031, 0.659±0.076, 0.767±0.137, 2.339±0.350 and 0.320±0.039 %ID/g, respectively. The estimated concentration of boron-10 were 0.021±0.005, 0.018±0.004, 0.035±0.008, 0.040±0.012, 0.048±0.019, 0.145±0.055 and 0.019±0.003 ppm, respectively. Conclusions : The FBPA PET/MRI provided absolute boron-10 concentration in clinical organs of normal rats. The ratio of estimated accumulation of boron-10 to injected dose in normal rats was similar to the previous human intraoperative data (Imahori et al, Clin Cancer Res, 1998). This method can be extended to FBPA PET in candidate patients of BNCT.

P50-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Brain

P0443

Clinical use of 11C-methionine and 18F-FDG PET for germinoma in central nervous system

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Objective Central nervous system (CNS) germinoma is generally sensitive to radiotherapy and chemotherapy, and the 10-year survival rate is approximately 90%. If CNS germinoma is suspected, biopsy is recommended for diagnosis. But biopsy is occasionally omitted based on typical imaging and tumor marker. In these patients who have CNS germinoma localized in the areas which is difficult to perform biopsy, the non-invasive neuroimaging plays an important role for pre-therapeutic survey. The purpose of our study is to examine the usefulness of positron emission tomography (PET) with ^{11}C-methionine (MET) and ^{18}F-fluorodeoxyglucose (FDG) in the diagnosis of CNS germinoma. **Materials and Methods** We evaluated retrospectively 10 patients, who were diagnosed as CNS germinoma by histopathology and clinical course. PET scans with MET and FDG were performed before initiating therapy. We assessed the images qualitatively and quantitatively. In qualitative assessment, we used 3 and 5 steps visual scores for MET and FDG, respectively. In quantitative assessment, the maximal standardized uptake value (SUV max) in tumor and the ratio of SUVmax in tumor to

SUVmax in normal white matter or gray matter (T/N (WM), T/N (GM)) were calculated. We compared tracer uptake between CNS germinomas with and without β-HCG (human chorionic gonadotropin) elevation which was known related to prognosis. **Results** Seven patients harbored solitary tumor, and 3 multifocal lesions. Mean values and SDs of SUV max, T/N (WM), and T/N (GM), were 2.3±1.1, 2.5±1.3 and 1.7±0.9 in MET-PET, respectively, and 5.8±2.2, 1.6±0.5 and 1.8±2.7 in FDG-PET, respectively. In MET-PET, only one lesion was not detected visually and the other 9 lesions were well confirmed. In FDG-PET, the intensities of FDG-PET in all lesions were between those in normal white and gray matters. As an important finding, the uptake of brain parenchyma in the affected hemisphere apparently decreased in some cases. There was no significant difference in tracer uptake between CNS germinomas with and without β-HCG elevation. **CONCLUSION** In general, CNS germinoma could be detected by MET-PET and FDG-PET. We concluded that MET-PET enabled us to delineate the tumor areas **favorably, whereas** the interpretation of FDG-PET for CNS germinoma was complicated because of the diversity of uptake in brain parenchyma around tumor. Tracer uptake in CNS germinoma was not correlated with β-HCG elevation.

P0444

Incidental pituitary uptake on whole-body F-18 FDG PET/CT

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We aimed to investigate the clinical significance and incidence of FDG uptake in pituitary gland on F-18 FDG-PET/CT scan. For this purpose we investigated 716 patients who underwent whole-body F-18 FDG-PET/CT between December 2010 and March 2011 for the purpose of evaluation of various malignant diseases (4 patients) and diagnosis of suspected Alzheimer disease (1 patient). Among these patients five subjects (3 male, 2 female; age range, 28-67 y, mean 47.8) demonstrated increased accumulation of FDG in the pituitary gland. Correlative brain MRI of these patients were obtained. Brain MRI detected microadenomas in 3 patients and macroadenomas in 2 patients. SUVmax of the FDG uptake in these patients were between 10-25 (mean 17,4). In 4 of the patients the pituitary adenomas were nonfunctioning according to the the laboratuary findings but in 1 patient growth hormone and somatomedine levels were found to be high. The incidence of FDG uptake in pituitary gland is found as 0.7% in our study. Although the number of patients in this study group is not enough to obtain statistically significant results, there seems to be no correlation between PET-FDG results and hormone secreting activity in pituitary adenoma. The growth rate of tumor rather than the hormone production ability might have role in the increasing energy metabolism. The patients in this study group are still being followed up and the lesions in the pituitary gland are accepted as benign although histopathological evaluation couldn't be done. Although incidental pituitary uptake is not a common finding, but we must pay attention to the unusual 18F-FDG accumulation in pituitary gland since it might be helpful in identifying pathologic pituitary lesions that require further diagnostic evaluation.

P51-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Head & Neck

P0445

Prognostic value of FDG-PET/CT in patients with head and neck squamous cell carcinoma

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Purpose: Positron emission tomography (PET) / computed tomography (CT) with 18F-fluorodeoxyglucose (FDG) is widely used in patients with head and neck squamous cell carcinoma (HNSCC), but its prognostic value is controversial. The purpose of this study was to evaluate the prognostic value of FDG-PET/CT before initial treatment in HNSCC. Material and Methods: A retrospective review of pre-treatment FDG-PET/CT scans from August 2005 to December 2009 for 109 consecutive patients (M:F=94:15) with a histologically-proven oropharyngeal (n=28), hypopharyngeal (n=35), laryngeal (n=29) and oral squamous cell carcinoma (n=17), without any co-existing other malignancies was performed. On FDG-PET/CT images, region of interest was placed over a primary tumor, and maximal standardized uptake value (SUVmax) was calculated. Survival time was defined as the duration between the completion of treatment and the event, survival analysis was performed using the Cox proportional hazards model in order to investigate predictors of the disease specific survival (DSS) and the local control (LC). Covariates included were SUVmax of primary tumor (T-SUVmax) as a continuous variable, and T and N staging, clinical staging, and therapeutic methods, i.e. surgery or radiotherapy. A two-sided p value of < 0.05 was considered significant. Results: The median follow-up period was 157.6 weeks. Of 109 patients, 80 patients were alive without local recurrence, 10 patients were alive with recurrence, and the remaining 19 patients were dead. According to the Cox proportional hazards analysis, T-SUVmax (p=0.040) and clinical stage (p=0.044) were significant and independent prognostic factors of DSS. As for the LC, the therapeutic method (p=0.039) and T staging (p=0.014) were considered significant and independent prognostic factors, but the T-SUVmax was not an independent prognostic factor in this population. Conclusions: Our preliminary data indicate that the FDG uptake of primary tumor in pre-treatment PET/CT could be an independent prognostic factor for the disease specific survival in HNSCC, while it was not for the local control.

P0446

Single-photon emission computed tomography with 99mTc-MIBI and 199Tl-chloride in complex diagnostics and assessment of the efficiency of neoadjuvant chemotherapy of primary and recurrent tumors of the larynx and laryngopharynx.

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Aim: to study potentials of single-photon emission computed tomography (SPECT) with 99mTc-MIBI in the diagnosis and assessment of laryngeal and laryngopharyngeal cancer response to neoadjuvant chemotherapy as well as to study feasibility of 199Tl-chloride for visualization of primary and recurrent laryngeal tumors. Materials and Methods: The study included 51 patients with stage T1-4N0-1M0 laryngeal and laryngopharyngeal cancers and 4 patients with recurrent laryngeal cancer who underwent SPECT with 99mTc-MIBI at primary diagnosis and after two courses of neoadjuvant chemotherapy and SPECT with 199Tl-chloride for visualization of primary and recurrent laryngeal tumors. Results: Sensitivity of SPECT with 99mTc-MIBI was found to be 97% and sensitivity of SPECT with 199Tl-chloride was 100%. Calculation of quantitative parameters showed that for 99mTc-MIBI the mean value of the tumor/mandibular glad/early index was 0.73±0.37, the mean value of the tumor/parotid gland/early index was 0.76±0.47 and the mean value of the tumor/scalp/early index was 5.81±2.98. For 199Tl-chloride, the mean values of the tumor/mandibular gland/early index, tumor/parotid gland/early index and tumor/scalp/early index were 0.93±0.46, 1.11±0.66 and 5.53±3.15, respectively. In the group of patients who re-examined after neoadjuvant chemotherapy, significant decrease in 99MTc-MIBI tumor uptake was observed in 14 patients. This fact was considered as a positive treatment effect confirmed by CT and fibrolaryngoscopy findings. The tumor/mandibular glad/early ratio was reduced from 0,73±0,37 до 0,51±0,09 (p<0,05), tumor/parotid gland/early ratio from 0,76±0,47 до 0,46±0,19 (p=0,06), and tumor/scalp/early ratio from 5,81±2,98 до 4,47±1,22 (p>0,08), thus indicating that the tumor/mandibular gland ratio is feasible for using in the assessment of neoadjuvant chemotherapy efficacy. Conclusion: This study has shown that SPECT with 99mTc-MIBI can be considered as not only one of the additional methods in diagnosis of laryngeal and laryngopharyngeal cancers but also as a method of assessing the neoadjuvant chemotherapy effect. Also, the present study has shown that 199Tl-chloride SPECT can be one of the supplementing methods in detection of primary and recurrent laryngeal tumors.

P0447

A new F-18 FDG parameter in evaluating lymph node metastatis in the patients with T1-4 N0-3 M0 oral cavity cancers

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Aim: Detection of metastatic lymph node (LN) metastasis is the most important factor for the management of patients with oral cavity cancers (OCC). Increased F-18 FDG uptake in LN may show metastatic involvement. There are need to be standardized evaluation parameters for assessment of F-18 FDG uptake in the LN. We investigated "lymph node SUVmax / liver SUVmax ratio" as a new evaluation parameter in the assessment of LN in patients with OCC. **Methods:** 16 patients (4 Female; 12 Male, 29-81 years) were included in this study. F-18 FDG PET-CT was performed for all the patients. SUVmax values were obtained by drawing regions of interested (ROI) for neck LN and liver at level of porta hepatis in transaxial slice. There were no abnormal uptake in the livers. The patients also did have not any liver disease history as well as abnormal liver function tests. SUVmax LN/ SUVmax liver ratios (T/L) were obtained. The ROC curve was obtained and the threshold T/L value for malignancy was calculated. **Results:** Histopathological evaluations revealed 5 patients had metastatic LN (N+) whereas 11 patients had benign LN (N-). 14 of 43 LN that were visualized in CT of F-18 FDG PET-CT were evaluated as malignant whereas 29 of 43 LN were evaluated as benign. While T/L ratios of malignant LN were 2,85±1,83, benign LN were 0,59±0,22. There was significant

difference in T/L ratios between malignant and benign LN (p<0.01). In the result of ROC analysis, 93% sensitivity and specificity were found with the treshold value of T/L ratio as 1,0. **Conclusion:** T/L ratios can be used as a new parameter in the assessment of LN involvement in patients with OCC. The threshold value as 1,0 for T/L ratio seems to have high sensitivity and specificity values. The further studies with the high number of patients are needed.

P0448

Impacts of texture characteristics of pretreatment 18F FDG PET/CT and human papillomavirus type 16 in prediction survivals of oropharyngeal squamous cell carcinoma

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Purpose: Human papillomavirus type 16 (HPV-16) positivity is associated with favourable survival in oropharyngeal squamous cell carcinoma (OPSCC). Herein, we examine the association of ^{18}F-FDG PET/CT texture features and HPV-16 infection in terms of the clinicopathological characteristics and OPSCC patient survival. **Methods**: We retrospectively analysed 69 patients with OPSCC who had pretherapy ^{18}F-FDG PET/CT and completed concurrent chemoradiotherapy or curative radiotherapy. All patients were followed up for ≥ 24 months or until death. Patients were classified as responders (partial responders, or complete responders), and nonresponders (progressive or stable disease) after primary therapy according to the Response Evaluation Criteria in Solid Tumours. We determined the tumour volume using standard uptake value of 2.5 and segmented the tumour for texture analysis from the pretherapy ^{18}F-FDG-PET/CT images. Five texture features (contrast, correlation, energy, homogeneity, and entropy) were derived based on the gray-level co-occurrence matrix (GLCM) and applied for survival analyses. **Results**: Thirteen patients (18.8%) were HPV-16 positive. The texture feature of entropy was able to significantly differentiate responder and nonresponder patients after primary therapy (p=0041). Cox regression analyses revealed HPV-16 positivity, and texture features of correlation and entropy to be independently associated with overall survival (p=0.028, 0.040, and 0.005, respectively) and entropy was independently associated with progression free survival (p=0.044). **Conclusions**: Texture features of pretherapy ^{18}F-FDG PET/CT allow for the stratification of therapy-response of OPSCC patients and were independent predictors for overall and progression free survival. 2

P0449

Impact of a second FDG-PET before adjuvant therapy for the early detection of residual/relapsing tumours in high-risk patients with oral cavity cancer and pathological extracapsular spread

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Purpose: Extracapsular spread (ECS) to the cervical lymph nodes represents a major adverse prognostic factor in oral cavity squamous cell carcinoma (OSCC). We prospectively examined the value of positron emission tomography (PET) using 2-[fluorine-18]fluoro-2-deoxy-d-glucose (FDG) immediately before postoperative radiotherapy/concurrent chemoradiotherapy (RT/CCRT) to detect residual/relapsing disease in the early postsurgical follow-up period in high-risk OSCC patients with ECS. *Methods:* We examined 183 high-risk OSCC patients with ECS who underwent preoperative FDG PET/CT for staging purposes. Of these patients, 29 underwent a second pre-RT/CCRT FDG PET/CT scan. The clinical utility of the second FDG PET/CT was examined using Kaplan-Meier curve analysis. *Results:* Patients who underwent the second FDG PET/CT scan had baseline clinicopathological characteristics similar to those who did not undergo a second scan. Of the patients who underwent the second scan, 7 (24%) had unexpected, newly discovered lesions. Five eventually died of the disease, and 2 had no evidence of recurrence after a change in RT field and dose. In an event-based analysis at 2 months, rates of neck control (6/29 vs. 6/154, p = 0.001), distant metastases (3/29 vs. 4/154, p = 0.046), and disease-free survival (7/29 vs. 10/154, p = 0.003) were significantly higher in patients who received a second PET scan than in those who did not. The second pre-RT/CCRT PET was of particular benefit for detecting new lesions in OSCC patients with both ECS and lymph node standardised uptake value (SUV) of ≥ 5.2 in the first PET scan. ***Conclusion:*** The present findings support the clinical value of pre-RT/CCRT FDG PET for defining treatment strategy in OSCC patients with both ECS and high nodal SUV, even when FDG PET had already been performed during the initial staging workup.

P0450

Complementary Roles of 18F-fluoride PET/CT and 18F-FDG PET/CT for the Detection of Bony Metastases in Head and Neck Cancer

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The comparative utilities of ^{18}F-FDG PET/CT and ^{18}F-fluoride PET/CT for detecting bony metastases are not clear. This prospective study compared the diagnostic accuracy of ^{18}F-FDG PET/CT versus that of ^{18}F-fluoride PET/CT for the detection of bony metastases in patients with head and neck cancer. **Methods:** Patients with head and neck cancer suggestive of bony metastases were included in this study. All enrolled patients underwent both whole-body ^{18}F-FDG PET/CT and ^{18}F-fluoride PET/CT to evaluate the status of the bony metastases. Areas under the curve (AUC) were estimated to compare the diagnostic capacities of each imaging modality. **Results:** Eighty patients were included in the final analysis, and 18 patients (23%) were found to have bony metastases. A total of 403 bone lesions were detected by ^{18}F-fluoride PET/CT or ^{18}F-FDG PET/CT, 98 of which were malignant. In the lesion-based analysis, ^{18}F-fluoride PET/CT showed a trend of increased sensitivity (69.4% versus 57.1%, P = 0.126) and AUCs (0.7474 versus 0.7050, P = 0.149) over ^{18}F-FDG PET/CT. However, the combined interpretation of both modalities showed a significantly greater sensitivity (88.8%) and a greater AUC (AUC = 0.8073) than either ^{18}F-fluoride PET/CT or ^{18}F-FDG PET/CT alone (P < 0.001). For the patient-based analysis, ^{18}F-fluoride PET/CT and ^{18}F-FDG PET/CT demonstrated similar sensitivities (72.2% and 77.8%, P = 0.99) and similar AUCs (0.8450 and 0.8889, P = 0.5). The combined interpretation demonstrated a borderline significantly greater AUC than ^{18}F-fluoride PET/CT alone (P = 0.065). The bony metastases from head and neck cancers presented both osteosclerotic and osteolytic patterns. For lesions with osteosclerotic changes, the detection rate of ^{18}F-fluoride PET/CT was significantly higher than that of ^{18}F-FDG PET/CT (91.9% vs. 43.2%, P = 0.01). In contrast, ^{18}F-FDG PET/CT had a higher detection rate than ^{18}F-fluoride PET/CT for osteolytic lesions (92.3% vs. 69.2%, P = 0.31). **Conclusion:** ^{18}F-fluoride PET/CT showed a moderately high and comparable sensitivity to that of ^{18}F-FDG PET/CT for the detection of bony metastases in patients with head and neck cancers. However, each modality had its limitations. A high detection rate could be achieved with the combined interpretation of both imaging methods.

P52-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Thyroid

P0451

Incidence of 131-I Scan Conversion in Thyroglobulin-Elevated Negative Iodine Scintigraphy (TENIS) Syndrome: Stratification by Thyroglobulin (Tg) Level

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Objective: Measure the incidence of positive post-therapy I-131 scans in individuals with negative pre-therapy diagnostic I-131 scans with high and low serum Tg levels. Method: Retrospective review of patients with history of differentiated thyroid carcinoma who, during an 80 month interval, received I-131 therapy after a negative whole body I-131 scan imaged at 24 and 48 hours following 5 mCi (185 MBq) I-131 administered orally. All patients had previous surgical remnant radioiodide ablation. All patients were prepared by hormone withdrawal and low-iodine diet and had post-therapy scan performed 48 hours after RIT. All patients had TSH and Tg levels recorded by Beckman assay. Patients were stratified according to hormone-withdrawal pre-therapy Tg level: Group A, Tg >= 10 and Group B, Tg < 10 ng/dl. Results: Identified were 74 patients who received RIT (mean 225 mCi, (8.33 GBq) range 92 - 692 mCi, (3.40 - 25.60 GBq) standard deviation 111 mCi (4.11 GBq)). Group A had 35 patients (26 papillary, 4 tall cell variant papillary, 2 follicular variant papillary and 3 follicular cell thyroid cancer). Of these 35 patients, 13 (37%), showed evidence of iodide-avid disease in the post therapy scan. The other 22 remained scan negative. Group B had 39 patients (25 papillary, 3 tall cell variant papillary, 1 Hürhtle cell variant papillary, 8 follicular variant papillary, 1 columnar cell variant papillary and 1 follicular cell thyroid cancer). Of these 39 patients, 5 (13%) patients showed evidence of iodide-avid disease in the post therapy scan. The other 34 remained scan negative. Conclusion: Fewer patients in Group B (13%) turned scan positive in their post-therapy scan as compared to Group A (37%). This can be expected as Group B patients had less extensive disease as demonstrated by their lower Tg levels. Additionally, in our series, Group A patients had a 37% scan conversion rate, which is less than usually reported in the literature.

P0452

F-18 FDG PET/CT evaluation of negative or minimally I-131 avid disease in patients with raised thyrolgobulin and thyroglobulin antibodies

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Objective: To determine the role of FDG PET/CT in the assessment of negative or minimally I-131 avid disease in patients with raised serum thyroglobulin/thyroglobulin antibodies. Methods: 105 follow up patients (65 females, 40 males) with negative or minimally I-131 avid disease on whole body scan (WBS) but raised serum thyroglobulin/thyroglobulin antibodies (Tg/TgAb) were subjected to FDG PET/CT scans. The results were grouped into three categories: negative scans with no evidence of FDG-avid disease, positive scans with FDG avid- disease and equivocal scans. Results of the FDG PET/CT scans were correlated with clinical, radiological, cytological and/or histopathological findings. Results:Category 1 (16 patients) **:** Two had borderline neck nodes on CT which were biopsied and confirmed to be metastatic. The rest of 14 patients were followed-up over a minimum period of 12 months. None demonstrated clinical or scintigraphic evidence of cancer. Serum Tg levels remained stable or declined. Category 3 (11 patients) : Equivocal findings mostly in the form of minimally increased FDG avidity in cervical nodes. One of the 11 patients on follow-up developed increase in size and avidity of the node, subsequent biopsy revealed metastasis. Category 2 (78 patients) : Most common sites of FDG-avid disease detected: cervical nodes, mediastinal nodes, lungs, bones and adrenal. Sixteen of these patients underwent surgery and histology confirmed metastases in 14 cases (87.5%). False positive results in two patients were benign reactive lymphadenopathy and chondrosarcoma of the mandible. These 16 patients were then followed-up (minimum 3 months, maximum of 77 months period). Twelve patients were disease free until until one developed extensive disease and died six months after presentation. There rest of the four patients had initially stable disease but two developed progression. One of the patients died from extensive lung metastases. Conclusion: F-18 FDG PET/CT scans helped in evaluating the extent of non-I-131 concentrating metastasis and identifying patients for surgical intervention. Patients with limited disease benefited from surgery like cervical nodal clearance or lung nodule resection.

P0453

Role of post therapy 131-Iodine-SPECT/CT imaging in patients with thyroid cancer.

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Aim: The aim of this project was to identify the additional role of post therapy ^{131}Iodine (^{131}I) SPECT/CT imaging over conventional planar ^{131}Iodine whole body imaging. **Methods:** Planar ^{131}I whole body and ^{131}I-SPECT/CT imaging in post ^{131}Iodine therapy were retrospectively reviewed in 67 patients. Two nuclear medicine physicians reviewed the scans independently. Foci of increased tracer uptake were identified in neck, thorax and elsewhere. Within the neck foci of ^{131}I increased uptake were graded qualitatively as probable or definite uptake in thyroid remnant and probable or definite uptake in lymph nodes. Serum thyroglobulin level, histopathology and other imaging served as the reference standard. **Results:** 57 patients (85%) had radioiodine avid disease and 10 patients (15%) non-radioiodine avid disease. Within the neck and mediastinum, post therapy ^{131}I-SPECT/CT downgraded lymph node staging in 18 patients and upgraded in 3 patients. Further, ^{131}I-SPECT/CT imaging changed management in 9/57(16%) of radioiodine avid patients. In 10 patients non-radioiodine iodine avid disease was confirmed on post ^{131}I-SPECT/CT. ^{131}I-SPECT/CT changed the management in 4 patients. Additional clinically significant findings such a lung cancer, symptomatic pleural effusion and consolidation were also diagnosed in both group of patients. **Conclusion:** In patients with thyroid cancer, ^{131}I-SPECT/CT is a useful modality in addition to standard post therapy ^{131}I-planar imaging. ^{131}I-SPECT/CT improved diagnostic confidence and provided crucial clinical information leading to change in management.

P0454

Tc-99m pertechnetate SPECT/CT for detecting thyroid remnants after total thyroidectomy in patients with well-differentiated thyroid cancer

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Purpose: I-131 ablation of the thyroid remnants after total thyroidectomy provides benefits in high-risk patients with well-differentiated thyroid cancer. Success rates of ablation would depend on the size of thyroid remnants. Tc-99m pertechnetate scintigraphy is a feasible method for detecting thyroid remnants because thyroid tissue is one part of physiological accumulation of Tc-99m pertechnetate. A few reports have demonstrated the usefulness of Tc-99m pertechnetate scintigraphy for detecting thyroid remnants after total thyroidectomy. However, no report has used Tc-99m pertechnetate SPECT/CT for detecting thyroid remnants. The aim of this study was to evaluate the additional value of SPECT/CT over planar imaging in Tc-99m pertechnetate scintigraphy for detecting thyroid remnants after total thyroidectomy in patients with well-differentiated thyroid cancer. *Materials and Methods*: This study included 13 patients (4 males and 9 females, mean age = 53.8 years old) who underwent first I-131 therapy after total thyroidectomy for well-differentiated thyroid cancer (10 papillary thyroid cancers and 3 follicular thyroid cancers). Tc-99m pertechnetate planar image and SPECT/CT were performed 3 days before I-131 therapy. We evaluated the number of thyroid remnant accumulations of Tc-99m pertechnetate scintigraphy which were compared with I-131 post-treatment scintigraphy. *Results*: I-131 post-treatment scintigraphy with SPECT/CT detected 23 thyroid remnants in all 13 patients. With Tc-99m pertechnetate planar image, 16 of 23 thyroid remnants (70%) in 10 of 13 patients (77%) were detected. Tc-99m pertechnetate SPECT/CT found additional 3 thyroid remnants in 3 patients, therefore, detected 19 of 23 thyroid remnants (83%) in 12 of 13 patients (92%). Tc-99m pertechnetate SPECT/CT could correctly locate the sites of thyroid remnants. *Conclusion*: Tc-99m pertechnetate SPECT/CT has high sensitivity in detecting thyroid remnants and provides information on their location before I-131 therapy in patients with well-differentiated thyroid cancer.

P0455

Parathyroid dual phase scintigaphy in primary hyperparathyroidism: correlation to parathormone levels and histologic findings

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Aim: Preoperative scintigraphic dual phase analysis of parathyroid adenomas and evaluation to complementary diagnostic: parathormone (PTH) levels, ultrasonography findings and histological results. **Materials and mehod**: The study group of 104 patients with biochemical, hormonal and clinical diagnosis of primary hyperparathyroidism (HPT) underwent preoperative dual- tracer 99m Tc-pertecnetat and 99mTc-MIBI dual- phase technique: 150 MBq tecnetium, 500 MBq MIBI dynamic acquisition 35 min, delay images after 60 (120 min), and in subgroup of 15 pts modified procedure with orally admision of sodium perclorate 400 mg, to promote clearance of pertechnetate. Concomitant thyroid pathology was present 60(58 %) pts. The subtraction method and comparation to pertechnetate scan, delayed MIBI images and ultrasound was performed. We correlated scintigraphy findings with PTH levels, and in only 51 operated patients we compared scintigraphic findings to histology results. **Results**: We localized 70 solitary adenoma: 69 behind thyroid, 1 outside the thyroid border and hyperplasia in 10 patients. In 19 patients thyroid nodule coexisted with HPT, in 35 multinodular goiter and in 6 functional thyroid disease. PTH levels were: in positive scan median PTH level was 133,5 pg/ml and in negative studies 83 pg/ml, with p=0.0000000831 statistical difference. The ultrasound investigation was helpful in the group of patients with concomitant thyroid diseases. This method presented maximal sensitivity. Histopathology revealed 1 case carcinoma of parathyroid, and 3 cases thyroid carcinoma concomitant with parathyroid adenoma. The specificity in our group was 54%, false positive (6pts) included coexistant thyroid adenoma/carcinoma with persistant MIBI uptake. **Conclusion**: In our study we had high diagnostic accuracy in indentifying and localizing parathyroid adenomas. Increased PTH level are in excellent correlation with positive scan findings of PHT.

P0456

Threshold Primary Tumor Sizes for Nodal and Distant Metastases in Papillary and Follicular Thyroid Cancers.

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Background: In papillary and follicular thyroid cancers (PTC, FTC), nodal and distant metastasis are generally considered important determinants of recurrence and survival respectively. However, there is no consensus about the threshold primary tumor size (PTS) for these determinants. The aim of this study was to find out threshold primary tumor size for developing nodal, pulmonary, bone and over all distant metastases. **Material and methods:** This was a prospective study which included 139 (93 females and 46 males) consecutive biopsy proven patients with PTC (114/139, mean age 40.96 ±15.7 years, M: F, 35%:65%) and FTC (25/139, mean age 39.16 ± 14.29 years, M: F: 24%:76%). **Results:** Average primary tumor size was 23.4 ± 11.1 mm and 26.5 ± 13.1 mm for PTC and FTC respectively (p value=0.223). Nodal metastasis was found more common in PTC than FTC (49% Vs 28%, p value <0.05). Incidence of overall distant metastasis was same for PTC and FTC (13% and 24%, p value =0.277); however, bony metastasis was significantly higher in FTC than PTC (24% Vs 5%, p value <0.05). Similarly, the incidence of pulmonary metastasis was same (p value = 0.818). Cumulative risk for nodal and distant metastases for FTC and PTC starts at PTS <20 mm and may indicate an unusual

aggressive tumor behavior in studied population. Highest cumulative risk for nodal and pulmonary metastases in PTC and for bone metastasis in FTC was found to be ≥50 mm PTS. **Conclusion:** We conclude that (1) Cumulative risk for nodal and distant metastases for FTC and PTC starts at PTS <20 mm and may indicate an unusual aggressive tumor behavior in studied population; (2) highest cumulative risk for nodal and pulmonary metastases in PTC and for bone metastasis in FTC was found to be ≥50 mm PTS.

P0457

Thyroid incidentalomas in PET-18F-FDG

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Introduction: PET scans with 18F-FDG are increasingly important in the staging and follow-up of patients (pts) with several neoplasms. Thyroid incidentalomas, either focal or diffuse, are reported and may require further investigation. According to recent studies, incidentalomas in PET scans correspond to thyroid carcinoma in 30 to 50% of the cases. Objective: To determine the prevalence of thyroid incidentalomas in 18F-FDG-PET and evaluate its etiology. Material / Methods: Four thousand eight hundred and sixty two (4862) PET studies performed between 01/01/2008 and 31/12/2010, at the Department of Nuclear Medicine of our institution, were analysed. Tomographic images were obtained 50-60 minutes after the intravenous administration of 3.7MBq/kg of 18F-FDG in a PET scanner ECAT ACCEL LSO. The study included pts who had increased uptake of 18F-FDG in the topography of the thyroid gland, with no known history of thyroid neoplasm. The pattern of radiopharmaceutical uptake was considered focal or diffuse, and the SUVmax was determined. Results: Thyroid uptake was identified in 29 studies (0.6%), of which 23 (79%) were female and 6 were male, with an average age of 56 years. Twenty-three pts (79%) showed focal lesions of the thyroid and 6 pts, a diffuse pattern. Nineteen of the 29 pts (65,5 %) included in the study were investigated with other supplementary diagnostic methods: ultrasound of the thyroid in 17 pts and fine-needle aspiration cytology (FNAC) in 12 pts. Of the investigated pts, 6 presented with papillary thyroid carcinoma, all of them with a focal pattern in 18F-FDG-PET, corresponding to 31.5% of investigated incidentalomas. Of the remaining patients, four had nodular goiter; one, adenomatous goiter; one, thyroid adenoma, all documented by FNAC. Two pts had thyroid nodules who were not submitted to FNAC and one pt was diagnosed with thyroid nodular hyperplasia and parathyroid adenoma after surgery. Four pts (21%) had no ultrasound abnormalities. PET studies on these 4 pts were reviewed and we concluded that 3 of them were false positives and the remaining one a finding with no ultrasound expression. . There was a difference in average SUVmax values between malignant and benign lesions, with 6.76 (2.9 - 11) and 4.62 (two - 7.34), respectively. Conclusion: According to our results, focal incidentalomas of the thyroid are associated with carcinoma in a substantial proportion of cases, in particular, the ones with higher SUVmax. These lesions should be further investigated.

P0458

Lymph node metastases of differentiated thyroid cancer more frequently develops into non-iodine-avid lesions than lung or bone metastases

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Objective: Differentiated thyroid cancer (DTC) patients with non-iodine-avid metastases have a poor prognosis. The present study was conducted to evaluate the influencing factors of radioiodine uptake in metastases of DTC patients. **Methods:** DTC patients (n=121) with metastases treated with ^{131}I were retrospectively included. Metastases were diagnosed by ^{18}F-fluorodeoxyglucose positron emission tomography, computer tomography, magnetic resonance imaging, or surgery. Iodine avidity was determined by visual uptake at the metastatic site using a post-therapeutic ^{131}I whole body scan. Patients with metastases were classified into iodine-avid and non-iodine-avid subgroups and their clinical features were retrospectively evaluated. **Results:** Fifty-one patients had non-iodine-avid metastases (42.1%). A univariate analysis showed that lymph node metastases became non-iodine-avid more frequently than distant metastases (χ^2 = 4.338, p = 0.037); however, there was no significant differences between lung and bone metastases (χ^2 = 1.509, p = 0.216). A binary variable logistic regression model revealed four significant predictors of non-iodine-avid metastasis occurrence: papillary histology (OR = 0.059; 95% CI 0.010, 0.037; p = 0.001), age (OR = 1.050; 95% CI 1.019, 1.082; p = 0.001), time of metastasis development (OR = 4.122; 95% CI 1.421, 11.894; p = 0.000), and recurrence (OR = 4.299; 95% CI 2.132, 7.685, p = 0.000). **Conclusions:** The lymph node metastases in DTC patients lost the ability to concentrate iodine more frequently than distant metastases, but bone and lung metastases showed an equivalent rate of becoming non-iodine-avid lesions. Age, papillary histology, time of metastasis development, and recurrence were identified as predictive factors of non-iodine-avid metastases.

P0459

Clinical conditions related to positive thymic uptake on I-131 post-therapeutic scans in thyroid cancer patients

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Purpose: Thymic uptake is a well-known cause for false-positives on I-131 post-therapeutic scans. The purpose of this study was to identify the clinical conditions related to thymic uptake on I-131 post-therapeutic scans in thyroid cancer patients. **Methods:** 389 patients with thyroid cancer following total thyroidectomy who were admitted for adjuvant radioactive iodine (RAI) therapy between January 2010 and June 2010 were included in the current study. Post-therapeutic scans were retrospectively reviewed. Thymic uptake of post-therapeutic scans were analyzed in relation to clinical conditions such as sex, age, TSH (thyroid stimulating hormone), Tg (thyroglobulin), anti-Tg (anti-thyroglobulin antibody) levels, Cr(creatinine) level (normal or elevated), regimen for TSH stimulation (thyroid hormone withdrawal or recombinant human TSH injection), and prior history of RAI therapy (first or repeated). **Results:** Twenty nine patients (7.5%) demonstrated thymic uptake on I-131 post-therapeutic scan. Twenty three patients(79.3%) were female in positive thymic uptake group. The mean age of those comprising this group was 38 years and mean levels of TSH, Tg and anti-Tg were 102.8 mIU/L, 4.8 ng/ml, 74.1 IU/ml, respectively. 27 patients (93%) had a normal Cr level, 26 patients (90%) underwent thyroid hormone withdrawal, and 14 (48.3%) had a prior history of RAI therapy. Mean age of the positive thymic uptake group was significantly lower than that of the negative group (p<0.001). Significant indicators for thymic uptake were thyroid hormone withdrawal and history of repeated RAI therapy (p<0.05). Logistic regression analysis showed that young age and history of repeated RAI therapy correlated with thymic uptake (p<0.001). **Conclusion:** In patients with young age and history of repeated RAI therapy, there was a tendency for the thymic uptake to be more prominent.

P0460

Efficacy of low-dose radioablation therapy using 740 MBq of I131 in postoperative differentiated thyroid cancer patients. An Initial Experience

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Aim Thyroidectomy followed by radioiodine (131I) ablation of residual thyroid tissue (remnant ablation) is considered the ideal treatment for differentiated thyroid carcinoma. There is a number of patients who display postoperatively a large thyroid remnant and refuse to undergo surgical reintervention, or there are patients who resist being admitted to hospital and in isolation after I-131 radioiodine treatment. These compelling reasons led us to conduct a study with a low dose radioiodine ablation of I-131 740 MBq (20 mCi) in order to treat on an outpatient basis. Materials and methods Sixteen patients with DTC (6 men and 10 women; age range, 20-78 years) with histological diagnosis of papillary carcinoma in all but one patient with follicular carcinoma were divided postoperatively into 3 groups according to radioiodine thyroid bed uptake at 24h (RAIU): >20% in 6 pts(group1), 10-20% in 6 (group 2) and <10% in 4 (group3) respectively. All pts received a low-dose therapy of I-131 740 MBq and were monitored at 6-month intervals using 131I-WBS performed at TSH stimulation Tg(st Tg) and compared to pre radioiodine treatment values. Radioiodine ablative therapy was considered successful (complete ablation) if the I-131 whole body scan was negative and st Tg level was < 2 ng/ml. If, after the first posttherapeutic evaluation, the patients did not meet the criteria for thyroid ablation, then additional 131I doses were administered until thyroid ablation was achieved. Results: Successful radioremnant ablation with one dose of I-131 was obtained in 4 (25%) of the 16 patients, in 3 pts from group 3 (RAIU: <10%) and 1 from the group 2 (RAIU:10-20%). The remaining patients showed partial ablation, objectively assessed by reduction in RAIU≤ 1% and received a second dose of radioiodine, because of residual tissue or metastases (2 pts). Serum stTg values, decreased to below 1.6 ng/mL in all but 2 patients who presented metastases. The pretreatment mean RAIU was 6,6% (range 2,6-15%) in the ablated patients and 18.5% (range 4,1-27,7%), in partial ablated patients respectively Conclusion According to our first data it seems that a dose as small as 740 MBq of 131I was good enough for a complete remnant ablation in most pts with RAIU<10% and also for a significant ablation of large thyroid remnants RAIU>20%. Low-dose-I-131 therapy having the advantage that all patients can be treated on an ambulatory basis with reduction in patient inconvenience and whole-body radiation-absorbed dose.

P0461

Significance of Serum Antithyroglobulin Antibodies in the Follow-up of Patients With Differentiated Thyroid Carcinoma

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Introduction Serum Thyroglobulin (Tg) measurement is the most sensitive marker for the detection of recurrent or persistent disease in the follow-up of patients with differentiated thyroid carcinoma (DTC). As antithyroglobulin antibodies (ATG) may interfere with Tg determinations, the interaction of ATG with Tg could result in inadequate further diagnosis and treatment of recurrent or persistent DTC. In literature, ATG has been proposed as an alternative tumor marker by some authors, but contested by others. Aim To evaluate the significance of elevated serum ATG levels, detected in the follow-up of patients with DTC. Materials and Methods A total of 449 consecutive patients, all initially underwent total thyroidectomy and followed by radioiodine remnant ablation between 2006 and 2011 were retrospectively studied. 6-9 months after radioiodine remnant ablation, 21 patients (19 female, 2 male) with positive serum ATG levels but undetectable TSH stimulated (OFF) Tg levels and no evidence of persistence or metastasis of DTC on simultaneous WBS and neck USG were included in the study. Serum ATG levels were compared with; ATG levels before thyroid hormone withheld (ON) and regularly performed neck USG, Tg and ATG measurements on all patients at 6 or 12 monthly time intervals (min 1-max 3 years). Lastly, to screen for pre-existing autoimmune thyroiditis, histology reports from all patients were re-evaluated. Results In 20 patients, OFF ATG levels were lower than ON. In the follow-up period up to 3 years; 11 of them became ATG negative while 9 were positive but decreasing continuously. In only one of the overall 21 patients, OFF ATG level was higher than ON. In this patient ATG was positive in 3 years follow-up but was decreasing continuously. None of 21 patients had evidence of disease on neck USG, and serum Tg measurements were undetectable in the follow-up period. According to histopathology reports, autoimmune thyroiditis was described in 5 patients (23%). Discussion Persistently elevated ATG levels with no evidence of disease may be associated with prolonged lymphocytic memory cell expression or low load of thyroid remnant that could not be shown by other diagnostic modalities. However, during the follow-up, as most of the patients lost their ATG positivity and it was continuously decreasing in the remaining patients, we thought that it was probably due to the prolonged lymphocytic memory cell expression. Also, it should be remembered that the prevalence of positive ATG is higher in patients with DTC than in the general population.

P0462

Meaning of Small Pulmonary Nodules on High-Resolution CT in Papillary Thyroid Carcinoma Patients with Elevated Serum Thyroglobulin without Recurred Lesion after ^{131}I Ablation Therapy

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Purpose The purpose of this study is to determine the meaning of small pulmonary nodules on high-resolution CT (HRCT) for the lung in papillary thyroid carcinoma (PTCA) patients who were elevated serum thyroglobulin (s-Tg) without evidence of recurrence on the other imaging studies after ^{131}I ablation therapy. We evaluated the relationship between the level of off-T4 s-Tg and the number and the size of small pulmonary nodules on HRCT. *Methods* In 100 patients who underwent ^{131}I ablation therapy after total thyroidectomy for PTCA, we excluded 5 patients who had known lung metastases or recurred lesions located out-side of the lung in the body. We measured off-T4 s-Tg and obtained ^{18}F-FDG PET/CT with enhancement, ^{123}I whole body scan, neck ultrasonography and HRCT for the lung in all patients. *Result* Ninety-five patients (age, 48.1±12.3 years; female, 76) had no recurred lesion on the imaging studies. Mean serum TSH and s-Tg was 66.6±13.1 (30.1 ~ 86.0) uIU/ml and 2.8±13.2 (0.1 ~ 120.8) ng/ml. Seventeen patients (17.9%) were elevated s-Tg (≥2.0 ng/ml; mean s-Tg, 14.7±29.1 ng/ml). On HRCT, 21 patients (22.1%) had pulmonary nodules with size≥5mm (group 1, 0.6±1.4 nodules) and 26 patients (27.4%) with size≥3mm (group 2, 1.0±3.1 nodules). In both groups, no statistical significance was found between elevated s-Tg level and pulmonary nodules (p=0.343, p=0.771). There were neither significant correlation between the s-Tg level and the number of pulmonary nodules (p=0.812, p=0.622) nor that between the s-Tg level and the size of pulmonary nodules (p=0.406, p=0.462). *Conclusion* The number and size of small pulmonary nodules on HRCT are no correlation with the s-Tg level, which means that several small pulmonary nodules on HRCT may not indicate lung metastases in patients with elevated s-Tg level. So HRCT could not be useful for routine study in PTCA patients without evidence of recurrence on the other image studies.

P0463

Prognostic factors effecting clinical outcome in patients with recurrent differentiated thyroid carcinoma (DTC) detected by PET/CT

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The aim of this study was to analyze the prognostic factors effecting clinical outcome in patients with recurrent differentiated thyroid carcinoma (DTC) detected by PET/CT based upon a 3 year follow-up. Methods: 77 patients with PET-detected recurrent DTC on follow-up were enrolled for this analysis. All patients were previously treated with total thyroidectomy followed by radioiodine therapy. Patients were grouped as having (a) complete remission (n:6), (b) partial remission (n:10), (c) stable disease (n:21), (d) progressive disease (n:40). Based upon the follow up results, we retrospectively examined the prognostic value of gender, age, serum Thyroglobulin, TNM stage, tumor size, histology, radioiodine avidity, the presence of vascular invasion and extrathyroidal spread, number of FDG-avid lesions, the location of FDG-avid lesions (locoregional or distant) and the glycolytic rate of the most active lesion and the presence of surgically amenable disease. Results: The presence of vascular invasion and extrathyroidal spread, higher off-therapy Thyroglobulin, non-papillary histology, presence of distant metastasis rather than locoregional recurrence on PET/CT and the lack of effective surgery after PET/CT correlated with progressive disease by univariate analysis. Only the presence of vascular invasion and extrathyroidal spread continued to be strong predictors of complete/partial remission under multivariate analysis. However, complete/partial remission could only be achieved by curative metastasectomy. Patients without curative surgery for recurrence/metastasis had 43 times higher risk to develop progressive disease than patients with surgically amenable disease. SUVmax of the most active lesion, number of FDG avid lesions, TNM stage did not correlate with clinical outcome. Conclusions: Patients with vascular invasion and/or extrathyroidal spread at initial diagnosis are at higher risk to develop progressive disease among all recurrent/metastatic patients with DTC; must be treated aggresively and follow up closely. Effective/curative surgery is mandatory for having remission of metastatic/recurrent DTC. PET/CT is successful for selecting patients to benefit from curative surgery.

P0464

Contribution of I-131 SPECT/CT on Staging of Differentiated Thyroid Carcinoma

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Purpose: To assess the impact of SPECT/CT in staging of differentiated thyroid cancer (DTC) with respect to the planar image. **Materials and Methods**: SPECT/CT study was performed in 152 patients whose planar imaging showed tracer uptake in the cervical and/or extracervical area, of which 130 corresponded to post-treatment scans (mean dose 3827.4 MBq of I-131) and 22 controls scans (mean dose 296.5 MBq). WBS was performed 7 d after therapy, and 2 d after low dose of I-131 (control scan). Patients, 117 women and 35 men, diagnosed with DTC (96 papillary, 26 micropapillary, 10 papillary follicular subtype, 1 tall cell papillary, 15 follicular, 3 Hurthler cell tumors and 1 insular carcinoma) had been previously treated with surgery. In 17 patients was carried out prior stimulation with exogenous recombinant human TSH, and the rest of patients hormonal deprivation for 4 weeks. The images were made with a hybrid SPECT/CT system (Symbia T2). Two experienced nuclear medicine physicians in consensus interpreted the WBS and the SPECT/CT. Before scintigraphy, all patients underwent laboratory tests, such as the assay of TSH, thyroglobulin, and antithyroglobulin antibodies, while hipothyroidal or after rh-TSH stimulation. **Results:** SPECT/CT provided additional global information regarding planar imaging in 42 of the 175 lesions (24%), modifying tumor staging in 34 /152 patients (22.3%). In the cervical region was useful in 18/140 (12.8 %), being determinant to differentiate thyroid bed regard lymph nodes (n= 12), sublingual thyroid (n=3) and salivary glands that showed asymmetric uptake (n=3). In the extracervical area, low-resolution integrated CT images allowed improved characterization of numerous equivocal uptakes in mediastinum, as adenopathies (n= 9), timus uptake (n= 2), tuberculous process (n=1), hiatal hernia (n=3), bone metastases (n=2) or costochondral joint (n=1). It was also useful in abdomen, where it allowed identified a large renal cyst (n=1), uterus uptake (n=2) and skin contamination of the abdominal wall (n=3), therefore, SPECT/CT had a diagnostic impact in 24/35 (68.5%) of extracervicals lesions. **Conclusions**: SPECT/CT changes tumor staging especially at extracervicals locations, characterizing better the lesions, specifying better location Therefore, SPECT/CT would allow the proper management and staging of patients respect planar imaging and it would avoid unnecessary treatments and differentiating areas of physiological uptake so reducing false positives cases.

P0465

Comparison of 2590 MBq vs 3700 MBq 131-iodine administration for thyroid remnant ablation in patients with differentiated thyroid cancer. A 4 years follow up study.

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Aim: The aim of this prospective study was a) to evaluate the rate of successful thyroid ablation using 2590 MBq I-131 in comparison to 3700 MBq in patients

prepared either with recombinant thyrotropin (rhTSH) stimulation or after thyroid hormone withdrawal b) to assess the long-term course of disease in a 4 years follow up period. Method: Atotal of 124 patients categorized in four groups depending of the ablation method used: 31 in group A (rhTSH and 3700 MBq), 31 in group B (rhTSH and 2590 MBq), 31 in group C (OFF-T4 and 3700 MBq) and 31 in group D (OFF-T4 and 2590 MBq). In groups A and B one injection of 0.9 mg rhTSH was administered for 2 consecutive days and 131I was given 24h after the last injection. In groups C and D 131I was administered after a sufficient TSH elevation (>50mU/ml). A post therapy whole-body scan (WBS) was performed 7 days later. None of WBS showed I-131 uptake out of the thyroid bed. A second RAI under rhTSH stimulation was performed where necessary with 4440 MBq (group A,C) and 3700 MBq(group B,D). All patients achieved full remission. Success rate of thyroid ablation was assessed 8-12 months after RAI using a second whole-body scan. To evaluate the long-term outcome of RAI the course of the follow-up and the most recent disease status were assessed by sonography and serum Tg estimation (on LT4-suppressive treatment) 4 years after successful ablation. Results: Successful ablation rate (86% in total) had no statistical difference between all groups. After RAI1, in groups A, B and D, 27/31 (87%) of patients had no uptake in the follow up scan, 26/31 patients (83%) in group C and after RAI2 100% in all groups. Stimulated by rhTSH or thyroid hormone withdrawal, serum thyroglobulin was nearly undetectable (<1 ng/ml) in all successfully ablated patients. Within the 4 years observation period, local relapse was stated in 2(6%), 1(3%), 1(3%) and 2(6%) patients of groups A, B, C and D respectively. Conclusion: The use of 2590 MBq I-131 as ablation dose has similar ablation effect as 3700 MBq, in patients with low-risk, no distal metastastic DTC, no matter if rhTSH or LT4 withdrawal is used for patient preparation. No significant differences in the 4 years efficacy of thyroid remnant radioiodine ablation were observed.

P0466

Role of F-18 FDG PET/CT in elevated thyroglobulin and negative diagnostic whole body iodine-131 scan in patients with differentiated thyroid cancer

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Aim: We conducted this study to assess the role of positron emission tomography (PET) in the patients with elevated thyroglobulin (Tg) and negative diagnostic whole body iodine-131 scan (DxWBI scan) (TENIS syndrome). Material and Methods: We conducted a retrospective analysis from the records of all the patients who underwent radioiodine therapy at our department. Of a total of 130 patients over a period of one year (2011 - 2012) we encountered 12 patients who could be characterized into the TENIS group. After having a documented negative DxWBI scintigraphy, these patients underwent PET scan. The results of the PET scan findings were compared with further follow up investigations or post empirical therapy whole body scan (RxWBI scan). Results: The mean age was 41.9 years and the patients included 3 males and 9 females, all with papillary carcinoma. The patients had undergone near total or total thyroidectomy followed by iodine therapy for remnant ablation. Negative DxWBI scan was noted in 9/12 patients during the first follow up (at 6 - 12months) after remnant ablation. Only F18-FDG PET/CT was done in 7/12 patients, both F18-FDG and Ga68-DOTATATE scans were done in 3/12 and Ga68-DOTATATE alone in 2/12 patients. F18-FDG PET/CT showed hypermetabolic foci in 8 of the 10 patients who underwent the scan. These were confirmed on RxWBI scan in four. Of the remaining 4, three had a negative RxWBI scan but confirmed metastasis on fine needle aspiration in one and suggesting dedifferentiation. F18-FDG PET failed to show abnormal foci in 2 patients and in both these patients the Tg levels are reducing on follow up suggesting possible heterophile reaction. In 2/3 patients with both F18-FDG and Ga68DOTATATE scans the findings were in concurrent. The third patient showed decreasing Tg levels on follow up with negative F18-FDG scan as described. Of the two who underwent only Ga68-DOTATATE PET, the findings were confirmed in RxWBI scan in one while the other had no abnormal lesions on the PET as well as on RxWBI scan. Conclusion: PET scan can identify lesions missed on DxWBI scan and dedifferentiated lesion as well in patients under TENIS group. PET scan seems to have a good negative predictive value to identify patients with false positive Tg levels.

P0467

Response to Initial Radioiodine Therapy in Pediatrics with Differentiated Thyroid Carcinoma

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Aim: The aim of the current study was analyze the clinicopatological data and treatment response of children with differentiated thyroid carcinomas (DTCs) to radioiodine therapy (RIT). **Methods:** Twenty-six patients with DTC were evaluated. There were 20 females and 6 males. Patients ages ranged from 3 to 17 years (mean age 13.7±3.7). The follow-up was min-6 month, max-16 years. The diagnosis was papillary thyroid carcinoma (PTC) in 24 patients and follicular in 2. Pretreatment serum concentration of free T_4 (fT_4), thyroid stimulating hormone (TSH), thyroglobulin (Tg) and antiTg were measured, neck ultrasonography and thyroid scintigraphy were applied. Whole body scintigraphy applied 7-10 days after the RIT. Follow-up was performed by measuring Tg, TSH, antiTg levels, and applying neck ultrasonography, thyroid scintigraphy and PET/CT, MRI at need. **Results:** There were no patients who had previous radiation exposure to the head and neck. 4 patients had positive family history. All patients had total thyroidectomy. There were 24 PTC and 2 follicular carcinomas. At diagnosis, 13 patients had metastatic lymphadenopathy, 15 had multicentricity, 16 capsule invasions and 11 extrathyroidal extansion (soft tissue and vascular invasion). The activity of RIT, applied after surgery, ranged from 30 to 200 mCi. One patient with metastasis (femur and lung metastasis) received a total of 700 mCi. Repeated RIT were given to 4 patients with evidence of local recurrence or distant metastasis. 22 patients showed a complete recovery after initial radioiodine treatment. One patient had only partial response, 3 patients exhibited persistent disease. **Conclusion:** Findings at the initial diagnosis revealed that a) lymph metastasis rate during childhood is high, b) radioiodine therapy is effective in regional metastasis and remnant cancer, and however the young patients have a more agressive clinical presentation with frequent lymph node and distant metastases. Successful surgery and an effective radioiodine ablation have a crucial role in good outcomes of childhood DTCs.

P0468

Postsurgical thyroid remnant ablation in patients with Differentiated thyroid carcinoma (DTC) using a 1100 MBq (30 mCi) 131Iodine dose. Preliminary results.

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Objective: To evaluate the efficacy and safety in the thyroid remnant ablation after total thyroidectomy in low-risk DTC patients using a 1100MBq (30 mCi) 131Iodine dose. Population and method: 16 patients referred for ablation with the diagnosis of low-risk DTC (>1<4 cm, without evidence of lymph node or metastasic disease, pT1-T2N0M0). An ablative dose of 1100 MBq of 131Iodine was administered in conditions of stimulated TSH. All of them underwent whole-body scanning (WBS)/SPECT-CT seven days after ablation. We performed a WBS/SPECT-CT 6 and 24 hour after administration of 4 mCi of 123Iodine, in conditions of stimulated TSH, 6 months after ablation in 12 patients. These 12 patients are our study subgroup (11 women), mean age 63±13 years. The basal and stimulated thyroglobulin (Tg) levels were determined before and 6 months after ablation. Successful ablation was established as absence of any abnormal uptake 6 months after ablation, with basal Tg <1ng/ml and negative anti-TgAb. We also determined if stimulated Tg was <2 ng/ml. Results: All 12 patients showed remnant uptake without lymph node identification nor metastases in the WBS/SPECT-TC after ablation. 8 patients (67%) had basal Tg level <1ng/ml. 7 patients (58%) had stimulated Tg level <2ng/ml. The mean basal Tg value before the ablation was 0,5 ng/ml and increased to 2,3 with TSH stimulation. None of the 12 patients presented any neck symptoms, nor xerostomia, nor nausea and vomiting, nor gastralgia and nor change in taste Successful ablation was achieved in 11 of 12 patients (92%) as determined by the 6 month control. One patient showed persistence of thyroid remnants, although her basal Tg level was <1 ng/ml (the stimulated Tg level was 2,02 ng/ml). The mean basal Tg value six months after the ablation was 0,2 ng/ml and increased to 0,9 with TSH stimulation. If we defined successful ablation as absence of abnormal uptake on control follow-up diagnostic scan, 6 months after ablation, with stimulated Tg<2 ng/ml, it was achieved in 10 of 12 patients (83%). If we defined successful ablation with the same criteria but 1 year after ablation, it was achieved in 100% of patients (6/6 patients in which 1-year-follow-up have been completed). Conclusion: Our preliminary results seem to indicate that an activity of 1100MBq could be effective, safe and cost-efficient in a great majority of patients with low-risk DTC. In the subgroup of one year follow-up patients, successful ablation was 100%.

P53-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Breast

P0469

Indeterminate pulmonary nodules on Computed Tomography (CT) images in breast cancer (BC) patient: the additional value of 18F-Fluorodeoxyglucose (FDG) Positron Emission Tomography (PET)/CT

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Aim. The objectives were 1) to determine the additional diagnostic data provided by FDG PET/CT in definition of indeterminate lung nodules found by CT and 2) the metabolic correlation with histological BC. **Material and methods.** Twenty-nine consecutive BC patients (mean age 65±12 years) with evidence of indeterminate lung nodules at CT scan (diameter ≥ 5 mm) were retrospectively analysed. All patients underwent PET/CT within three months from CT. PET/CT was considered positive in the presence of abnormal FDG-uptake in the pulmonary nodules and/or in other organs. The nature of lung nodules was defined by histopathology or a follow-up plan; thus the therapeutic management was planned. **Results.** Totally 51 malignant lung nodules (malignant rate: 61%) were found, and 53% of them were histologically confirmed. No a statistically significant difference between the greatest dimension of benign and malignant lesions (8.39±4.25 *vs.* 9.36±4.92; *p=0.363*) and between the size of metastases and second primary tumours (*p=0.455*) was found. Malignancy was diagnosed in 29 of 48 lesions (60%) that measured <8 mm in greatest dimension and in 22 of 35 lesions (63%) that measured >8 mm in greatest dimension (*p value*=N.S.). There were 33 nodules (40%) with a significant FDG uptake (SUVmax>2.5) that measured a mean greatest dimension of 14.47±5.24 mm (range, 5.1-25.4 mm). In particular, out of 48 nodules with a diameter < 8 mm, 5 (10%) had a significant uptake, while out of 35 nodules with a diameter >8 mm 17 (49%) were FDG positives (p<0.001). The sensitivity and specificity for PET/CT in evaluating lung lesions were 17% and 100% for nodules <8 mm in diameter and 77% and 85% for nodules with a diameter >8mm, respectively. The SUVmax ratio was significantly different between malignant and non-malignant nodules (2.03±1.27 and 0.64±0.24; p<0.001). ROC curve demonstrated that a value of 0.80 showed a sensitivity of 83% and specificity of 89% for identifying malignant lung nodules (AUC: 0.78, p<0.001). At patient-based analysis, in 12 patients with FDG-avid nodules, the malignancy was confirmed in 11 patients included 6 with second primary tumours and 5 with lung metastases from BC. Twelve/29 patients changed their treatment or were just followed, after the inclusion of PET/CT in evaluating indeterminate lung nodules, avoiding an unnecessary over-treatment. **Conclusion.** PET/CT can be useful in indeterminate lung nodules found by CT scan, considering its high sensitivity in particular when the nodule size increase. PET/CT saved about 40% of patients from an un-useful over-treatment.

P0470

Scintigraphy with 99mTc-MIBI in diagnosis of multifocal/multicentric breast cancer: simple and simply best.

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Purpose: Accurate diagnosis of multifocal and multicentric breast cancer (MF/MC BC) can significantly influence therapeutic decision in candidates for breast sparing treatment. We compare sensitivity of breast scanning (BSc) and first line examinations (mammography (MMg) and ultrasound (US)) in detection of MF/MC BC. **Material & Methods:** retrospective analysis of BSc, MMg and US was performed in 108 consecutive primary patients (pts) that underwent mastectomy with subsequent routine histological examinations of breast specimens. In histological reports only MC BC was described as separate entity so patients with MF BC were analyzed as an additional group. Planar BSc (PBSc) in lateral and anterior views was started 15 min. after i/v injection of 700-800 MBq of 99Tc-MIBI. PBSc was followed by SPECT examination on dual head detector with 360` orbit and 6` steps (30` per frame). High frequency digital wide field of view US and conventional MMg were performed by radiologists dedicated to breast examinations. **Results**: According to histological reports MC BC was diagnosed in 8 (7.4%) of 108 evaluated pts. Planar imaging revealed MC character of BC in 7 of these 8 pts. In one additional pt MC BC was diagnosed only by SPECT examination. Surprisingly, in US and MMG reports MC BC was mentioned only in one (US) of 8 pts. MF BC was detected on MMG in 3 pts. All of them were negative for MF BC on BSc and 2 were concordantly positive on US examination. US diagnosed MF BC in 5 pts: 2 of them had sings of MF BC on BSc, 2 abovementioned pts - on US and last one had benign disease according to histological examination. 8 additional pts with BC had sings of MF disease on BSc with unifocal BC on US and MMg. Unfortunately, histological reports does not permit correct evaluation of this cases. **Conclusion:** 1. Histological diagnosis of MC BC was determined in 8 of 108 evaluated pts with primary BC and was correctly detected byPBSc in 7 of 8 (87.5%) cases. 2. Sensitivity of MMG and US was significantly lower (12.5%) but because of retrospective nature of the study this data need prospective confirmation.

P0471

Semiquantitative Methods for Characterization of Breast Lesions on ^{99m}Tc-sestamibi Scintimammography

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Breast cancer is the commonest malignant neoplasm with the highest mortality in women. Mammography is currently the most effective screening modality for detecting early cancer which is not clinically palpable. However, it has limited sensitivity in patients with dense breasts or patients who have implants or surgical intervention. Scintimammography (SM) has been recently found useful in such cases**.** The aim of our study is to optimize the performance of SM using semiquantitative methods thereby improving its sensitivity and specificity for differentiation of benign from malignant breast lesions. This was a prospective study over 6 months on a qroup of patients who had equivocal findings on mammography performed for suspicion of a breast mass. SM was done 20 min after iv injection of 25 mCi of ^{99m}technetium sestamibi in anterior, lateral and posterior oblique views of torso. The images were analyzed using a Standard and a Scaled Visual system by alteration of the intensity of the image display. Semiquantitation was done by BiLinear Interpolative Background Subtraction (BLIBS) to improve lesion detectability and contrast. Comparison was done with histo/cytology as a reference test. A total of 69 masses were included, forty five masses had histo/cytological diagnosis. The sensitivity, specificity, positive and negative predictive values for malignancy using standard visual analysis was: 73%, 57%, 56% and 75% respectively. The sensitivity increased to 79% using BLIBS, however, at the expense of reduced specificity, positive and negative predictive values (42%, 50%, and 44% respectively). We concluded that the use of the semiquantitative approach for analysis of SM was of some benefit in giving an objective means of characterization of breast lesions over the non-quantitative method. The application of such methods for analysis would provide a valuable addition to the overall diagnostic performance of SM.

P0472

Sentinel node biopsy in patients with breast cancer and previous tumorectomy: does the reliability of the technique change depending on the time since the surgery?

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AIM To analyze the reliability of radioisotopic detection and sentinel node biopsy (SNB) in patients with breast cancer and previous excisional biopsy. MATERIAL AND METHOD 32 patients with breast cancer and SNB with previous excisional biopsy (EB) were included in this study. Patients were divided in two groups, according to elapsed time between EB and radioguided surgery: group A: ≤ 30 days, 12 patients, average age 53 years; and group B: > 30 days, 20 patients, average age 50 years. All of them underwent a superficial injection of 111 MBq ^{99m}Tc-nanocolloid and a subsequent lymphoscitigraphy the day before the surgery. In those cases without initial scintigraphic detection of the sentinel node (SN), a subdermal re-injection was performed. The analyzed parameters were: 1) scintigraphic and surgical detection of the SN, 2) histologic state of the SN and of the axillary lymphadenectomy (AL) in those patients with positive SN, and 3) presence of axillary recurrence in patients with negative SN. Follow-up was up to 4.5 years (13-54 months). RESULTS Group A: both scintigraphic and surgical detection of the SN were of 100%. Sentinel nodes didn't show involvement. Group B: scintigraphic detection was of 100% (2/20 patients after subdermal re-injection), as well as surgical detection. SN was positive in only 1/20 patients (with negative AL). Any patient, neither from group A nor from group B, showed regional recurrence or distant disease during the follow-up. CONCLUSION Sentinel node detection following excisional biopsy seems to be a highly accurate procedure. Despite the small number of patients studied, time between excisional biopsy and sentinel node biopsy doesn't influence the reliability of the technique.

P0473

Local Advanced Breast Cancer: Correlation of Negative/Doubtful Axillary Lymph Node Involvement in ^{18}F-FDG PET/CT Scan with Histological Analysis

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OBJECTIVE: To correlate negative/doubtful axillary lymph node involvement (not visualized or lymph nodes with SUVmax <2.5) in ^{18}F-FDG PET/CT scans with histological analysis in Local Advanced Breast Cancer (LABC). MATERIALS AND METHODS: We retrospectively reviewed ^{18}F-FDG PET/CT scans performed (according to the EANM protocol) from December 2008 to January 2012. Two-hundred-forty studies were undertaken for initial staging in LABC. We selected 46 patients (19.1%) with negative/doubtful axillary involvement without previous sentinel lymph node biopsy (SLNB). In 8 patients we do not have enough clinical data available. Chi^2 statistical analysis was used. PET/CT results in axillary lymph nodes (LN) were compared with histological analysis. RESULTS: Thirty-eight patients underwent SLNB (32), axillary lymphadenectomy (6) and both (13) after

PET/CT scan. Of the 38 patients, 25 had negative PET/CT results in axila while 13 were doubtful. In the 25 patients with negative axilar PET/CT result, only 5 (20%) had histological involvement. In the remaining 13 patients with doubtful axilar PET/CT result, 8 (61.5%) had axillary metastases. Doubtful PET/CT result in axila has a higher statistical significant risk of metastases than negative PET/CT (p<0.028). CONCLUSIONS: These results strongly suggest statistical significant risk of axillary lymph node metastases in doubtful PET/CT than in negative PET/CT. However SLNB must be performed in both cases.

P0474

Is the Assessment of the Central Skeleton Sufficient for Osseous Staging in Breast Cancer Patients?

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Aim: Positron-emission-tomography/computertomography (PET/CT) is increasingly used as an alternative imaging method for systemic staging of breast cancer. The majority of PET/CT protocols focus on the central skeleton. Analysing bone scans we want to find out, if a detection of the central skeleton is sufficient for bone metastases staging. Material and Methods: In this retrospective study a total of 837 bone scans for staging or restaging of breast cancer were included. Positive findings were correlated to additional imaging techniques as well as previous and follow up bone scans for further verification. 291 bone scans in 172 patients were positive for bone metastases. The localisation and distribution pattern of the metastases was re-evaluated by two readers in consensus. The involvement of the central skeleton was scored by a three-point scale and correlated to the incidence of peripheral metastases. Results: In all of the 172 patients (100%) bone metastases could be found in the central skeleton (including proximal third of humerus and femur). In 34 patients (19.8%) peripheral limb metastases (distal from the proximal third of humerus and femur) could be detected. 64 patients (37.2%) did show metastases of the skull. Summarizing the metastases of the distal limb and skull 71 patients (41.3%) had peripheral metastases. None of the patients did show peripheral metastases without an affection of the central skeleton. The incidence of metastases of the periphery was significantly correlated to the extent of central skeleton involvement (p<0.001). Conclusion: Regarding bone scans isolated metastases to the peripheral skeleton without any manifestation in the central skeleton seem to be an exception. Moreover, the probability of peripheral metastases depends on the extent of central skeleton manifestation. Thus, the assessment of the central skeleton should be sufficient for staging of bone metastases, but in case of progressive central osseous metastases, the physician should consider an additional work-up of the periphery for the risk of complications like bone pain and pathologic fractures.

P0475

Cell proliferation index Ki-67 correlates with serum calcitonin gene related peptide in breast cancer.

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Aim: To investigate the relationship of serum neuropeptide calcitonin gene related peptide (CGRP) and Ki-67 in different breast cancer subtypes. Materials and Methods: Twenty three women with histologically confirmed breast cancer (DCIS: n=6, mixed DCIS+IDC: n=8 and pure IDC: n=9) were studied. Serum CGRP concentration was measured by RIA methods and compared (t-test) between the three groups. Ki-67 expression was calculated by immunohistochemistry in the surgical specimens, was compared between the three groups and was correlated (linear regression analysis) with serum CGRP levels. Results: Serum CGRP concentration (mean±SD: pg/mL) in the three groups was: mixed DCIS+IDC: 359±170, DCIS: 218±159, pure IDC: 103±28. Serum CGRP was significantly higher in mixed DCIS+IDC as compared to pure IDC (P=0.003). Ki-67 expression in the different groups was (mean±SD: %): DCIS+IDC: 26±21.8, DCIS: 14.1±8.8, pure IDC: 5.3±2.39. Ki-67 presented significantly higher values in mixed DCIS+IDC as compared to pure IDC (P=0.04). Linear regression analysis revealed a significant coefficient of correlation between Ki-67 and CGRP (r=0.829, P<0.001). Conclusion: The relationship between serum CGRP and Ki-67 in breast cancer patients may indicate a potential mitogenic role of CGRP and eventually may contribute to the preoperative assessment of suspicious breast lesions and possibly the application of adjunctive administration of anti-CGRP therapy.

P0476

FDG PET/CT in detection of disease relapse in patients with breast cancer

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The aim of this study was to evaluate usefulness of FDG PET/CT in detection of disease relapse in patients with surgically treated breast cancer who had elevated tumor markers or suspicious findings on conventional imaging, and to assess the impact of FDG PET/CT findings on patients managing. Material and methods: Forty-three females, mean age 53±12 years with treated breast cancer, suspicious on disease relapse, were referred to FDG PET/CT investigation. Eight patients was suspicion on disease relapse at clinical examination, 15 patients had mass lesion on CT/MR, 13 patients had elevated tumor markers CA 15.3, 3 patients equivocal whole body bone scan, 2 patients with pleural effusion and 2 patients with ascites. The final diagnosis of recurrent breast cancer was established by surgery or biopsy of pathological lesion or by clinical follow-up for at least 6 months by additional morphological imaging techniques.Whole body PET/CT was performed 60 minutes after iv. injection of 370MBq of 18F-FDG on PET/CT 64 slice scanner. Results: Among 43 patients, 25 had invasive lobular carcinomas and 18 invasive ductal carcinomas. Thirty patients had positive FDG PET/CT finding: 28 true positive (1 had local recurrence, 2 had axillary lymph node metastases and 25 had distant metastases in bone, liver, lungs, mediastinal lymph nodes and pelvis), while 2 were false positive. There was no pathological accumulation on FDG PET/CT scan in 13 patients (11 true negative, and 2 false negative with osteoblastic metastases on bone scan). Overall, FDG PET/CT scan showed 93% sensitivity, 85% specificity and 90% accuracy for the detection of disease relapse in patients with breast cancer. According to the FDG PET/CT scan finding, the tumor stage was upstaged in 6/43 (14%) patients . This findings led to change of the therapeutic strategy in 5/43 (12%) patients. As a result of PET/CT, surgery was performed in one patient with local recurrence and in 2 patients with axillar metastases. In 2 patients, additional irradiation (rib metastasis, axilla) was performed. Conclusion: Our results indicate that FDG PET/CT is useful diagnostic tool in detection of diseases relapse in breast cancer patients with additional impact on patients management.

P0477

Neither ductal nor lobular invasive breast cancer and sentinel node.

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Neither ductal nor lobular invasive breast cancer corresponds to around 10% of all breast cancers detected, and comprises a heterogeneous group of breast malignancies, with different prognosis and outcome. Sentinel node biopsy (SNB) is the gold standard technique for staging the axilla in early stage breast carcinoma. However, there is not extensive data on its feasibility in unusual subtypes of breast carcinoma. The purpose of this study was to assess the feasibility of sentinel node biopsy in neither ductal nor lobular invasive breast cancer. METHODS From January 1997 to July 2008, 2253 patients from 6 affiliated hospitals having early breast cancer, and clinically negative axilla, underwent SNB. Patient data were collected in a multicenter data base. For lymphatic mapping, all patient received an intralesional dose of radiocolloid Tc ^{99m} (4mCi in 0.4mL saline), at least two hours before surgical procedure. SNB was performed by the same Nuclear Medicine Department in all cases. RESULTS Of 2253 patients in data base, sentinel node identification rate was 94.5% (no migration of radiotracer in 123 patients), and positive sentinel node prevalence was 22%. Neither ductal nor lobular carcinoma was pathology reported in 144 cases (6.4%) of the whole series. In this subgroup, migration of nanocolloid was unsuccessful in 8 patients (identification rate was 94.4%) and positive sentinel node was positive in 7.4%.

CONCLUSIONS Sentinel node biopsy is feasible also in special histological subtypes of breast carcinoma with a good identification rate. Lower migration rates however might be associated with special histological features (as in colloid subtype). Sentinel node positivity prevalence in these tumours is heterogeneous. Higher probability of lymphatic spread seems to be related to tumour aggressiveness (as with micropapillar and cribiform subtypes).

P0478

Which Clinical and Pathological Factors Influence Sentinel Lymph Node (SLN) Success Rate in Early Stage Breast Cancer?

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Introduction: Although higher SLN success rate has been well known in early stage breast cancer by using preoperative lymphoscintigraphy, on the other hand in many cases unsuccessful SLN can be seen. In the literature, some clinical and pathological factors have been accused for SLN detection failure. Our aim in this study is to investigate some clinical and pathological factors whether influence success rate or not. Materials and method: Totally 237 patients (mean age 54.2) with early stage breast cancer (stage I-II) underwent sentinel lymphoscintigraphy by using intradermal injection technique. The lymhoscintigraphy were performed at prone position and dynamic and static images were obtained sequentially along

2 hours after 15 MBq Tc99m Nanocolloid injections. If there was no SLN detected within 2 hours it was accepted as unsuccessful. Then we compared the success rate according to patient's age (patient were divided into 3 groups such as under 40 years old, from 40 to 60 and above 60. This division resemble Pre, Peri and post menopausal period), tumor types (invasive ductal, invasive lobular, invasive ductal plus invasive lobular, carcinoma in situ and others), tumor size (T1a, b, c and T2), injection location (breast was divided four quadrant such as UOQ, UIQ, LOQ, and LIQ) and previous operation (Yes or No). Statistic was done with multichanel qi square test and p value less than 0.05 was accepted as statistically significant. Results: The SLN success rate was 96.2% (228/237). In 9 of patients SLN lymphoscintigraphy were failed. There was no statistically difference between patient's age, tumor types, tumor size, injection location and previous operation according to success rate. Conclusion: In our study high SLN success rate was establised and this result was the similar with literature reported previously. Besides this knowledge, body mass, age, tumor location, operated previously also accused of unsuccessful SLN in the literature. But in our study we also didn't find any clue that these clinical and pathological factors such as patient's age, injection location, tumor size and previous operation influence SLN success rate. Furthermore we also thought that unsuccessful SLN in our study may be due to imaging time.

P0479

Correlation between the hormone receptor and HER-2 status of the primary tumor and ^{18}F-FDG uptake in sites of recurrence in breast cancer

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Aim: Studies have shown that the expression of hormone receptors and HER-2 status in breast primary tumors can influence the ^{18}F-FDG uptake in PET/CT scans. The aim of the study is to determine the impact of this expression on ^{18}F-FDG uptake in sites of recurrence. **Materials and Methods**: We studied 41 patients with breast cancer and known hormone receptor and HER-2 status of the primary tumor who underwent ^{18}F-FDG PET/CT scans for detection of suspected recurrence. 29 patients with positive ^{18}F-FDG PET/CT scans were included in the study, with a mean age of 55.2 years old (from 31 to 76 years old). 21 had ductal, 7 lobular and 1 mixed type of breast cancer. **Results:** The sites of recurrence studied were 91, located mainly in bones (24 lesions), internal mammary lymph nodes (7), other mediastinal lymph nodes (13), clavicular-jugular lymph nodes (11), lung (9), liver (6), axilla (4), chest wall (4), skin-subcutaneous lesions (3). Based on the hormonal and HER-2 status of primary tumor, 71 lesions were related to positive estrogen receptors and 20 lesions to negative, 66 to positive progesterone receptors and 25 to negative. 18 lesions were related to overexpression of HER-2 and 73 to HER-2 negative status. Positivity for estrogen or progesterone receptors and overexpression of HER-2 showed no significant impact on SUVmax values: ER+ lesions had SUVmax=8.2 vs ER-, SUVmax=6.8, (p=0.201); PR+ lesions had SUVmax=8.3 vs PR-, SUVmax= 6.6, (p=0.093); lesions with HER-2 overexpression had SUVmax=9.7 vs no HER-2, SUVmax=7.5, (p=0.155). **Conclusion:** In this study, no statistically significant correlation was found between ^{18}F-FDG uptake in lesions of recurrence and hormone receptor and HER-2 status of the primary tumors. This might be explained by the fact that, according to the literature, there is a significant change in the hormonal and HER-2 status between the primary tumor and the lesions of recurrence

P0480

Comparison of Subareolar Injection Lymphoscintigraphy with the 1 Day and the 2 Day Protocol for the detection of Sentinel Lymph Nodes in Patients with Breast Cancer

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Objectives: Lymphoscintigraphy and sentinel node biopsy were used for the detection of axillary lymph node metastasis in breast cancer patients. We compared the results of subareolar injections on the day of surgery (1 day protocol) with injections the day before surgery (2 day protocol). **Methods:** This study included 604 breast cancer patients who underwent surgery between 2001 and 2012. For the 1 day protocol 0.8 ml of Tc-99m Tin-Colloid (37MBq) was injected in 336 in the subareolar region on the morning of the surgery. For the 2 day protocol 0.8 ml of Tc-99m Tin-Colloid (185MBq) was injected in 268 patients on the afternoon before surgery. Lymphoscintigraphy was performed in the supine position and sentinel node identification was performed by hand-held gamma probe during surgery. **Results:** Among 336 patients with the 1 day protocol, 311 cases (92.6%) were identified by sentinel node lymphoscintigraphy, and 314 cases (93.5%) were identified by gamma probe. Among the 268 patients, in the 2 day protocol, 246 cases (91.8%) had the sentinel node identified by lymphoscintigraphy, and 237 cases (88.4%) had the sentinel node identified by the gamma probe. There was no significant difference in the identification rate of the sentinel node between the 1 day and 2 day protocol by lymphoscintigraphy and the gamma probe. **Conclusions:** The results of the identification of the sentinel node according to 1 day or 2 day protocols showed no significant differences. Because the 2 day protocol allows for an adequate amount of time to perform the lymphoscintigraphy, it is a more useful protocol for the identification of sentinel nodes in patients with breast cancer.

P0481

Comparison of the Efficiency for Tc-99m Tin-colloid and Tc-99m Phytate in Sentinel Node Detection in Breast Cancer Patients

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Objectives: Lymphoscintigraphy and sentinel node biopsy has become a standard method for detection of axillary lymph node metastasis in breast cancer patients, but the standard radiopharmaceutical was not prepared. About detection of axillary lymph node metastasis by lymphoscintigraphy and sentinel node biopsy in breast cancer patient, we compared the results of Tc-99m Tin-colloid and Tc-99m Phytate by subareolar injection. **Methods:** This study included 604 breast cancer patients who were performed operation during 2001-2012. Four hundred twelve patients was injected 0.8 ml of Tc-99m Tin-colloid (37-185 MBq) by subareolar injection. One hundred ninety two patients was injected 0.8 ml of Tc-99m Phytate (37-185 MBq). Lymphoscintigraphy was performed in supine position and sentinel node localization was performed by hand-held gamma probe in operation. **Results:** Among 412 patients by Tc-99m Tin-colloid, 374 cases (90.8%) localized the sentinel node by lymphoscintigraphy and 367 cases (89.1%) localized by gamma probe. Among 192 patients by Tc-99m Phytate, 183 cases (95.3%) localized by lymphoscintigraphy and 184 cases (95.8%) localized by gamma probe. Detection rate by lymphoscintigraphy and gamma probe was superior for Tc-99m Phytate compared to that with Tc-99m Tin-colloid, with a statistically significant difference.($p<0.05$, $p<0.05$) **Conclusions:** Tc-99m Phytate is a better choice for localization of sentinel node than Tc-99m Tin-colloid in breast cancer patients.

P0482

^{99m}Tc-3P$_4$-RGD$_2$ scintimammography (RSM) in its diagnostic performance for palpable and nonpalpable breast lesions

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Purpose: The aim of this study was to explore ^{99m}Tc-3P$_4$-RGD$_2$ scintimammography (RSM) in its diagnostic performance for palpable and nonpalpable breast lesions, and to compare RSM with mammography to assess the possible incremental value of RSM in breast cancer detection. **Methods:** A total of 94 patients (92 women, 2men; 110 lesions, 87 palpable and 23 nonpalpable) were included in this study. Prone RSM was performed 1h after injection of ^{99m}Tc-3P$_4$-RGD$_2$ using a planar acquisition of 13 min. Mammograms were evaluated by a specialized imaging radiologist according to breast imaging reporting and data system (BI-RADS) for malignancy and breast density. Scintigraphic images were interpreted independently by two experienced nuclear medicine physicians using a 3-piont system. The Kappa value was calculated to determine the inter-reader agreement. The McNemar test was used to compare RSM and mammography with respect to sensitivity, specificity, and accuracy, whereas Fisher exact test was used to compare the PPV and NPV of the two methods. Diagnostic values for breast cancer detection were calculated lesion by lesion. **Results:** Histopathology revealed 46 malignant lesions and 64 benign lesions. The overall sensitivity, specificity, accuracy, PPV and NPV of RSM were 83% [95% confidence interval (CI) 69- 91%], 73% (95% CI 62 - 83%), 77% (95% CI 69 - 84%), 69% (95% CI 56 - 80%) and 85% (95% CI 74 - 92%), respectively. The K value between the two reviewers was 0.63. The diagnostic values of RSM were higher than that of mammography in evaluating overall breast lesions. But there was no statistical difference between these two methods. A sensitivity of 91% (95% CI 80 - 97%) was achieved when RSM and mammography results were combined, with 60% of all false-negative mammography findings classified as true-positive results by RSM. For lesions between 1.0-1.5cm, RSM yielded a sensitivity of 86% (95% CI 68 - 83%). **Conclusion:** RSM is promising to be used as an additional tool to mammography in avoiding unnecessary biopsies. Fully credible assessment of the clinical efficacy of this procedure is needed. **Keywords:** breast cancer; scintimammography; ^{99m}Tc-3P$_4$-RGD$_2$

P54-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Lung

P0483

Comparison of diagnostic ability between 99mTc-MDP bone

scan and 18F-FDG PET/CT for bone metastasis in patients with small cell lung cancer

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Objective: The aim of this study was to compare the diagnostic ability of ^{18}F-fluorodeoxyglucose (^{18}F-FDG) PET/CT with that of ^{99m}Tc-methylene diphosphonate (^{99m}Tc-MDP) bone scan for bone metastasis in staging patients with small cell lung cancer (SCLC). **Methods**: We retrospectively enrolled 95 patients with SCLC who underwent both ^{18}F-FDG PET/CT and ^{99m}Tc-MDP bone scan for initial staging work-up were retrospectively enrolled. All ^{18}F-FDG PET/CT and bone scan images were visually assessed. Bone metastasis was confirmed by histopathological results and all available clinical information. **Results**: Of 95 patients with SCLC, metastatic bone lesions were found in 30 patients, and 84 metastatic lesions were evaluated on a lesion-basis analysis. The detection rate of ^{18}F-FDG PET/CT was 100% on a per-patient basis and 87% on a per-lesion basis, and there was no false-positive lesion on PET/CT images. In contrast, the detection rate of the bone scan was 37% on a per-patient basis and 29% on a per-lesion basis. The bone scan showed 11 false-positive lesions. The bone scan detected 2 metastatic lesions that were not detected by PET/CT, which were outside the region scanned by PET/CT. On follow-up bone scan, 21 lesions that were not detected by the initial bone scan but were detected by PET/CT were newly appeared. **Conclusions**: In patients with SCLC, ^{18}F-FDG PET/CT showed higher detection rate of bone metastasis than ^{99m}Tc-MDP bone scan. Thus, ^{18}F-FDG PET/CT can replace bone scan in staging patients with SCLC.

P0484

Single photon emission tomography (SPECT) with 99mTc-MIBI in diagnosis of lymph node invasion by non small cell lung cancer (NSCLC).

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The purpose: to evaluate accuracy of SPECT with 99mTc-MIBI in diagnosis of LN invasion by NSCLC and compare results of SPECT with routine staging by computerized tomography (CT). **Material & Methods:** SPECT with 99mTc-MIBI was performed after conventional staging in 84 operated NSCLC patients. Acquisition on dual head camera was started 15 min after i/v injection of 740 MBq of 99mTc-MIBI. SPECT images of the chest were acquired 15 min later over 360° using the following parameters: a 64 -64 word matrix, a 3° angular step, and 30 s/frame. Diagnostic results of SPECT and conventional CT staging were validated by histological examinations of operation material. **Results:** According to histological verification 35 of 84 evaluated patients had LN invasion by NSCLC. SPECT detected LN involvement in 28 of these 35 patients and was false positive in additional 16 patients. Pneumonia or atelectasis was detected in 12 of 16 patients with false positive SPECT results. Sensitivity (Sen), specificity (Sp) and accuracy (Ac) of SPECT in diagnosis of LN invasion by NSCLC was as follows: 80%, 67%, 72%. Diagnostic accuracy of CT for detection of LN involvement were inferior to SPECT: Sen - 70%, Sp - 63%, Ac - 66%. Combination of SPECT and CT data offer interesting diagnostic solution. If LN involvement is detected by at least one of these methods Sen reached 94% with corresponded Sp -52%, Ac - 70%. This strategy can be used for discrimination of patients that can be operated from those who need further invasive diagnostic procedures. **Conclusions:** 1. In patients with NSCLC SPECT with 99mTc-MIBI can significantly improve diagnostic accuracy of conventional CT staging. 2. LN invasion by NSCLC can be refused in 94% of patients with normal SPECT and CT data.

P0485

Predictive value of early and late residual 18F-FDG and 18F-FLT uptake using different SUV measurements in non-small cell lung cancer patients treated with erlotinib

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Purpose To evaluate the predictive value of early and late residual ^{18}F-FDG and ^{18}F-FLT uptake using different SUV measurements in positron emission tomography (PET) in patients with advanced non-small cell lung cancer (NSCLC) treated with erlotinib. Patients and Methods We retrospectively reviewed data from 30 patients with untreated stage IV NSCLC who had undergone combined FDG-PET and FLT-PET at one (early) and six (late) weeks after start of erlotinib treatment. Early and late residual FDG und FLT uptake was measured in up to five lesions per scan with different quantitative standardized uptake values (SUV_{max}, SUV_{2Dpeak}, SUV_{3Dpeak}, SUV_{50}, SUV_{A50}, SUV_{A41}) and compared with short-term outcome (progression vs. non-progression after 6 weeks of erlotinib treatment). Receiver-operating characteristics (ROC) curve analysis was used to determine the optimal cut-off value for detecting non-progression after 6 weeks. Kaplan-Meier analysis and the log-rank test were used to evaluate the association between residual uptake and progression-free survival (PFS). Results Non-progression after 6 weeks was associated with a significantly lower early and late residual FDG uptake, measured with different quantitative parameters. In contrast, non-progression after 6 weeks was not associated with early and late residual FLT uptake. **Furthermore, patients with a lower early and late residual FDG and FLT uptake showed a significantly longer PFS in comparison to patients with higher values in survival analysis.** Patients with a lower early residual FDG uptake measured with SUV_{max} and SUV_{2Dpeak} had a significantly prolonged PFS (282 days vs 118 days; p=0.022) than patients with higher values. **Similarly, lower late residual FDG uptake and early residual FLT uptake measured with SUV_{3Dpeak}, SUV_{A50} and SUV_{A41}, and late FLT uptake measured with SUV_{3Dpeak} and SUV_{A50} was associated with an improved PFS**. Conclusion Early and late residual FDG uptake, measured with different quantitative SUV parameters, are predictive factors for short-term outcome in patients with advanced NSCLC treated with erlotinib. **Additionally, low residual FDG and FLT uptake early and late in the course of erlotinib treatment is associated with improved PFS.**

P0486

CT-Perfusion in Lung Cancer: Correlation of Perfusion Parameters and PET/CT Parameters - Initial Results

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AIM To investigate the correlation of CT-perfusion (CTP) parameters (blood flow (BF), blood volume (BV), mean transit time (MTT)) and FDG-PET/CT parameters (maximum standardized uptake value (SUVmax), mean standardized uptake value (SUVmean), PET volume (PETvol), total lesion glycolysis (TLG)) in patients with lung cancer. **MATERIALS AND METHODS** Fifty-four patients (median age 72 years, range 48 to 87 years, 12 female, 42 male) with suspected lung cancer were referred for baseline staging PET/CT. A CTP scan of the lung tumor was performed (40ml of contrast medium at 4.5ml/s flow rate, delay 3s, tube voltage 100kV, tube current 100mAs, scan length 7cm, scan time 60s, rotation time 1.0s, reconstructed slice thickness 5mm) and post-processed with a commercially available perfusion software. BF, BV, and MTT of the tumor tissue were calculated and correlated with SUVmax, SUVmean, PETvol and TLG by Spearman's correlation coefficient. **RESULTS** According to biopsy, 5 patients had a SCLC, 40 NSCLC (23 adenocarcinoma (AC), 9 squamous cell carcinoma (SCC), 7 large cell carcinoma (LCC), 1 neuroendocrine carcinoma), 9 patients had non-neoplastic lesions. Mean BF, BV and MTT was 35.8 mL/100mL tissue * min^{-1}, 8.5 mL/100mL tissue, and 13.9 seconds. Mean SUVmax, SUVmean, PETvol and TLG was 11.7, 7.2, 33.45cm^3 and 284.2. Weak inverse correlations were found between BF and SUVmax and SUVmean (-0.28; -0.27). For all other CTP parameters, no statistically significant correlation was found with PET/CT parameters. **CONCLUSION** CT-perfusion parameters showed only partially weak correlation with PET/CT parameters. This suggests that both parameter sets may reflect independent patho-physiological mechanisms of lung cancer. CT-perfusion might serve as a non-invasive method to assess lung tumor biology in addition to PET/CT.

P0487

F-18 FDG PET/CT for evaluation of the change of FDG uptake to pulmonary tumors after radiofrequency ablation

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Purpose: The aim of this study was to evaluate semiquantitatively the accumulation of F-18 fluorodeoxyglucose (FDG) in pulmonary tumors on positron emission tomography (PET)/ computed tomography (CT) after radio frequency ablation (RFA) with LeVeen needle. Methods: Thirty of 25 patients with 30 lung tumors after RFA with LeVeen needle (n=10, non-small cell lung tumor [adeno=8, SCC=2]; n=20, metastatic lung tumor) were studied in historical cohort study. F-18 FDG-PET/CT was performed before RFA, at 3 months after RFA, and 6 months after RFA. We evaluated the accumulation of F18-FDG to the pulmonary tumors after RFA with the maximum standardized uptake value (SUVmax) and with the retention index (RI) of SUVmax (RI-SUVmax), compared with the long-axis diameters of the pulmonary lesions. All tumors were confirmed without local recurrence by 2-year clinical follow-up. Results: The median of SUVmax for all tumors were 4.599 at pre-RFA, 4.292 at 3 month after RFA, and 2.95 at 6 month after RFA, respectively**.** Significant difference in the median of SUVmax was found between at pre-RFA and at 6 month after RFA (p=0.0157), between at 3 month after RFA and at 6 month after RFA (p=0.021) for all tumors. No significant difference was found between at pre-RFA and at 3 month after RFA for all tumors (p=0.5885). Median RI-SUVmax

were -3.40% for those at 3 months after RFA, and -32.90% for those at 6 months after RFA . The RI-SUVmax was significantly lower at 6 months after RFA than those at 3 months after RFA (p=0.0329). Conclusions: The accumulation of F-18 FDG in pulmonary tumors after RFA with LeVeen needle was higher at 3 months after RFA than those of 6 months after RFA for all pulmonary tumors, for metastatic tumors, and for NSCLC, respectively. PET/CT study at 6 months after RFA may be more appropriate for the assessment of F-18 FDG accumulation for pulmonary tumors than PET/CT study at 3 months after RFA.

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Lymph-node mediastinal staging in patients with NSCLC: 18-FDG PET-TC versus TC mdc

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The aim of our study has been to value the diagnostic accuracy of PET/CT and contrast-enhanced CT to notice pathological mediastinal lymphadenopathy in patients with lung cancer.Lymph node involvement differentiates patients who are candidates for surgical treatment (N0-N1) from those who benefit from neoadiuvant treatment (N2-N3).Lymph node mediastinal staging may be intraoperatoria o preoperatoria.CT is the most appropriate modality to detect an increase in size of mediastinal lymph node.Small lymph nodes can be metastasis in 20% of patients as well as big lymph nodes can be benign; it is for this reason that upstaged or understaging may occur in 40%. A diameter great more 1 cm in short axis is considered a suspect in CT.Minimal invasive modality include transoesophageal and transbronchiale endoscopic ultra sound with FNA (EUS-EBUS FNA). MATERIALS AND METHODS Retrospectively we have value 28 patients with NSCLC (12 squamous cell, 14 adenocarcinomas, 2 poorly differentiated). All patients have been submitted surgical resection or mediastinoscopy with histologic correlation. All patients have performed contrast-enhancedCT and PET/CT18F-FDG in 4-weeks. Contrast-enhancedCT protocol: Siemens Medical System, 64 slices; Infusion of 100 ml of contrast at a flow of 3 ml/sec with a delay of 30 seconds starting from the apex lung to the bases lung and scans on the upper abdomen in the portal phase. PET/CT protocol: images acquired form the apex to the upper portion of the thigh, 60 min after intravenous administration of 370 ± 50 MBq 18F-FDG (CT: 140 KeV, 80 mA, 0.5 sec/rotation section thickness 3.75 mm). PET was considered negative in cases where there was not or there was very low metabolic activity (less than mediastinal blood-pool activity) RESULTS According with istological results sensitivity, specificity, positive, negative predictive value, accuracy were: 18F-FDG-PET/CT: 92%; 71%; 76%; 91%; 82% Contrast-enhancedCT: 55%; 80%; 83%; 50%; 64% In seven patients mediastinal lymph node dimensions signalled to HSCT between 10-15mm, were not confirmed to PET/TC and to histology response. PET/CT showed 2 patients with paratracheal lymph nodes uptake confirmed to histological exam and not signalled like suspect with HSCT; these cases would have a less staging instead of IIIA CONCLUSIONS The accuracy to treat pathological mediastinal lymph nodes greater than 1 cm of diameter is not very satisfactory in contrast-enhanced CT and in this retrospective study is 65%.The diagnostic accuracy of PET/CT instead is 90% and 92% VPN allowing to obtain a distinction between the stage operable-inoperable

P0489

Role of 18F-FDG PET/CT in Malignant Pleural Mesothelioma

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Introduction Malignant pleural mesothelioma (MPM) is the most common malignant tumor of the pleura and is an aggressive tumor with poor prognosis. Exposure to asbestos is a well-established etiological factor for MPM which tends to have a long latency period of 20-40 years after asbestos exposure. Although it is an uncommon disease, the incidence is expected to increase significantly in the coming 10-20 years due to the widespread exposure to asbestos in the past decades. Imaging plays an essential role in the evaluation of MPM. The primary imaging modality in MPM is computed tomography. Recently, PET/CT demonstrated significant improvements in diagnosis and accurate staging of MPM. PET/CT has emerged as a modality that can provide additional important diagnostic and prognostic information to help further delineation of the extent of disease, especially in surgical candidates. Aim We aimed to evaluate retrospectively the 18F-FDG PET/CT scans of the patients on suspicion of MPM to find the sensitivity, spesificity, positive and negative predictive values of 18F-FDG PET/CT and the cut-off SUVmax value in differentiation of MPM from benign pleural lesions. Methods 45 patients were included in the study who underwent 18F-FDG PET/CT scan in our clinic on suspicion of MPM. The scan reports and SUVmax values were recorded and compared with histopathological results. The mean of SUVmax values of benign and malignant lesions, sensitivity, spesificity, positive and negative predictive values of 18F-FDG PET/CT and the cut-off SUVmax value in differentiation of MPM from benign pleural lesions were calculated. Results The mean SUVmax value was 9.1±3.7 in 22 histopathologically verified MPM cases and it was 3.2±2.9 in benign lesions of 23 patients. Statistically significant difference was found between benign and malignant pleural lesions (p<0.001). When compared with histopathological results, the sensitivity, spesificity, positive and negative predictive values of 18F-FDG PET/CT were 95%, 65%, 72% and 93% respectively. The cut-off SUVmax value in differentiation of MPM from benign pleural lesions was 5.2 (95% sensitivity, 82% spesificity). Conclusion The SUVmax values of malignant pleural lesions are significantly higher than benign pleural lesions. 18F-FDG PET/CT has a high sensitivity and negative predictive value in evaluating patients on suspicion of MPM. The cut-off SUVmax value of 5.2 can be used in differentiation of MPM from benign pleural lesions. This cut-off value differs from the results of previous studies which are approximately 2.0.

P0490

Accuracy of 18F-FDG PET/CT (PET) for the characterization of solitary pulmonary nodule (SPN): Experience of Ferrara's University Hospital

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Objectives : To characterize SPN incidentally found after the correlation between PET, SUV and CT size. Methods : We selected 145 patients with lung nodules incidentally detected by XRay and/or CT performed for other problems. All patients underwent histopathology biopsy following PET and CT. We calculated PET sensitivity, specificity, accuracy, PPV and NPV. Linear regression equation (RL) was obtained, respectively, for malignant (72 patients; 49.6%), benign (73; 50.4%), adenocarcinoma (37; 25.5%), squamous cell carcinoma (18; 12.4%), other carcinoma (small cell, secondary lesions, mesothelioma; 17, 11,7%), granuloma lesions (10; 6,9%) and negative histology (flogosis, metaplasia; 63, 43.4%), fitted to SUV and CT size. Results : PET sensitivity, specificity, accuracy, PPV and NPV were respectively 89%, 82%, 85%, 83%, 88%. The RL for malignant and benign lesions show trend similar but malignant RL starts from a higher baseline. Granuloma RL shows a very steep slope. Adenocarcinoma RL shows no significant slope. Squamous cell Carcinoma RL starts from a high baseline and has a significant slope but not so steep as Granuloma RL. Other cancers RL includes nodules of different histologies and no rational observation is valid. Conclusions : Granuloma RL slope is due to inflammatory reaction and high FDG avidity. Adenocarcinoma RL does not show correlation between SUV and nodule size. The line starts at already high value and indicates that it does not depend from GLUT1 concentration or vascularization, already high at small size. An explanation could be the necrotic tissue and mucinous component of cancer that is created as the lesion grows, maintaining or increasing slightly as the number of malignant cells and the presence of fibrotic center. Data must be confirmed by further studies, in particular PET with contrast agent. In light of these data is not excluded to think we can better characterize SPN with serial PET acquisition.

P0491

Clinical importance of ^{18}F-FDG PET/CT in the management of patients with bronchoalveolar carcinoma (BAC): the role of the method in detection of recurrence

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Aim: ^{18}F-FDG PET/CT has been reported to have a low sensitivity in the initial diagnosis of bronchoalveolar carcinoma (BAC) due to its low metabolic activity. The aim of our study is to assess the value of ^{18}F-FDG PET/CT in detection of BAC recurrence. **Materials and Methods:** During the period 2/2007- 9/2011, we studied the ^{18}F-FDG PET/CT scans that were performed in patients with known, histologically proven BAC. 24 ^{18}F-FDG PET/CT scans were performed in 22 patients, 16 men and 6 women, with a mean age of 65±9 years old. Among them, 15 were performed for probable recurrence with equivocal findings in conventional imaging methods and 9 for restaging post-therapy. In all cases conventional imaging studies (CT, MRI) were performed 5-30 days before PET/CT. **Results:** Among the 24 ^{18}F-FDG PET/CT scans, 18 were positive and 6 negative. Of the 15 scans performed for suspected recurrence, in 9 appeared upstaging, 2 were in agreement with findings in conventional modalities, in 2 extra lesions and in 1 fewer lesions were detected, with no change in staging and 1 scan was negative. ^{18}F-FDG PET/CT scans detected 4 lesions and the mean value of SUVmax was 6.8 ± 3.26. On the other hand in patients examined for restaging, there was agreement of ^{18}F-FDG PET/CT findings with conventional modalities in 8 out of 9 cases. There were only 5 lesions with mean SUVmax of 4.86±3.18. **Conclusion**: Regardless the fact that ^{18}F-FDG PET/CT

has been reported to have a low sensitivity in the initial diagnosis of BAC, our results indicate that ^{18}F-FDG PET/CT may provide further information in patients evaluated for recurrence. It seems that lesions become [^{18}F]FDG avid and so,^{18}F-FDG PET/CT could improve patient management.

P0492

18F-FDG PET-CT in Evaluation of Adrenal Lesions in Patients with Lung Cancer.

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Aim of study: The aim of this study was to assess the role of PET-CT with 18F-FDG in differentiating benign from metastatic adrenal masses of patients with lung cancer. Materials and methods: In our study, there were 52 patients with 63 adrenal nodules. All of them were diagnosed with NSCLC. Diagnosis of adrenal malignant lesions (n=8) was based on the radiological (CT) detection of a nodule's growth over a one-year minimum follow-up period. Adrenal nodules, which remained unchanged, were diagnosed as benign (n=55). Mean diameter, attenuation value, SUVNmax, SUVratio and SUVBP for adrenal malignant and benign lesions were compared with Student's t-test. SUVNmax, SUVratio and SUVBP were estimated by Receiver - Operating Characteristic analyses (ROC) in order to calculate thresholds for malignant lesions. In the second part of our analysis, we made an assumption that adrenal masses with an attenuation value ≤10 H.U. were benign. Adrenal masses - with an attenuation value >10 H.U and ≥ SUVNmax, SUVratio or SUVBP thresholds were classified as malignant lesions. Sensitivity, specificity, accuracy, positive predictive value and negative predictive value were calculated for all diagnostics models. Results: Malignant lesions had a longer diameter than benign lesions 26.63±13.86mm vs. 14.40±5.95mm (p<0.001). They were characterized by a higher 18F-FDG uptake (SUVNmax) (4.29±2.61 vs. 1.41±0.41, p=0.001) and a higher CT attenuation value (24.63±14.86 vs. 10.87±9.74, p<0.001). There were also significant statistical differences between SUVratio (2.20±1.57 vs. 0.63±0.18, p<0.001) and SUVBP (2.88±1,73 vs. 1.21±0.32, p<0.001). On the basis of Receiver - Operating Characteristic analyses we determined the most accurate thresholds for SUVNmax, SUVBP and SUVratio. Adrenal metastases were classified on the basis of SUVNmax≥2.5, SUVBP≥1.2 and SUVratio≥1.0. In the differentiation between metastatic and benign lesions SUVNmax≥2.5 corresponded to 75% sensitivity, 100% specificity, 98.8% accuracy, 100% PPV and 96.5% NPV. For both SUVBP≥1.2 and SUVratio≥1.0 sensitivity, specificity, accuracy, PPV and NPV corresponded to 87.5%, 96.4%, 95.2%, 77.8% and 98.1% respectively. In the combined PET-CT, the attenuation value >10 H.U. and one of the following values: SUVNmax≥2.5 or SUVBP≥1.2 or SUVratio≥1.0, were adopted as a criterion for diagnosing adrenal metastases. Those models were characterized by 63-75% sensitivity, 100% specificity, 95-97% accuracy, 100% PPV and 95-97% NPV. Conclusions: 18F-FDG PET-CT is an accurate, noninvasive technique, characterized by 95-97% accuracy in the differentiation of NSCLC metastases from benign adrenal nodules. Information from both modality (PET and CT) should be consider in order to correct differentiate NSCLC metastases from benign adrenal nodules.

P0493

Feasibility of Limited Thoracic FDG PET/CT for the Evaluation of Solitary Pulmonary Nodules in Patients With Intermediate and High Risk of Lung Cancer

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AIM Medical radiation from diagnostic imaging has become an important source of concerns in the past decade. Industries and health professionals are working together to reduce the radiation to patients. Therefore, we are investigating the feasibility of a limited thoracic FDG PET/CT scan for the evaluation of solitary pulmonary nodules (SPN) in patients with intermediate and high risk of lung cancer. METHOD AND MATERIALS This is a retrospective review of patients referred for the evaluation of SPN discovered by conventional imaging (radiography, CT or MRI) who underwent a whole-body FDG PET/CT (skull base to mid-thighs) at our institution. Final diagnosis of all SPN and extra-pulmonary findings are proven with histopathology sampling, further imaging and/or clinical follow-up (minimum 12 months). Patients were staged according to the seventh edition of the American Joint Committee of Cancer. All findings outside of a limited thoracic FDG PET/CT (skull base to the upper portion of kidneys) were recorded and compared to the whole-body scan. Descriptive statistics and frequencies were used for demographics, imaging and pathologic findings. RESULTS 61 consecutive patients (71.4 ± 10.7 year-old) were enrolled from October 2010 to March 2012. 52% were men (n=32), 61% were past/current smokers (n=37) and 38% had a history of cancer (n=23). Mean SPN diameter was 2.4 ± 0.9 cm and median SUV_{max} was 3.7 ± 3.4 (range: 0.8-14.4). Lung primary malignancies were found in 82% (n=44) of cases, while 28% were benign on histopathology (n=13) or on follow-up (n=4). Of all lung cancers, 34 were stage I, 8 were stage II or III, but only 2 patients had metastasis (stage IV): one was diagnosed with pleural nodules (M1a) and the other, with liver and bone metastasis (M1b). Both cases would be accurately staged if only limited thoracic FDG PET/CT was done. CONCLUSION Comparing to whole-body scans, the limited thoracic FDG PET/CT did not alter the accuracy for staging lung cancer since most metastases were confined to the area evaluated from the skull base to the upper portion of kidneys. These preliminary data highlights the possibility to avoid unnecessary radiation from the CT portion, by limiting the area to scan in patients referred for the evaluation of SPN. These results should be confirmed on a larger scale study.

P0494

The Impact of Partial Volume Correction in the Evaluation of Solitary Pulmonary Nodules by FDG PET/CT in a Population at Intermediate Risk of Lung Cancer

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AIM Accurate quantification of FDG PET/CT is essential for a better characterization of solitary pulmonary nodules (SPN). Unlike motion related to breathing, partial volume effect (PVE) is easier to correct and to apply into daily practice, and with no additional radiation to patients. This study investigates the impact of PVE correction on the evaluation of SPN in a population with an intermediate risk of lung cancer. METHOD AND MATERIALS This is a review of a prospective observational study of patients referred for the evaluation of SPN identified by conventional imaging (radiography, CT or MRI) who underwent FDG PET/CT imaging at our institution. Final diagnosis was confirmed by histopathology and/or follow-up (minimum 12 months). SUV_{max} was evaluated after mirroring the region of interest drawn around the lung lesion from the CT component of PET/CT and the largest diameter for the SPN was recorded on the CT images. Recovery coefficients for PVE correction were derived from phantom studies and applied on the SUV_{max} obtained originally. Parametric measurements were compared between benign and malignant cases using unpaired Student's t-test. The accuracy of SUV_{max} to define the nature of SPN was evaluated with the area under the ROC curves. RESULTS From October 2010 to March 2012, 60 consecutive patients (71.5 ± 10.7 year-old) were enrolled: 53% were men (n=32) and 60% were past/current smokers (n=36). Pathology was confirmed in 58 cases (44 malignant, 14 benign) and clinical follow-up showed resolution of benign anomalies in 2 cases. There were no statistically significant differences between benign and malignant cases, when tumor size (1.9 vs 2.2 cm, p=0.21), SUV_{max} pre-PVE correction (3.5 vs 4.7, p=0.07) or SUV_{max} post-PVE correction (5.9 vs 5.8, p=0.35) were analyzed. The area under the ROC curves for SUV_{max} pre- and post-PVE correction was 0.616 and 0.511, respectively (p=0.23). Using a SUV_{max} 2.5 as a cutoff value, the accuracy was evaluated at 61%, sensitivity at 65% and specificity at 50%: PVE correction increased the accuracy to 65% and the sensitivity to 81%, but the specificity dropped to 19%. CONCLUSION Despite the easy use of partial volume correction on a routine basis, this technique did not improved the accuracy of a combined FDG PET/CT in the differentiation between malignant and benign SPN in a cohort with an intermediate risk of lung cancer. This improved quantification might be useful for other purposes such as prognostic value, but this hypothesis should be evaluated with other studies.

P0495

Preoperative Mediastinal Staging of NSCLC: The Clinical Impacht of 18F-FDG PET/CT

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Aim Accurate mediastinal staging, especially N2 node status determines treatment opportunities for patients with NSCLC. Our purpose was to test the clinical impact of 18F-FDG PET/CT in the preoperative mediastinal staging of patients with NSCLC. Methods Eighty-three patients were enrolled in the retrospective study. All of them underwent whole body PET/CT scanning indicated for preoperative staging. Patients with postoperative histology result other than NSCLC (n=11) were excluded from the study. A total of 72 patients (mean age: 60.2 (44-72) years, male/female: 35/37) met the inclusion criteria. The pathological stage indicated T1 in 29/72 (40.3%), T2 in 33/72 (45.8%) and T3 in 3/72 (4.2%), and T4 in 7/72 (9.7%) of the cases. Our patients underwent lobectomy in 50/72 (69.4%), pneumonectomy in 1/72 (1.4%), wedge resection in 13/72 (18.2%), bilobectomy in 1/72 (1.4%), exploration in 4/72 (5.6%), mediastinoscopy in 1/72 (1.4%), lobectomy+wedge resection in 1/72 (1.4%) or mediastinoscopy+lobectomy in 1/72 (1.4%) cases. The results of PET/CT data were compared to those of invasive nodal staging, including a total of 237 lymph node stations. Results Primary tumours presented SUVmax data between 2.2 and 24.0. PET positive N2 stations demonstrated SUVmax with a range between 5.7 and 22.6. Twenty (27.8%) patients with pathologically positive N2 nodes had a ratio of SUVmaxmediastinal

lymph node / SUVmaxprimary tumor (RSm) <0.56. The sensitivity and specificity of PET/CT was 80.0% and 92.0%, respectively. Conclusion The clinical use of SUVmax PET data or the ratio of SUVmaxmediastinal lymph node/SUVmaxprimary tumor in the prediction of nodal pathology is very helpful; however, it needs careful consideration. The clinical impact of FDG PET/CT is high by identifying NSCLC patients having pathologic lymph nodes with high sensitivity and specificity. Additionally, the metabolic PET/CT measurement has a great potential in identifying the site of optimal sampling.

P0496

Performance of FDG PET/CT in mediastinal nodal staging in NSCLC; Comparsion with chest CE-CT scan and EBUS/TBNA

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Background & Objective: Optimal mediastinal staging in NSCLC is crucial for appropriate treatment strategy. The aim of this study was to investigate the diagnostic accuracy of FDG PET/CT in mediastinal nodalstaging of NSCLC and to compare this integrated non-invasive modality with Chest CT scan and EBUS/TBNA. Patient & Methods: A 30 patients with potentially operable NSCLC underwent Chest CE-CT scan and 18F-FDG PET/CT for primary staging. In twelve patients, endobronchial ultrasound/ tansbronchial needle aspiration (EBUS/TBNA) was performed. Findings of ipsi-lateral (N2) and contra-lateral (N3) mediastinal lymph nodes on each of these staging methods were documented. Final diagnosis was established by histopathology confirmation of dissected lymph nodes during thoracotomy in 12 cases, imaging follow up with lung cancer multidisciplinary clinic consensus along with EBUS/TBNA results in another 6 cases and imaging (six of these cases had also EBUS), follow up with lung cancer multidisciplinary clinic consensus in the other 12 cases. Sensitivity, specificity, negative predictive value, positive predictive value and accuracy were calculated for CT scan and PET/CT. Results: In 30 patients who underwent CT scan and PET/CT, there were 24 correlating findings, 13 true positive, 8 true negative, 2 false positive and one false negative. However, in 6 discrepant findings, PET/CT was true negative in all 6 cases and CT scan false positive in all cases. Comparison between CT scan and PET/CT in 30 patients is shown in table 1. In 12 patients who underwent PET/CT and EBUS/TBNA, there were 9 correlated findings, 5 true positive and 4 true negative. However, in three discrepant findings, PET/CT was true positive in one case which was missed by EBUS and false positive in the other two cases that were correctly staged by EBUS/TBNA. Conclusion: PET/CT offers significantly higher accuracy versus CT scan in mediastinal nodal staging in patients with NSCLC, mainly because of improved specificity. Negative predictive value of PET/CT in mediastinal nodal staging in patient with NSCLC is reliable and may be privileged to the minimally invasive EBUS procedure.

P0497

Diagnostic Performance of 18F-FDG PET/CT for Solitary Pulmonary Nodules in Case of Discordant Diagnoses between PET and CT

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PURPOSE: To determine the diagnostic performance of 18F-FDG PET/CT in case of discordant diagnoses between PET and CT for assessment of solitary pulmonary nodules (SPN). MATERIALS AND METHODS: One hundred and ninety consecutive patients with 190 SPNs underwent standard whole-body PET/CT followed by a low-dose chest CT. All SPNs were pathologically diagnosed, and classified into malignant SPNs (n=128) and benign SPNs (n=62). PET component of PET/CT and simultaneously acquired chest CT were separately assessed by a 5-point visual scoring system according to the confidence level of diagnosis of malignant SPN. The lesions were also divided into two groups according to the concordant and discordant diagnosis between PET and CT. To compare the diagnostic performance between two groups, sensitivity (SE), specificity (SP) and accuracy (AC) of each were assessed by the Fisher's exact test and the McNemar's test. Logistic regression analysis was performed to evaluate the possible findings that induced the discrepancy between PET and CT. RESULTS: 114 SPNs were evaluated with concordant diagnoses whereas the diagnoses of remaining 76 SPNs were discordant between PET and CT. In the discordant group, the SE, SP and AC of PET component (48.3%, 33.3% and 44.7%, respectively) and that of CT (51.7%, 66.7% and 55.3%) were significantly poorer than that of concordant PET/CT (77.1%, 90.9% and 82.5%) ($p<0.05$). From the regression analysis, CT findings of irregular margin, notch and ground glass opacity were significantly correlated with malignant SPNs even though the PET accumulation was low. The sensitivity of discordant PET/CT adjusted by these CT criteria (89.7%) was higher than each modality alone, but the specificity (44.4%) was lower than that of concordant PET/CT. CONCLUSIONS: When the diagnoses of PET and CT are discordant, each of the diagnostic performance is significantly lower than concordant PET/CT. The diagnostic performance of discordant PET/CT may be improved by the CT criteria, but is not equivalent to that of concordant PET/CT.

P0498

Accuracy of sentinel node biopsy in the staging of non-small cell lung carcinomas: systematic review and meta-analysis of the literature.

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Introduction: Mediastinal lymph node dissection is not necessary for all patients with NSCLC, since less than 30% of clinically stage I patients have mediastinal lymph node involvement. Sentinel node biopsy has been used for NSCLC since 1999 to decrease the need for mediastinal lymph node dissection. In the current study, we systematically searched the literature on sentinel node biopsy in NSCLC and reported the results in a systematic review and meta-analysis format. Materials and Methods: Medline, SCOPUS, and ISI web of knowledge were searched using: "(lung AND sentinel)" with no date or language limit. Any study with more than 5 patients and enough information to calculate detection rate and sensitivity were included. Results: Overall 47 and 43 studies (including subgroups) had the criteria for detection rate and sensitivity pooling respectively. Pooled detection rate was 80.6% [76.7-84%] and pooled sensitivity was 87% [83-90%]. Using radiotracers or both radiotracers and dyes had higher detection rate and sensitivity compared to dye alone. Among studies using radiotracers, peri-tumoral and pre-operative injections had higher detection rate and sensitivity compared to intra-tumoral or intra-operative injections. Un-conventional new techniques (magnetic materials, fluorescent dyes, CT contrast agents, and carbon nano-particles) had fairly high detection rate and sensitivity. Conclusions: Sentinel node mapping is a feasible and reliable technique for mediastinal lymph node staging of N0 NSCLC patients. New methods of sentinel node mapping had very promising results and warrant further studies with larger sample size.

P0499

Evaluation of bronchoscopy and ^{18}F- FDG PET-CT in a fast track assessment of suspected lung cancer

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Introduction: The aim of this study was to evaluate the clinical performance of bronchoscopy and ^{18}F- FDG PET-CT in an outpatient fast track assessment for suspected lung cancer. **Methods:** We evaluated 215 patients who were referred to our hospital between December 2007 and November 2010, due to an abnormal chest X-ray and a clinical suspicion of pulmonary malignancy. The fast track consists of blood sampling, pulmonary function tests, whole body ^{18}F-FDG-PET/CT scan and bronchoscopy on a single day. The results of these modalities were discussed in a multidisciplinary setting, with histopathological evaluation as the reference standard whenever available. **Results:** In 195 patients (91%) a histologically proven diagnosis was made. In 85 % of these a malignancy was diagnosed. In the group with histologically proven malignancy, a complete bronchoscopy was performed in 91 %. In this group, histological diagnosis was achieved in 50 % by bronchoscopy. In all other cases, malignancy was proven by CT guided biopsy, ultrasound guided biopsy or surgery. In the group of patients with a tumor positive bronchoscopy ^{18}F-FDG-PET/CT revealed lymph node metastases or distant metastases in 75 % at locations which were more attractive for biopsy than bronchoscopy **Conclusion:** Bronchoscopy reveals a histologically proven malignancy in 50 % of cases. ^{18}F-FDG-PET/CT showed more attractive locations for biopsy in the majority of these patients. Therefore, routine use of bronchoscopy can be debated, because of the invasive manner of the procedure and its very limited role in staging. An ^{18}F-FDG-PET/CT should be considered as a first step in PET guided biopsy preventing unnecessary bronchoscopy.

P0500

Significance of FDG PET/CT in Clinically Suspicious Supraclavicular Lymph Nodes in Primary Lung Cancer Patients

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Aim: The purpose of this retrospective study was to evaluate the clinical significance of FDG PET/CT in suspicious supraclavicular lymph node metastasis found on diagnostic CT in lung cancer primary staging patients. Materials and Methods: From August 2006 through February 2012, patients with suspicious supraclavicular lymph node metastasis on diagnostic CT who had undergone FDG PET/CT for lung cancer staging prior to therapy were included. All patients had a

pathological diagnosis of lung cancers. Those who had a second primary cancer history were excluded to avoid interference. The correlation between SUVmax of supraclavicular lymph nodes with the presence of distant metastasis, the rate, patterns of distant metastasis demonstrated on FDG PET/CT, and discrepancies between FDG PET/CT and other image modalities in metastatic site detection were analyzed. Results: There were 164 patients enrolled. The histological types of lung cancers were adenocarcinoma in 99 (60.4%) patients, squamous cell carcinoma in 24 (14.6%) patients, small cell carcinoma in 19 (11.6%) patients and large cell carcinoma in 6 (3.7%) patients. One hundred and eleven patients (68% out of total 164) had M1b disease identified on FDG PET/CT. All the 6 patients of large cell lung cancers and 78% of adenocarcinoma patients had M1b disease. The mean SUVmax of supraclavicular lymph nodes in the M1b group was significantly higher than either the M1a group (8.3 vs. 4.9, p=0.029) or the M0 group (8.3 vs. 6.1, p=0.008). Regarding the distant metastasis, bone was the most frequent site in all histological types of lung cancers, which was noted in 70 patients (63%). Bone metastases in 37 of these 70 patients (53%) were not detected by diagnostic CT. In 14 patients with sole site metastasis, brain (7/14, 50%) was the most common organ with false-negative FDG PET/CT findings in five patients (5/7, 82%). Conclusion: Lung cancer patients with suspicious supraclavicular lymph nodes metastasis on diagnostic CT had high probability of coexisting M1b disease, which could be depicted by FDG PET/CT. SUVmax of supraclavicular lymph nodes correlated with M-disease status. Most discrepancies in distant metastatic site detection as compared with other image modalities were noted in bone and brain. In case of no distant metastasis identified on FDG PET/CT, contrast-enhanced brain CT or MRI was highly recommended to exclude brain metastasis.

P0501

FLT PET for response assessment in malignant pleural mesothelioma (MPM) using a semi-automated volume-based region growing algorithm

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Aim: 18F-Fluorothymidine (FLT) is a PET cellular proliferation tracer, which has been studied in response evaluation in solid tumours, but not in MPM. Our group has previously used a semi-automated region growing algorithm to define total glycolytic volume (TGV) for FDG PET in MPM, and demonstrated the prognostic and response evaluation potential of this technique. With FLT PET imaging, there is physiologic bone marrow and liver activity, which is problematic for semi-automated region generation in MPM, as the tumour activity is contiguous with normal bone or liver. The region growing algorithm was modified to allow masking of bone and liver from the FLT scan, based on their CT Hounsfield units or operator created volumes of interest. The feasibility and potential utility of 3D volume based quantitation using semi-automated region generation with FLT PET in MPM was assessed in this study. Materials and methods: Patients with confirmed MPM commencing first line chemotherapy were prospectively recruited. Patients had FLT and FDG PET scans at baseline and after 1 cycle of chemotherapy. FLT and FDG PET scans have been analysed with the semi-automated region growing technique to obtain tumour total proliferative volume (FLT TPV), FDG TGV and SUVmax. Patients had CT scans for response assessment at baseline and after cycles 1, 4 and 6, and were followed for progression and survival. Results: 15 patients underwent with pre and post chemotherapy FLT and FDG PET scans. The median FLT TPV on the baseline study was 1200 (range 97- 7436) and median FLT SUVmax was 6.4 (range 3.6-12.8). Baseline median FDG TGV was 2239 (range 198-22418) and SUVmax was 10.2 (5.2 -13.9). Baseline FLT TPV values demonstrated a strong correlation with baseline FDG TGV (r=0.87, p<0.001), however the FLT SUVmax and FDG SUVmax on the baseline scan demonstrated poor correlation (r= 0.37, p= 0.17 NS). In the two patients who obtained CT defined partial response, the FLT TPV reduced by 96% in each patient, and the FDG TGV reduced by 88% and 89%. Conclusion: Semi-automated region growing of FLT PET scans in MPM is feasible after subtraction of normal bone and liver. Initial results suggest a strong correlation between distribution of FLT and FDG activity, however a poor correlation between maximum intensity of FLT and FDG in MPM. Outcome data is being compiled.

P0502

Clinical value of semi-quantitative analysis of 18F-FDG PET/CT in the diagnosis of Lung lesions

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Objective: To evaluate the clinical value of maximum standardized uptake value (SUVmax) and percentage change of SUVmax(ΔSUVmax) in the diagnosis of lung lesions. **Methods:** Forty-six cases, 68 pulmonary lesions were divided into malignant group and benign group according to the pathological results or clinical and radiological follow-up. All of them underwent ^{18}F-FDG PET/CT imaging, thirty-seven cases performed delay ^{18}F-FDG PET/CT imaging. SUVmax and for early and delay PET/CT imaging and volume of lesions were measured. **Results:** The volume and SUVmax of malignat group (including 34 patients and 49 lesions)and benign group (including 12 patients and 19 lesions)were (20.17 ± 40.91) ml , 5.81 ± 4.56 and (12.37 ± 32.62)ml, 3.48 ± 2.07 respectively. Thirty seven patients performed dual-time PET/CT imaging, the volume and ΔSUVmax of malignat group (including 26 patients and 33 lesions)and benign group (including 11 patients and 17 lesions)were (16.12 ± 37.38) ml , (35.21 ± 2 5.25)%and (13.43 ± 34.44)ml, (19.47 ± 17.65)% respectively. The SUVmax of malignant lesions had significant positively correlation with the volume of that (*P*=0.00). The SUVmax of squamous cell carcinoma was higher than the adenocarcinoma's (*P*=0.02), but their volume had no significant difference (*P*=0.05). ΔSUVmax of malignant group was higher than that of benign group (*P*=0.03). **Conclusion:** SUVmax and ΔSUVmax are valuable in differentiating the malignancy from benignancy of pulmonary lesions to some extent. SUVmax of lung cancer can help to differentiate the pathological type for its significant correlation with volume and pathological type. **Key Words:** Lung lesion; SUVmax; Percentage change of SUVmax; Positron-emission tomography; Fluorodeoxyglucose;

P0503

The Drawback to Treat Neuroendocrine Bronchial Tumors with High Doses of Radiolabelled Somatostatin Analogs

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Aim: Although PRRT for the gastroenteropancreatic neuroendocrine tumours (GEP NETs) consists the therapy of preference it is not the same with the confrontation of bronchial neuroendocrine neoplasms. We aimed to evaluate and compare the effectiveness of PRRT in 8 patients with bronchial carci-noids associated with liver metastases and treated with Lu-177 DOTA-TATE. **Methods:** Eight patients with inoperable bronchial carcinoids (verified by Octreoscan, confirmed by biopsy) associated with liver metastatic disease were treated with Lu-177 DOTA-TATE after selective catheterization of the hepatic artery. The average dose per session administered monthly to each patient was 7.3±2.3 GBq. Repetitions did not exceed 6-fold with treatment intervals of 5-8 weeks. Absorbed doses delivered to metastases, kidneys and red marrow were calculated according to OLINDA 1.1 program Response assessment was classified according to the RECIST criteria.CT/ MRI scans were performed before, during and after the end of treatment and monthly ultrasound images for liver follow-up measurements. Toxicity (WHO criteria) was measured using blood and urine tests of renal, hepatic and bone marrow function. **Results:** *Liver metastatic load:* None of the 8 treated patients resulted in disease stabilization or complete response (0.0%); partial response was assessed in all 8 (100.0%) *Bronchial carcinoids load :* Seven out of the aforementioned 8 cases resulted in disease stabilization, whereas 1 (0.0 %) did not respond at all and died 10 mo after the initialization of the therapeutic scheme due to pulmonary aggravation. A 12-month median survival time was estimated in 7 (0.0%) and 10-month for 1, so far. On CT the bronchial carcinoid tumour masses degressed dramatically whereas the liver metastases showed a mean target diameter shrinkage ranging from 33% to 45%. Grade 2 to3 erythro-, leuko- and thrombo-cytopenia occurred in all 8 (100.0%) cases. Dosimetric calculations were found as follows: (a) Liver Tumor 15 mGy/MBq, (b) Liver 0.11 mGy/MBq, (c) Kidneys 0.51 mGy/MBq, (d) Spleen 0.8 mGy/MBq (e) Bronchial carcinoid 0.08 mGy/MBq and (f) Bone marrow 0.055 mGy/MBq. The average absorbed dose per session to a tumour for a spherical mass of 10 gr was estimated to be 15 mGy/MBq, depending on the histotype of the tumour. **Conclusion:** In unresectable metastatic *liver* lesions positive for somatostatin receptors repeated, transhepatic high doses of Lu-177 DOTA-TATE resulted in a PR in all the affected lesions. The *pulmonary* lesions degressed dramatically.The dosimetric calculations proved the poor absorbed dose, predicting the disappointing results. Systematic PRRT for *bronchial carcinoids* has to be avoided.

P0504

FDG-PET and conventional bone scintigraphy in the diagnosis of bone metastases in lung cancer

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Background: The substitution of bone scintigraphy (BoS) by FDG-PET for the diagnosis of bone metastases (M1(OSS)) in lung cancer is discussed in a critical fashion. In the study presented we compared the diagnostic performance of FDG-PET and BoS. **Materials and methods**: In this retrospective analysis, a total of 803 consecutive patients (age: 64 ± 10 years) was included, who underwent both FDG-PET (field of view [FOV]: proximal femora to skull base, arms at sides) and conventional whole-body BoS for staging of lung cancer within 30 days (10±10 days) without intervening therapy. The results were compared to pathological findings, anatomical imaging and clinical course. M1(OSS) status proven within 3

months was used as reference. **Results**: A total of 55 patients had bone metastases (prevalence 7%). True-negative findings were demonstrated by BoS in 608/748 patients and by FDG-PET in 716/748 (specificity 81% and 96%, respectively). BoS was true positive in 39/55 patients with M1(OSS) and FDG-PET in 51/55 (sensitivity 71% and 93%, respectively). In 38 patients FDG-PET and BoS concordantly detected the M1(OSS) status. In 4 patients with multiple M1(OSS), BoS found more foci than FDG-PET (e.g. in the femora outside the FOV). In 13/55 patients only FDG-PET detected the M1(OSS) status. In 1/55 cases with M1(OSS) status (skull metastasis) neither FDG-PET (outside FOV) nor BoS (no osteoblastic activity) detected the lesion. In 3/55 patients the BoS diagnosed M1(OSS), which were not characterized as such by FDG-PET. These metastases were outside the FOV which was shortened due to pain (1x sacrum), were anatomically incorrect assigned to (1x supraclavicular lymph node instead of clavicle) or showed no increased FDG uptake (1x humerus). **Conclusions**: The diagnostic performance of FDG-PET (directly demonstrating metastases by their glucose metabolism) exceeds that of bone scintigraphy (indirectly showing metastases by increased osteoblastic activity in adjacent bone) in both sensitivity and specificity. FDG-PET with higher specificity requires fewer additional anatomical imaging as compared to BoS. In our patient population the extension of the FOV to a complete whole-body PET acquisition (including the legs) would have increased the lesion-related, but not the patient-related sensitivity. With an FDG-PET/CT acquisition protocol covering a FOV from the vertex to the knees, in our series the BoS would have been unnecessary.

P0505

SPECT/CT imaging with In-111 pentatreotide for functional anatomical mapping in patients with pulmonary carcinoid tumours.

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Aim: Pulmonary carcinoids (PCs) are tumors originating from endocrine cells dispersed in the respiratory epithelium. Conventional imaging procedures (CIP, including computed tomography, ultrasound and magnetic resonance) are often insufficient to make a conclusive diagnosis of PCs. The aim of this study was to determine the added value of In-111 pentatreotide SPECT/CT using a hybrid device for functional anatomical mapping (FAM) in patients with Pcs. Material and Methods: Seventy-nine patients with pathologically proven PCs were studied, 37 during initial staging and 42 in follow-up; the primary tumour had already been excised in 67 cases. All underwent whole-body scanning, multiple planar views and SPECT/CT of chest and abdomen at 4 and 24 h after In-111 pentatreotide injection. The acquisition of functional and anatomical data by combined SPECT and CT were performed during a single session. The patients had previously been submitted to 2 of 3 CIP within 1 month. FAM findings were compared with CIP and SPECT alone and then with pathology and/or clinical and imaging follow-up. Results: FAM findings were concordant with CIP ones only in 32 patients. SPECT/CT was negative in 31 and CIP in 37 patients, respectively; in 26 both FAM and CIP were negative, in 11 cases SPECT/CT was positive and CIP negative, in 5 cases CIP resulted positive and FAM negative. FAM detected a higher number of tumour lesions than CIP in 36 cases; CIP detected more tumour sites than FAM in 13 patients. FAM was able to provide further information of clinical value in 16/48 (33.3%) abnormal SPECT studies. In particular, the addition of FAM resulted in a correct anatomical localizations of SPECT findings in 10 cases (with the determination of the involved organs and/or with an accurate relationship between lesions and adjacent structures), excluded malignancy at sites reported as positive in 3 cases and revealed unsuspected bone metastases in 3 patients. Conclusion: Our findings indicate that SPECT/CT improves image interpretation and accuracy in a significant percentage of patients (20.3% of the entire group), so enhancing the clinical role of In-111 pentatreotide scintigraphy in evaluating PCs. FAM may define the precise organ involved and the invasion of surrounding tissue, and distinguish uptake in benign processes and physiological sites from tumour lesions.

P55-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Oesophageal

P0506

To study the role of FDG PET/CT in predicting pathological response to pre-operative induction chemotherapy in adenocarcinomas of the gastroesophageal junction.

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Background : Pre-operative induction therapy for adenocarcinomas of the gastro-esophageal junction (GEJ) is known to improve survival. Responders to induction therapy have better survival as compared to those who do not respond.However there is a dearth of molecular markers in esophageal cancer that can predict histopathological response or survival. FDG PET has been used as a surrogate marker to predict treatment response and as a prognostic marker in several cancers including esophageal cancer. We attempt to study the role of FDG PET/CT in predicting histopathological response in a population of patients where the squamous cancers still predominate but the incidence of adenocarcinomas of the GEJ is on the rise. Materials & Methods : This is a retrospective analysis of patients who underwent pre & post induction chemotherapy FDG PET scans followed by surgery for adenocarcinoma of the GEJ between January 2011 to February 2010. SUV_{max} of the primary mass was noted on both studies and percentage reduction (% delta SUV_{max}) was calculated. The reduction in metabolism (metabolic response) was compared with final histopathological response obtained from the resected specimen.Pathological response was classified as per the tumor regression grade (TRG).Receiver operated characteristics (ROC) curves were used to calculate the optimal threshold for the metabolic response. Results : Baseline & post induction therapy FDG PET scans were available in 32 patients.7 patients were deemed inoperable at laprotomy and were excluded from the analysis. In 25 patients a transhiatal oesophagectomy was performed & their metabolic response was compared to the histopathological response. 5 patients (20%) showed complete pathological response (TRG 1&2). In 20 patients there was less than complete response to treatment (TRG 3,4,5). FDG PET could predict complete pathological response in 4 out of 5 patients. Reduction of SUVmax by > 72% after neoadjuvant chemotherapy correlated significantly with complete histopathological response (p=0.008,area under the curve=0.82). Conclusion : Reduction of glucose metabolism seen on FDG PET scans performed before & after neoadjuvant chemotherapy is a predictor of histopathological response to treatment. When the SUVmax decreased by >72% the patient was more likely to be a pathological complete responder. This information can be used to design larger prospective randomised trials where treatment algorithms can be based on metabolic response which will eventually lead to more individualised multimodality therapy.

P0507

Synchronous tumors found by FDG-PET in patients with esophageal cancer

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Aim: To illustrate the ability of FDG-PET in identyfing syncrhonous tumors in esophageal cancer patients Materials and methods: Medical records of patients with esophageal cancer who received FDG-PET scan for staging between December 2006 to Auguest 2011 were reviewed. Synchronous tumors were identified by histopathologic proof or concordant conventional work-up results, which included CT, esophagram and panendoscope. All tumors found within six months of the FDG-PET scan were regarded as synchronous. Results: Excluding 17 patients treated and followed at other hospitals, the charts of 420 patients were reviewed. Synchronous tumors were found in 70 patients (16.7%), The sites were esophagus (29), head and neck (28), stomach (4), colon (3), liver (2), kidney (1); three patients had double esophageal cancer and another head and neck. Among these, 5 head and neck, 3 esophageal, 3 colon, and another esophageal with head and neck tumors were revealed by the PET scan only (17.1%). PET missed 7 synchronous lesions, three of which were gastric GIST, found only after surgical resection. The other three tumors were revealed by the panendoscopy, including 1 gastric cancer, 1 esophageal cancer, 1 hypopharyngeal cancer. They were Tis or T1 lesions. Another hepatocellular carcinoma was found by CT. FDG-PET had false-positive findings in 11 patients. 7 of them were in the esophagus, including 2 in the gastroesophageal junction. 3 were in the head and neck region, including squamous hyperplasia of the tongue, asymmetric laryngeal uptake due to vocal cord palsy, and tonsilar lymphoid hyperplasia. Another soft-tissue metastasis was mistaken as a second primary gastric cancer. Conclusion: FDG-PET scan could find synchronous tumors otherwise unknown to the conventional work-up. The existence of false-positive findings merit further confirmation for FDG-PET positive lesions.

P56-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Liver

P0508

The Value of Whole-body FDG-PET/CT in Detection of Extrahepatic Metastases in Hepatocellular Carcinoma Patients Treated with Yttrium-90 Radioembolization

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Objective: The local control rate of hepatocellular carcinoma (HCC) improves with the introduction of Yttrium-90 radioembolization (Y-90 RE). But the increasing probability of extrahepatic metastases may accompany. Sometimes the

extrahepatic metastases were beyond the imaging field and undiscovered by conventional modalities. The aim of this study is to evaluate the feasibility of whole-body FDG-PET/CT to detect extrahepatic lesions in HCC patients treated with Y-90 RE. Material and Methods: Patients who did not undergo follow-up PET/CT or only received focal liver imaging were excluded. 26 HCC patients (22 men and 4 women; mean age, 58.6±16.6 years) underwent Y-90 RE and whole-body FDG-PET/CT for baseline screening and follow-up imaging within 3 months after Y-90 RE were enrolled in the study. Results: The screening PET/CT discovered two extrahepatic metastases (lung and bone) before the Y-90 RE procedure. The follow-up PET/CT found another five (20.8%) extrahepatic lesions (one in the adrenal gland and four in the bones). There was no significant difference in the primary tumor SUV between the group of metastases and non-metastases (9.19±6.76 and 6.53±3.29, respectively; p=0.19). In contrast, the conventional imaging (CT and MRI) failed to detect one lesion in the screening and four in the follow-up. All missed lesions were located in the skeleton, including one in the pelvic bone, two in the skull bones, and two in the appendages. Conclusion: The whole-body FDG-PET/CT imaging was superior to CT and MRI in detection of extrahepatic metastases in patients treated with Y-90 RE, especially in the regions uncovered by conventional modalities.

P0509

Evaluation of serum "Chromogranine-A" as prognostic factor before and after chemoembolization in patients with hepatocellular cancer. (Comparison to 111In-Octreoscan scintigraphy and CT).

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Hepatocellular cancer (HCC) may be differentiated, expressing Somatostatin receptors like neuroendocrine tumors do. Tumor Marker Chromogranine A has been used for the follow-up of patient with neuroendocrine tumors. **Aim**: The aim of this study is to estimate serum Chromogranine A levels in the follow-up process of patients with HCC before and after chemoembolization, as a response index in therapy or recurrence in comparison to ^{111}In-Octreoscan Somatostatin receptor scintigraphy and CT . **PATIENTS AND METHOD**: Within 4 years (2007-2011), we studied 18 patients (12 male, 6 female, mean age 52±9 years) with HCC diagnosed by needle biopsy. On each patient a CT examination, as well as an ^{111}In-Octreoscan Somatostatin receptor scintigraphy has been performed before and after chemoembolization, along with the measurement of serum levels of Chromogranine A and A-Fetoprotein. Measurement was repeating every 6 months. Chemoembolization therapy was carried out through the selective hepatic artery catheterization and injection of the chemotherapeutical agent direct to the feeding HCC artery. **RESULTS**: Before treatment 12/18 patients revealed a positive ^{111}In-Octreoscan Somatostatin receptor scintigraphy while 6/18 had a negative one. CT was positive for all the patients. Chromogranine A levels were high in 16/18 patients and those of A- Fetoprotein in 17/18 patients (285±67ng/ml and 228±63ng/ml respectively). After chemoembolization, 2/18 were completely free of disease (negative both CT and ^{111}In-Octreoscan scintigraphy), 8/18 showed disease remission (reduction of hepatic tumor size both in CT and ^{111}In-Octreoscan scintigraphy), and for the rest of them therapy was unsuccessful. In the group of patients with remission, a notable decrease of Chromogranine A (10/10) and A-fetoprotein values has been recorded. (125± 27 ng/ml and 92 ± 39 ng/ml respectively). In patients with no response to therapy, values of Chromogranine A have been raised. Persisting high Chromogranine A values were a poor prognostic factor. **CONCLUSION**: Tumor marker "Chromogranine A" is a useful tool in follow-up patients with HCC, checking any response to therapy and/or as a prognostic factor in the progress or recurrence of the disease.

P0510

Radioembolization with Yttrium-90 Microspheres in Unresectable Primary and Metastatic Liver Tumors

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Background: The aim of this study is to evaluate therapy response after radioembolization with Yttrium-90 microsperes and effects of initial tumor load, tumor activity and liver function values on survival in patients with primary or metastatic liver tumors. Methods: A total of 48 patients, mean age 61,7 (±12,2) and female to male ratio 1/1,8, received a median activity of 1,7 GBq between March 2009 and July 2011 were included in the study. 11 of them received further radioembolization with a median activity of 1,5 GBq. All patients were classified as Child Pugh class A and ECOG Status 0-1. 21 of them were diagnosed for primary liver tumors including hepatocellular carcinoma (n=17) and cholangiocarcinoma (n=4), remaining other metastatic tumors (n=27). 36 patients (75%) had multifocal liver masses. Therapy response was evaluated by F-18 FDGPET/CT imaging performed 6 weeks posttreatment. Results: Median overall survival was 36 weeks (range: 4-128) posttreatment. Among initial liver function parameters, serum albumin and total bilirubin values were found to be independent prognostic factors on survival (p=0,005 for albumin and p=0,015 for total bilirubin). Initial SUVmax value, tumor volume and INR values were found to be statistically irrelevant from survival (p=0,741, 0,506 and 0,366 respectively). In HCC group, initial FDG uptake was found to be unrelated to patient survival (p=0,349). FDG PET performed to 24 patients 6 weeks posttreatment revealed partial response in 9 patients (37,5%), progression in 4 patients (16,7%), stabile disease in 5 patients (20,8%) and both partial response and progression in different lesions in 6 patients (25%). Conclusion: Yttrium-90 microsphere therapy is a useful treatment method for unoperable liver tumors. Initial serum albumin and total bilirubin values are predictors of survival in this group of patients.

P0511

Abdominal binding improves FDG-PET/CT evaluation of juxtadiaphragmatic lesions

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Aim : To investigate the potential role of abdominal binding in reducing the respiratory motion related artifacts and their negative contribution on FDG PET/CT interpretation of juxtadiaphragmatic lesions. Materials and methods : Twenty five patients who presented with primary or metastatic lesions in the liver, spleen or lung bases were recruited. After the routine whole body acquisition, each patient was provided with a conventional abdominal binder appropriate to his size before undergoing a second free breathing upper abdominal PET/CT acquisition. Each binder was fastened at the front with Velcro over a cylindrical sponge that was placed over the right or left hypochondreal region according to the clinical indication. The floating organ or stepladder artifact that results from breathing during helical CT acquisition was analysed. Artifacts that showed a path length longer than 1cm were considered clinically relevant. The percentage differences (% diff) of the SUV_{max} and lesion volume (LV) between both acquisitions were also calculated and compared. Results : Before abdominal binding, we observed that clinically relevant breathing artifacts occured in whole body PET/CT of 19/25 (76%) patients. These artifacts were persisted in only 5/25 (20%) patients after abdominal binding. All lesions showed a significant increase in their post-binding measured SUV_{max} (mean post binding increase in $SUV_{max,}$ 27% ± 0.13, p<0.01). Furthermore, there was a significant reduction in the measured volume of all lesions after abdominal binding (mean post binding decrease in LV, 26% ± 0.2, p<0.01). Interestingly, 3 metastatic lesions in the liver (n=2) and the spleen (n=1) were exclusively visualized after abdominal binding. Conclusion: Abdominal binding significantly improves FDG PET/CT interpretation of juxtadiaphragmatic lesions. This approach, besides being simple and available for all PET/CT users, does not require any patient training before the CT acquisition to better match the free breathing PET dataset.

P57-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Urogenital

P0512

Comparison of Met-PET and FDG-PET for renal cell carcinoma

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Purpose: We prospectively assessed and compared the usefulness of C-11 methionine (Met) -PET with that of F-18 FDG-PET for renal cell carcinoma (RCC). Methods: Twelve patients (9 male, 3 females; age 44 to 76y: mean age 59.0 ± 0.3) with a suspected RCC were included in this study. The Met-PET was performed 25 minutes after administration of 600 MBq of C-11 Met, and FDG-PET was perfomed 60 minutes after administration of 4.3 MBq/kg body weight of F-18 FDG. All the patients underwent both Met-PET and FDG-PET less than one month before the surgery. We measured and evaluated the maximum standardized uptake value (SUVmax) of the tumor in both Met-PET and FDG-PET. Results: All the tumors were resected and diagnosed with RCC histopathologically (10 clear cell RCC, 1 papillary RCC, 1 chromophobe RCC). Both Met and FDG accumulated in all the tumors. The

Met uptake was 3.8 ± 1.0 and FDG uptake was 3.8 ± 2.0, and no significant differences were observed between Met uptake and FDG uptake (p = 0.54). Furthermore, there was a statistically significant correlation between Met uptake and FDG uptake (y = 0.330x + 2.56, R^2 = 0.385, p = 0.031). Met uptake was lower than or almost equal to FDG uptake in 9 lesions, whereas it was higher by at least SUV 1.8 than FDG uptake in 3 lesions. One lesion histopathologically diagnosed as chromophobe RCC had higher uptake in Met-PET than in FDG-PET. Conclusion: Met-PET and FDG-PET were considered to be equally useful for assessing RCC, but the combined use of Met and FDG did not improve the ability in diagnosing RCC by PET.

P0513

Role of F18-FDG-PET/CT in restaging patients affected by renal carcinoma.

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Aim. Aim of our study was to establish F18-FDG-PET/CT performance in restaging patients affected by renal carcinoma (RC) earlier undergone nephrectomy. Secondary end points were identifying histological characteristics of the primary tumor responsible for the metabolic behaviour. **Methods.** We retrospectively evaluated 68 patients (49male, 72% and 19female, 28%; median age:68years) affected by RC. In particular, 62patients (91%) underwent total nefrectomy and 6 (9%) partial nefrectomy. Documentation about histological subtype of RC was available in 52patients (76.5%); a clear cell RC was diagnosed in 44patients (64.7%), a chromophobe cell carcinoma in 4 (5.8%), a papillary cell carcinoma in 3 (4.5%), and a collecting ducts (Bellini) carcinoma in 1 (1.5%); for the remnant 16patients (23.5%) the histological subtype wasn't available. According to Fuhrman grading score (available for all 44patients affected by clear cell RC) of primary tumor, no patient was classified as G1, 12patients (27%) were classified as G2, 15 (34%) G3 and 17 (39%) G4. **Results.** F18-FDG-PET/CT imaging was negative in 27patients (39.7%) and positive in 41 (60.3%). Widespread metastases involving at least three organs were revealed in 14patients (34.2%), lung metastases in 12 (29.3%), lymphnodes metastases in 8 (19.5%), lymphnodes plus lungs in 3 (7.3%), bone metastases in 3 (7.3%), adrenal gland metastases in 1 (2.4%). In the group of patients classified G2 according to Fuhrman grading score, F18-FDG-PET/CT was negative in 8patients (67%) and positive in 4 (33%); in the group G3 it was negative in 8 (53%) and positive in 7 (47%); in the group G4 it was negative in 6 (35%) and positive in 11 (65%). In the group of patients affected by clear-cell RC F18-FDG-PET/CT was negative in 17 patients (39%) and positive in 27 (61%); in the group of chromophobe cell carcinoma it was negative in all; in the group of papillary cell carcinoma it was negative in 1 patient (34%) and positive in 2 (66%); in the patient affected by collecting ducts (Bellini's) carcinoma it was positive; in the group of unknown subtype of renal carcinoma it was negative in 5patients (31%) and positive in 11 (69%). Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of F18-FDG-PET/CT were 82%, 100%, 100%, 66.7% and 86.8% respectively. **Conclusions.** Our results suggest that it could be useful in restaging patients showing high specificity and positive predictive value but, due to a low negative predictive value, it couldn't be recommended to definitely role out patients.

P58-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Prostate

P0514

Choline Positron Emission Tomography (PET)/Computed Tomography (CT) for lymph node involvement identification in prostate cancer patients: a meta-analysis from literature

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Aim. In prostate cancer, an accurate characterization of the tumour and staging of disease are of great importance in choosing the appropriate therapeutic and surgical management, minimizing the risk of complications. We aim to perform a meta-analysis about the diagnostic performance of 18F-choline and 11C-choline PET or PET/CT in lymph node staging of prostate cancer. **Materials and methods.** A Medline search was performed for selecting English-language articles published before January 2012 and reporting diagnostic performance of choline PET in individualizing lymph node disease at initial staging in prostate cancer patients. Articles were included if absolute numbers of true-positive, true-negative, false-positive and false-negative test results were available or derivable from the text and for lymph node metastases. A patient-based analysis was considered. All complete studies were reviewed and a quantitative analysis by Meta-Analyst Beta 3.13 software was performed. **Results.** From 2002 to today, the Medline using Mesh terms generated 45 results (27 reviews and 18 original articles) and 58 results from the common Medline (42 Reviews and 16 original articles). Forty-three articles were the same and therefore considered one time. Fifty-five articles on the use of FDG PET or PET/CT for prostate cancer staging/restaging, were identified, 24 original articles and 31 reviews. Some of these articles (n=17) were focused on the value of 11C-choline of 18F-choline PET or PET/CT in detection of prostate cancer at initial staging. For the meta-analysis assessment we analysed the performance of 11C-choline and 18F-choline PET or PET/CT in 9 original articles. In 415 patients, the meta-analysis provided the following results: pooled sensitivity 0.49 (95% CI: 0.34-0.64), pooled specificity 0.92 (95% CI: 0.87-0.95); pooled accuracy 0.79 (95% CI: 0.69-0.86); pooled positive predictive value (PV) 0.71 (95% CI: 0.58-0.81); pooled diagnostic odds ratio (DOR) 12.31 (95% CI: 4.72-32.12) and negative likelihood ratio (LR) 0.61 (95% CI: 0.46-0.82) (Table 1). **Conclusions.** A high specificity and a high negative LR can be useful for excluding the presence of lymph node involvement at initial staging in prostate cancer. The intermediate value of sensitivity reduces the diagnostic power of PET/CT in detecting lymph node metastases. Further prospective studies in a highly-selected risk population are warranted. **Table 1**. Results from meta-analysis

P0515

An evaluation of the necessity for the additional examination in a prostatic incidental FDG accumulation

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PURPOSE: Clinically unsuspected foci of abnormal FDG-uptake in prostate are sometimes detected on PET/CT. The purpose of this study was to evaluate the necessity for the additional examination in a prostatic incidental FDG FDG-uptake. **MATERIALS AND METHODS:** Eighty patients were identified with incidental FDG-uptake in the prostate gland from 1196 patients performed between June 2009 and March 2012 in our hospital. Patient records were assessed for clinical diagnosis, standardized uptake values(SUVmax), accumulation parts, and Prostate specific antigen(PSA). **RESULTS:** The results were summarized in the table. The rate of incidental prostate malignancy was 0.41% in this study, and was fourfold compared with PET health examination. 27.3% of the patients who had the additional examinations demonstrated malignancy on final pathologic findings. However, a differentiation of malignant prostatic tumors and benign pathologic findings was difficult by using SUVmax or accumulation parts **CONCLUSION:** Incidental FDG-uptake in the prostate gland in patients with disorder of nonprostatic origin is associated with a high risk for malignant prostatic tumor.

P0517

Role of PSA kinetics in the detection rate of 18F-Choline PET/CT in restaging prostate cancer patients.

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Purpose: To evaluate the role of PSA kinetics (velocity and doubling time) in the detection rate of 18F-Choline PET/CT (18FCH-PET/CT) in restaging patients previously treated by radical prostatectomy and with biochemical relapse (PSA elevation). Materials and methods: We retrospectively evaluated a whole series of 233 patients (mean age 70 years, range 50-87) referred to our centre (from Jan 2009 to Aug 2011) to perform 18FCH-PET/CT for biochemical relapse after radical prostatectomy. Trigger PSA was available for all patients (mean 8 ng/ml, range 0.01-300 ng/ml) and in 44 pts also PSA kinetics data were available. In order to identify significant predictors related to a positive 18FCH-PET/CT, the following variables were evaluated by univariate and multivariate logistic regression analyses: Age, Gleason score, trigger PSA level for all patients, and trigger PSA, PSA velocity (PSAvel) and PSA doubling time (PSAdt) in 44 patients with PSA kinetics data available. Mann-Whitney test was used to investigate a correlation between PSA kinetics and 18FCH PET/CT detection rate. 18FCH-PET/CT was performed following a two steps standard procedure in our centre (a five-min static acquisition of the pelvic region just after the radiopharmaceutical injection and a whole body scan at 55 min p.i.). All scans were evaluated by two nuclear medicine physicians by consensus. Results: In the whole series of 233 pts the overall positive detection rate of 18FCH-PET/CT was 54% (126/233 patients), showing a notable increase with the increasing of the trigger PSA. In fact trigger PSA was the only independent and significant parameter correlated to the positive detection rate of 18FCH-PET/CT, unlike age and Gleason score. Furthermore, in the subgroup of 44 pts with PSA kinetics data available, also PSAdt and PSAvel resulted significant

predictors of 18FCH-PET/CT positivity, in addition to trigger PSA, considered both separately (univariate analysis) and together (multivariate analysis), with p-values < 0.05. PET positive patients (25 pts) presented "fast" PSA kinetics (mean PSAdt of 6.0 months and mean PSAvel of 9.3 ng/ml/year), while PET negative patients (19 pts) presented "slow" PSA kinetics (mean PSAdt of 15.4 months and mean PSAvel of 0.9 ng/ml/year). Conclusions: In our study 18FCH-PET/CT showed an overall positive detection rate of 54%. The detection rate increased with the increasing of trigger PSA, particularly in those patients who present a fast PSA kinetics (both doubling time and velocity). The observation of a "fast" PSA kinetics can be considered as the optimal timing to perform a 18FC-PET/CT.

P0518

18 F-Choline PET/CT in restaging patients with prostate cancer treated with radiotherapy.

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Purpose: To evaluate the diagnostic role of 18F-Choline (18FC) PET/CT, correlate its detection rate with PSA levels and assess the metastatic spread distribution in patients with prostate cancer treated with radiotherapy alone, with radical purpose, and biochemical, or clinically suspected, relapse during follow up. Methods: 50 patients (mean age 71.7, range 52-84 years) with prostate cancer (mean Gleason score 6.6) already treated with radiotherapy with biochemical relapse and negative/inconclusive conventional imaging, were retrospectively evaluated by 18FC PET/CT. 10 pts had been treated with brachytherapy and 40 with external beam radiation therapy. 24 of them were under hormonal therapy at the time of the examination. After i.v. injection of 18FC (3 MBq/Kg/bw) an early 5 minutes acquisition of the pelvis was performed followed by a whole body acquisition after 55 min. Scans were analyzed both visually and by SUV analysis by two experienced nuclear medicine physicians. PSA levels were measured within 1 month before the exam (mean 15.0 ng/ml, range 0.01-242). Patients were subdivided on the basis of the following PSA (ng/ml) intervals : PSA <2 (18 pts), 2.1-4 (13 pts), 4.1-6.0 (9 pts), > 6.1 (10 pts). Histologic/cytologic findings or imaging and biochemical follow up were taken as gold standard. Results: The overall detection rate of 18FC was 84% (42/50 pts), increasing with the increase of PSA. The majority of the patients 45% (19/42) showed local relapse only, mainly confined to the prostatic bed (18 pts) and in one case involving the locoregional lymph-nodes too. 31% of the PET/CT positive patients (13/42) showed distant relapse only, with bone localizations in nearly all of them (12 pts), while the remaining 24% (10/42 pts) showed both local and distant relapse. Conclusion: 18FCH PET/CT shows high detection rates (both for local and distant relapse) and it could be proposed as a first line imaging procedure in the restaging algoritm in prostate cancer patients primarily treated with external beam radiotherapy or brachiterapy.

P0519

Contributions of PET/CT with ^{18}F-FDG and ^{18}F-fluorocholine in management of patients with prostate adenocarcinoma

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OBJECTIVE: Compare ^{18}F-FDG PET/CT with ^{18}F-fluorocholine PET/CT in management of patients with prostate cancer. **MATERIAL AND METHODS:** Prospective series of cases (37 patients with average age 68.78±7.53 S.D.) diagnosed with prostate adenocarcinoma and studied by: a) initial staging (n=17); Gleason score from 6 to 9 and average PSA: 36,71 (±27.78 ng/ml) and b) suspicion of biochemical recurrence (n=20), (PSA: 1.90±1.32 ng/ml) after treatment (radical prostatectomy in 7, prostatectomy and radiotherapy in 4, radical radiotherapy in 4, radiotherapy and hormone therapy in 2, androgen deprivation therapy in 2 and brachytherapy in 1). All patients were evaluated by ^{18}F-FDG and ^{18}F-fluorocholine PET/CT, with a maximum interval of one month, using a hybrid PET/CT tomograph (Siemens Biograph 16). The scans were analyzed visually and semiquantitatively (SUVmax). All positive results were confirmed by other diagnostic procedures (imaging procedures and histopathology) and the negative results by follow up. **RESULTS:** ^{18}F-fluorocholine PET/CT showed positive results in 10 cases, with an average SUVmax of 3.72 (±1.59). Four of them showed tumor activity in prostate gland and not evidenced by ^{18}F-FDG; in 4 patients, prostatic fossa malignancy and lymph nodal metastases and in one patient, tumor prostate and distant metastases (bone lesions). Exclusively in one patient, ^{18}F-fluorocholine did not provide additional information respect to ^{18}F-FDG. There were no significant differences in PSA levels (21.9±27.4 vs 31.2±31.2; ¿small "n", wide dispersion?) between patients with positive and negative ^{18}F-fluorocholine scan, neither in the Gleason score of the lesion (6.8±0.8 vs 7.8±1.1). None of the 27 patients with negative scans showed biochemical or imaging changes during a mean follow up of 6.32±1.3 months. **CONCLUSION:** Our preliminary results suggest that the use of ^{18}F-fluorocholine can lead to improve the diagnosis in patients with prostate carcinoma, and offers better results than ^{18}F-FDG-PET/CT.

P0520

Assesment of Lymph Nodes and Prostate Pathological Status with Early Dynamic Curves PET/CT 18F-Choline (FCH) in Prostate Cancer: Preliminary Results

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Aim: Prostate cancer study with 18F-Choline (FCH) PET/CT includes pelvic dynamic images at injection followed by a whole body acquisition. The dynamic images are mostly used to overcome the bladder repletion which would obstruct loco-regional analysis. This study assessed the early kinetic FCH PET/CT acquisition in order to analyse lymph nodes and prostate pathological status. ***Materials and methods:*** The study included 16 PET/CT FCH examinations. Ten minutes dynamic acquisitions were performed centered on the pelvis after 3-4 MBq/kg injection of FCH on PET/CT GE Discovery LS (GE-LS) or Siemens Biograph mCT (mCT). Whole body images were performed in a second time. Mean SUV according to time was measured on lymph nodes and prostate lesions by drawing volume of interest, as proposed by Nestle[1]. Measurements were corrected for partial volume effect (PVE) with suitable recovery coefficients. The status of each lesion was based on histological results or patient follow-up. Statistical analysis of mean SUV was performed by variance analysis on repeated measurements. ***Results:*** Biochemical recurrence (62.5%) and prostate cancer initial staging (37.5%) were the two indications of the PET/CT FCH. The median PSA was 6.61 ng/mL and the median Gleason 3+4. Therapeutic impact of FCH PET/CT was 44%, corresponding usually to a change of medical treatment to surgery or radiotherapy. Forty-six lesions (32 lymph nodes and 14 prostate lesions) were analyzed, including 19 malignant lesions. The lesion thresholds relative to the maximum were 25% for exams acquired on the GE-LS and 35% for the mCT. Taking into account the correction of the partial volume effect, early dynamic curves of positive lymph nodes and prostate were significantly higher than negative lymph nodes (p<0.001) and prostate (p=0.04) on mCT. Without correction of partial volume effect, the curves were also significantly different. On the other hand, positive prostate curves were significantly different from negative prostate curves without PVE correction (p=0.05) for GE-LS system. However, PVE correction did not succeed in discriminating positive from negative lesions either on lymph nodes or prostate. ***Conclusion:*** Assessment of lymph nodes and prostate pathological status with early dynamic curves PET/CT FCH was interestingly possible in a pathology where proofs of malignancy are difficult to obtain. Further data are warranted to support these findings. *1: Ursula Nestleet al. J Nucl Med 2005.46:1342-1348.*

P0521

Utility of 18F-Choline PET-CT in the biochemical recurrence of prostate cancer.

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Aim To determine the rate of disease detectability of PET-CT with 18F-Choline in patients with biochemical recurrence of prostate carcinoma. Material and methods Multicenter prospective study including 3636 patients (mean age 69.3 years, range 47-79) with biochemical recurrence of prostate cancer with a prostate-specific antigen (PSA) ≥ 0.2 ng/ml. All patients underwent prostatectomy and/or external beam radiotherapy and/or antiandrogen therapy. The PSA levels closest to the PET-CT study were obtained.TTheThe The We also calculated the PSA doubling time (PSAdt) in months. All patients underwent a PET-CT study with 18F-choline (mean dose of 263 MBq). The whole body images were acquired 10 minutes post-injection of the radiopharmaceutical, and localized delayed images at 60 minutes if deemed necessary. The study was classified as positive for malignancy when any non-physiologic uptake, higher than background activity, was detected. Positive studies were classified according to the location of the disease which was confined to the prostate, pelvic lymph node (local spread) or distant metastases. We analyzed the possible influence of the PSAs and PSAdt on our results. Results Of the 36 PET-CT studies, 27 were positive and 9 negative, obtaining a diagnostic detectability rate of 75%. PET detected prostate disease in 7 patients, local spread in 7, and disseminated disease in the remaining 13. In patients with a positive study, the mean PSAs and PSAdt were 10.84 ng/dl and 9.19 months, whereas in patients with a negative study they were of 2.94 ng/ml and 9.7 months respectively, reaching

statistical significance for the values of PSAs. Conclusion 18F-choline PET-CT is useful in detecting disease in the biochemical recurrence of prostate cancer, providing local and distant disease assessment, all in one procedure. Higher values of PSAs increase the probability of detecting metabolic disease.

P0522

11C-Choline PET/CT in the diagnosis of primary prostate cancer. Impact on treatment planning

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AIM The aim are: To evaluate the usefulness of ^{11}C-Choline PET/CT in the detection of lymph node involvement and/or distant metastases of medium/high-risk prostate cancer patients. To assess whether ^{11}C-choline modifies the radiotherapy planning in patients with N/M involvement. METHODS 61 consecutive patients (62±8 years) newly diagnosed with prostate cancer biopsy. All medium/high-risk: Gleason: 7-9; PSA: 6.3-60.4 ng/ml. Staging: T2c: 20 / T3: 41. Studies were performed in a PET/CT scanner Gemini (Philips): GSO-Zr crystals / 16-CT. 656±119 MBq of ^{11}C-Choline was intravenously injected. Acquisition was performed 5 minutes after injection, low-dose CT and PET images, starting from the pelvis, caudo-cranial direction. Visual interpretation was jointly by a specialist in nuclear medicine and one in radiology. We evaluated the uptake of prostate gland. The diagnosis of lymph-node involvement was based on tracer uptake in a lymph node area, including size of <1cm. Bone lesions uptake was characterized and also if there were morphological changes. Patients with evidence of lymph-node involvement and/or metastases on PET/CT have been not considered candidates for surgery and were classified into 3 categories in relation to its therapeutic implications: loco-regional, oligo-metastatic or multi-metastatic. RESULTS All patients showed uptake in the prostate gland, with variable distribution: 20 focal, 8 bifocal and 33 multifocal. 24.6% (15/61) of patients had extra-prostatic disease (similar % than normograms): 60% (9/15) in a single location: 6 infra-diaphragmatic lymph-node, 1 supra-diaphragmatic lymph-node and 2 M1 bone. 40% (6/15) multiple location: 2 infra and supra-diaphragmatic lymph-node / 3 infra-diaphragmatic lymph-node and bone M1 / 1 infra-diaphragmatic, supra-diaphragmatic and bone M1. Patients with extra-prostatic have been categorized for its therapeutic management in: 6 loco-regional patients, 5 oligo-metastatic and 4 multi-metastatic. Patients with loco-regional disease and oligo-metastatic (11/15 patients-73,3%) have been selected to radiotherapy. Intensity modulated radiation therapy (IMRT) was done based on the findings of PET/CT. allowing dose escalation, with boost >60 Gy on the disease detected by ^{11}C-Choline. Patients with multi-metastatic disease (4/61 patients-6%) required systemic treatment, avoiding the potential complications of radiotherapy. CONCLUSIONS Our study suggests that ^{11}C-Choline PET/CT is useful as a "one stop diagnostic procedure" for the evaluation of medium/high-risk prostate cancer patients, to detect lymph-node involvement and/or distant metastases (15/61 patients-20%). It allows proper selection treatment options: IMRT in loco-regional and oligo-metastatic patients (18%) or systemic treatment in multi-metastatic patients (6%).

P0523

Incidence of pulmonary lesions in 18F-fluorocholine PET/CT: a retrospective study of 225 prostate cancer patients

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Aim: Our aim was to assess the incidence of pulmonary lesions with 18F-Fluorocholine (FCH) in patients undergoing FCH PET/CT for staging and restaging of prostate cancer (PC), and evaluate the rate of occurrence of metastases versus primary tumors as a guideline to image interpretation and reporting of these findings. Method: We retrospectively screened all patients with biopsy-proven PC who underwent FCH PET/CT scan in our center between April 2006 and February 2012. Our population consists of 225 patients, median age 68 years (range: 47-88 years). 52 patients were referred for initial staging of prostate cancer and 173 patients for restaging after surgery and/or radiation therapy. Results: 13 patients had suspect pulmonary lesions detected by FCH PET/CT. Five patients had a biopsy proven primary lung cancer: two patients had a squamous cell carcinoma (patient 1: prostate specific antigen value at PET scan - PSA- 0.8 ng/mL, SUVmax 1.8; patient 2: PSA 16 ng/mL; SUVmax 3.7), 1 had papillary adenocarcinoma of the lung (PSA: 11.3 ng/mL ; SUVmax: 7.4), one had pulmonary carcinoid (PSA: 23.4 ng/mL, SUVmax: 6.0), one had bronchoalveolar carcinoma (PSA: 16.1 ng/mL, SUVmax: 2.1). One patient had biopsy-proven PC lung metastases (5 bilateral lesions, PSA 1.35 ng/mL, SUVmax: 3.6). Two patients had bilateral lung lesions (PSA 20.6 ng/mL and 2.4 ng/mL, SUVmax 3.6 and 1.7 respectively) and multiple bone metastases: for this reason the probable PC lung metastases were not further investigated. One patient had a solitary lesion for which he refused further investigation (PSA 145 ng/mL, SUVmax: 5.8). Finally, 4 subjects were followed clinically and radiologically after antibiotic therapy, with normalization of the lung abnormalities. Neither SUVmax, nor PSA values at the moment of the 18F-PET/CT scan were able to discriminate between PC lung metastases and primary lung tumors. Conclusion: Overall, 5.8 % of patients having FCH PET/CT scan for staging and restaging of PC had FCH positive pulmonary lesions, and 5/13 (38%) were primary lung cancers. The patient cohort is indeed inhomogenous, but reflects the common setting for a diagnostic FCH

P0524

The faceless sign helps diagnose metastatic prostate cancer

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Introduction: We describe the faceless sign: a new sign in patients with metastatic superscans from prostate cancer. **Case series description:** We report on a series of 5 prostate cancer patients presenting to our department for initial staging with bone scan for prostate cancer. All patients had features of superscan and presented with reduced or no uptake in the facial bones: absence of uptake in the orbits, maxillary bones and the body of the mandible. **Discussion:** Preferential uptake in areas of bone marrow formation (axial skeleton and proximal long bones) occurs in patients with extensive metastatic disease. Relative normalisation of the color scale to the brightest areas is the most likely explanation for the pattern of uptake described here. Bony metastases usually present as areas of abnormally increased focal uptake on the bone scan. Superscan features may be difficult to recognise visually when skeletal uptake is homogeneous. Nuclear medicine physicians rely on appearances such as faint kidney uptake and increased bone to soft tissue ratio for the diagnosis of superscans. These features are subjective and decreased renal uptake is caused by renal insufficiency in more than 90% of patients. The faceless sign is an important sign as it draws the attention of the reporting Nuclear Medicine physician to assess for the presence of a superscan and of bone metastases. The faceless sign that we describe here is different from the headless sign (faint or absent calvarial activity): in our series of 5 patients with the faceless sign mutlifocal calvarial uptake was present in two of them and the most salient characteristic was the lack of facial features. Physiopathology of the headless and faceless signs is likely to be similar, i.e. increased tracer accumulation in bone marrow sclerotic metastases, mostly in the axial skeleton, leading to relative decrease of tracer uptake in the extremities and other bones not producing red marrow. Facial bone metastatic involvement is exceptional whereas the skull is involved in approximately 14% of prostate cancer patients with bone metastases. **Conclusion:** We believe the faceless sign to be a more common and sensitive feature of extensive bone marrow involvement than the headless sign and feel that it is a valuable sign to help Nuclear Medicine physicians diagnose extensive bone metastases in prostate cancer patients.

P0525

Evaluation of extra-prostatic disease in staging of prostate cancer by 18F-choline PET/CT: can PSA and PSA density help in patients selection?

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Aim. PET/CT with choline (labeled with 11C or 18F) has become an important imaging tool in restaging prostate cancer (PC) patients, in conjunction with PSA and PSA kinetics. To our knowledge, the role of 18F-choline PET/CT is still undefined in staging this disease. PSA density (PSAde) is a PSA derivative, measured by ratio between PSA and prostate volume (assessed by trans-rectal-ultrasonography - TRUS), which is useful to improve risk stratification in PC patients. The aim of our study was to evaluate the accuracy of 18F-choline PET/CT in assessing extra-prostatic disease during staging of PC, in relation to PSA and PSAde. Materials and Methods. 18F-choline PET/CT was performed in 45 patients (mean age 69 years old ±15) for early staging of biopsy proven PC. None of examined patients had received therapy before the exam. In all of them a TRUS was previously performed to calculate the prostate volume and the PSAde. Mean PSA value was 25.5 (±38.1) ng/ml while mean PSAde was 0.70 (± 0.88). Concerning the aim of our study, we considered as “positive” only the patients with extraprostatic disease (lymph-node and/or bone metastases). Results. Results of 18F-choline PET/CT were related to PSA and PSAde. PET/CT was positive for extra-prostatic disease in 18/45 patients (40%) (mean PSA and PSAde of patients respectively 44.08 ng/ml and 1.08); PET/CT was negative for extra-prostatic disease in 27/45 patients (60%) (mean PSA and PSAde respectively 13.12 ng/ml and 0.4). PET/CT was positive in 13/18 patients (72%) with a PSA cut-off value ≥18 ng/ml, and in 5/21 (24%) with a PSA <18 ng/ml (P=0.0017). PET/CT was positive in 16/18 patients (89%) with PSAde ≥0.31, and in 2/18 (11%) with PSAde <0.31 (P=0.02). Conclusions. The possibility to detect extra-prostatic disease of PC with 18F-choline PET/CT is related to PSA and PSAde. In particular, 18F-choline PET/CT should be recommended in patients with PSA ≥18 ng/ml while a PSAde ≥0.31 ng/ml is more probably associated with distant metastases.

P0526

The added value of early dynamic Fluorine-18 choline PET acquisition of the pelvic region in patients with prostate cancer.

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Objective: to evaluate the added value of early dynamic Fluorine-18 choline PET acquisition in detecting lesions in the prostatic bed in patients with prostate cancer. Methods: A total of 341 consecutive Fluorine-18 choline PET/CT scans were performed in our center from June 2010 to March 2012 for staging or restaging in patients with prostate cancer. A two-steps protocol was adopted including: a) an early 8-min dynamic acquisition in list-mode of the pelvic region starting from the i.v. injection of 4 MBq/kg of Fluorine-18 choline; b) a whole-body acquisition after the dynamic acquisition at 30 min post-injection. Early dynamic and subsequent whole-body studies were retrospectively reviewed and blind interpreted by two experienced nuclear medicine physicians. Detection rate of pelvic lesions in the prostatic bed in both acquisitions was registered. Results: Overall, lesions in the prostatic bed were found in 170/341 (49.8%) patients by using the two-steps acquisition protocol. The early dynamic acquisition allowed to detect additional lesions in the prostatic bed compared to whole-body acquisition in 64 (18%) patients, leading to an increase of the detection rate of lesions in the prostatic bed when added to whole-body acquisition (from 31% to 49.8%). Early dynamic Fluorine-18 choline PET acquisition allowed to overcome the possible interference of urinary radioactivity, which may lead to a difficult interpretation of the prostatic bed using the whole-body acquisition only. Conclusions: The early dynamic Fluorine-18 choline PET acquisition of the pelvic region significantly increases the detection rate of lesions in the prostatic bed compared to the whole-body acquisition only. Therefore, early dynamic acquisition of the pelvic region should be included in the acquisition protocol of Fluorine-18 choline PET/CT in patients with prostate cancer.

P0527

PET/CT with ^{18}F-Fluorocholine in Prostate Cancer. Comparison to Clinical Follow-up

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Aim: Choline is a substrate for the synthesis of cellular membranes that accumulates in prostate cancer. ^{18}F-Fluorocholine PET/CT has been found to be useful in imaging prostate cancer, particularly for staging high risk patients and in biochemical relapse. The aim of this study was to evaluate the clinical usefulness of ^{18}F-Fluorocholine PET/CT performed in prostate cancer patients from our institution. Materials and Methods: Sixty nine ^{18}F-Fluorocholine PET/CT scans were performed in 67 patients (aged 45-87, mean 65.36 years) with histopathological proven prostate cancer, between December 2009 and March 2012. Fifty seven patients (85.07%) were referred due to biochemical relapse, 8 (11.94%) for initial staging and 2 (2.99%) for restaging after surgery. PSA levels at the time of the study ranged between 0.01ng/ml and 228ng/ml (mean 13.31; median 2; mode 0.4) and the Gleason score from 5 to 9 (mean 7). All examinations were obtained after injection of 4MBq/Kg of ^{18}F-Fluorocholine, starting with dynamic pelvic acquisition, followed by whole body acquisition at 30 minutes and imaging of the pelvis at 60 minutes. PET/CT results were compared to clinical follow up (mean 10.5; range 1 to 27 months). Results: Initial staging studies showed local disease in 6 patients and distant metastases in 2. In the 2 high-risk patients restaged after surgery ^{18}F-Fluorocholine PET/CT detected local disease in 1 and no evidence of disease in the other. These results were used to guide treatment planning. A successful outcome has been achieved in all these cases, except in one. Among the 57 patients with biochemical relapse, ^{18}F-Fluorocholine PET/CT was negative in 25 (43.86%) but showed pathological uptake consistent with recurrence in 32 (56.14%), 18 of whom had local relapse (2 also with lymph node metastases and 2 also with bone metastases), 10 had lymph node metastases, 3 had lymph node plus bone metastases and 1 had bone metastases only. Thirteen patients underwent salvage radiation therapy and 19 systemic therapy (hormonal or chemotherapy). Thirty one (96.88%) patients of this group showed decrease in PSA-levels after treatment. In the 25 PET/CT negative patients, 13 were not treated but in 12 microscopic disease was assumed and local radiation performed. No evidence of recurrence was detected by clinical follow-up in 24 (96%) of these patients.Conclusion: Our data confirms that ^{18}F-Fuorocholine PET/CT is a useful tool for staging of prostate cancer, suspicion of recurrence, identification and localization of disease, and has significant impact on therapeutic management.

P59-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibtion Area

Oncology Clinical Science: Gynaecological

P0528

F-18 fluorodeoxyglucose positron emission tomography for uterine and adnexal carcinosarcoma

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Purpose We evaluated the ability of F-18 fluorodeoxyglucose (FDG) positron emission tomography (PET) imaging to diagnose and stage uterine and adenaxal carcinosarcoma. Materials and Methods We used FDG-PET to evaluate 24 patients aged 59.5(SD, 7.2) y who had been pathologically diagnosed with carcinosarcoma of the uterus (n=15), ovary (n=8) and fallopian tube (n=1). Restaging and post-therapy surveillance was determined based on the findings of FDG-PET/CT. Normal glucose levels were confirmed in the patients, who fasted for at least 4-th before being intravenously injected with 185-250 MBq of F18-FDG. Images were acquired one hour later FDG-PET imaging using Aquiduo 16 (PET/CT). Regional FDG uptake in the affected area is expressed as standardized uptake value (SUV). Data were stastically analyzed using SPSS (Version 11.0, SPSS, Inc. Chicago, IL, USA). Results The histological types of fallopian tube tumors were homologous (n=20) and heterologous (n=4), endometrioid adenocarcinoma (n=13), adenocarcinoma (n=6), serous adenocarcinoma (n=3), clear cell adenocarcinoma (n=2). All lesions were correctly staged from F-18 FDG PET/CT images in 20 of 24 patients (83.3%) as 1 (n=6), 2 (n=1), 3 (n=10), and 4 (n=7). One patient each with intestinal invasion, pelvic lymphatic metastasis, and pelvic and paraaortic lymphatic metastasis were false-negative, whereas two with lymphatic metastasis were false-positive. The SUV max of the primary lesion was 14.98 (7.20) . F-18 FDG PET/CT for 17 restaged patients identified cancer relapse in eight of them. SUVmax (SD) of patients in complete remission was 12.08 (3.82), compared with those who had recurrence (19.3 (9.4) P=0.044) and stage 1and 2 12.7(5.5)) or stage 3 and 4 (15.4(8.1) P=0.342) uterine and adnexal carcinosarcoma.. Conclusion F-18 FDG PET/CT imaging was useful for the primary staging of uterine and adnexal carcinosarcoma, for selecting the optimal treatement strategy and for the clinical detection of metastasis and recurrence.

P0529

PET-CT for Pelvic and Para-Aortic Lymph Node Staging in Locally Advanded Cervical Cancer Compared with Lymphadenectomy

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BACKGROUND The most important prognostic recurrence factor in patients with cervical cancer was paraaortic nodal status. We proposed FDG PET-CT as diagnostic imaging tool for lymph node staging and its possible role with laparoscopic verification in the staging management algorithm. PURPOSE The aim of the study was to evaluate the accuracy of FDG PET-CT for detecting pelvic and para-aortic lymph nodes (LNs) metastases in patients with locally advanced cervical cancer. MATERIAL AND METOTHS This prospective study included 12 consecutive women with recent diagnostic of cervical cancer (mean 44y, range 29-66) stage FIGO IIB-IVA. All patients underwent RMN and PET/CT in order to evaluate pelvic and paraaortic LN staging. After that a laparoscopic lymphadenectomy (LDN) of the para-aortic and/or pelvic LNs was performed in order to obtain histological verification of imaging results. A median of 12.3 LNs/patient (±4,7) were removed in LND. A patient was excluded from surgery because of several metastasic spread diagnosed by PET-CT and histopathologicaly confirmed. RESULTS - PET-CT detected the primary cervical tumor in all patients, with a mean value of SUVmax of 13.6 (range 5.6-29.4). The tumor local infiltration was analized with RMN. - Pelvic region was studied with PET-CT showing LN involvement in 6/11 patients. Of these 6 patients, 4 were true positives after LDN. 1 patient with pelvic LN metastasis in MRI and PET-CT was considered false positive and another patient did not have pelvic LDN for histopathological confirmation due to surgeon's decision. - Para-aortic region was studied with PET-CT showing LN involvement in 3/11 patients, all of them were true positive after LDN. No LN infiltration was obtained in 8 patients with negative PET-CT (true negatives). - Overall, the therapeutic approach was modified in 27.2% of patients. The presence of para-aortic metastasis lead to expand the radiation field in 3 patients and 1 more patient with metastasis was excluded from surgery and underwent palliative treatment. CONCLUSION Preliminary results of our study show that PET-CT was able to correctly predict para-aortic lymph node staging in all patients recently diagnosed with a locally advanced cervical cancer. In our study, the therapeutic approach was modified in 27.2% of patients, mostly increasing RT fields. We suggest that PET-CT may be

performed as the first diagnostic tool in these patients, reserving laparoscopic LDN for those patients with N1.

P0530

Clinical significance of PET/CT for the evaluation of neck nodal metastasis in patients with gynecologic cancer

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Objective. To evaluate the diagnostic accuracy of fluorodeoxyglucose positron emission tomography (FDG-PET) for the detection of metastatic neck lymph nodal status in patients with gynecologic cancer patients. *Methods.* Between April 2008 and December 2011, we retrospectively analyzed 4170 PET/CT scans with pathological-proven gynecologic malignancies including cervix cancer, endometrial cancer and ovarian cancer. We evaluated the lower neck node including inferior jugular and supraclavicular nodes by excluding the upper neck node uptake on FDG PET-CT due to usually benign reactive nodes. Eleven patients (0.2%) were suspected of neck lymph node metastasis in PET/CT and underwent a sono-guided neck lymph node biopsies. *Results.* Six patients among 11 patients were pathologically diagnosed neck node metastasis. The median age was 51.3 (range 29-76). The PPV of the PET/CT was 54.5%, retrospectively. The treatment was chemo-radiation in eight and surgery in three patients. *Conclusions.* We found that the incidence of neck node metastases in the gynecologic malignancy were very low (0.2%). But, PET/CT is an effective imaging technique to evaluate neck lymph nodal status workup in gynecologic cancer. It may help planning the management and recommend as an early diagnosis modality in the workup of these patients. We should rule out the neck node metastasis in case of neck node uptake on the PET/CT even though neck node metastasis in gynecologic malignancy is very rare.

P0531

Suspected recurrence ovarian cancer: correlation between 18F-FDG PET/CT, CA125, histology and the cause of referral.

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Aim: To evaluate the relationship between the PET/CT result and the histological type, the serum level of CA125 and the cause of suspicion, in patients with history of ovarian cancer. Material and Method: We performed a retrospective study that included 67 patients with ovarian carcinoma previously treated, in remission, and with suspicion of recurrence due to elevated serum markers or/and conventional imaging techniques (CIT) . We calculated values of sensitivity, specificity, positive and negative predictive value. The result of the FDG PET/CT, in terms of positivity or negativity, was compared with the cause of referral, the histological type of tumour and with the serum level of Ca-125, measured one month around the PET/CT. Results: We obtained a total of 55 positive PET/CT studies (82%), 54 of them were true positive, and 12 negative PET/CT, 10 of them true negative. So we achieved for the PET/CT the following statistical parameters: sensitivity 96.4%, specificity 90.9%, PPV 98.1% and NPV 83.3%. When analyzed according to the different histological types, 36/41 serous tumours were positive (87.8%), 5/6 endometriod (83.3%), 6/6 (100%) undifferentiated, 4/4 (100%) cistoadenocarcinoma, 1/2 (50%) granulomatous, 2/4 (50%) mucinous and 1/1 (100%) teratoma. The remaining three patients showed a negative study, and corresponded with one Krukenberg tumour (false negative), and one borderline and clear cells tumours. In the most prevalent tumours, we obtained a median value of CA125 in the positive PET/CT studies much higher in the undifferentiated type (176.5 UI/ml), as compared with the serous (62 UI/ml) and endometrioid type (21.6 UI/ml). On the other hand, the CA125 value of the negative PET/CT studies was 17 UI/ml and 3.9 UI/ml for the serous and endometriod histology, respectively. In relation to the cause of referral, we obtained a higher number of positive studies when this was the elevated serum markers (n=21), when compared with CITs (n=29) [statistically significant difference ($p<0.05$, Chi 4.3)]. Conclusions: The probability of having a positive PET/CT study is higher when the cause of referral is elevated CA125 levels, in comparison with those studies performed due to alterations in the CITs. The likelihood of having a metabolic positive study seems to be related with the CA125 levels and with the histologycal type, being maximal in the case of undifferentiated type of tumour.

P0532

The significance of additional SPECT/CT imaging in sentinel lymph node scintigraphy of patients with cervical and endometrial cancer

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Aim: The presence of lymph node metastases is one of the most important prognostic factor in gynecologic malignancies however the lymph node status is not included in the FIGO staging. Presently the standard surgical procedure of these diseases is the pelvic lymphadenectomy. The purpose of this study is applying the sentinel lymph node technique in the surgical therapy of early stage cervical and endometrial cancer. Patients and methods: Between 1 Apr 2011 and 31 Mar 2012 examinations of 35 patients (mean age 62 years, from 31 to 87 years) were performed. In 10 patients cervical cancer in 25 patients endometrial cancer were diagnosed. One day before the operation the cervix was infiltrated in four localization with 4x20 MBq 99mTc-HSA colloid (Sentiscint) in 4x0.2 ml volume. Two minutes, 1 and 3 hours after the administration planar imaging was investigated from the abdomen, the pelvic and the 2 inguinal regions. SPECT/CT (low dose, native scan, multislice CT) examination was performed in the delayed time. In 18 cases open laparatomy and in 17 cases laparascopy technique was applyed. The radioactive lymph nodes were removed using gamma probe but total pelvic lyphadenectomy was also carried out in every patients and all the lymph nodes were sent to histological examination in a special separating box which was planned for this purpose. Results: There was no lymph node detection in 8 patients, in 1 case of them the sentinel was not detected but the other extracted lymph nodes were positive. In 7 cases the sentinel lypmh node was detected but the removal of that was unsuccessful. In 20 cases sentinel was removed and in 19 patients all the lymph nodes were negative. In 1 patients only the sentinel lymph node was positive, the others were negative. Conclusions: Our method seems to be very useful to detect the sentinel lymph nodes in early stage cervical and endometrial cancer patients and it may replace the total pelvic lyphadenectomy in the future in case of negative sentinel lymph node like in breast cancer and malignant melanoma. The preoperative additional SPECT/CT image and the application of intraoperative gamma probe give a valuable support to the gynecologist finding the sentinel lymph nodes.

P0533

Optimizing diuretic protocols for detecting pelvic malignancies with FDG PET/CT

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Purpose: A standardized diuretic protocol is essential for the detection of pelvic malignancies with delayed F18-FDG PET. The purpose of this study is to compare the results of different protocols of delayed diuretic F18-FDG PET/CT in the detection of pelvic malignancies. **Methods:** One hundred and twenty one patients with pelvic malignancies (81 cervical cancers, 23 bladder cancers, 4 vaginal cancers, 3 ovarian cancers, 5 colon cancers, and 5 suspicious malignancy) underwent whole body F18-FDG PET/CT 60 min after the intravenous injection of 370 MBq of F18-FDG. Additional delayed pelvic images were acquired about 3 h after the intravenous injection of FDG with 4 different protocols: Group 1 (n=8) received 800 ml oral hydration after initial scan. Group 2 (n=24) received 800 ml oral hydration and IV furosemide after initial scan. Group 3 (n=56) received 800 ml oral hydration before injection of FDG, and another 800 ml oral hydration and IV furosemide after initial scan. Group 4 (n=33) did not receive oral hydration or diuretics and served as controls. PET/CT findings were confirmed by pathology or follow up. **Results:** All three hydration groups showed significant lower bladder urine activity than controls (group 1: SUV mean 6.8+2.6, group 2: 2.5+1.2, group 3: 2.1+0.8, vs controls 16.4+7.6, $p<0.001$). All cervical cancers and bladder cancers were hypermetablic (SUV 11.2 + 6.3 and 20.2 +5.5, respectively) and were better demonstrated in group 3 (tumor/urine ratio 5.7) as compared with other groups (tumor/urine ratio 5.0 in group 2, 2.4 in group 1 and 0.6 in controls, $p<0.001$). One hundred and sixty-five regional nodal metastases were identified in 41 patients in initial scan. Additional 10 nodal metastases were detected by delayed scan. Patients tolerated all 4 protocols well. **Conclusion:** Adequate hydration before injection of FDG plus forced hydration and diuretics after initial scan offers optimal results of bladder urine washout effect and better pelvic tumor detection with delayed FDG PET/CT. A standardized diuretic protocol may play an important role both in detection of primary pelvic tumors and for staging and restaging of pelvic malignancies.

P0534

The Association of Clinical Characteristics and Metabolic Parameters as Detected by FDG PET/CT with Disease Persistence in Patients with in-operable Cervical Cancer

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The objective of this retrospective study was to evaluate the prognostic significance of clinical characteristics and PET/CT findings, such as metabolic tumor volume (MTV), maximum standardized uptake values of tumor (SUVmax) and lymph nodes (LN) in patients with in-operable cervical carcinoma. Methods: 58 patients with

cervical carcinoma (stage IIB-IVB) underwent FDG PET/CT for pretreatment evaluation and included in this study. Patients were staged according to International Federation of Gynecology and Obstetrics [FIGO] system. After chemoradiation therapy, patients were evaluated for persistent disease by clinical examinations, smear tests, pelvic MRI and PET/CT. Based upon follow-up results, clinical characteristics (patient age, tumor histology, FIGO stage) and PET/CT findings (the presence of PET-positive pelvic/para-aortic LN, MTV, tumor and LN SUVmax) were analyzed for disease persistence. Results: At the time of last follow-up (15±8, range:6-36 months), 38 patients (65%) had persistent disease (PD), 20 patients (35%) had no evidence of disease (NED). Patient age, histology and tumor SUVmax did not differ between groups. The frequency of PET-positive pelvic/para-aortic LN (84% vs. 60%, p=0.03), LN SUVmax (10.2 vs. 6.5, p=0.02), MTV (107cm^3 vs. 41.5cm^3, p=0.03) and FIGO stage were significantly differed between PD and NED groups. When the Cox proportional hazards model for the risk of persistent disease was performed including frequency and SUVmax of LN, MTV and tumor stage; advanced FIGO stage and the presence of para-aortic LN metastasis were found as independent predictors. The Kaplan-Meier curves for disease-specific survival (DSS) indicated better outcomes for patients without PET-positive LN compared to others. The worst outcome curves were seen for patients with PET-positive para-aortic lymph nodes among all patients, p=0.03. Similarly, DSS showed progressive worsening as the disease advances. Better outcome results were demonstrated on Kaplan-Meier curves for stageII patients than stageIII and stageIV patients respectively, p=0.015. Conclusion: Advanced FIGO stage and the presence of para-aortic LN on PET/CT are significant prognostic biomarkers for persistent disease in patients with in-operable cervical carcinoma independent from tumor and LN SUVmax

P0535

The standardized uptake value for F-18 FDG and metabolic tumor volume are predictors of the presence of pelvic/para-aortic lymph node metastasis in patients with cervical carcinoma

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The objective of this study was to evaluate whether cervical tumor FDG uptake (SUVmax) and metabolic tumor volume associate with the presence of pelvic/para-aortic lymph node (LN) metastasis and tumor stage in patients with cervical cancer. Method: 74 patients with stage IB- IVB cervical cancer (squamous [n:66], nonsquamous [n:8]) underwent FDG-PET/CT imaging for initial staging and treatment planning. SUVmax, tumor volumes, sites of LN metastasis were recorded. Results: Patients were staged according to International Federation of Gynecology and Obstetrics [FIGO] criteria as; stage I(n:5), stage II(n:25), stage III(n:15) and stage IV(n:29). No significant difference was observed in tumor SUVmax according to FIGO stages (17.3, 17.7 and 18.3, in stage II, III and IV, respectively). Tumor volumes differed significantly according to FIGO stages (41, 98 and 107 cm^3, in stage II, III and IV respectively, p=0.015). There was no correlation between tumor SUVmax and volume (correlation coefficient (R^2) =0.07). SUVmax and volume were significantly higher in patients with PET-positive LN (n:53) compared to others (n:21) (18.4 and 88.8 cm^3 vs. 13.9 and 39.9 cm^3, respectively). Cut off values in association with the presence of PET-positive LN were calculated as 15.2 for SUVmax and 35 cm^3 for volume on ROC curve analysis. Conclusion: Tumor FDG uptake and volume associate with the presence of PET-positive LN in cervical carcinoma patients. These findings support the use of PET/CT as a complementary approach to FIGO staging in the pretreatment evaluation of cervical cancer patients in order to identify cases with high risk of lymphatic involvement.

P0536

The contribution of 18F-FDG-PET/CT in restaging patients with endometrial cancer

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Purpose: Endometrial cancer is one of the most common gynecologic malignances in European countries, with good prognosis at early stages. However prognosis becomes poorer at advanced stages as well as at recurrence. Accurate staging after treatment is of incremental value. In this retrospective study, we evaluated the role of 18F-FDG-PET/CT in restaging patients with endometrial cancer after therapy. Method-Material: 34 PET/CT examinations, of 28 patients with endometrial cancer, were retrospectively reviewed. All patients had received the appropriate treatment according to the disease (surgical removal, chemotherapy, radiotherapy) and were referred to PET/CT department for restaging after treatment. 60 min after the intravenous administration of 18F-FDG whole body Positron Emission Tomography/ Computed Tomography was performed at a Siemens Biograph LSO PET/CT device. All of the patients were previously restaged by conventional imaging (CT). Comparison between the results of the two imaging modalities occurred. Results: In 11/34 (32.3%) cases both CT and PET were positive; in 1/11 PET revealed more metastatic lesions concerning lymph nodes and osseous disease; PET did not show small pulmonary nodules in 2 cases and one small liver metastasis in 1 case. In 2/34 (5.8%) cases CT was positive showing pulmonary nodules but PET was negative as these nodules did not accumulate the radiopharmaceutical. In 6/34 (17.6%) cases both CT and PET were negative. In 5/34 (14.7%) cases CT was negative, while PET was positive (lymph nodes, peritoneal implantations, osseous metastasis, and local disease). In 10 (30%) cases CT was stable compared to previous CT examination or equivocal. PET was positive in 4/10 (lymph node invasion in 3, local disease in 1), negative for 5/10 (all true negative in 3 year surveillance) and equivocal in 1/10. Conclusion: PET/CT is a whole body imaging modality, helpful in restaging patients with endometrial cancer, with generally higher accuracy compared to conventional anatomic imaging. Particularly, it is helpful in characterizing lymph nodes, peritoneal implantations, local disease and osseous metastasis. Attention should be paid in the evaluation of small pulmonary nodules and small liver lesions.

P60-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Colorectal Cancer

P0537

Fluorodeoxyglucose (FDG) Positron Emission Tomography (PET/CT) and metabolic features in advanced rectal cancer: additional information at initial staging and after neoadjuvant therapy

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Aim: PET/CT has been provided to be useful in staging of colorectal cancer for detecting extra-hepatic disease in high risk patients and for examine for post-operative recurrence of disease. We aimed to evaluate the additional information provided by FDG PET/CT from qualitative and quantitative analysis in patients with advanced rectal cancer. Materials and methods: at our Institution, we prospectively evaluated 30 patients (21 males; mean age: 65±12 years) with rectal cancer, who underwent FDG PET/CT for initial staging. PET/CT findings and the maximum standardized uptake value (SUVmax) obtained by the analysis of the images were compared with clinical stage of disease and with response to neoadjuvant treatment (chemotherapy plus radiotherapy). A patient-based analysis was used. A p value <0.05 was considered statistically significant. Results: at initial staging, 3 (10%) patients were at stage I, 6 (20%) at stage II, 14 (47%) at stage III and finally 7 (23%) at stage IV. PET/CT correctly staged 11 patients, in particular in 4 patients localized visceral secondary metastases, whereas in the remnant 15 patients under-staged the lymph node involvement. In these latter patients, SUVmax at primary lesion was 21±8 (range: 9-36). SUVmax of primary lesion was similar among the different stage of disease (25±13, 17±6, 21±7 e 19±10, respectively at stage I, II, III e IV; ANOVA test p=0.551). After neoadjuvant therapy, 17 (57%) patients have had a complete or partial response to treatment, while 6 patients had not. The value of SUVmax at primary lesion was similar between responder and no-responder subset (19±7 vs. 25±11; t-Student test p=0.131). Conclusions: PET/CT can yield useful information for the initial evaluation of rectal cancer, in particular for the distant metastases. From our results, we did not find any correlation between metabolic aggressiveness and responsiveness to neoadjuvant therapy, but a larger study population is warranted to confirm this finding.

P0538

Effect of Hyperglycemia on the Uptake of [F-18] FDG in Colorectal Carcinoma and Normal Tissues

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Background: [F-18] FDG (FDG) is taken up by cells using the same mechanism as used for glucose through the glucose transporter (Glut), which is expressed on the cell membrane. Hyperglycemia is reported to significantly decrease FDG uptake in tumors in animal models. However, there have been few clinical studies of the effect of hyperglycemia on the uptake of FDG in tumors in humans. The main object of this study was to evaluate the effect of hyperglycemia on the uptake of FDG in colorectal cancers and normal human tissues. ***Materials and Meth*ods:** FDG PET/CT scans performed in patients with colorectal cancer from Jan. 2008 to Dec. 2011 were retrospectively reviewed. A hundred ninety-six cases of patients (111 men and 85 women, 24 to 90 yrs with median age of 69 yrs) who showed no evidence of metastases on PET/CT scan before surgical resection of a colorectal tumor were reviewed. All patients had been instructed to fast for 6 h and to have fasting blood sugar (FBS) measurement before intravenous injection of

commercially available [F-18] FDG. (Nihon-Medi Physics Co., Ltd, Japan). Sixty minutes after FDG injection, whole body images from the top of the skull to the proximal thighs were obtained in 3-D acquisition mode at 1 bed position per 2.0 min using PET/CT (GEMINI-GXL, Philips). ***Results*: The median of SBF was 110 mg/dl with range from 77 to 215 mg/dl.** The degree of tumor uptake (represented by SUVmax) did not show a significant correlation with FBS (SUVtumor = 11.92 - 0.00709*FBS, r=0.036, ns). It did correlate with the tumor size (p<0.0001). SUVmax in brain, liver and muscle correlated significantly with FBS (SUVbrain=16.17 - 0.05867*FBS, r=0.677, p<0.001; SUVliver = 2.32 + 0.00216*FBS, r=0.189, p=0.0089; SUVmuscle = 0.73 + 0.00075*FBS, r=0.155, p=0.032, respectively). The degree of brain uptake (SUVglu) after normalization for 5.0 mmol/L of plasma glucose level (Pglu) using the equation (SUVglu = SUVbrain*(Pglu/5.0)) showed almost straight line without a significant correlation coefficient. **Conclusions**: The present study indicates that uptake of FDG in colorectal cancer is not significantly affected by elevated plasma glucose levels. Uptake of FDG in normal tissues in hyperglycemic subjects may reflect physiologic uptake parallel to that of glucose, and the competition for the transporter sites between abundant glucose moieties and tracer amounts of FDG may be minimal. FDG PET scan should not be contraindicated in diagnostic evaluation of regional involvement and metastatic spreads of tumor in hyperglycemic patients.

P0539

A systematic Review of the survival predictive value of ^{18}FDG-PET in locally advanced rectal cancer after neo-adjuvant chemoradiation

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Introduction: Although the mainstay of therapy for locally advanced rectal cancer is preoperative radiation therapy with or without concomitant chemotherapy followed by radical surgery, predicting clinical outcome remains difficult. Improved long-term survival has only been reported in case of pathological complete response. The aim of the current systematic review is to determine the predictive value of ^{18}FDG-PET for assessing progression-free survival (PFS) and overall survival (OS) in locally advanced rectal cancer. ***Materials and Methods:*** We performed a literature search (PUBMED/MEDLINE, EMBASE, Cochrane) until January 2012 to identify full papers with sequential ^{18}FDG-PET and survival data, using indexing terms and free text words. Studies were selected by 2 observers. To be eligible, studies had to include at least 10 patients, to present sequential ^{18}FDG-PET(-CT) data and a Kaplan-Meier or actuarial survival curves with a minimal follow-up period of 24 months. We performed a meta-analysis for survival-type data using the hazard ratio (HR). ***Results:*** We identified 6 eligible studies including a total of 364 patients (mean age 63 years, 64% males). Only in half of the studies, PET-CT rather than PET imaging was used. The stage distribution was as follows: stage I 2%, II 44%, III 52% and IV 1%. The pooled HRs for complete metabolic response versus partial or no response were 0.32 for OS (95%CI, 0.16 to 0.65; P< 0.001) and 0.67 for PFS (95%CI, 0.18 to 2.42; P< 0.54), respectively. ***Conclusion:*** This systematic review indicates that complete metabolic response on sequential ^{18}FDG-PET data after preoperative chemoradiation of locally advanced rectal cancer is predictive of overall survival, but not of progression-free survival. The variability of the follow-up assessments may account for the lack of significance.

P0540

Incidentally detected focal colonic uptake on FDG PET/CT : etiology and clinical relevance.

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Background : The clinical value of incidental FDG uptake has been studied and has been attributed to various physiological phenomena, clinically significant pathologic processes, metastatic spread and synchronous or metachronous second malignancies. Incidental colonic uptake of FDG is not an infrequent finding encountered during whole body PET imaging. The aim of our study was to assess the relevance of an incidentally detected focal FDG PET finding in the colon by comparing it with colonoscopy in the context of detecting pre-cancerous lesions and synchronous malignancies in a population of patients which have a markedly different epidemiological profile for colo-rectal neoplasms. Aims & Objectives : The purpose of this study was to assess the aetiology of incidentally detected focal FDG PET uptake in the colon by comparing it with colonoscopy and histopathology. Materials & methods : Electronic medical records of patients who underwent FDG PET/CT at our institution for a two and half year period from January 2009 to July 2011 were reviewed .There were 32 out of 9000 patients whose PET/CT reports mentioned incidental focal colonic FDG uptake with a recommendation to obtain a colonoscopic confirmation. 24 patients subsequently underwent colonoscopy. Lesions which appeared neoplastic on colonoscopy were confirmed with histopathology obtained after biopsy or polypectomy/surgery. Colonoscopy and pathology findings were considered as gold standard. Results : The prevalence of incidental focal uptake in our study was 0.35 % (32 out of 9000).Adenomatous polyps were detected in 12 patients (37.5 %) whereas in 8 patients (25 %) malignant lesions were confirmed (adenocarcinoma n=5, NHL n=2, Malignant melanoma n=1). In one patient colonic uptake was diagnosed as inflammatory. The mean SUV_{max} for the 12 premalignant lesions was 16.9 $\pm$ 9.6 (range 7.5 - 37.4) and the mean SUV_{max} for the 8 malignant lesions was 12.9 $\pm$ 5.5 (range 6.7-21.6). The difference in SUV_{max} between the premalignant adenomatous polyps and the malignant lesions was not statistically significant (p=0.316) suggesting a broad overlap of uptake between the two groups. Conclusions : Our study shows that a significant proportion of patients (20/32-62.5%) showing an incidental focal FDG uptake will harbour pre-malignant or malignant lesions and further evaluation with colonoscopy and biopsy is warranted in such cases.

P0541

Correlation of K-Ras gene mutation status and ^{18}F-FDG uptake in PET/CT in recurrent colorectal cancer patients

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Aim: Mutations of the *K-Ras* gene occur in up to 50% of colorectal carcinomas. It has been recently reported that Ras-mutated cells exhibit increased rates of anaerobic glycolysis**.** PET is a molecular imaging modality which allows assessment of glucose utilization in tumor tissues, by utilizing the radiolabeled glucose analogue 2-deoxy-2-[18F]fluoro-D-glucose, [^{18}F]FDG. In this report, we address whether the existence of *K-Ras* gene mutations in patients diagnosed with colorectal cancer recurrence may influence the intensity of [^{18}F]FDG uptake in the PET/CT study. **Materials and Methods:** The study population consisted of patients initially diagnosed with colorectal cancer with known *K-Ras* gene mutation status and probable cancer recurrence, based on either increased tumor marker levels (Carcinoembryonic antigen, CEA) or equivocal findings in anatomic conventional imaging methods (Ultrasound, Computed Tomography, CT or Magnetic Resonance Imaging, MRI). Between February 2009 and May 2011, 41 patients underwent 46 ^{18}F-FDG PET/CT scans. The majority of the patients were *K-Ras* mutants (26/41, 63.4% *K-Ras* mutated vs. 15/41, 36.6% *K-Ras* wild-type patients). **Results:** Thirty-eight ^{18}F-FDG PET/CT scans were positive for colorectal cancer recurrence vs. 8 negative ones. The positive scan subset was further divided into two groups, based on the *K-Ras* mutation status. Group 1 (mutated *K-Ras*) was comprised of 26 PET/CT scans performed in 23 patients, while Group 2 (wild-type *K-Ras*) consisted of 12 PET/CT scans in 12 patients. ^{18}F-FDG PET/CT scans revealed 47 sites of recurrence in Group 1 and 24 sites in Group 2. The mean SUVmax value of all lesions showing ^{18}F-FDG uptake was 7.92±4.47 (range, 2.2-24) in the *K-Ras* mutated cases vs. 7.32±4.08 (range, 2.5-16.5) in the *K-Ras* wild-type ones. The difference in the SUVmax values between the 2 groups was not statistically significant (Mann-Whitney Test, 2-tailed Sig p=0.631). **Conclusion:** In this study, no statistically significant correlation was found between [^{18}F]FDG uptake and *K-Ras* mutation status. Larger studies are needed to elucidate the defective components of the glucose metabolism pathway in cancer.

P0542

Clinical significance of incidental 2-fluoro-2-deoxyglucose (FDG) findings during whole body PET/CT scans

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Aim of this study was to evaluate the clinical significance of unexpected foci of 2-fluoro-2-deoxyglucose (FDG) uptake during whole body PET/CT studies ("unexpected" means "not related with patient clinical history"). Materials and Methods: The files of 1190 patients referred for ^{18}F-FDG PET/CT (January-December 2011) were retrospectively reviewed. The incidence of scans showing unexpected focal uptake of 18F-FDG was determined. The site of these findings and their intensity were recorded. The etiology of the findings was confirmed histologically or by follow-up. Results: We found 37 incidentalomas out of 1190 scans (3%). The sites of unexpected tracer uptake were: thyroid (51%), colorectal tract (41%) and other sites (8%). So, the scans showing unexpected foci of FDG uptake were divided in two main groups: Group-A (thyroid incidentalomas) and Group-B (colorectal incidentalomas). We observed 19 incidentalomas (1.6%) in Group-A (15 females, mean age 66 yrs, range 41-81), and 15 incidentalomas (1.3%) in Group-B (6 females, mean age 74 yrs, range 62-90). In Group-A 9/19 patients underwent further investigations on the area of the unexpected tracer uptake. In Group-B 8/15 were further investigated on abdominal area. In Group-A 2/9 thyroid foci were scintigraphically confirmed as toxic nodules in goiter, the remaining 7 were biopsied and the diagnosis was colloido-cystic nodules. The mean SUVmax value was 4.9, range 2.7-17.2. In Group-B 1/8 colorectal uptakes was diverticulitis, 4 were dysplastic polyps, and the remaining 3 were adenocarcinomas. No significant differences in SUVmax values were found between precancerous and

cancerous lesions. Conclusions: this study shows that focal thyroid FDG uptake requires further evaluation (with TSH assay, ultrasonograpic and scintigraphic studies). Endoscopy is mandatory when incidental colorectal FDG uptake is found, because of the high probability of precancerous and cancerous lesions. This aspect is in accordance with literature.

P0543

Prediction of Response to Neoadjuvant Chemoradiotheraphy in Locally Advanced Rectal Carcinoma: Correlation Between Histopathology and F-18 FDG PET/CT

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Prediction of response to neoadjuvant chemoradiotheraphy (CRT) in locally advanced rectal carcinoma (LARC) may help to clinicians to make a choice among treatment alternatives. **Aim:** The effects of CRT in LARC were investigated using sequential F-18 FDG PET/BT imaging. Correlations between histopathology and F-18 FDG PET/CT were also aimed in this study. **Material and Methods:** Thirty nine patients (15 women, age range: 34 - 80 years) were included. The inclusion criteria were biopsy-proven rectal carcinoma staged as T3 or T4Nx disease using pelvic high resolution MR. All patients treated with CRT and surgical resection. Tumor regression grade (TRG) system was used to evaluate response to CRT histopathologically. TRG1 indicates no macroscopic residual tumor and significant fibrosis, TRG2 means there is both macroscopic tumor and fibrosis. TRG3 shows there is significant macroscopic tumor without fibrosis. Pre- and post- CRT F-18 PET/CT scans were obtained in all patients. SUV1max (pre-therapy), SUV2max (post-therapy), ΔSUVmax (SUV1max - SUV2max) and retention (RR%) rate [(SUV1max - SUV2max) x100 / SUV1max] values were calculated. The Wilcoxon test was used for paired data; the Mann-Whitney U test was used for unpaired data. A p value less than 0.05 was accepted as statistically significant. Spearman correlation test was used for the relationship between SUV1max, SUV2max, ΔSUVmax and RR% and TRG subgroups. **Results:** Twelve patients had TRG1 (%41), 10 patients had TRG2 (%35) and TRG3 (%24) was found in 7 patients. SUV1max (17.3 ± 7.3) values were significantly higher than SUV2max (5.8 ± 3.2) values. When the patients divided into 3 groups according to TRG, SUV2max were significantly lower than SUV1max for each group. There was no difference in SUV1max, SUV2max, ΔSUVmax and RR% between TRG subgroups (table). Significant correlation was found between TRG subgroups and SUV2max (p: 0.05, r: 0.37).

Conclusion: According to our results, response prediction to CRT using F-18 PET/CT in patients with LARC may be possible. Post-therapy SUVmax seems to be more valuable parameter for prediction of CRT response. There is a need for studies investigating the role of F-18 FDG PET/CT especially as a complementary tool for prognostic evaluation in patients with LARC.

P61-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Gastrointestine & Pancreas

P0544

Role of 18F-FDG PET/CT in the prediction of gastric cancer recurrence after curative surgical resection

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Purpose: The study evaluated the role of pre-operative 18F-fluorodeoxyglucose (18F-FDG) PET/CT in the prediction of recurrent gastric cancer after curative surgical resection. Methods: A total of 271 patients with gastric cancer who underwent 18F-FDG PET/CT and subsequent curative surgical resection were enrolled. All patients underwent follow-up for cancer recurrence with a mean duration of 24 ± 12 months. 18F-FDG PET/CT images were visually assessed and, in patients with positive 18F-FDG cancer uptake, maximum standardized uptake value (SUVmax) of cancer lesions was measured. 18F-FDG PET/CT findings were tested as prognostic factors for cancer recurrence and compared with conventional prognostic factors. Furthermore, 18F-FDG PET/CT findings were assessed as prognostic factors according to histopathological subtypes. Results: Of 271 patients, 47 (17%) had a recurrent event. Positive 18F-FDG cancer uptake was shown in 149 patients (55%). Among tumor size, depth of invasion, presence of lymph node metastasis, TNM stage, positive 18F-FDG uptake, and SUVmax, which were significantly associated with tumor recurrence in univariate analysis, only depth of invasion, positive 18F-FDG uptake, and SUVmax had significance in multivariate analysis. The 24-month recurrence-free survival rate was significantly higher in patients with negative 18F-FDG uptake (95%) than in those with positive 18F-FDG uptake (74%; $p < 0.0001$). In subgroup analysis, 18F-FDG uptake was a significant prognostic factor in patients with tubular adenocarcinoma ($p = 0.003$) or poorly differentiated adenocarcinoma ($p = 0.0001$). However, only marginal significance was shown in patients with signet-ring cell carcinoma and mucinous carcinoma ($p = 0.05$). Conclusions: 18F-FDG uptake of gastric cancer is an independent and significant prognostic factor for tumor recurrence. 18F-FDG PET/CT could provide effective information of the prognosis after surgical resection of gastric cancer, especially in tubular adenocarcinoma and poorly differentiated adenocarcinoma.

P0545

Evaluation of the FDG uptakes in gastric cancers using dual-time-point FDG-PET/CT

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Objectives: The purpose of this study was to retrospectively evaluate the degree of the FDG uptakes in gastric cancers using dual-time-point FDG-PET/CT. Methods: Of the patients performed dual-time-point FDG-PET/CT scanning from August 2006 to November 2011, 87 patients with 93 lesions who were diagnosed histopathologically to have gastric cancer investigated in this study (61 males and 26 females; age ranged from 35 to 89, average 68). For dual-time-point FDG-PET/CT scanning, the early and delayed images were acquired at 1 and 2 hours after intravenous FDG injection, respectively. FDG-PET/CT images were examined visually and statistically. Results: By visual analysis of PET images, 74 of 93 lesions in early images and 76 of 93 lesions in delayed images showed abnormal FDG uptakes. 73 of 76 lesions detected in delayed images showed increasing FDG uptakes compared to those in early images. 13 of 23 early cancers in both early and delayed images and 6 in early images and 4 in delayed images of 70 advanced cancers showed no FDG uptakes. By quantitative analysis of PET images, standardized uptake values (SUVs) of advanced cancers was 7.2 ± 4.0 as mean ± standard deviation in early images and 9.1 ± 5.4 in delayed images, with significant difference between them ($p<0.0001$). SUVs of early cancers was 3.4 ± 3.6 in early images and 3.9 ± 4.7 in delayed images, without significant difference between them ($p=0.0952$). Concerning advanced cancers, SUVs of 28 tubular adenocarcinomas (TUBs), 27 poorly differentiated adenocarcinomas (PORs), 5 papillary adenocarcinomas (PAPs) and 5 signet-ring cell carcinomas (SIGs) were 7.3 ± 3.5, 7.3 ± 4.1, 9.8 ± 2.3 and 2.6 ± 1.0 in early images and 9.3 ± 4.7, 9.3 ± 5.5, 12.6 ± 3.9 and 2.8 ± 1.2 in delayed images, respectively. SUVs of SIGs in advanced cancers were significantly lower than SUVs of other histological types. There was significant difference between SUVs of TUBs and SUVs of PORs in advanced cancers at both early and delayed images. SUVs of 18 TUBs in early cancers were 3.1 ± 2.8 in early images and 3.7 ± 3.4 in delayed images. Regarding TUBs and PORs, SUVs at both early and delayed images showed significant differences between early cancers and advanced cancers.Conclusions: Most of advanced gastric cancers can be detected using FDG-PET/CT but almost half of early cancers cannot be detected. The degree of the FDG uptake in advanced cancers was different according to histopathological type.

P0546

Primary Gastric Lymphoma: utility of 18F-FDG PET-CT for detecting relapse after treatment

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Objective: To evaluate the role of 18F-Fluorodeoxyglucose (18F-FDG) positron emission tomography-computed tomography (PET-CT) for detecting relapse in post treatment patients of primary gastric lymphoma. Methods: Data of patients with previously treated primary gastric lymphoma who underwent 18F-FDG PET-CT for suspected relapse or routine follow up was retrospectively evaluated. Seventy one 18F-FDG PET-CT studies of 39 patients (Age: 50.3±13.8 years; Male: 24;DLBCL-26, MALT lymphoma-7,B-NHL-5 & Hodgkin's lymphoma-1) were included for final analysis. Images were evaluated by two experienced nuclear medicine physicians in consensus. Findings of PET-CT were divided into three major groups: local disease, nodal disease and organ involvement (other than stomach). Semiquantitative analysis was also done using the standardized uptake value (SUVmax). A combination of clinical follow up/ imaging follow up (minimum 6 months; range: 6-35 months), endoscopy and/or histopathology (when available) was taken as reference standard. Results: Fifty three PET-CTs were done for suspected relapse and 18 for routine follow up. Based on reference standard 61% (43/71) patients were positive for relapse and 39% (28/71) were negative for relapse at time of PET-CT. Lymph node was the commonest site followed by local relapse. PET-CT was true positive in 27, true negative in 39, false positive in 4 and false negative in 1.Per

patient based sensitivity was 96% [95% CI: 82-100], specificity 91% [95% CI: 78-97], positive predictive value 87% [95% CI: 70-96], negative predictive value 97.5% [95% CI: 87-100] and accuracy 93%. Accuracy was 90.5% in suspected relapse group and 100% in routine follow up group (P=0.409).The mean SUVmax of local lesions was 4.5±3.1 (median: 3.2; range: 1.9-13.6), nodal lesions was 5.8±2.4 (median: 5.3; range: 2.3-10.3) and organ lesions was 5.9±3.3 (median: 5.1; range: 2.8-12.3).The SUVmax of nodal lesions was significantly higher than local disease (P=0.019) and but not organ lesions (P=0.917). No significant difference was found between local and organ lesions (P= 0.142). Conclusion: 18F-FDG PET-CT appears to be highly accurate for detection of relapse in post treatment patients of primary gastric lymphoma, either when suspected or during routine follow up.

P0547

The correlation between FDG-PET and Diffusion weighted image in pancreas cancer

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Objectives: Apparent diffusion coefficient (ADC) is a quantitative parameter providing information regarding tumor cellularity and tumor aggressiveness. Several studies demonstrated that ADC and SUV had a negative correlation in various cancers. The aim of this study was to assess correlations between ADC and SUV in pancreatic cancer. Methods: This study included 110 patients with histopathologically proven pancreatic cancer. 85 were solid type and 25 were cystic type. ADC maps were generated from 3T-MR image with workstation. Minimal ADC (ADC min), mean ADC (ADC mean) and maximal SUV (SUVmax) were measured. Maximal SUV were measured in both early (1hr) and delayed (2hr) images. Pearson correlation coefficients were calculated to assess the relationship between ADC and SUVmax in all patients. We also calculated in both cystic lesion and solid lesion respectively. Results: Both ADC mean and ADC min was weakly and negatively correlated to SUVmax of early image (r = -0.350 and r=-0.346) and of delayed image (r = -0.329 and r=-0.334) in all patients. In solid lesions, each correlation coefficient was similar (r =-0.333, r =-0.325, r =-0.315 and r=-0.301). In contrast in cystic lesions, each correlation coefficient was weak on delayed image. (r =-0.344, r =-0.345, r =-0.233 and r=-0.279) Conclusions: The present study demonstrated weak negative correlations between ADC and SUVmax in pancreas cancer. However in cystic lesion, the correlation became considerably weaker on delayed image.

P0548

Radioimmunotherapy Combined With Radiosensitizing Chemotherapy For Therapy of Advanced Pancreatic Adenocarinoma (APA): Phase I/II Results

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Objectives: The evaluation of safety and efficacy of ^{90}Y-clivatuzumab tetraxetan (humanized anti-pancreatic mucin IgG) plus low-dose gemcitabine as a first-line therapy in Stages 3-4 APA. **Methods**: Cycles of gemcitabine once-weekly x 4 with ^{90}Y-clivatuzumab (PAM4) on weeks 2, 3 and 4 were repeated until progression, withdrawal or unacceptable toxicity. Part I had ^{90}Y-activity escalated with gemcitabine fixed at 200 mg/m^2, while Part II had gemcitabine increased to 1000 mg/m^2 with ^{90}Y fixed at 12 mCi/m^2 for 1st cycle, then reduced for retreatment. **Results:** Ninety of 100 patients enrolled were assessable (73 stage 4, 17 stage 3) after receiving 1-4 cycles. Part I: 38 patients received a single cycle of the radioconjugate at 240.5, 333, 444, and 555 MBq/m^2 (6.5, 9.0, 12.0, or 15.0 mCi/m^2) x 3, which was repeated 1-3 times in 13 patients. NCI-CTCv3 Grade 3-4 platelets or ANC developed in 20/38 after cycle 1 (all reversible) and in all retreated patients (irreversible in 4/9 at highest 2 doses). By CT-RECIST, 16% had PR and 42% had stabilization as best response (58% disease control). Median overall survival was 7.7 months, with 11.8 months for the 13 retreated patients (46% surviving $\geq$1 year), and with improved efficacy at the higher radiation doses. Part II: Increasing gemcitabine doses were given to 52 patients without improved outcome. **Conclusion:** Repeated radioimmunotherapy with ^{90}Y-clivatuzumab tetraxetan with low-dose gemcitabine is feasible and active in first-line APA.

P0549

Comparison of SUVmax and SUVpeak measuring FDG uptake for robust predictions of patient prognosis of pancreas cancer treated by carbon ion radiotherapy

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Purpose: Various parameters are used for measuring tumor glucose metabolic activity with ^{18}F-FDG PET including measuring the single maximum pixel value within the slice with highest radioactivity concentration (SUVmax) or placing a fixed ROI in the area of the tumor with the highest level of ^{18}F-FDG uptake (SUVpeak), which it defines as the largest possible mean value of a 1 cm^3 spherical VOI positioned within a tumor. SUVmax is avoided inter-observer variation, but a major drawback of this approach is its susceptibility to noise in the data. SUVpeak is also removed inter-observer variation, and the averaging of multiple voxels reduces the susceptibility to noise. In this study we determined which parameter of glucose metabolic activity provided the most robust predictions of patient prognosis of pancreas cancer treated by carbon ion radiotherapy. Materials and Methods: A total of 41 patients (28 males, 13 females; mean age, 65 ± 8 y) with pancreas cancer underwent 18F-FDG PET/CT scan before carbon ion radiotherapy. The following parameters on the pretreatment scans were measured: maximum standardized uptake value (SUVmax), two types of peak SUV (small: SUVpeak5, large: SUVpeak10), and average SUV (SUVave). SUVpeak5 and SUVpeak10 are measured using spherical VOI with radius 5 mm and 10 mm, respectively. SUVave is an average pixel value of the circular ROI with radius 5 mm within the slice with the highest radioactivity concentration. Correlation coefficients were calculated for these parameters, and receiver operating characteristic (ROC) analysis was performed to compare the prediction performance of each parameter for pancreas patients. Results: Pretreatment SUVmax, SUVpeak5, SUVpeak10, and SUVave averaged 6.6, 6.1, 5.1, and 6.0, respectively. Correlation coefficients between all four parameters, SUVmax and SUVpeak5, SUVmax and SUVpeak10, SUVmax and SUVave, SUVpeak5 and SUVpeak10, SUVpeak5 and SUVave, SUVpeak10 and SUVave, were 0.995, 0.964, 0.994, 0.973, 0.995, and 0.969, respectively. The areas under the ROC curve of SUVmax, SUVpeak5, SUVpeak10, and SUVave were 0.69, 0.69, 0.92, and 0.70, respectively. ROC curves of SUVmax, SUVpeak5 and SUVave were closely approximated to each other, but the ROC curve of SUVpeak10 was different from others and much better than others. Conclusions: Four FDG-PET uptake parameters were correlated closely. ROC analysis showed that SUVpeak10 was much better than others for prediction of pancreas patient prognosis. It seemed that relatively large sphere for calculating SUVpeak is better than small sphere if the tumor is large enough for setting the sphere within it.

P0550

Relationship between diffuse FDG accumulation of the stomach and Helicobacter pylori infection

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Purpose: Diffuse gastric FDG accumulation is occasionally observed during FDG-PET study, and the exact mechanism is still unknown. The purpose of the study was to elucidate the relationship between FDG accumulation and *Helicobacter pylori* (Hp) infection in the stomach. **Methods:** We comparatively analyzed gastric accumulation of FDG and the results of urinary antibody titers of Hp in 96 subjects (58 men and 38 women; mean age, 53.0±11.9 years old) who had undergone PET/CT and gastroscopy from September to December, 2005. No subjects had gastric tumors or ulcers. We also examined 22 subjects (14 men and 8 women; mean age, 55.0±9.9 years old) for the degree of FDG accumulation before and after successful Hp eradication performed between November 2008 and October 2010. The degree of gastric FDG accumulation was classified as low, moderate, or high if the accumulation was lower, similar, or higher, respectively, compared with hepatic FDG accumulation. **Results:** (1) While FDG accumulation in the Hp-positive group was classified as 10 lows, 17 moderates, and 12 highs, the accumulation in the Hp-negative group was 47 lows, 8 moderates, and 2 highs, with a statistically significant difference between the groups ($p<0.05$, Chi-squared test). (2) Comparison of FDG accumulation before and after Hp eradication revealed 6 and 16 lows, 8 and 6 moderates, and 8 and 0 highs, respectively, with statistical significance ($p<0.05$, t-test). **Conclusion:** These results indicate that Hp infection is significantly associated with diffuse high FDG accumulation in the stomach.

P0551

Role of [18F]FDG PET/CT for distinguishing benign and malignant lesions of the pancreas

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Aim: Pancreatic cancer has been called the "silent killer" for its silent onset and subsequent aggressive and highly lethal behavior. Despite recent advances in radiological imaging, the strength of functional imaging lies in its ability to detect malignant disease irrespective of lesion morphology. The aim of our study is to assess the ability of [18F]FDG PET/CT for distinguishing benign and malignant lesions of the pancreas and to evaluate the additional information that PET/CT provides over routine radiological imaging, in either solid and/or cystic pancreatic lesions, including serous adenoma, Mucinous Cystic Neoplasia (MCN) and Intraductal Papillary Mucinous Neoplasia (IPMN) the frequency of which is increasing. Methods: We reviewed 72 [18F]FDG PET/CT examinations performed for diagnostic purposes in patients who had radiological suspicion of malignant pancreatic disease. Histological confirmation was obtained for each lesion. All patients had undergone radiological imaging before the [18F]FDG PET/CT scan and were followed up for a mean of 33.3±19.7 months. Results: Sensitivity and specificity of [18F]FDG PET/CT for discriminating between benign (n=39) and malignant (n=33) pancreatic lesions were 90% and 87%, respectively, when adopting an SUVmax cut-off ≤2.4 (P<0.0001) for benign lesions; PPV was 86%, while PNV was 92%. Conventional radiology (CT/MRI) had a sensitivity and specificity of respectively 90% and 40% (P=0.01). SUVmax in benign lesions was significantly lower than in malignant lesions (1.9±0.9 versus 4.7±2.8, P<0.0001). Moreover, SUVmax of pancreatic lesions was closely correlated with overall survival of patients (P<0.0001). Concomitant inflammatory disease did not affect our results. When considering only cystic lesions (n=48), sensitivity and specificity were 78% and 79.5%, respectively, based on an SUVmax cut-off ≤2.1 for benign lesions; the corresponding PPV was 44%, while NPV was 94% (P=0.006). CT/MRI had 87% sensitivity and 40% specificity, respectively (P=0.01). SUVmax in benign cystic lesions was significantly lower than in malignant lesions (1.8±1.0 versus 4.14±2.6, P=0.0003). Conclusion: These results indicate that [18F]FDG PET/CT is a useful method to characterize suspicious pancreatic lesions, especially in patients with inconclusive radiological imaging. Even in cystic lesions [18F]FDG PET/CT could play a relevant role for treatment decisions, as a patient-specific follow-up strategy could be defined when SUVmax of the lesion is lower than 2.1, especially in patients for whom total pancreatectomy (with its associated higher risk of surgical complications) would be required based on radiological imaging alone.

P62-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Lymphoma

P0552

The value of FDG-PET/CT in assessment of patients with Non-Hodgkin's Lymphoma of the Tonsil

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Introduction: Primary extranodal non-Hodgkin s lymphomas (NHL) of the head and neck account for 10-20% of all NHL. Primary tonsillar lymphoma accounts for less than 1% of head and neck malignancies, although the tonsil is the most common primary extranodal site of head and neck NHL. The purpose of this study is to evaluate the value of fluorine-18-fluorodeoxyglucose positron emission tomography/computed tomography (FDG-PET/CT) in staging and re-staging tonsil lymphoma. **Material and Methods:** 29 patients with primary tonsillary NHL (23 diffuse large B-cell lymphoma (DLBCL), one marginal zone B-cell lymphoma, one malignant T-cell lymphoma, two Burkit lymphoma, two Mixt cellular small and large cell lymphoma) who had been evaluated with FDG-PET/CT in our Center between January 2009 and November 2011. There were 12 male patients and 17 female patients. The mean age was 44±20 years (age range 8-86 years). The majority of patients presented with cervical lymphadenopathy. Patients presented symptoms were tonsillar swelling, cervical lymphadenopathy, dysphagia, odynophagia or sore throat, change in voice. 11 of these 29 patients underwent tonsillectomy before imaging. All patients included in this study were diagnosed on the basis of histopathology. Most patients had DLBCL. Patients were indicated for primary tumor detection staging, metabolic characterization and restaging. **Results:**12 patients out of 29 were referred to our clinic for staging and 17 were for restaging. In 20 patients there was lymphadenopathy in the internal jugular chain, involving the jugulodigastric or upper internal jugular node, ipsilateral to the tonsillar NHL. Seven out of 9 patients had no FDG uptake and 2 had increased uptake only in tonsils revealing the primary focus and no metastasis.The histologic verification was done by tonsilectomy in 11 patients and biopsy in 18 patients (14 left, 12 right and 3 bilateral tonsils). Out of 12 patients admitted for staging. Five patients presented primary focus in tonsils (SUVmax:22± 8) and lymph node metastasis. Two patients presented no metastasis and primary focus in tonsils. The remaining five patients who had tonsillectomy prior to PET/CT presented lymph node metastasis. Post treatment FDG-PET/CT was applied to 17 patients for restaging. Seven patients were PET/CT negative, revealing cure. Ten patients presented relapse and lymphatic metastasis. **Conclusion:** FDG-PET/CT imaging is a valuable tool for staging and as a follow-up modality for assessing the therapeutic response of patients suffering from primary extranodal lymphoma and in detecting malignancies.

P0553

Valure of PET/CT with 18F-FDG in the Evaluation of Leukemic Processes Transformation: Richter's Syndrome and Granulocytic Sarcoma

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Richter's syndrome (RS) is a complication of B cell chronic lymphocytic leukemia (CLL) in which the leukemia changes into a fast-growing diffuse large B cell lymphoma. Granulocytic sarcoma (GS) is a solid tumor composed of myeloblasts in the setting of underlying chronic myelocitic leukemia (CML). Aim: the objective was to evaluate the use of PET/TC in the diagnosis of transformation to a high grade lymphoma or GS in patients with CLL or CML Methods: We studied retrospectively 12 patients (7 men and 5 women; mean age, 72 years, range, 62-82 years) with CLL or CML, in which lymphoma transformation was suspected due to changes in their symptoms. 10 patients were diagnosed with CLL and 2 with chronic CML. All of them underwent a PET/CT scan (Gemini TF, Phillips Healthcare) between August 2010 and November 2011. All PET/CT scans were reviewed and reported by consensus of 2 nuclear medicine physicians. PET/CT findings were correlated with bone marrow analysis or biopsy performed within 6 wk of PET/CT and/or with clinical follow-up Results: In 8/10 patients with CLL (90%), and in 2/2 patients with a CML (100%) and clinical suspicions of transformation, PET/CT scan detected sites of abnormal 18F-FDG uptake (hypermetabolic lymphadenopathies or extranodal affectation) confirmed as transformation to RT or GS. Confirmation was due by biopsy or clinical features (6 of them died in less than three months even they were treated). In one patient with CLL PET/CT scan did not show pathological uptake and there was no malignancy in 7 months of follow up. In one patient PET/TC shows hypermetabolic lymph nodes confirmed as CLL affectation without signs of transformation. For the specific diagnosis CLL or CML transformation to diffuse large B-cell lymphoma or GS, PET/CT had overall sensitivity, specificity, and positive and negative predictive values of 100%, 66%, 90% and 100%, respectively. Conclusion: PET/CT can detect malignant transformation of leukemia in patients with clinical suspicion with a high sensitivity and negative predictive values.

P0554

How Does Reference Background Affect PET/CT Results in Lymphoma?

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Objectives : In this study, we aimed to investigate the effect of reference background in the interpretation of PET/CT scans during initial staging and assessing response to therapy in patients with lymphoma. Methods : A total of 122 patients with lymphoma was included (37 patients with Hodgkin lymphoma, 85 patients with non-Hodgkin lymphoma, 63 female, 59 male, mean age, 52 ± 18.7 yrs). Abnormal FDG uptake unrelated to the physiological sites or benign pathologies were analysed. Nodal regions were defined according to Rye symposium. Extranodal regions were also evaluated. Using three reference backgroud regions, such as surrounding tissue, mediastinal blood pool and liver activity, three interpretation criteria (highly sensitive-HS, sensitive-S and conservative-C, respectively) were generated. The lesion activity higher than or equal to that of reference background considered as positive in each criteria. Results : A total of 3050 sites (1464 nodal and 1586 extranodal sites) were evaluated. The statistical analysis demonstrated significant difference in the number of lesion between the three criteria in both initial evaluation and evaluating the response of therapy (p<0.001, friedman,). The major difference with these three criteria has been revealed in the depiction of nodal disease sites rather than extranodal sites. Conclusions : In conclusion, the reference region can affect the nodal disease sites significantly but the evaluation of extranodal disease sites seems to be less problematic with each criteria. The position of PET/CT in the management of patients with lymphoma will be further improved with a better definition of interpretation rules.

P0555

Cardiac FDG uptake increases after ABVD (Adriamycine, Bleomycine, Vincristine, Dacarbazine) and support therapy with steroids and G-CSF: an observation on 24 patients with newly-diagnosed Hodgkin's Disease.

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Background and aim of the study It is a common empirical observation that cardiac uptake of FDG shows a marked increase during chemotherapy. Our hypothesis is that some element during the treatment period shifts the myocardial metabolism, from beta oxidation of fatty acids to glicolysis; in this setting we paid particular attention to the possible role of steroids (iatrogenic hyperglycaemia) and G-CSF (insulin-like effects) in addition to the possible cardiotoxic effect of chemotherapy itself. Materials and methods We retrospectively studied 24 patients with Hodgkin's disease (14 males, 10 females, median age 32 yrs; staged between II and IV), who, between November 2007 and March 2012 had undergone, after six-hour fasting, 18F-FDG PET/CT at our centre at staging, after 2 cycles and about 1 month after the end of first line chemotherapy with ABVD+ 20mg Desametasone. We excluded patients with diabetes, cardiovascular disease and previous chemotherapies. 10 patients also received 50-575 mg of steroids extra from the standard, all of them in the early phases of treatment, 2 continuing after interim evaluation. 17 patients also received support therapy with G-CSF during their treatment. For each study multiple ROIs were placed to cover the entire left ventricle, in order to obtain the maximum SUV value. Results For this group, the mean values of cardiac SUVmax at staging, at the interim study and at the final evaluation were respectively 6.81 (+/-1.3), 8.26(+/-0.97) and 10.19(+/-1.13), p.0.110. Using a univariate model, we searched amongst the variables considered (age, gender, administration of extra steroids and G-CSF) if it was possible to identify one or more with a significant effect on cardiac SUVmax, obtaining a p. value of 0.005 for the steroids administered early during treatment; also a p. value of 0.073 was observed for G-CSF. A multivariate model was applied in order to identify whether there were significant interactions between administration of steroids and G-CSF (steroids: p.0.011; G-CSF: p. n.s.). Delta SUVmax between interim PET and staging PET in the “extra steroids” and “no extra steroids” groups were +69% and +37%, respectively. Conclusions Our data, though obtained from a small but homogeneous population, not only confirms a significant and linear increase of the cardiac SUVmax during first-line therapy, but also appears to indicate a strong, independent (and possibly transient) correlation between administration of extra steroids and this phenomenon.

P0556

Dual Point Acquisition baseline FDG-PET can play a role in predicting outcome of Hodgkin Lymphoma patients with bulky lesions.

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Background: Baseline FDG-PET is a powerful staging tool in Hodgkin Lymphoma (HL): however its role in predicting treatment (Tx) outcome is yet to be investigated. ***Aim***: to assess the role of Dual-Point Baseline FDG-PET (2P-PET0) for outcome prediction in early and advanced HL with Bulky lesions (B-HL). ***Methods***: from December 2008 a cohort of 13 B-HL patients (p) from Italian, French and Polish Centres were submitted to 2P-PET (5 p IIA, 1 IIB, 3 IIIB, 3 IVA, 1 IVB; 2:classic, 5: scleronodular, 5 :mixed cellularity, 1: lymphocyte depletion). All p had Bulky masses with axial diameter ≥5 cm in baseline CT (average: 7.8, range 5.5-12; 12/13 mediastinum,1/13 abdomen). 10 p were treated with 4-6 ABVD, 1 with 2 ABVD + BEACOPP, 1 with BEACOPP, 1 with 2 ABVD + IGEV; 7/13 underwent consolidation/involved-field radiotherapy (RT). 3/13 p showed a PET relapse/progression (RELPRO outcome group) on Bulky sites, 10/13 were in continuous complete remission (CCR) after a mean PET follow-up of 15 months. 2P-PET0 consisted in 2 consecutive whole-body CT-PET scans at 60±10 (+60) and 120±10 (+120) mins after a single FDG administration. Scans were analysed retrospectively by 2 expert physicians in a consensus session. $SUV/_{MAX}$ was calculated in Bulky lesions both in +60 and +120 by using single or multiple Volume of Interest regions (VOIs) within CT Bulky profile. ΔSUV_{MAX} (defined as SUV_{MAX}+120 - SUV_{MAX}+60) and Retention Index (RI) (defined as [(SUV_{MAX}+120-SUV_{MAX}+60)/SUV_{MAX}+120]%) were also calculated. Data were statistically analysed with a linear correlation test (Bravais-Pearson). ***Results***: all 2P-PET0 scans showed increasing values of SUV +120 in bulky lesions (average ΔSUV_{MAX} :2.7,range 1-6.5; average RI:+14%, range 7-25). Highest SUV +120 increase was found in RELPRO p (average RI:+22%, 20-25; average ΔSUV_{MAX}: 4.7, 3.5-6.5) with respect to CCR p (average RI:+12%, 7-18; average ΔSUV_{MAX}: 2.1, 1-3.3) with a positive correlation between ΔSUV_{MAX} or RI and outcome (r:0.766, r:0.803 respectively). RI= 17.8%±0.8 resulted as cut-off value for outcome. No correlation was found between ΔSUV_{MAX} or RI and clinical stage (r:0.191 and 0.111), bulky diameter (r:-0.159 and -0.142) or histotype (r: -0.108 and 0.093). Furthermore no correlation was found between outcome groups and absolute SUV values at +60 (r: 0.231) or Bulky diameter (r:0.008). ***Conclusions***: this preliminary experience suggests a potential role of 2P-PET0 in predicting clinical outcome in B-HL p: in bulky lesions a RI ≥18% predicts higher probability of treatment failure, while absolute PET +60 values or CT diameter are not predictive.

P0557

PET/CT in patients with Hodgkin Disease (HD) who underwent autologous transplantation: Correlation of pre-transplantation PET with post-transplantation PET and the outcome of the disease.

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Purpose: To evaluate a) the correlation of pre-transplantation PET with the post-transplantation PET, co-evaluating additional therapy and disease at tissues outside lymph nodes and b) the correlation of post-transplantation PET with the final outcome of the disease in patients with HD who underwent autologous transplantation. Method-Material: In this retrospective study, 41 patients with HD who underwent autologous transplantation were included. 36/41 underwent PET/CT examination before transplantation (1st PET), 41/41 after transplantation (2nd PET). The data from 9 months to 4.5 years surveillance were available for 24/41 patients. Extra lymph node disease (ELN) meaning hypermetabolic lesions in organs and tissues apart from lymph nodes revealed at 1st PET and additional therapy between the 2 PET examinations were co-evaluated. A cutoff SUVmax 2.5 was used to discriminate positive from negative results. Results: For 29/36 PET was positive before transplantation. 19/29 received additional therapy between 1st and 2nd PET and PET remained positive for 10 (8 had ELN) and became negative for 9 (2 ELN). 10/29 did not receive additional therapy and PET became negative for 4 (2 ELN) and remained positive for 5 (2 ELN). In 1/10 patient, who did not have ELN, 2nd PET was negative, became positive 3months later, received additional treatment and finally became negative. For 7/36 pre- transplantation PET was negative; none of the patients received additional therapy and PET remained negative for 6/7, and became positive for 1. Concordance between 1st and 2nd PET regardless of additional treatment is 52% for positive PET, 86% for negative and 60% in total. For 24/41 patients follow up data were available. 11/24 with positive post-transplantation PET continued to suffer from disease during follow up. 2/24 with positive post-transplantation PET reached complete response, one with multiple therapies and the other without any therapy (SUVmax of the post-transplantation PET was just above 2.5). 7/24 patients with negative 2nd PET continued to be in complete response during surveillance. For 3/24 with negative post-transplantation PET disease relapsed. 1/24 with negative post-transplantation PET was diagnosed with second primary 2.5 years later. Conclusion: A negative pre-transplantation PET ensures for a negative post-transplantation PET and a favorable outcome of the disease. Patients with positive pre- transplantation PET and especially patients with extra lymph node hypermetabolic lesions at pre-transplantation PET are more likely to have positive post-transplantation PET and despite additional treatment, a prolonged course of disease.

P0558

18FDG PET/CT in children lymphomas: five years experience in a large tertiary non pediatric hospital

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AIM: To evaluate the role of ^{18}FDG PET/CT in children lymphomas. **MATERIALS & METHODS:** This is a retrospective study involving 65 children (36 boys, 29 girls) aged 4-16 (mean age: 13.7 years) from March 2007 to March 2012. Whole body CT and PET scans were performed 60 min after the injection of 3.7MBq/kg ^{18}F-FDG with adequate acquisition parameters. Additional images were obtained when necessary. No child needed sedation and collaboration was excellent. **RESULTS:** 47 children referred for HL and 18 children for NHL. They were performed 126 (94 HL and 32 NHL) PET/CT scans: 18 for initial staging: PET/CT and conventional imaging finding were concordant in 7 studies, while in 6 studies PET>CT leading to upstaging in 4 children, in other 4 children staging was performed only with PET/CT. In 1 child PET/CT was negative. 21 for early assessment of treatment response (interim): 6/9 children [10(+) scans] had positive and end treatment restaging PET/CT and 3 of them relapsed, while in 2 children PET/CT were negative after end treatment and in other 1 therapy is not finish yet. 6/11 children -with equal in number negative studies- were also performed end treatment restaging studies which were negative and only 1 relapsed, in other 1 therapy is not finish yet. 45 end treatment restaging studies: 5/11 children with positive study relapsed, 4 had also positive interim studies. 8/34 children with negative study had performed interim studies [6(-), 2(+)] and only 3/34 relapsed. 8 studies for recurrence: 2 of them were positive with

similar findings of conventional imaging, 1 PET/CT>>CT leading to upstaging and 5 were negative excluding recurrence in 2 cases-confirmation by follow up. 13 studies for follow up: [5(-), 8(+)]. At the positive studies, one was true positive, while four were false positive (inflammation)-confirmation by follow up. 21 studies for Stem Cell Transplantation (S.C.T): 6 children were performed PET/CT before S.C.T.: 3 were positive (1 died, 1 relapsed) and 3 were negative (2 children relapsed, too). 5 children were performed only post S.C.T. PET/CT: 1 was negative and 4 were positive, one of which became negative after radiotherapy. Other 2 post S.C.T were 1(+) and 1(-). **CONCLUSION:** In children, the main reason with strong prognostic value for PET/CT scan seems to be end treatment restaging and consequently interim studies, while in S.C.T. studies the role of PET/CT is not yet confirmed. Also, the staging studies seems to rely on conventional imaging.

P63-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Leukaemia & Myeloma

P0559

Leukemia impairs cortical bone structure: A study by a computational approach to PET/CT images

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Aim. Experimental evidence indicates that leukemia cells impair osteoblastic cell function. In the present study, we hypothesized that this alteration can determine measurable changes in bone composition in leukemic patients. Materials and Methods. We evaluated the whole body intra-bone volume (IBV), compact bone volume (CBV) and red bone marrow (BM) extension and glucose metabolism in 18 leukemic patients submitted to PET/CT. Data were compared with corresponding values obtained from 18 age and sex matched subjects, selected according to a case-control criterion among a data base of 101 patients studied in the follow up of non metastatic, completely removed, low grade melanoma. PET study was performed with a hybrid PET/CT scanner under fasting conditions, by whole body acquisition 60 minutes after injection of 4.8-5.2 MBq of 18F-fluorodeoxyglucose (FDG) per kilogram of body weight. Red BM was defined on a statistical analysis of the whole normalcy data-base: in these 101 control subjects, all intraosseous voxels in lumbar and dorsal vertebrae were considered as occupied by red BM. Average SUV in this spinal district was 2.01±0.36. Accordingly, all IBV voxel with FDG uptake greater than mean vertebral SUV - 2.5 SDs (i.e. >1.1) were defined as red BM. Results. IBV in the leukemic group was significantly higher than in control subjects (2048±559 cm3 vs 1654±578 cm3, respectively, $p<0.05$). This difference was specular to the one displayed by CBV that was significantly lower in leukemic patients with respect to normal (2279±779 cm3 vs 3592±477 in controls, $p<0.01$). As a consequence, the whole skeletal volume was similar in both groups (5027±1229cm3 in leukemic patients vs 5246±987cm3 in control subjects, p=ns). Red BM volume was larger in leukemic than in control subjects (792±381 ml vs 521±154 ml, $p<0.02$). Conclusion. Our mathematical approach to PET/CT images documents a reduced compact bone asset and an enlargement of metabolically active BM in leukemic patients. These data suggest that leukemia alters bone marrow microenvironment leading to reabsorption of cortical bone.

P0560

Multiple Myeloma: integration between 18F-FDG-PET/CT and MRI in the evaluation of spinal and extramedullary lesions

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Aim: Multiple myeloma (MM) is a proliferative disorder that originates from a single clone of plasma cells with elective localization in bone marrow and most lesions are osseuous. Myelomatous involvement outside the skeleton system, is less common and often associated with advanced multiple myeloma. There has been a recent increase in the clinical radiological incidence of this entity. New clinical staging guidelines for MM, which includes the use of positron emission tomography/computed tomography (18F-FDG-PET/CT) and magnetic resonance imaging (MRI), for accurate detection and optimal management are necessary. The goal of this study was to compare 18F-FDG-PET/CT and MRI in the detection of spinal and visceral involvement in patients (pts) with MM. Materials and methods: We retrospectively studied 51 pts (29 men, 22 women; mean age 64 years; range 45-89 years) with confirmed MM (MGUS in 4/51; smoldering myeloma in 1/51, 46/51 clinical evidence myeloma), who performed whole body 18F-FDG-PET/CT for initial staging (18/51 pts), restaging after therapy (30/51 pts) and follow-up (3/51 pts) of disease. All pts had previously performed MRI (total body 2 pts; district 49 pts) at least 6 months before 18F-FDG-PET/CT. K of Cohen test was used to compare the 2 methods results. Results: 18F-FDG-PET/CT was positive in 19/51 pts (MRI was positive in 15/19 and negative in 4/19 pts). In 4/15 pts, in which 18F-FDG-PET/CT and MRI were positive, the number and location of the lesions were essentially comparable; in 11/15 18F-FDG-PET/CT identified more lesions than MRI. 3/19 pts were positive for extra-medullary lesions at 18F-FDG-PET/CT, but only one of them was positive at MRI. 18F-FDG-PET/CT was negative in 32/51 pts (MRI was negative in 12/32 and positive in 20/32 pts). In 4/20 pts, was affected by MGUS, 1/20 was affected by smouldering myeloma and in 8/20 18F-FDG-PET/CT was performed for restaging after chemotherapy and/or radiotherapy. The correlation between the 2 methods was moderate (K = 0.448, 95% CI: 0.122 to 0.773). Conclusions: 18F-FDG-PET/CT has become an established and well-studied imaging modality for the detection of both osseous and extraosseous lesions. It can identify in one easy scanning procedure all sites of disease and it also allows to distinguish the early sites of active disease from fibrotic post-treatment outcomes, which are instead still visible for 9-12 months in MRI. However, MRI remains an important instrument in the management of pts with MM, especially for the mild forms, as MGUS and smoldering myeloma.

P64-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: NET (Neuroendocrine Tumours)

P0561

Functional study with In-111 tagged Pentetreotide (Octreoscan) in gastro-entero-pancreatic tumors.

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Aim: Somatostatin receptors have been demonstrated in endocrine cells throughout the body, as well as, in numerous neuroendocrine tumors (NETs). In-111 tagged DTPA-Pentetreotide (Octreoscan-OS) has been shown to be a safe and effective radiopharmaceutical for the localization of primary and metastatic NETs. We aim to delineate the usefulness of OS in cases of suspected NETs of the gastro-entero-pancreatic system. Methods: A total of 27 patients (13 males and 14 females) aged 20-76 years (55.4±9.2) are enrolled in the study. Primary diagnosis was as follows: intestinal carcinoid in 11, possible insoulinoma in 3, gastric neoplasm with neuroendocrine manifestations in 3, pancreatic neoplasms in 2, carcinoid of the appendix in 2, hepatic lesions of unknown origin in 3, gastrinoma in 3 of them. All patients underwent clinical and biopathological examinations, anatomical imaging evaluation and OS study 4, 24 or/ and 48 hours views, including total body, tomographic and spot acquisition. Results:For each patient, localizations detected by CT, surgery and/ or biopsy performed prior to scintigraphy were compared to OS results using the following criteria: true positive (TP) were characterized lesions detected by all methods, true negative (TN) in cases of no NET by all methods, false positive (FP) were lesions localized by OS, but not with other methods and false negative (FN) lesions localized by conventional methods only. Accordingly to the above our results for patients with NETs are as follows: TP 18/20 pts, FP 2/20 pts, TN 4/7 pts and FN 3/7 pts, yielding thus a sensitivity of 85.7% and a specificity of 66.7%. The clinical impact resulted in 10/27 (37%) of patients, in terms of a different therapeutic approach concerning application of radionuclide targeted treatment with β-emitters tagged somatostatin analogues . Conclusions: We can conclude that OS study is a sensitive functional method in the evaluation of patients with NETs of the gastro-entero-pancreatic system and it is able to guideline to targeted treatment in selected cases.

P0562

I-123 MIBG SPECT/CT in the evaluation of malignant pheochromocytoma; Comparison with FDG-PET

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[Purpose] In the evaluation of the metastatic lesion of malignant pheochromocytoma, FDG-PET/CT is useful and it can be applied to the evaluation of therapeutic effect of I-131 metaiodobenzylguanidine (MIBG) therapy as we reported in the previous report (Nakazawa A, et al, Eur J Nucl Med 2011). In the current study, we evaluated the utility of I-123 MIBG SPECT/CT in the diagnosis of the extent of metastasis. [Materials and Methods] Twelve patients with malignant

pheochromocytoma were enrolled and FDG-PET/CT and I-123 MIBG SPECT/CT were performed within 2 weeks interval. FDG-PET/CT scan was performed 60 minutes after injection of 5MBq/kg of FDG with PET camera (Discovery STE; GE Healthcare, USA, Biograph 16; Siemens Medical Solutions, USA). Planar and SPECT/CT images were obtained 6 hours after injection of 222MBq of I-123 MIBG with SPECT/CT camera(Symbia T, Siemens Medical Solution, Hoffman Estates, IL, USA). Qualitative and quantitative analysis of images were performed by 2 experienced nuclear medicine physicians. For FDG-PET/CT, SUVmax for each lesion were calculated using circular region of interest (ROI). In MIBG scan, circular ROIs were placed over tumor lesion and background in planar and SPECT images and lesion to background ratio (L/B) were calculated by the formula of tumor ROI maximum pixel counts divided by the average of background average ROI counts of at least 3 regions. Diagnostic sensitivity, specificity and accuracy were calculated. The correlation of FDG and I-123 MIBG uptakes was evaluated by multi-regression analysis. [Results]Totally 97 metastases were diagnosed (62 bone, 3 liver, 14 lung and 18 lymph node lesions). Diagnostic sensitivity of FDG-PET/CT and I-123 MIBG SPECT/CT were 79.4% (77/97) and 92.8% (90/97), respectively, and interestingly, 20.1% (20/97) of the lesion were only detected by I-123 MIBG SPECT/CT. In 58% (7/12) of the patients, the highest FDG uptake lesions were compatible with the highest MIBG uptake lesions. Although no significant correlation was noted between SUVmax and MIBG L/B ratio in 40 assessable lesions containing all kind of metastatic organs, significant correlation of those was noted in 24 bone metastases ($p<0.05$). [Conclusion] I-123 MIBG SPECT/CT showed better diagnostic sensitivity than FDG-PET. In addition, Strength of I-123 MIBG uptake seems to have similar tendency with FDG uptake and positive correlation of accumulation was noted in bone metastasis. These results suggested the possible contribution of I-123 MIBG-SPECT/CT in more accurate diagnosis of malignant pheochromocytoma lesions and future application for therapeutic response evaluation can be expected.

P0563

SPECT/CT hybrid imaging in assessment of Neuroendocrine Tumours with 111In-pentetreotide Scintigraphy

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Introduction: Hybrid single photon-emission computed tomographic (SPECT) and computed tomographic (CT) imaging for the investigation of neuroendocrine tumors (NET) allows the fusion of functional and anatomic information in a rapid and efficient method. The aim of this study was to assess the incremental diagnostic value of 111In-pentetreotide SPECT/CT imaging compared with traditional planar imaging on study interpretation (lesion localization and characterization and reader confidence). Patients and Methods: Twenty five patients (11 female and 14 male; age range 18-71 y, mean 51 y) with proven or suspected NET were studied with routine planar Somatostatin receptor scintigraphy (at 4 and 24 hours) and SPET/CT (at 24 and optionally 48 hours) after injection of 185-222 MBq 111In-pentetreotide. Fourteen patients came for initial diagnosis and detection of metastases, 8 patients for follow up after treatment (gastric tumors n = 5, endocrine pancreatic tumors n = 8, midgut tumors n= 6 and other NETs n= 3) and 3 patients for metastatic NET of unknown primary. Results: Planar scintigraphy was positive in 11 patients, doubtful in 5 patients and negative in the other 9 cases. Whereas SPECT/CT imaging was positive in 16/17 patients : showed unsuspected foci in 2 negative planar scans, confirmed doubtful foci in 3 patients and showed all 11 pathologic planar lesions with detection of additional lesions in 6 among them. SPECT/CT allowed disease exclusion in site of physiological uptake in two patients. In global, SPECT/CT imaging provided incremental diagnostic value in 60% of cases. Conclusion: 111In-pentetreotide SPECT/CT imaging provides incremental diagnostic value and greater reader confidence over planar imaging, allowing a better therapeutic management of patients with NET.

P0564

Usefulness of 123 I-MIBG Scintigraphy in Patients with Suspected Pheochromocytoma : Contribution of SPECT-CT Imaging

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Introduction: Pheochromocytomas are rare catecholamine-producing neuroendocrine tumors that arise from chromaffin cells of neural crest origin. Iodine-123 metaiodobenzylguanidine (123 I-MIBG) was in clinical use for the imaging of pheochromocytoma for many years. The aim of this study was to provide a confirmation of the performance of 123 I- MIBG scintigraphy for the evaluation of patients with suspected pheochromocytoma and to evaluate the additional contribution of SPECT-CT imaging over traditional planar scan. Patients and Methods: We evaluate 22 patients (10 M, 12 F, age 42,1±11 years) with suspected pheochromocytoma based on symptoms of catecholamine excess, CT findings, or elevated catecholamine or metanephrine levels. All patients underwent whole-body planar imaging 18-24 hr following IV administration of 5-8 mCi (185-296 MBq) 123 I- MIBG. SPECT /low dose CT was performed with a Symbia T camera in 18 patients. Final diagnoses were based on histopathology, correlative imaging, catecholamine or metanephrine measurements, and clinical follow-up. Results: Among the 22 patients with definitive diagnoses (disease present: 12 and disease absent: 10), 123 I-MIBG planar scintigraphy had a sensitivity of 75% (9/12) and a specificity of 100%. SPECT-CT imaging improve diagnostic confidence in all patient and provide additional diagnostic information in 2 patients with negative planar scans (small extra-adrenal pheochromocytoma in one case and left adrenal pheochromocytoma masked by physiologic bowel uptake in the other case). The addition of SPECT-CT increased the sensitivity to 90% (9/10) but the specificity decrease to 88% (one false-positive interpretations of a physiological adrenal uptake). Conclusion: Our results support the utility of 123 I-MIBG imaging in the diagnosis of pheochromocytoma and highligh the incremental value of SPECT-CT acquisition, particularly in patients negative planar scans.

P0565

The Utility of 18F-DOPA PET/CT in Staging and Restaging of Neuroendocrine Tumours: Initial Experience

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Aim: Neuroendocrine tumours (NET) are rare tumours. The diagnosis of NET is often very difficult and expensive for a multiplicity of clinical manifestations and lack of diagnostic tests.^{18}F-DOPA PET/CT (FDOPA) seems to be a useful diagnostic tool. *Material and methods*: 25 patients (16 females and 9 males; mean age 63 yrs, range 17-86) were examinated with FDOPA between April 2011 and March 2012: 17 pts with suspected or restaging NET (increased tumor markers: chromogranin-A, gastrin, CEA, CA 19.9, CA 13.3); 3 pts in staging with pheochromocytoma/paraganglioma (increased plasmatic and urinary metanephrines); 4 pts with medullary thyroid carcinoma (MTC) (2 in staging and 2 in restaging; increased serum calcitonin); 1 pt in follow up of Meckel carcinoma. FDOPA was performed in dual time modality (whole body acquisition 10 and 60 minutes after iv injection of 4 MBq/Kg of ^{18}F-DOPA). FDOPA was compared with CT/ MRI and/or abdominal ultrasound, and it was correlated with tumor markers. *Results*: FDOPA was considered pathologic in 11/25 (44%) patients, and negative in 14/25 (56%) patients. FDOPA had an overall sensitivity of 75% [95% confidence interval (CI) 68-81%], a specificity of 85% (95% CI 80-90%), a positive predictive value (PPV) of 81% (95% CI 75-87%) and a negative predictive value (NPV) of 79% (95% CI 72-83%). The diagnostic accuracy of FDOPA was 80% (95% CI 64-95%). In particular MTC and pheochromocytoma/paraganglioma FDOPA had a sensitivity of 100% even if the number of pts were limited. NET (GEP) FDOPA, instead, had a sensitivity of 50%, a specificity of 81%, a PPV of 60% and a NPV of 75%. The diagnostic accuracy of GEP FDOPA was 70% (95% CI 48-91%). FDOPA in patient with Meckel carcinoma was negative. Conclusions: Even if FDOPA doesn't give the NET receptor status information, it provides an accurate diagnosis and (re)staging of some subtypes, such as CMT and pheochromocytoma/paraganglioma. In these cases, preliminary data suggest that positive PET scan seems to be related to tumor marker levels.

P0566

The usefulness of 111I pentetreotide SPECT/CT in the detection of functioning and non functioning neuroendocrine gastroenteropancreatic (GEP) tumors

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Aim. The aim of this study was to investigate the usefulness of ^{111}In-pentetreotide SPECT/CT in the diagnosis, staging and follow-up of GEP tumors in comparison with conventional imaging procedures (CIP), such as CT, MRI, US, which represent the most available diagnostic methods in detecting these types of tumor and their metastases, and to evaluate whether SPECT/CT may have an incremental diagnostic value in affected patients. **Methods.** We enrolled 122 patients with GEP, 88 at initial diagnosis and staging and 34 in follow-up; 86 patients have functioning and 36 non functioning tumors for neuroendocrine hormone overexpression. Definitive diagnosis was obteined by surgery, percutaneous biopsy and laparotomy. All patients underwent at least 2 CIP procedures within a month before both whole body scan performed at 4h and 24h and SPECT/CT over abdomen and other suspect regions using a hybrid double head system including a low-dose x-ray tube. **Results.** Neoplastic lesions, including primitive and metastatic lesions, were ascertained in 85/122 patients; SPECT/CT was positive in 70/85 and CIP in 64/85 cases, both procedures being true negative in the remaining 37/122 patients. Both SPECT/CT and CIP were concordantly true positive in 64/85 cases, only SPECT/CT was positive in 21 and only CIP in 15. Per-patient sensitivity, specificity and accuracy were 82.3%, 100% and 87.7%, respectively for SPECT/CT and 75.3%, 100%, 82.8% respectively for CIP; the difference was not significant. Globally, 289

lesions (68 hepatic, 113 abdominal extra-hepatic, 108 extra-abdominal) were identified and SPECT/CT was positive in 242/289, while CIP in 187/289 (per-lesion sensitivity 83.7% VS 64.7%, p<0.0001). SPECT/CT detected 55/68 (81%) hepatic, 94/113 (83.2%) abdominal extra-hepatic and 93/108 (86.1%) extra-abdominal lesions, while CIP identified 59/68 (86.8%), 67/113 (59.3%) and 61/108 (56.5%) respectively. SPECT/CT correctly modified CIP patient classification and management in 36/122 patients (29.5%), while it gave an uncorrect classification downstaging the disease in 18/122 (14.7%). SPECT/CT had an incremental values detecting and characterizing additional lesions, particularly small size bone, pulmonary and abdominal lymph node metastases. **Conclusion.** ^{111}In pentetreotide SPECT/CT proved to be a more sensitive diagnostic non functioning tool than CIP in our series of functioning and non functioning GEP tumors giving additional information for patient classification and for the most appropriate therapeutic strategy. However, the combined use of the two procedures seems to give the highest performance and the most accurate disease staging.

P0567

Incidence of focal uptake of 99mTc-HYNIC-octreotide by the uncinate process of the pancreas mimicking somatostatin receptor expressing tumor

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OBJETIVE: Radiolabeled somatostatin analogs are important tools for the in vivo localization of somatostatin receptor expressing tumors. However, physiologic uptake by the uncinate process of the pancreas is described in 68Ga-DOTA-NOC PET/CT and 111In-pentetreotide (OctreoScan®) somatostatin receptor scintigraphy (SRS). The aim of this study was to assess the incidence of increased uptake of a somatostatin analog 99mTc-HYNIC-octreotide by the uncinate process of the pancreas. MATERIALS AND METHODS: Thirty-nine consecutive scans of 36 patients (15 men, 21 women; age range, 23-82 y) with hystologically-proven NET (n = 22) and biochemical suspicion of NET (n =14) were evaluated in retrospect. 99mTc-HYNIC-octreotide was prepared from a commercially available lyophilized kit (Radiopharmacus). Planar whole body scans and SPECT/low-energy CT fusion images of the thorax and abdomen were obtained 4 hours after administration of 555 MBq of 99mTc-HYNIC-octreotide. Uptake in uncinate process of the pancreas in SPECT/CT images was classified as either diffuse or focal and the uptake intensity was compared with the uptake in normal liver parenchima. RESULTS: Five patients with documented pancreatic NET in CT or MR had uptake in these tumor sites and were excluded from this analysis. Among 34 cases without previous known pancreatic pathology, SRS of five patients showed faint homogeneous uptake in the pancreas head. Four patients presented focal intense uptake in a small area corresponding to uncinate process. The intensity of focal uptake in uncinate process was higher than the physiological liver uptake in 1 (2.9%) and equal to the liver in 3 (8.8%) patients. None of these patients showed any focal lesion in the pancreas head in the concomitant diagnostic CT or MR or during the follow-up. CONCLUSION: 99mTc-HYNIC-octreotide uptake by pancreatic uncinate process must be interpreted with caution as it may be sufficiently intense to be misinterpreted as pathologic and mimick a somatostatin receptor expressing tumor in 11,7% of the patients.

P0568

Our Experience with FDG PET/CT, Somatostatin Receptor Scintigraphy and Radionuclide Lymphangiography in the Management of Merkel Cell Carcinoma Patients.

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Background: Merkel cell carcinoma (MCC) is a rare skin cancer with high mitotic activity. It is known for being locally aggressive with high incidence of metastases especially into regional lymph nodes. Fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography combined with computed tomography (FDG-PET/CT) is proven to be a useful imaging modality for patients with many types of cancer due to providing metabolic activity as well detailed anatomical information of a tumor in a single study. Somatostatin receptor scintigraphy (SRS) may prove to be useful in the clinical managements of MCC patients by virtue of neuroendocrine nature of tumor cells. We present this case series in order to better define the utility of aforementioned nuclear medicine imaging modalities for patients with this deadly malignancy. Methods: This is a retrospective case series of twelve patients with biopsy proven MCC who underwent whole-body FDG-PET/CT, SRS and/or radionuclide lymphangiography (RL) at two institutions. Four patients were males and eight were females, age ranged from 59 to 98 years old (mean age was 74). Eight of them underwent FDG-PET/CT, total number of 20 FDG-PET/CT were evaluated. One patient underwent somatostatin receptor SPECT/CT. Six patients also had RL performed. Results: RL resulted in successful mapping of sentinel lymph nodes in all six patients, including one patient after prior RL in the same anatomic location for invasive breast carcinoma. In 3 cases metastases were identified on histopathologic examination of lymph nodes. All proven sites of MCC greater than 5 mm were positive on FDG-PET-CT with mean maximum standardized uptake values (SUV max) of 4.4 in primary lesions, 9.7 in local recurrences, and 9.4 in nodal metastases. FDG-PET/CT imaging contributed to change in management in 3 out of 8 patients (37.5%). In 5 patients complete responses after surgical excision of MCC were noted. In two patients local recurrences as well as overall disease progression were detected earlier by FDG-PET/CT compared to CT alone. Somatostatin receptor scintigraphy successfully localized multiple MCC lesions in one patient. It is worth noting that MCC accumulated FDG more avidly then octreotide. Conclusion: Our case series suggests that FDG-PET/CT, RL and SRS imaging modalities appear to be useful in the management of patients with MCC. Because of the rarity of MCC, multicenter studies are warranted.

P0569

Determination of Tumour-Liver-Ratios (TLR) using Ga-68-DOTATATE PET and Grading of Patients with Neuroendocrine Tumours (NET) Suitable for Peptide Receptor Radionuclide Therapy (PRRT)

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Aim: In patients with neuroendocrine tumours (NET) a somatostatin receptor scintigraphy may assess the chances of a peptide receptor radionuclide therapy (PRRT). The uptake by tumour tissue destined for therapy should be equal or higher than normal liver uptake. Nowadays Ga-68-DOTATATE PET is well established in diagnosis and follow-up of NET as a very sensitive method with the possibility of semiquantitative analysis by determination of SUV max. In order to prove its clinical value we calculated the tumour-liver-ratios and subdivided the uptake into four categories. Materials and methods: In 70 patients (36 women and 34 men aged 19 - 83 years, mean 56 years) with neuroendocrine tumours (gastroenteropancreatic n=48, cancer of unkown primary (CUP) n=6, lungs n=5, breast n=1, ovaries n=1, paraganglia n=1, thyroid cancer n=8) 88 Ga-68-DOTATATE PET were carried out. Twenty minutes after intravenous injection of 90 - 230 MBq (mean 156 MBq) Ga-68-DOTATATE a whole body PET examination was performed. An ACCEL PET scanner (Siemens, Erlangen, Germany) was used. Standardized uptake values (SUV max) in tumour lesions and tumour-free liver were determined; a tumour-liver-ratio (TLR) was calculated and a classification into 4 groups was performed (group 0: TLR <1.0; group 1: TLR 1.0 - 2.9; group 2: TLR 3.0 - 4.9; group 3: TLR >5.0). Results: Somatostatin receptor 2 (SSR-2) positive lesions were found in 59 of 70 patients (84%); 12 patients belonged to group 3; 9 patients to group 2; 31 patients to group 1; 7 patients were assigned to group 0. Locations, number of patients, SUVmax, and TLR follow in details. Pancreas: 15/18.2±12.4/2.4±1.8; lungs: 5/10.6±20.8/1.1±2.0; liver: 21/24.6±14.1/3.8±2.5; skeleton: 15/12.1±9.0/1.8±1.3; lymph nodes: 22/12.8±11.0/1.9±1.7. Up to now 21 patients underwent a PRRT; in 9 patients a posttherapeutic PET was performed. Comparing all tumour lesions, after therapy there was no significant decrease of SUVmax (21.6±18.3 to 19.2±15.4, p=0.6886) and TLR (3.2±3.0 to 2.9±2.5, p=0.7526). Although 7 of 9 patients (77 %) had a clinical benefit, only 2 patients (one with stable disease in CT) changed into a lower group (22 %), 1 patient into a higher group (11%), whereas no change occurred in 6 patients (67 %). Conclusion: In patients with neuroendocrine tumours the determination of tumour-liver-ratios may assist to select patients for PRRT. The grading into different groups appears to be not helpful to assess response to therapy.

P65-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Oncology Clinical Science: Bone

P0570

Tc-99m DMSA (V) scintigraphy for evaluation in patients with cartilaginous bone tumor

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PURPOSE: The aim of this study is to evaluate whether Tc-99m DMSA (V) scintigraphy can differentiate enchondroma from chondrosarcoma. **METHODS:** 19 patients with cartilaginous bone tumors (5 enchondroma and 14 chondrosarcoma) underwent Tc-99m DMSA (V) scintigraphy (9 men, 10 women; age [mean±SD], 52.00±11.11; range, 24-67 years). Isotope uptake was used as a proxy for tumor-to-background ratio (TBR). The differences of TBR were analyzed between enchondroma and chondrosarcoma with the Mann-Whitney U test. Appropriate cut-off value of TBR was set for the diagnosis of chondrosarcoma. **RESULTS:** The TBR value for enchondroma was 46.20%±28.51%(mean±standard deviation). The

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TBR value for chondrosarcoma was 255.88%±82.31%. A significant difference was identified in TBR for enchondroma and chondrosarcoma (p=0.0332). The cut-off of TBR for the diagnosis of chondrosarcoma was set at 55.50% (with 76.7% sensitivity and 75.0% specificity). **CONCLUSIONS:** Tx-99m DMSA (V) scintigraphy may have the potential to distinguish enchondroma from chondrosarcoma.

P0571

Invisible Bone Lesions of Computed Tomography in Hybrid Fusion Imaging : Preliminary Results of 19 Patiens with Known Malignancy

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Introduction: In nuclear medicine practice, detecting FDG or MDP-positive bone lesions (hot), not corresponding to any morphological change on computed tomography (CT) which could be named as invisible bone lesions poses a diagnostic dilemma. Our aim was to investigate the consequence of these invisible bone lesions perceived in SPECT/ CT or PET/CT fusion imaging during investigation of metastatic spread. **Methods:** Nineteen patients (9 FM;10 M, 60±17 yrs) with known malignancy and having hot but CT-negative bone lesions in hybrid imaging (*^{99m}Tc MDP bone SPECT/ CT or ^{18}F-FDG PET/ CT*) were prospectively studied (14 patients were firstly performed PET/ CT and 5 patients underwent SPECT/CT in the beginning).15 patients had both SPECT/CT and PET/CT hybrid imaging. 7/15 patients had also diffusion-weighted-magnetic resonans (DWMR) imaging in addition. All imaging procedures were performed within a week. The results obtained from the scans were compared and folllow up imaging was planned within 3 to 6 months. **Results:** Five patients referred from bone scan had solitary vertebral (2 patients) and costal lesions (3 patients). 8/14 patients referred from PET/ CT had solitary (vertebral:6, costal:1,pelvic:1) and 6/14 patients had multifocal CT-negative bone lesions predominantly located in vertabral column. 5/14 patients with solitary FDG-positive lesions showed also MDP-positivity (36% complete agreement). In 5 of 14 patients, only some of the multiple FDG-positive lesion showed MDP activity (36% partial agreement). 4/7 patients who underwent DWMR imaging (7/7 patients were FDG-positive) demonstrated positive (3/4 patients had MDP-positive and 1/4 had MDP-negative lesions) and 3/7 patients had negative (all had MDP positive) findings for metastases. On follow up imaging, 3/19 patients with both MDP and FDG-positive activity on vertebral column showed progression (increased activity with sclerosis). The probability of metastases for invisible lesions was high in 7/19 patients because of the existence of other active lesions on SPECT or PET partly having sclerosis on CT . **Conclusion:** In the early stages of metastatic skeletal disease, metabolic abnormalities precede morphologic changes depicted on CT. Preliminary results of the study support that invisible bone lesions (CT-negative but MDP or FDG-positive) should be cautiously interpreted and considered as highly suspicious for metastasis until proven otherwise.

P0572

Additional value of FAMT-PET/CT over FDG-PET/CT for the assessment of bone metastasis

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Purpose: Utility of [F-18] fluoro-deoxy-glucose (FDG) positron emission tomography/computed tomography (PET/CT) in the evaluation of bone metastasis has been already established in the definition of active lesions. [F-18] 3-fluoro-alpha-methyl tyrosine (FAMT), which was established in our institute, is an amino acid PET tracer which transported into tumor cells via L-type amino-acid transporters and was reported to be more specific to malignancy. In our study, we evaluated the additional value of FAMT-PET in the evaluation of bone metastasis. Materials and Methods: Twenty one patients with bone metastasis (15 men and 6 women; age, 55-81 years, mean age 71.0 years) were included. FDG and FAMT-PET/CT were performed within 3 weeks interval. FAMT (5MBq/kg) and FDG (5MBq/kg) were administered after fasting for more than 6 hours and image acquisition was done at 60 minutes after injection by 3D-mode with PET/CT. The uptakes of tracers were semi-quantitatively evaluated using maximam standardized uptake value (SUVmax). Lesions with positive FDG uptake were picked up and SUVmax for FDG and FAMT in corresponding region were measured. Those values were statistically compared using paired t-test and multi-regression analysis. *P* values less than 0.05 were considered as significant. Results; Totally 72 bone metastasis in 21 patients were confirmed in FDG-PET and used as reference standard fro bone metastasis. In FAMT-PET, 87.5% (63/72) of the FDG positive lesions were detected. FDG and FAMT uptake showed weak correlation (n=72, r=0.2589 and p=0.027). In the category of organ, lung cancer (n=40, r=0.6755, p<0.01) showed good positive correlation, and in histological type, adenocarcinoma (n=23, r=0.5197, p=0.011) also showed good positive correlation. No significant correlation was noted in osteoblastic or osteoclastic bone metasis groups. As for the degree of FAMT uptake, esophageal cancer showed highest average SUVmax ratio of FAMT to FDG (4.165 vs. 2.239). Conclusion: Likewise with FDG-PET, FAMT-PET could detect most of the bone metastatic lesions and was expected to be used as an complementary PET study with FDG-PET. Especially in esophageal cancer, relatively higher FAMT uptake in bone was seen and its application for the diagnosis of bone metastasis seemed to be promising. On the other hand, FAMT uptake was identical to FDG-PET and using its characteristics, further application of FAMT-PET in the initial diagnosis of bone metastasis and therapeutic response evaluation is expected in the future study.

P0573

Diagnostic value of resolution recovery in planar bone scans

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Introduction Recovery of spatial resolution lost through increasing lesion-to-detector distance is increasingly used with iterative SPECT reconstruction, mainly for myocardial perfusion imaging, but also bone SPECT. The technique can improve spatial resolution of planar images as well. We compare two commercial solutions, HiScan (www.scivis.de) and Xact.bone (www.ultraspect.com), to unprocessed planar whole body bone scans. Methods Thirty-five patients with suspected metastases routinely referred for a bone scan were scanned 3 hours after injection of 600 MBq 99mTc-MDP at 12 cm/min. Two double-head gamma cameras (Siemens Symbia T, GE Infinia) equipped with LEHR collimators were used. Anonymised data were sent to manufacturers (Scivis, UltraSPECT) for processing. Two patients with >20 lesions were used for reporter training and excluded from analysis. Two blinded reporters with 11 and 9 years post-qualification experience categorised each scan as benign/unclear/malignant and assigned individual lesions to those same categories. Image quality was first graded on a 1 (worst)-10 (best) scale for each individual scan, and then all 3 scans of each patient were ranked according to image quality. Results Reporter A detected 65/90/83 malignant lesions with the unprocessed scan/HiScan/Xact.bone, and 23/24/17 unclear lesions. Reporter B detected 60/80/75 malignant lesions with the unprocessed scan/HiScan/Xact.bone, and 17/16/14 unclear lesions. To summarise, reporters A/B detected 38/33% vs 28/25% more malignant lesions with HiScan vs Xact.bone than with the unprocessed scan, respectively (Friedman test, p<0.05). The number of unclear lesions did not increase, but the percentage of unclear lesions decreased. The effect on interpretation of the whole scan was not as profound, with reporter A characterising 10/9/10 scans as malignant with the unprocessed scan/HiScan/Xact.bone, and reporter B calling 6/9/8 scans malignant. Mean image quality for the unprocessed scan/HiScan/Xact.bone was 6.5/9.1/7.9 for reporter A, and 5.6/7.5/6.7 for reporter B (p<0.0001). HiScan was ranked best for image quality in 82% of patients, and Xact.bone in 18%. Conclusion Resolution recovery in planar whole-body bone scans significantly increases the absolute number of malignant lesions, decreases the percentage of unclear lesions, significantly increases image quality and is an easy-to-implement addition to routine clinical practice.

P0574

18F-NaF PET/CT Imaging in Metastatic Bone Disease: Preliminary Results from Turkey

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OBJECTIVE: To investigate the role of 18F-NaF PET/CT in metastatic bone disease and to compare with planar whole body bone scintigraphy or 18F-FDG PET/CT. METHOD: 31 histopathologically proven cancer patients (16M,15F, mean age 57.12) and bone metastasis were included. 11/31 patients had bone scintigraphy, 18F-FDG PET/CT, and 18F-NaF PET/CT while 20/31 patients had bone scan and 18F-NaF PET/CT. RESULTS: Bone scan and 18F-NaF PET/CT were positive in all patients. However, the number of lesions demonstrated was equal in 3 cases and 18F-NaF PET/CT showed multiple pathological foci in the others. Because 18F-NaF PET/CT could show both lytic, blastic and small lesions with much better resolution, high target/background ratio, fast blood clearance. The comparison results with 18F-FDG PET/CT and 18F-NaF PET/CT revealed that 18F-NaF PET/CT demonstrated a greater number of metastases in 9/11 patients and they showed the same lesions in 2/11 patients. 18F-NaF PET/CT could show both blastic and sclerotic lesions. 18F-FDG PET/CT was commonly less successful in blastic metastasis than 18F-NaF PET/CT. Additionally, 18F-NaF PET/CT could easily catch the cranial bone involvement that 18F-FDG PET/CT missed because physiological brain metabolism masked. Bone marrow involvement could not be demonstrated in the bone scans but was positive in 5/31 patients on 18F-NaF PET/CT. Only 1/5 patients also had 18F-FDG PET/CT and it also showed pathological uptake in the bone marrow. The CT component of 18F-NaF PET/CT was primarily helpful in differentiating degenerative lesions like osteophytes from metastasis. CONCLUSION: 18F-NaF PET/CT is more successful than both bone scan and 18F-FDG PET/CT and can be performed as the first scanning method for bone metastasis.

P0575

Association between Bone Scan Index and Bone Metabolic Markers in Patients with Prostate Cancer during Treatment of Bone Metastasis with Zoledronic Acid

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Background: A computer-aided diagnosis system on bone scan images could help understanding spread of bone metastasis and indicates quantitative index "Bone Scan Index (BSI)". In patients with prostate cancer, a few papers have reported that BSI had possibility to be an indicator of treatment response like prostate specific antigen (PSA). But no paper has shown the relation between BSI and bone metabolic markers in patients with prostate cancer. Purposes: This retrospective study aimed at determining relations between absolute changes in BSI, bone metabolic markers, and PSA in prostate cancer patients with bone metastasis from baseline to after zoledronic acid therapy. Patients and Materials: Sixteen patients with median age 73 years old, range 57 to 80, were studied. Bone scintigraphy and blood examinations were performed before and after 6- to 12-month use of zoledronic acid. The markers of PSA, pyridinoline cross-linked carboxyterminal telopeptide of type I collagen (1-CTP), and bone alkaline phosphatase (BAP) were examined. As the values of PSA and BAP covered a large range of scales, we also used the logarithms of the variables. BSI was automatically calculated by BONENAVI® (FUJIFILM Pharma, Co., Ltd., Tokyo, Japan). Results: BSI correlated positively with the values of log PSA (P=0.04, r2=0.27), BAP (P< .0001, r2=0.80), log BAP (P=0.003, r2=0.54), and 1-CTP (P=0.005, r2=0.50) at baseline, respectively. After use of zoledronic acid, BSI correlated with the values of BAP (P=0.0006, r2=0.64) and log BAP (P=0.002, r2=0.58), respectively. The absolute change of BSI from the baseline to after zoledronic acid therapy correlated only with that of log BAP (P=0.03, r2=0.41), but not with PSA in this study population. Conclusions: BSI correlated with biomarkers, especially to BAP, before and after use of zoledronic acid. Furthermore, the absolute change of BSI was well associated with that of log BAP. BSI can be an indicator of treatment response of prostate cancer patients. The role of each biomarker and BSI should be determined in further studies.

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Oncology Clinical Science: Melanoma

P0576

Role of the sentinel lymph node biopsy in patients with low risk cutaneous malignant melanoma.

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PURPOSE. Analyze the role of the sentinel lymph node biopsy (SLNB) and its prognostic value in patients with low risk cutaneous malignant melanoma (CMM). METHOD AND MATERIALS. We conducted a retrospective study from 2009 until 2011 identifying 25 patients (12 males and 13 females, mean age 52 y.o.) in our database with histopathological diagnosis of CMM with a Breslow thickness of < 1,0 mm, ulcerated lesions, mitotic index of > 1 mm2 or Clark´s level III or superior, with a follow up period of 7 months - 3 years. Before the SLNB, we performed in all patients 4 intradermal injections of 0,2 ml of 37 MBq of 99mTc-nanocolloid around the scar of the CMM, which was previously removed, acquiring dynamic and planar scintigraphic images afterwards. Once the sentinel lymph node (SLN) was scintigraphically detected, it was removed in the operation room guided with a surgical gamma probe. Once removed, the SLN was histopathologically examined. In cases were the SLN was positive a regional lymphadenectomy was performed in a second time surgery. RESULTS. 11 CMM lesions were located in the trunk, 8 in inferior extremities, 4 in upper extremities and 2 in the head and neck. The SLN was positive for metastases in 7 (28%) cases: 6 micrometastases and 1 macrometastases. When lymphadenectomy was performed, the histopathology results showed that the only lymph node affected was the SLN. All the positive SLN had a tumor thickness of 0,80 mm and 0,90 mm. During the follow up period of 7 months - 3 years we have found a disease free survival in 100% of the patients with a positive SLN. CONCLUSION. The SLNB allows identifying lymph node metastases in patients with low risk CMM. All patients are currently disease free; however we probably need a longer follow up period to confirm our results since CMM can disseminate through the hematological system, which would modify the disease free period in the patients.

P0577

Diagnostic value of melanoma visualization with 99mTc-MIBI.

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The purpose of this study was to evaluate diagnostic value of scintigraphy with 99mTc-MIBI as an additional tool of noninvasive detection of primary tumor and lymph nodes (LN) invasion by melanoma. **Material & Methods**: we performed retrospective analysis of scintigraphic data in 52 consecutive patients with melanoma: 33 - primary and 19 - during follow-up. In all cases conventional regional staging included palpation and ultrasound (US) examination of suspicious LN areas. Scintigraphy of the primary tumor and areas of possible LN metastases was performed 15 min after i/v injection of 740MBq of 99mTc-MIBI. Foci of hyper-accumulation of 99mTc-MIBI in projection of primary lesion and/or regional LN were considered as abnormal. All 52 patients were operated and final diagnosis was confirmed by histology. LN dissection was performed in 32 patients who had sings suspicious for LN invasion. **Results:** Primary lesions were visualized in 19 (58%) and non-visualized - in 14 (42%) primary patients. Ulceration and Breslow thickness above 1mm on histology were detected in 73% (14/19) and 63% (12/19) patients with 99mTc-MIBI accumulation in primary melanoma. On the contrary, this unfavorable signs were mentioned only in 36 (5/14) and 40% (5/14) of persons with non-visualized primary lesions. According to histological examination 20 of 32 patients with dissected LN had morphological confirmation of LN involvement by melanoma. Scintigraphy with 99mTc-MIBI visualized accumulation of 99mTc-MIBI in abnormal LN in 19 of these 20 cases (95%). In addition, abnormal tracer accumulation in regional LN was detected in 7 of 12 patients with normal LN histology. In this preselected group sensitivity (Sn) and specificity (Sp) of scintigraphy with 99mTc-MIBI were 95% and 38%. On US examination sings of LN invasion were detected in 15 of 20 patients with regional metastases of melanoma and in 7 of 12 patients with histologically normal LN. Sn and Sp in this preselected group were 75% and 38%. **Conclusion:** 1. Scintigraphy with 99mTc-MIBI can significantly improve sensitivity of conventional regional staging in patients with melanoma. 2. Accumulation of 99mTc-MIBI in primary lesions associated with unfavorable histology. This preliminary data need accurate prospective confirmation.

P0578

Spect -CT sentinel node examination in patients with cutaneus melanoma

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A prerequisite for a successfull sentinel node procedure is an accurate lymphatic drainage map. The aim of our study has been to evaluate the value added of Spect-CT in the localization of sentinel lymph nodes in cases in which planar images can be less accurate. Our attention is addressed to patients with melanoma of the spine for the assessment of lymphatic drainage directed towards the triangular intermuscular space, and then it is addressed to patients with melanoma of the head and neck in which may be involved multiple sentinel-nodes with localizations on the base on the neck or occipital or upper cervical areas or from the scalp down to neck base. MATERIALS AND METHODS We evaluated 20 patients with cutaneous melanoma (20% head/neck, 60% spine, 10% lower limbs, 10% chest). All patients underwent primary excision and lymph node mapping procedure. The SNL procedure was performed using 99mTc nanocoll (37 +/- 20 MBq) the day before surgery. The injection of radiotracer consist in more subdermici inocula around the lesion. The spect-ct (Symbia-Siemens-Germany) consisted of a dual-head gamma camera with variable angle and multislice spiral CT. SPECT images were corrected for attenuation and scattering before fusion with CT images. Acquisition consisted in planar imaging and SPECT-CT immediately after planar imaging RESULTS 2 patients with melanoma of the spine have drainage to sentinel lymphnodes in the triangular intermuscular spaces, with problems of exact limphonode localization; the spect-tc correctly identifies location of sentinel nodes. 2 patients with melanoma of the back have axillary and triangular drainage 8 patients with melanoma of the back have axillary or inguinal drainage 3 patients with melanoma head/neck have drainage on occipital area, upper cervical area. 1 patient with melanoma head/neck showes the localization from the scalp down at neck base. 2 pz with melanoma limbs have inguinal drainage 2 pz with melanoma of chest have axillary drainage The Spect-Tc has identified better multiple localizations and it is resulted useful to the surgeon. CONCLUSION The SPECT-TC is a value added in the process of the lymphnode map for identification sentinel lymph node; particularly in patients with melanoma of the back it allows a more accurate assessment of the drainage to the triangular intermuscular space and it specifies the localization useful to the surgeon and it is profit in patients with melanoma head/neck to detect additional LS and it shows exact anatomical localization making it easier surgical exploration

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Oncology Clinical Science: Soft Tissues & Sarcoma

P0579

Assessment of tumor response by F-18 FDG PET/CT in osteosarcoma patients with neoadjuvant chemotherapy

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Objective: To assess the value of FDG PET/CT in evaluating response to neoadjuvant chemotherapy (NAC) in osteosarcoma patients especially in comparison to pathologic result after surgery Materials and methods: Total 11 osteosarcoma patients who had received NAC followed by surgical resection were retrospectively reviewed. All patients underwent FDG PET/CT at baseline and 7 patients of these underwent FDG PET/CT after completion of NAC. SUVmax before NAC (SUVmax1) and SUVmax after completion of NAC (SUVmax2) were measured in primary tumors. In addition, percentage variation of SUVmax between SUVmax1 and SUVmax2 (ΔSUVmax) was calculated. In histologic results from resection, necrosis rate of primary tumor was categorized as follows: grade I, <50%; grade II, 50-90%; grade III, 91-99%; and grade IV, 100%. Pathologic responses were classified as non-responder (grade I and II) and responder (grade III and IV). Results: Tumor necrosis rate by pathology were grade I in 5 patients, grade II in 4 and grade IV in 2. The average values of SUVmax1, SUVmax2 and ΔSUVmax were 11.0, 7.0 and 13% in patients with grade I, 8.9, 4.0 and 70% in grade II, and 5.8, 0.9 and 68% in grade IV, respectively. Pathologic responders were 2 patients, and 1 patient of these had complete metabolic response after completion of NAC. Conclusion: FDG PET/CT response may be helpful in predicting pathologic response in osteosarcoma patients with NAC. Further validation for this result is necessary.

P0580

18F-FDG PET/CT in Angiosarcoma

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Angiosarcomas (AS) account about 2-3% of adult soft tissue sarcomas. At the initial diagnosis, lymph node involvement is present in about 15-20% of AS, higher than other types of sarcomas. The rate of recurrence is high after resection of the main tumor and it is often associated with distant metastasis. **Aim**: We attempted to evaluate whether ^{18}F-FDG PET/CT is helpful to detect regional lymph node or distant metastasis of AS in this preliminary study. **Materials and Methods**: From May 2006 to March 2012, 11 patients (seven male. four female; mean age: 58, range 31-58 years) with a diagnosis of AS, who had ^{18}F-FDG PET/CT scans for staging (n=7) or restaging (n=4), were included in this retrospective study. The findings on ^{18}F-FDG PET/CT were compared with MRI, CT or bone scan (^{99m}Tc-MDP or NaF) if available. Pathological results or imaging follow-up were used as the reference standard. **Results**: Nine patients had primary tumors in the head and neck regions, one patient had fibular AS, and the other had breast AS. ^{18}F-FDG PET/CT detected regional lymph node metastasis in four patients, which were confirmed by pathological examinations in two of them and by image follow-up in the others. All these lymph nodes had SUV higher than 4.5. The two pathologically-confirmed lymph nodes measured less than 10 mm in diameter on MRI, i.e. negative by size criteria. ^{18}F-FDG PET/CT confirmed the benign nature of the regional neck lymph nodes in two patients. Distant metastases in the bones, lungs, mediastinal and pelvic lymph nodes were identified on ^{18}F-FDG PET/CT in another two patients. In one patient who also had NaF bone scan, ^{18}F-FDG PET/CT revealed more metastatic bone lesions. Only mild NaF uptake was noted at the periphery of the FDG-avid osteolytic foci. ^{18}F-FDG PET/CT helped to confirm the benign nature of solitary lung nodule, fractured rib and post-operative change of the breast in three patients, which all had mild or little FDG uptake but showed equivocal characteristics on CT or bone scan. These lesions remained stationary on the follow-up images. ^{18}F-FDG PET/CT failed to detect metastases in small lung nodules in a patient with breast AS. **Conclusion**: ^{18}F-FDG PET/CT is a potential adjuvant imaging tool to detect regional lymph node and distant metastases, and is helpful to confirm or exclude metastatic lesions of AS in the presence of equivocal findings on other image modalities.

P0581

A simple visual score of heterogeneity of FDG uptake as prognostic marker in sarcoma patients

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Objectives Spatial heterogeneity of FDG uptake in the tumor is a promising predictor of patient outcome in various tumor entities. Different definitions have been proposed for spatial heterogeneity of tracer uptake and mathematical approaches range from simple to very sophisticated algorithms. Here we propose a simple score for visual assessment of both heterogeneity (VSHETER) and shape irregularity (VSIRREG) of FDG uptake in the primary tumor. The prognostic value of these new scores was evaluated in sarcoma patients with F18-FDG-PET for initial staging. Methods In total 56 sarcoma patients (30 m, median age 15 y, range 2-61 y) were included retrospectively. Histological subtypes were 22 Ewing sarcomas (EWS), 17 osteosarcomas (OS) and 17 sarcomas with various subtypes (VS). Primary tumors were visually analyzed for maximum tracer uptake relative to the liver uptake (5-score), size (3-score), heterogeneity of FDG uptake (3-score), irregularity of the shape of FDG uptake (3-score) and central necrosis (yes/no). The presence or absence of metastases was also taken into account (yes/no). The metabolic tumor volume (MTV) was measured using the semi-automatic ROVER 3D segmentation tool which is based on thresholding at the volume-reproducible intensity threshold after subtraction of the local background. Cox proportional hazards models and corresponding hazard ratios (HR) were used to analyze the predictive value of the visual scores as well as SUVmax and MTV for overall survival (OAS) and progression free survival (PFS). Results 40 patients (17 EWS, 15 OS, 8 VS) survived till the end of the follow-up with OAS times ranging from 9.1 to 97.8 months (median 46.5 months). OAS of non-survivors ranged from 2.7 to 49.6 months (median 17.1 months). A significant association with sarcoma subtype was observed for SUVmax ($p<0.01$), VSHETER ($p=0.05$) and central necrosis ($p<0.01$). Multivariate cox proportional hazard analysis revealed VSHETER (HR=2.4, $p=0.01$) and tumor subtype (VS vs EWS, HR=4.9, $p<0.01$) as significant predictors of PFS whereas there was no significant association of PFS with VSIRREG, central necrosis, presence of metastatses, SUVmax or MTV. OAS was associated with the presence of metastases (HR=5.1, $p=0.01$), VSHETER (HR=2.6, $p=0.04$) and tumor subtype (VS vs EWS, HR=3.2, $p=0.05$). Conclusion A simple visual 3-score for heterogeneity of FDG uptake in the primary tumor provides additional power for the prognosis of sarcoma patients based on F18-FDG-PET. Simple visual scores are easily implemented in the routine clinical workflow.

P0582

Role of 18F-FDG PET/CT in the management of teenagers and young adults bone sarcomas.

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Aim: Bone sarcomas are rare neoplasms that mainly affect children and teenagers. Standard imaging consists of MRI, CT and bone scintigraphy. The role of 18F-FDG PET/CT is still under evaluation. The purpose of this study was to assess the diagnostic usefulness and the potential added value of 18F-FDG PET/CT in teenagers and young adults affected by bone sarcomas. Materials and methods: Twenty-four consecutive patients with sarcomas of bone origin (7 female and 17 male; mean age 27±7) were included in the study. Thirteen patients had Ewing sarcoma, 7 osteosarcoma and 4 chondrosarcoma. All patients underwent at least an 18F-FDG PET/CT scan for initial staging (n=3), restaging (n=4), therapy response assessment (n=26), and/or follow up (n=15), for a total of 48 studies. 18F-FDG (3.7 MBq/kg) was intravenously injected in fasting condition. Images were acquired 60 minutes after tracer administration with a Discovery ST/8 scanner (GE Healthcare, Milwaukee, USA). A low-dose CT was performed for attenuation correction and image co-registration. PET/CT study interpretation was based on abnormal uptake and SUVmax. PET/CT results were compared to those obtained with MRI and CT. Results: In 26/35 evaluations 18F-FDG-PET/CT confirmed the findings of MRI and/or CT. In 13 cases patients underwent only PET/CT. 18F -FDG PET/CT correctly changed therapeutic strategy by disclosing distance metastases in 6 patients and by discriminating loco-regional scar tissue from pathological tissue in 3 patients. 18F-FDG PET/CT had a false negative rate of 3/31 (10%) (2 lung and 1 kidney metastasis) and a false positive rate of 2/15 (13%) (1 mediastinal and 1 inguinal lymphoadenopathy). In 2 cases PET/CT was inconclusive (uncertain findings). Conclusion: 18F -FDG PET/CT resulted to be an accurate diagnostic tool in patients affected by bone sarcomas showing a good agreement with MR and CT in the evaluation of locoregional disease. PET/CT provided relevant additional information about the presence of distant metastases and of locoregional disease in 19% of the cases, thus changing clinical management of these patients. Moreover, the PET/CT scan was useful as a baseline evaluation for assessing response to treatment, especially early response.

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Oncology Clinical Science: Miscellaneous

P0583

Dual-time point 18F-FDG PET/CT scan: is it always working?

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Purpose of the study: to assess the added value of dual-time-point (DTP) ^{18}F-fluoro-2-deoxyglucose (^{18}F-FDG)-PET/CT in differentiation malignant fro benign lesion. **Methods:** The study prospectively included 60 patients with cancer (19 women, 41 men) with mean age of 63±10.4 years. All patients suspected to have

malignant lesions and investigated by performing whole body PET/CT at 60 minutes and delayed limited PET/CT on areas of interest at 120 minutes after the tracer injection. Visual and semiquantitative analysis was performed on both the early and delayed images. All findings were confirmed by histopathology and/or at least 3 months follow-up (clinical, PET/CT, CT or/and MRI). The result consider true positive (TP) in lesions with increased SUV in delayed image and confirmed to be malignant, false positive (FP) in lesions with increased SUV and confirmed to be benign, true negative (TN) in lesions showed decreased or unchanged SUV and confirmed to be benign and false negative (FN) in lesion showed decreased SUV and confirmed to be malignant. **Results:** The total number of suspicious was 82 (the common lesions were 10 presacral soft tissue lesions, 9 lung nodules, 7 hepatic lesions, 8 rectal lesion, , 9 Hodgkin's disease (HD) lesions, 8 head and neck (H&N) lesions, 7 Non-Hodgkin's lymphoma (NHL) lesions). 32 lesions were histopathologically confirmed and 50 lesions confirmed based on 3 months follow-up. There were 33 TP lesions, 27 FP, 22 NT and no FN results. The overall sensitivity was 98.5% of DTP FDG PET/CT in detecting suspicious lesions. The specificity was 44.9% in differentiating benign from malignant lesions and the accuracy was 67%. PPV was 55%, NPV 100%. All hepatic lesions were TP. Lung nodules showed 5 TP, 2 FP and 2 TN with accuracy 78%. Rectal lesions showed 1 TP, 3 FP and 4 TN with accuracy of 71.4%. Presacral soft tissue lesions showed 2 TP, 2 FP and 6 TN with accuracy 80%. Mediastianl LN showed accuracy of 33.3%. HD lesions showed accuracy of 78% and NHL lesions showed accuracy of 71%. H&N lesions (LN and suspicious recurrent lesions) showed accuracy 75%. **Conclusions:** DTP ^{18}F-FDG-PET/CT protocol is not always working. However; promising results was noted in hepatic lesions and presacral soft tissue lesions and to less extent in lung nodules and lymphomatous lesions which need further studies with large patient number to emphasize these results. Also concluded that decrease SUV in delayed image has high NPV.

P0584

Characteristics of additional PET/CT findings that had not been pointed out by prior conventional imaging modalities

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Objects: PET/CT using ^{18}F-fluorodeoxyglucose can sometimes identify unexpected lesions that had not been detected by morphological imaging modalities (CI), such as CT, but characteristics of these lesions have not been fully investigated. The purpose of this study was to analyze additional PET/CT findings that had not been pointed out on prior CI images.Methods: By reviewing a total of 2697 reports of PET/CT performed for the purpose of staging, restaging, or evaluation of unknown primary cancer, and by checking their available CI reports when PET/CT revealed positive findings for malignancy, we picked up newly-identified lesions that had not been mentioned on prior CI. These lesions were classified into four groups: CL, clearly depicted on CI; UC, unclearly depicted on CI; ND, not depicted on CI; and OUT, outside of the field of view. These findings were analyzed in terms of location, primary cancer, and the purpose of scanning.Results: There were 67 lesions in 57 patients which were newly identified by PET/CT as a new finding. The number of CL, UC, ND and OUT lesions was 33, 17, 10 and 7, respectively, suggesting half of the lesions were clearly depicted on previous CI images. The most newly-identified lesion by PET/CT was bone metastasis (n=27), followed by nodal metastasis (n=12), local recurrence (n=5), peritoneal implants (n=4). Nine (75%) of 12 nodal metastasis and 4 (80%) of 5 local recurrences were clearly depicted by CI, while there were only 6 (22%) of 27 cases of bone metastasis that can be pointed out retrospectively. There was no statistical significant difference of prevalence, according to their primary tumor, nor the purpose of scanning.Conclusion: Bone and nodal metastases tended to be found as an additional finding by PET/CT in spite of negative CI results. Approximately half of these additional findings can be pointed out retrospectively on prior CI, especially for nodal metastasis, but PET/CT or conventional bone scan might be required to detect bone metastasis for screening purpose.

P0585

Clinical value of FDG-PET/CT in suspected paraneoplastic syndromes

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AIM Paraneoplastic syndromes are relatively rare, but remain important differential diagnoses in a wide range of clinical settings, sometimes preceding occult malignancies by months or years. The use of FDG-PET/CT in the diagnostic workup of these patients is increasing at our institution, but the literature on its value is scarce. We present results of a retrospective review of consecutive patients referred for FDG-PET/CT with suspected paraneoplastic syndromes. MATERIAL AND METHODS All patients referred for FDG-PET/CT with suspected paraneoplastic syndrome in a 3-year period were screened for inclusion. A comprehensive retrospective chart review provided dates and conclusions of all diagnostic procedures and events during follow-up. A PET/CT scan was considered true positive for cancer, if an FDG uptake suggestive of malignancy was confirmed by biopsy, and false positive, if subsequent investigations could not confirm the findings or only found evidence of benign disease. A scan was considered true negative, if a normal FDG uptake or an abnormal FDG uptake interpreted as reflecting a benign condition were reported, and no malignant disease was found during follow-up. A scan was considered false negative, if no abnormal FDG uptake suggestive of malignancy was reported, and a cancer was diagnosed during follow-up. RESULTS Of 73 eligible patients, eight were excluded (lost to follow up (n=1), diagnostically unresolved (n=2), history of cancer (n=5)). Of the remaining 65 patients, 28 were females and 37 males with a mean age of 64 years. Patients were referred from the departments of neurology (n=34), rheumatology (n=11), dermatology (n=10), nephrology (n=5), and others (n=5), and were followed for a mean period of 15 months. PET/CT was suggestive of cancer in 16 patients: 4 were true positive, 12 false positive, and showed no cancer in 49 patients: 48 true negative, 1 false negative. Thus, the sensitivity, specificity, accuracy, positive and negative predictive values were 80%, 80%, 80%, 25%, and 98%, respectively. The majority of cancers (4 of 5) were found in the subgroup of neurological patients, in whom the corresponding diagnostic values of FDG-PET/CT were 100%, 93%, 94%, 67%, and 100%, respectively. CONCLUSION FDG-PET/CT had an impressively high diagnostic value in neurological patients suspected of paraneoplastic syndromes, but in other types of patients the high number of false positives made interpretation and clinical impact more dubious. To our knowledge, the material presented here is the largest of its kind in the literature. Still, larger, prospective studies are warranted.

P0586

The effectiveness of dual-time-point FDG PET/CT in assessing malignant tumors

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Objectives: In assessing malignant tumors using dual-time-point FDG PET/CT, to our knowledge, many reports are reviewed for each malignant tumor, but few reports are analyzed on overall malignant tumors. The purpose of this study was to retrospectively evaluate the effectiveness of the dual-time-point FDG-PET/CT in assessing malignant tumors.Methods: A total of 648 consecutive patients on whom dual-time-point FDG-PET/CT scanning was performed from November 2010 to October 2011 were investigated in this study; these patients (399 males and 249 females; age ranged from 21 to 90, average 67) were diagnosed histopathologically to have 682 malignant lesions. The lesions involved in this study consisted of 45 malignant lymphomas, various cancers (160 lung, 96 colon, 48 stomach, 46 esophagus, 32 larynx, 27 oropharynx, 27 pancreas, 25 tongue and 23 hypopharynx) and 153 other malignant tumors. For dual-time-point FDG-PET/CT scanning, the early and delayed images were acquired at 1 and 2 hours after intravenous FDG injection, respectively. FDG-PET/CT images were evaluated visually and quantitatively.Results: By visual analysis of PET images, 606 (89%) of 682 lesions showed abnormal FDG uptakes in early images. In delayed images, abnormal uptakes were detected not only in all 606 lesions detected in early images but also in an additional 30 (39%) of 76 lesions which were not detected in early images. These 30 lesions consisted of 2 MALT lymphomas and various cancers (6 lung, 5 stomach, 2 bile duct, 2 pancreas, 2 larynx, 2 uterine corpus, 1 esophagus, 1 thyroid gland, 1 uterine cervix, 1 liver, 1 oropharynx, 1 hypopharynx, 1 tongue, 1 colon, and 1 duodenum). By quantitative analysis of PET images, standardized uptake values (SUVs) was 7.1 ± 5.4 as the mean ± standard deviation in early images (SUVe) and 9.1 ± 6.8 in delayed images (SUVd), with significant difference between them ($p<0.0001$). The ratio of SUVd to SUVe (SUVd/e) of overall lesions was 1.28 ± 0.17. The highest SUVd/e was 1.36 as the mean in lung cancers, and the lowest was 1.18 in hypopharyngeal cancers. Twelve lesions (1.8%) showed SUVd/e less than 1 (i.e. 1 bile duct, 2 gastric, 2 thyroid, 2 tongue, 1 hypopharyngeal, 1 gingival, 1 breast, 1 lung and 1 pancreatic cancers).Conclusions: The delayed images could detect more lesions visually compared to the early images, and SUVs of the delayed images were statistically higher than those of the early images. Therefore delayed images are suitable for assessing the primary lesions.

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Evaluation Skin Metastasis With 18FFDG PET/CT

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Background: Skin metastasis is a very rare condition for malign diseases. Abnormal FDG uptake at dermal regions can be due to dermatological benign diseases, infection/inflammation, travmatic events or some romatologic and metabolic situations, but if we see an abnormal skin FDG uptake while evaluating a cancer

patient skin metastasis should be considered. Aim: The aim of this study was to evaluate the patients who had skin metastasis and to investigate the primary malignities on ^{18F}FDG PET/CT. Material and Methods: From March 2009 to December 2011, 5450 patients were underwent ^{18F}FDG PET/CT for diagnosis, staging, restaging or therapy response evaluation of known or suspected oncological disease. PET acquisition was performed 60-90 minutes after intraveneous injection of 10-15 mci (370-555 MBq) FDG, with an integrated PET/CT system. Skin metastasis were observed in FDG PET/CT scans of 41 patients (25 males, 16 females; ages:35-94, mean 63±13.8 years). Patients with primary skin malignities were excluded from this study. For quantitative analysis, the standardized uptake value of the skin metastatic lesions (SUV) were calculated. Results: The prevalence of skin metastasis was found 0.75% in this study. Among 41 patients; 10 had non-Hodgkin's lymphoma, 8 had lung carsinoma, 7 had breast carcinoma, 5 had colorectal carsinoma, 3 had pancreatic cancer, 2 had renal cell carcinoma, 1 had gastric cancer, 1 had prostate cancer, 1 had parotid cancer, 1 had urinary bladder cancer, 1 had multiple myeloma (plasmocitoma) and 1 had both esophagus cancer and lung carcinoma as primary tumor. Diagnosis were proved as metastasis by biopsy in 13 patients. 28 other patients' lesions were confirmed with clinical and radiological methods. The SUVmax values were measured between 2.6-47.5. Conclusion: Determination of distant metastasis is overriding important in cancer patients' management. Although skin is a very uncommon metastatic region, an abnormal skin FDG uptake should be taken into consideration. By using PET/CT for evaluating oncological patients, more unexpected metastasis have been revealed.

P0588

PET/CT for the Characterization of adrenal masses using SUV adrenal-to-liver ratio.

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Introduction The aim of this study was to verify whether characterization by calculation of the ratio SUVmax adrenal/ SUVmax liver would allow us to reach a diagnosis of exclusion of malignancy to avoid intervention when performed with the sole purpose of removing the adrenal in cancer patients undergoing adrenalectomy and had a PET/CT with 18F-FDG. **Material and Methods** We conducted a retrospective analysis of studies PET/CT with 18F-FDG obtained from 18 patients (9 men, 9 women), ranging 50.8 ± 11 years, suffering from various tumors who underwent adrenalectomy maximum 3 months after the PET/CT. Patients were asked to fast for 4 hours. The studies were acquired 74.8 ± 16 minutes after the administration of 232 ± 53 MBq (3.1 ± 0.5 MBq / kg) of 18F-FDG with a Philips GEMINI TF-16. Water was used as oral contrast. SUVmax values of each adrenal were measured in then axial slice. For liver the mean value of SUVmax was selected. This value was provided by two ROI's of 15 cm^2 taken from liver areas not suspected of pathology. SUVmax adrenal/ SUVmax liver (index S/L) ratio was calculated with these results. The patients were operated by laparotomy, obtaining the result of 18 pathological adrenals. **Results** The studies were grouped according to pathology: normal (N) 4, benign (7) 5: 1 hyperplasia, 6 adenoma, metastases (M) 7. There were significant differences between the SUVmax values of the adrenals (N + B) versus M (P <0.0001) and between B and M (P <0.001). There was no significant difference in SUVmax between B and N (P = 0.06). The value of SUVmax of the liver was similar in all groups. There were significant differences between the N+B (0,70±0,23) y M (2,12±0,82) (P = 0.00002) in the S/L index indicating difference between N (0.48±0.10) and B (0.82±0.19) (p<0,01). The accuracy of visual analysis gave 86% and if only used in the S/L index reached 94%. **Conclusion** The S/L index is superior to the adrenal SUVmax and visual assessment when discerning whether an adrenal is metastatic or not in cancer patients. **Discussion** The PET/CT performed in the test population differ These doses are lower than those indicated in the clinical practice guidelines published by the EANM and SNM (references).

P0589

Can you make a PET/CT to 1800 Km from a cyclotron?.

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OBJECTIVES Our hospital is on a Island, approximately 1800km from mainland with a population of 852945 people. Despite we do not have a cyclotron, on March 2008 we purchased a PET/TAC PHILIPS GEMINI TOF-16, as this would enable smaller dosage and time of acquisition. We considered "supply hit rate", "arrival time" and "adequacy of the scheme dosage to our conditions". MATERIALS AND METHODS We would require one of mainland cyclotrons as a source of 18F-FDG, transportation by air. A set of different circumstances limited our choice: Transport on a regular company; direct flights (possibly originating from Seville, Madrid and Barcelona); morning flights due to our working hours (10am - 17pm) and companies that met the requirements for transportation of radioactive substances. The choice was narrowed to Madrid, with one provider since 2008 and two from 2009 onwards (production limited to 2500 MBq/day and 1200 MBq/day respectively). Using doses in accordance with SNM of 370-740 MBq and given the decay, we would be limited to 4 patients per day. We therefore decided to tailor the dose according to: variable dose/kg according to FDG received; time/bed variable according to body mass index (if less at 30, 1.5 min/bed if higher, 2 min/bed); values of 2 to 2.5 for waiting times longer than 90 minutes. We designed a spread sheet to calculate the accurate dosage quickly and accurately. RESULTS We conducted 2684 studies. The first year we experienced many challenges due to production supply and transportation issues. We improved in following years, especially in transport, reducing failure rates from 61% to 14%. The average "arrival time" variable did not change significantly from the expected time (11:45 GMT), however, for the 18F a high standard deviation represents losses of up to 50%. In 2009 we experienced delays due to airline strikes (12:23± 1h32m). Activity received varied, adding another provider meant more activity and a better hit rate, compensating any faults in one cyclotron with purchase in another or both. On Nov 14 2009 AENM published a study guide for PET/TAC oncological studies outlining dose recommendations according to variations in equipment. According to these criteria, our doses would have been up to 50% higher. However, we managed to meet our oncological needs without apparent lower clinical quality. CONCLUSIONS Pet can be used as a diagnostic tool living far from a cyclotron given similar equipment and adaptive dose schedules.

P0590

Sentinel Lymph Node Mapping with SPECT/CT

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AIM: The aim of this study was to investigate whether single photon emission computed tomography with computed tomography (SPECT/CT) is of additional value compared to conventional sentinel node (SN) lymphoscintigraphy in patients who were routinely scheduled for SN mapping. **METHOD**: In this prospective study forty eight consecutive melanoma, head and neck, breast and vulvar cancer patients scheduled for sentinel node biopsy, underwent conventional lymphoscintigraphy with dynamic and static planar imaging, and subsequently SPECT/CT. Hand-held gamma probe was used for identification of the SLNs in the nuclear medicine department and during surgery. We studied whether SPECT/CT showed additional sentinel nodes, provided better information on the location of the sentinel nodes, and whether this additional anatomic information had an impact on surgical approach or patients' management. **RESULTS**: SPECT-CT detected 122 SNs in 47 patients and conventional lymphoscintigraphy 97 SNs in 45 patients. SPECT-CT found 25 additional radioactive nodes (20,5%) in 19 patients (39,6 %), in 2 patients SN has been visualized by SPECT/CT only (4.16%). SPECT/CT provided additional information that led to an adjustment of the surgical approach or further changes in patient management in 12 patients (25%). SN was not detected either by conventional scintigraphy or SPECT-CT in only one patient (2%). **CONCLUSION:** SPECT/CT detected additional sentinel nodes and revealed the exact anatomical location of sentinel nodes in significant number of our patients. SPECT/CT provided relevant additional information in 19 (39,6%) of the 48 patients. Our preliminary results suggest that routine use of SPECT/CT in addition to conventional lymphoscintigraphy may improve sentinel lymph node detection, surgical procedure, and patients' management.

P0591

Usefulness of combined ^{18}F-FDG PET/CT for predicting the WHO malignancy grade of thymic epithelial tumours: a multicenter analysis on 47 patients

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Objective: To investigate the efficacy of combined ^{18}F-FDG PET/CT in predicting the grade of malignancy in thymic epithelial tumors based on the WHO-classification.**Methods:**From 05/2006 to 02/2012, the data of 47 patients with thymic epithelial tumors who underwent ^{18}F-FDG PET/CT examination before surgical treatment in three high-volume centers were retrospectively reviewed. The pre-treatment SUVmax and the ratio of the tumor SUVmax to the tumor size (SUVmax/T-size) have been matched with specific subgroups of the WHO-classification: low-risk thymomas (Types A-AB-B1), high-risk thymomas (Types B2-B3), and thymic carcinomas (Type C).**Results:** There were 22 men and 25 women (age range: 31-81 yrs). Mean tumor size was 44.7±19.0 mm. The WHO-classification was as follows: type A #2, type AB #11, type B1 #9, type B2 #9, type B3 #9 and type C #7. SUVmax and SUV/T-size were found to be well related to the classes of risk

(low-risk vs. high-risk vs. thymic carcinoma), Spearman correlation coefficients being 0.56 (p<0.0001) for SUVmax and 0.76 (p<0.0001) for SUV/T-size index. Moreover, the differences were statistically significant even when comparing low-risk tumors vs high-risk tumors/thymic carcinomas (SUVmax, p=0.0082; SUV/T-size, p=0.0027).**Conclusions:** A significant relationship was observed between ^{18}F-FDG PET/CT findings and histologic WHO-classification for this cohort of thymic epithelial tumors (the largest available in literature). In particular, pre-treatment ^{18}F-FDG PET/CT may be useful for differentiating the WHO classes of risk.

P0592

Detection of the first and the second primary malignancy by FDG PET/CT

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Objectives: To retrospectively evaluate the occurrence frequency of the first and the second primary malignancy and their detectability by FDG PET/CT. Methods: From January 2006 to November 2006, 602 patients (348 males and 254 females) underwent FDG PET/CT studies as a follow-up study after treatments of the first primary malignant tumors (patient group). Ninety-one people (53 males and 38 females) without history of malignancy received FDG PET/CT studies in the same period (control group). All patients have been followed for 1-74 months (median, 36 months) in terms of newly developed primary malignancy. Incidence of the second malignancy in the patient group was compared with that of the first malignancy in the control group. First clue to detection of new malignancy was examined among the people who undergone FDG PET/CT within a year before malignancy diagnosis. Results: The second primary malignancy was finally diagnosed in 36 patients of the patient group (6.0%, 36/602) and the first primary malignancy in 4 people of the control group (4.4%, 4/91) based on the pathological result in 95% (38/40) of them. There was not statistical significant difference between the 2 groups (p=0.81), however, the occurrence frequency of new primary malignancy in patient group tended to be higher than control group. FDG PET/CT was the first clue to detection of new malignancy in 29 % (9/31) of patient group and in 100% (2/2) of control group. Among them, 100 % (2/2) of thyroid cancer, 50% (3/6) of colon cancer, and 33% (2/3) of prostate cancer were detected by FDG PET/CT. Conclusions: The occurrence frequency of new primary malignancy in patient group tended to be higher than control group. When reading FDG PET/CT imaging, we should keep in mind the possibility of second primary malignancy in patients with the history of malignancy.

P0593

Potential Application of 18F-FDG PET/CT for Radiation Workers in Nuclear Power Plant and Control Group in South Korea

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Purpose: This study is based on medical health check-up and cancer screening using 18F-FDG PET/CT of radiation workers in nuclear power plants and control group in south Korea **METHODS:** Between March 2003 and December 2011, 8,922 of asymptomatic subjects were studied using 18F-FDG PET/CT (4,531 men and 4,391women, mean age was 58+/-10.4 years). **RESULTS:** Malignant tumors were discovered in 77 of the 8,922 subjects (0.86%). The detection rate of radiation worker is lower than that of control group (0.21% vs. 0.98%) Only 3 radiation workers were diagnosed with cancer among 1392 studied subjects. Those were lung, colorectal and nasopharyngeal cancers. The most common detected cancer in control group was thyroid. These cancers were detected at stage I (73%). Others were stage II (8%), and stage III, IV (19%). **CONCLUSIONS:** Most of cancers are not accompanied with symptoms especially in early stage. Therefore, 18F-FDG PET/CT has the potential to detect a wide variety of cancers at curable stages in asymptomatic individuals. Most of people concerned higher incidence of cancer in radiation workers. These results could be scientific evidence for unaware of concern

P71-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Conventional & Specialised Nuclear Medicine: Endocrinology

P0594

The Accuracy of 99mTc-MIBI Scintigraphy for Preoperative Parathyroid Localization in Primary and Secondary-Tertiary Hyperparathyroidism

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Objective: The aim of this study was to assess the accuracy of preoperative parathyroid localization using double phase planar 99mTc-methoxyisobutylisonitrile parathyroid scintigraphy (MIBI scintigraphy) in patients with primary hyperparathyroidism (pHPT) and secondary-tertiary hyperparathyroidism (stHPT) due to chronic renal failure . **Material and methods:** A retrospective study was conducted. Between1995 and 2010, seventy-one patients with hyperparathyroidism (mean age 47±15 years; range 14-84 years) underwent neck surgery ; 18 with pHPT and 53 with stHPT. None of these patients had undergone previous neck surgery. Preoperative demographics , clinical and laboratory values, MIBI scintigraphy , operative findings, location, size and histopathological results of all abnormal parathyroid glands were recorded. **Results:** The abnormal parathyroid glands excised from 18 pHPT patients included 11 solitary adenoma (61%), 5 carcinoma(28%) , 1 patient with single gland hyperplasia (6%) and 1 patient with two gland hyperplasia (6%). MIBI scintigraphy correctly lateralized and localized 17 of 19 abnormal parathyroid glands with sensitivity 90%, specificity 100%, positive predictive value (PPV)100% and accuracy 97.2%.The abnormal parathyroid glands excised from 53 stHPT patients included 48 patients with multiple hyperplasia(91%), 1 patient with single gland hyperplasia(2%),1 patient with solitary adenoma(2%) and 3 patients with multiple adenomas (6%).MIBI scintigraphy correctly lateralized 116 of 173 abnormal parathyroid glands with sensitivity 67.1 %, specificity 92.3%, positive predictive value (PPV) 97.5% and accuracy 71.7 %. Precise localization occurred in 63.6 % of the abnormal parathyroid glands. Significant differences were found with respect to age , intact parathyroid hormone, serum calcium , phosphorus, BUN levels between the pHPT and stHPT(p<0.001). The average size of abnormal parathyroid glands in pHPT(2.28±1.05 cm) was greater than that of stHPT (1.56±0.58 cm) with significant difference (p<0.001).Surgical parathyroid size were significantly greater in MIBI true-positive glands (1.79±0.68 cm) compared to MIBI-false negative glands(1.29±0.52 cm) with significant difference (p<0.001) **Conclusions** : MIBI scintigraphy is very sensitive and highly accurate for pre-operative localization of parathyroid lesion in patients with pHPT . So, it was useful for surgeon as a guide in the preoperative localization for performing unilateral surgery to reduce operating time and morbidity. In stHPT,MIBI scintigraphy appears fair sensitive and is not yet accurate to detect all abnormal parathyroid glands in multiple hyperplasia .So, it is not an essential prerequisite before surgery.

P0595

Dual-phase scintigraphy in the diagnosis of hyperparathyroidism

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Introduction: the most common cause of primary hyperparathyroidism (PHPT) is solitary adenoma (85 %), less frequently PHPT can be due to parathyroid hyperplasia or multiple adenomas. Secondary hyperparathyroidism (SHPT) is a complication in patients (pts) with chronic renal failure. Parathyroid glands can be imaged with multiple modalities, including scintigraphy. The agent of choice for single-tracer, dual-phase study is 99mTc-sestamibi (MIBI). Aim: assessment of the contribution dual-phase scintigraphy (including SPECT/CT) in the diagnosis of hyperparathyroidism (HPT), also in comparison with ultrasound (US). Materials: we examined by scintigraphy a total of 131 pts, 12 of them had advanced renal failure on maintenance dialysis. Parathyroid hormon (PTH) levels were increased in all cases. Endocrinologists also examined 50 pts (all of them positive by scintigraphy) by ultrasound (US). Methods: first phase - i.v. administration 600 MBq 99mTc-MIBI under the gamma camera detector (pin-hole collimator), anterior views of the neck 30-min dynamic acquisition (matrix 128x128, 2 frames/min), second phase - 2,5 h post-injection planar image (pin-hole collim., anterior view of the neck, duration 10 min) followed by SPECT/CT of the neck and chest. Focal area (areas) of MIBI uptake persisted on delayed images (especially on SPECT/CT) was regarded as positive. Results: 66 findings of 131 pts were positive, 64 of 66 were unifocal, one bi- and one trifocal (both pts on dialysis), none of them was ectopic. 20 pts of 64 unifocal positive findings were operated (17 of 20 by minimally invasive radioguided surgery - MIRS), in all cases was dg. PHPT histologically confirmed (19 adenoma, one hyperplasia), including precise localization according to SPECT/CT study. US findings were in agreement in 18 of 50 scintigraphically positive scans (36 %). Conclusion: Dual-phase MIBI scintigraphy was positive in about 50 % of total 131 pts with suspected HPT. PHPT was histologically proven in all 20 operated pts by (no scintigraphy was false positive). In 2 of 12 pts with suspected dg. SHPT multifocal findings provide useful information prior to elective surgery. Ultrasound is helpful noninvasive but less sensitive method than scintigraphy. In today´s era of MIRS dual-phase scintigraphy (including SPECT/CT) contributes to more accurate preoperative localization of the parathyroid glands pathology.

P0596

Comparison of Planar, Pinhole and SPECT CT Imaging in Dual Phase 99m Tc-Sestamibi Parathyroid Scintigraphy

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Introduction Parathyroid scintigraphy (PS) has proven to be the single best imaging modality for preoperative localization of parathyroid adenoma (PA)s that is superior to ultrasonography, CT and MRI.There is a limited number of comparative scintigraphic studies regarding methodology, reported to date. Our aim was to compare preoperative results of dual phase Tc-99m sestamibi PS in planar(Pa),SPECT and SPECT/CT imaging and to investigate the additive value of SPECT/CT scan. Methods: Thirty-three patients (*7 M, 26 FM; 50±12 yrs old; 32 primary and 1 secondary hyperparathyroidism*) with PS and being operated were included in the study. Planar, pinhole (PH) and SPECT/CT imaging were performed at 10th and 120th minutes after 600-900 MBq 99mTc-sestamibi injection. Retantion activity foci in neck and mediastinum were scored semiquantitatively (0 to 2) in both early and delayed parathyroid phases for all methods. Surgical location with the histopathologic diagnosis served as the gold standart. Sensitivity, specificity and accuracy were calculated for all methods. Kappa and Mc Nemar tests were used in statisticaly evaluation. Results: 24 PAs *(7 in right inferior, 8 in left inferior, 6 in left superior of thyroid lobe and 3 ectopic)* and 16 hyperplastic glands were diagnosed as histopathologically. A focus interpreted as an ectopic adenoma in planar imaging was proved to be sternal lesion in SPECT/ CT imaging. Sensitivity, specificity and accuracy of methods in early and late dual phase imaging in lesion detection were as follows: Pa-early (86%,67%,82%), Pa-late(86%,80%,85%), PH-early(81%,50%,81%), PH-late(82%,67%,74%), CT(82%,50%,81%), SPECTearly (90%,75%,83%); SPECTlate(70%,100%,71%), SPECT/CTearly(90%,75%,87%), SPECT/CT late (%88, %100,%92), respectively.The difference was not statistically different in visual scoring between the scintigraphic methods (p> 0.05). Conclusion : In conclusion, SPECT/CT provides not only accurate lesion localization but also differential diagnosis. Late SPECT/CT imaging has incremental diagnostic value in the accuracy of the method, especially for selected patients with diffuse thyroid activity precluding interpretation of adjacent thyroidal region in early phase.

P0597

Imaging findings in a patient with life threatening hypercalcemia and a history of parathyroid carcinoma

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A 46 year old man with a history of parathyroid carcinoma, presented with symptomatic hypercalcemia. In the previous years he underwent a subtotal parathyroidectomy, local radiotherapy, chemotherapy and resection of multiple lung metastases. Recurrent lung metastasis was treated by microwave ablation but his condition worsened, due to persistent hypercalcemia. An FDG PET/CT scan revealed a retrosternal nodule, with moderate FDG uptake. Furthermore, there was multifocal bone uptake, involving the costochondral junctions, scapulae and right acetabulum. CT-scan could not depict any abnormality in the skeleton. Tc-99m sestamibi SPECT demonstrated also low grade uptake in the pre-aortic, retrosternal mass but without any bone irregularity. In the literature, several cases of increased focal uptake of FDG and/or MIBI in the skeleton are described in patients with parathyroid carcinoma (1-4). Most reports focus on the increased uptake of FDG or MIBI in brown tumours, presenting on CT-scan as osteolytic lesions. It is known that these bone lesions, occurring in long standing hyperparathyroidism, tend to regress when the hyperparathyroidism is adequately treated. In the case presented here, there was an increased uptake of FDG in the bone, however without underlying radiological abnormality. The predominant symmetrical pattern did not favour the hypothesis of bone metastasis. The patient recovered from his hypercalcemic state following resection of the retrosternal nodule, confirming that the resected nodule was the source of PTH secretion. The multifocal bone uptake on PET scan is considered to be related to an elevated bone turnover, as seen in bone scintigraphy in patients suffering hyperparathyroidism (5). References 1. Kemps B, van Ufford HQ, Creyghton W, de Haas M, Baarslag HJ, Rinkes IB, de Klerk J. Brown tumors simulating metastases on FDG PET in a patient with parathyroid carcinoma. Eur J Nucl Med Mol Imaging. 2008;35:850. 2. Evangelista L, Sorgato N, Torresan F, Boschin IM, Pennelli G, Saladini G, Piotto A, Rubello D, Pelizzo MR. FDG-PET/CT and parathyroid carcinoma: Review of literature and illustrative case series. World J Clin Oncol. 2011;2:348-54. 3. Favia G, Lumachi F, Polistina F, D'Amico DF. Parathyroid carcinoma: sixteen new cases and suggestions for correct management. World J Surg. 1998;22:1225-30. 4. Le Stanc E, Wattel C, Hameg A, Vilain D, Tainturier C, Theodore C. FDG PET/CT findings in secondary hyperparathyroidism not mimicking multiple bone metastases. Eur J Nucl Med Mol Imaging. 2009;36:334. 5. Rosenthall L. Metabolic Bone Disease. In: Collier D, Fogelman I, Rosenthal L, editors. Skeletal Nuclear Medicine. SaintLouis: Mosby; 1996. pp.151-168.

P0598

18F-FDG-PET/CT prognostic value for initial diagnosis of intermediate and high risk of recurrence differentiated thyroid carcinoma patients

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INTRODUCTION: In differentiated thyroid carcinoma, an indication of 18F-FDG-PET/CT exists in patients with elevated thyroglobulin but negative 131I whole body scan during follow up. 18F-FDG-PET/CT, not recommended for preoperative assessment, can be useful in larger and aggressive tumours. The usefulness of 18F-FDG-PET/CT in high-intermediate risk of recurrence differentiated thyroid carcinoma remains not elucidated. OBJETIVE: To analyze the usefulness and prognostic value of 18F-FDG-PET/CT for initial diagnosis of high-intermediate risk of recurrence differentiated thyroid carcinoma. PATIENTS/METHODS: Observational-prospective study of 47 patients with total thyrodectomy for high (group A) and intermediate risk (group B) of recurrence differentiated thyroid carcinoma. We performed 18F-FDG-PET/CT using the usual protocol of our Department: 31 patients before thyrodectomy and 16 immediately after. We considered two possible results: positive PET/CT studies if we have positive findings in neck or out of neck excluding uptake in thyroid nodule. Negative PET/CT studies that with uptake only in thyroid nodule. Clinical reports were revised for surgical, analytical and pathology reports. We considered curation of cancer if patients have negative whole body scan, ultrasound and thyroglobulin one year after radioiodine ablation. Statistical analysis of data included descriptive analysis, paired tests (for comparing means and proportions) and logistic regression. Kaplan-Meier survival curves and Log rank test for survival analysis. RESULTS: We performed 18F-FDG-PET/CT to 47 patients (mean age 47,68 ±17,42 years, mean follow up: 16,65 ± 9,45 months). In addition of total thyroidectomy, central compartment lymphadenectomy (37,2%) and lateral compartment lymphadenectomy (18,6%) were performed. The most frequents histological subtypes were papillary, follicular and Hürthle cell carcinoma (54,8%, 9,5% and 7,1%). According to AJCC classification: 35,7% were stage I, 19% stage II, 21,4% stage III and 23,9% stage IV. 29 patients (61,7%, 29/67) showed positive PET/CT study. 21,3% of patients were considered cured. Patients in group B (intermediate risk of recurrence) reached major rates of curation of cancer compared with group A (High risk of recurrence) (53,8% vs 14,3%, p= 0,02). Patients with negative PET/CT reached major rates of curation of cancer compared with positive PET/CT patients (50% vs 7,4%, p=0,03). Multivariate analysis identified negative PET/CT study as main factor associated with curation (OR = 22,7 ; p=0,035). Negative PET/CT Patients showed shorter time for reach curation than others (p=0,003). CONCLUSIONS: 18F-FDG-PET/CT in initial diagnosis of high-intermediate risk of recurrence CDT patients allows identify that with major probability of curation. A negative 18F-FDG-PET/CT study has a positive prognostic value in these patients.

P0599

The Diagnostic Effectiveness of 99mTc-Sestamibi SPECT/CT in Primary Hyperparathyroidism

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Aim:Primary hyperparathyroidism is mostly caused by parathyroid adenoma. Surgical removal of the offending glands is the only cure. Because that minimally invasive parathyroidectomy is emerging as the choice of treatment, 99mTc-sestamibi scintigraphy has become a routine imaging procedure in preoperative localization of hyperfunctioning parathyroid glands. Recently, SPECT/CT has been shown to significantly improve the sensitivity and the anatomic localization ability of the lesions with abnormal radionuclide uptake. Yet, the advantage SPECT/CT over planar imaging for localizing hyperfunctioning parathyroid lesions has not been firmly established. The objective of this study is aimed to evaluate the effectiveness of SPECT/CT relative to dual-phase planar imaging of 99mTc-sestamibi scintigraphy in diagnosing and locating parathyroid adenomas or hyperplasia for patients with primary hyperparathyroidism. Materials and Methods:We retrospectively evaluated the imaging results in consecutive 27 patients (20 females, 7 males; mean age 58.16+17.29 years old) with primary hyperparathyroidism, who had received parathyroid scintigraphy during Jan, 2007 and Jan, 2009 in our hospital before their surgical intervention. After intravenous injection of 370 MBq 99mTc-Sestamibi, each patient received dual-phase planar images at 20 minutes and 120 minutes and SPECT/CT at 90 minutes. Accuracies of SPECT/CT and planar imaging were determined from post-operative histopathology. Results:The SPECT/CT showed 22 TP, 6 FP, 6 TN and 3 FN results while dual-phase planar imaging revealed 21 TP, 4 FP, 4 TN and 4 FN results. For diagnosing parathyroid adenomas or hyperplasia, the sensitivity, specificity and overall accuracy for SPECT/CT are 88%, 50% and 75.7%, and those for planar imaging are 84%, 50% and 75.8% respectively. The diagnostic accuracy of SPECT is not significantly different from that of dual-phase planar imaging (p=0.8192). SPECT/CT showed additional 1 TP and 2 TN results than planar imaging. Three lesions in 3 patients showed improvement in localizing parathyroid lesions using SPECT/CT. Conclusion:Our results demonstrate that SPECT/CT improves slightly the

sensitivity and localization ability of 99mTc-Sestamibi parathyroid scintigraphy without statistical significance.

P0600

Pinhole Collimator Double-Phase Scintigraphy with 99mTc-SESTAMIBI in Patients wirh Secondary Hyperparathyroidism Treated with Cinacalcet

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Aim: Cinacalcet is a safe and useful calcimimetic for reducing plasmatic levels of the parathyroidal hormone (PTH) in patients with secondary hyperparathyroidism, although paratyroidectomy is often necessary in refractory cases. Double-phase 99mTc-sestamibi scintigraphy has shown good results in the detection of parathyroid adenomas in primary hyperparathyroid patients, but its usefulness is less clear in the diagnosis of the multiglandular hyperplasia typical of secondary hyperparathyroidism. The aim of this study is to evaluate if Pinhole collimator-acquired images can improve the detection of hyperfunctioning parathyroid glands in patients with secondary hyperparathyroidism. **Materials and Methods:** Forty-two patients being treated with cinacalcet (between 15 and 120 mg/day) for secondary hyperparathyroidism were studied prospectively. Patients were divided into two groups according to their level of PTH, the hormone that defines response to treatment: responders (PTH<300 pg/mL) and non-responders (PTH≥300 pg/mL). Double-phase scintigraphy using 740 MBq of 99mTc-sestamibi was used to acquire early and late planar and pinhole collimator images 15 minutes and 2 hours post injection in all patients. All focal uptakes in any of the acquired images were considered positive. **Results:** PTH levels were in the range of 75-2631 pg/mL. The responder group comprised 24 patients while 18 patients were considered non-responders. At least one parathyroid gland with uptake was detected in 33/42 patients, with a total of 50 parathyroid glands located. The most frequent was the inferior right (n=16) and the least frequent was the superior right (n=2). The number of glands with uptake per patient was 0 (n=9), 1 (n=18), 2 (n=13) and 3 (n=2). Overall sensitivity in the diagnosis of patients with hyperfuntioning glands was 21% and 33% respectively for early and late planar images, with 64% and 70% for the pinhole images. In the responder group these figures were 25%, 29%, 62% and 67%, while for non-responders sensitivity was 56%, 72%, 83% and 89%. **Conclusion:** 99mTc-sestamibi scintigraphy is an appropriate diagnostic technique for secondary hyperparathyroidism in patients who are refractory to cinacalcet. The late pinhole collimator image was the most sensitive in the detection of hyperfunctioning parathyroid glands in this series.

P0601

18F-FDG PET / CT in Adrenal Incidentalomas

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INTRODUCTION: Adrenal incidentalomas are highly prevalent (4-10% of abdominal CT). Radiologic studies can often differentiate benign from malignant lesions, although they are indeterminate in a considerable percentage of cases. OBJECTIVE: To assess the contribution of PET / CT in adrenal incidentalomas in patients without known neoplasic background. MATERIAL AND METHOD: We retrospectively evaluated 11 patients (6 women and 5 men), who underwent PET / CT between May 2009 and December 2011, aged 28 to 81 years, no history of neoplasms, with adrenal incidentalomas (9 patients unilateral and 2 bilateral) in CT and /or MRI. The findings were interpreted as benign or malignant based on different methods of calculation: 1. Malignancy when SUV max > 3 found in the suspicious adrenal. 2. Malignancy if the SUV max of lesion was higher than SUV max of liver. 3. Malignancy when SUV max ratio of adrenal / liver SUV max was higher than 1.45. We calculated the S, E, PPV and NPV for each of them. RESULTS: 1. Accordingly to method 1: 6/13 lesions showed signs of malignancy (3 TP and 3 FP), and 7/13 criteria of benignity (7 TN). Sensitivity 100%, Specificity 70%, PPV 50% and NPV 100%. 2. Accordingly to method 2: 6/13 showed criteria of malignancy (2 TP and 4 FP), and 7/13 had benign criteria (6 TN and 1 FN). Sensitivity 66.6%, Specificity 60%, PPV 33% and NPV 85%. 3. Accordingly to method 3: 3/13 showed signs of malignancy (2 TP and 1 FP) and10/13 criteria of benignity (9 TN and 1 FN). Sensitivity 66.6%, Specificity 90%, PPV 66.6% and NPV 90%. CONCLUSIONS: Taking as a cutoff for malignancy an SUV max of 3 in the incidentaloma provides the best results in S and NPV, detecting all malignant lesions and avoiding unnecessary surgery in benign lesions.

P0602

Correlation of Serum Parathyroid Hormone Level with Size and Detectability of Parathyroid Adenoma on 99m-Tc SESTAMIBI Parathyroid Dual Phase Scintigraphy & Feasibility of Avoiding Delayed Imaging

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AIMS: 1. To correlate Serum Parathyroid Hormone (S.PTH) level with size of adenoma on SPECT/CT, postoperative tissue specimen and with the results of dual phase parathyroid scintigraphy (DPPS) for parathyroid adenoma. 2. To evaluate if early planar & SPECT/CT combined protocol for parathyroid imaging can replace delayed image of conventional DPPS. **MATERIALS & METHODS:** 1. 40 patients with primary hyperparathyroidism were studied. Fifteen minutes after intravenous injection of 555 MBq (15mCi) of Tc-99m sestamibi, a planar image followed by a SPECT/CT and a 3 hours delayed planar image were acquired. Two sets of images were evaluated; one early planar with SPECT/CT and the other with early & delayed planar image along with early SPECT/CT. Findings were compared with postoperative histopathology. 2. S.PTH levels were correlated with size of the adenoma on SPECT/CT, on postoperative tissue specimen and results of conventional DPPS for parathyroid adenoma. **RESULTS:** Out of total 40 patients of parathyroid adenoma we studied, 13 patients (33%) had S.PTH level of >1000 pg/ml and 27(67%) had <1000 pg/ml. S.PTH level ranged from >3000pg/ml to 163.6pg/ml with median of 409.9 pg/ml.38 patients had level >200pg/ml, all showed positive result on DPPS (sensitivity 100%) and 2 patients had <200pg/ml, one of which was negative on scintigraphy (sensitivity 50%) There was good correlation between S.PTH levels & size of the adenoma on SPECT/CT and postoperative tissue specimen. Out of 13 patients with S.PTH >1000, 11 showed size of >2 cm in maximum dimensions on SPECT/CT & 12 showed > 3cm in postoperative tissue specimen. Out of 27 patients with S.PTH <1000, 16 showed size of <1.5cm on SPECT/CT & 26 showed <2.5cm in postoperative tissue specimen respectively. In 22 patients with S.PTH levels > 400, parathyroid adenoma was localised in initial planar imaging with early SPECT/CT without any delayed scan in all patients except one case with associated thyroid nodule (sensitivity 95%). In 18 patients with S.PTH levels < 400, adenoma was localised in 8 patients without delayed imaging, while 10 patients required delayed phase imaging (sensitivity 44%). **CONCLUSION:** 1. There is good correlation between S.PTH levels & size of parathyroid adenoma on SPECT/CT, postoperative tissue specimen and detectability of parathyroid adenoma on DPPS. 2. Early planar imaging along with SPECT/CT can completely replace delayed phase image in patients with S.PTH level >400; while in patients with S.PTH level <400, some patients may require additional delayed phase imaging.

P0603

Determining the SUV Value of the Adrenal Incidentalomas with Positron Emission Tomography

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To determine the maximum SUV values for benign adenomas. We evaluated the patients with benign and non-secreting adenomas. This study was a retrospective and descriptive investigation. Patients who were followed for adrenal incidentaloma in the endocrinology department between 15.01.2010 and 15.01.2011 were retrospectively analyzed. The patients in whom an adrenal adenoma was diagnosed with MRI who were hormonally inactive were included in the study if they also had a F-18 FDG PET scan. The lesion was accepted as benign on follow up findings of at least 12 months and imaging results. Totally 33 patients and 44 adrenal adenomas were evaluated. Of the patients 10 were male and 23 were female. The hormonal inactivity was determined with the measurement of plasma ACTH for subclinical Cushing syndrome and suppression test with 1 mg dexamethasone (DST). The patients with a morning cortisol value below 1.8 g/dl after 1 mg DST performance was accepted as inactive for subclinical Cushing syndrome. The urinary excretion of catecholamine metabolites (metanephrine, normetanephrine, vanillylmandelic acid and homovanillic acid) were evaluated for pheochromocytoma and the patients' plasma aldosterone concentration levels and aldosterone/renin rate were evaluated in order to determine the primary aldosteronism. Cut off values were <15 ng/dL and <20 for plasma aldosterone concentration and aldosterone/renin rate, respectively. The patients with lower values were accepted hormonally inactive for primary aldosteronism. The average SUVmax value for adrenal adenomas was 2.48. There was not any calculated SUVmax value greater than 4.5 in our study group with adrenal adenomas. The average diameter of the adenoma was 2.35 cm (min:1.1, max:6.5 cm). There was a positive and moderate correlation between the size of the adrenal adenoma and the SUVmax value on FDG PET scan (p:0.022, r:0.346) statistically.

P72-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Conventional & Specialised Nuclear Medicine: Thyroid

P0604
Atlas of ectopic thyroid tissues

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Introduction:Ectopic thyroid tissue is an uncommon congenital aberration. To diagnose ectopic thyroid tissue , thyroid scan has been used successfully. Ectopic thyroid tissue may occur at any position in the path of thyroid descent.It is most common at the base of the tongue, just posterior to the foramen cecum, represents a failure of the thyroid to descend. In incomplete descent of the thyroid, the resulting final resting point of the gland may be high in the neck or just below the hyoid bone. With the availability of Nuclear medicine methods, however, it has become evident that, although usually small in mass, aberrant thyroid tissue does function. The use of Tc99m pertechnetate thyroid scan in diagnosis has made the recognition of ectopic thyroid tissue relatively simple in most instances. The tongue or along the route of descent of the gland does not necessarily give rise to symptoms or demand surgical removal. Thyroid scan of midline neck masses including thyroglossal duct cysts will prevent needless removal of the occasional normally functioning ectopic gland. Ectopic thyroid tissue is an uncommon congenital aberration. It is further unusual for ectopic thyroid to be present at 2 different sites simultaneously. It is extremely rare to have three ectopic foci at three different sites. Here we present 4 cases of ectopic thyroid tissue at different locations. Discussion : In these cases most common presentation was swelling in front of neck.Hypothyroidism with elevation of thyrotropin (TSH) secretion is commonly present because of the absence of a normal thyroid gland in most instances. An enlarging mass commonly occurs during infancy, childhood, or later life often, this mass is mistaken for a thyroglossal duct cyst because it is usually located in the same anatomic position .If it is removed, all thyroid tissue may be ablated, a consequence that has definite physiologic as well as possible medico legal implications.To prevent total thyroid ablation, it is recommend that a thyroid scan examination be performed in all cases of thyroglossal duct cyst before its removal to be certain that a normal thyroid gland is present. Preoperative thyroid scan helps in establishing diagnosis of ectopic thyroid which is the only functioning thyroid tissue. Thus, it prevented unnecessary surgery. Therefore it is suggested that thyroid scan and USG/ CT scan must be done as routine work up in neck swellings pre operatively to avoid unnecessary surgeries.

P0605
Is ^{99m}Tc scintigraphic thyroid imaging replaceable by colour duplex sonography for diagnostic of focal functional thyroid autonomy?

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Aim: Despite improved iodine supply in Europe, the prevalence of iodine deficiency caused nodular goitre as well as functional autonomy (plummers disease) is high. For diagnosis of autonomic adenoma, Guidelines provide thyroid scintigraphic imaging for nodes of >1 cm in diameter. However, it is repeatedly discussed that colour duplex sonography (cds) allows a reliable diagnosis of focal thyroid autonomies and therefore may replace thyroid scintigraphic imaging with ^{99m}Tc-pertechnetat (tsi). Therefore, the aim of the study was to compare cds with tsi. Methods: 191 patients suffering from thyroid nodes larger than 10 mm in diameter were examined with cds and tsi. Doppler-ultrasound measurement was done in the most active area marginal and/or central in the parenchyma of the thyroid nodule. The following parameters were determined: maximum flow at the margin (Vmax-perinodular) and at the centre of the nodule (Vmax- intranodular), resistance index (RI) perinodular and intranodular as well as pulsatility index (PI) perinodular and intranodular. The obtained data were correlated with scintigraphic ^{99m}Tc thyroid uptake. In addition, volume, length, width and depth of the node were determined and compared to the ^{99m}Tc Uptake. Statistical evaluation was performed with spearman-correlation. Results: In total, 282 thyroid nodules detected by conventional ultrasound imaging were further examined with cds and tsi. 189 thyroid nodules were confirmed as autonomic adenoma by tsi and fT3, fT4 and TSH-basal. No correlation between scintigraphic ^{99m}Tc uptake and perinodular Vmax- (p=0.11), -RI (p=0.84) and -PI (p=0.53) could be detected. In only 49 out of 189 autonomic thyroid nodules an intranodular Vmax, RI and PI could be measured. There was also no significant correlation to scintigraphic ^{99m}Tc uptake (intranodular Vmax p=0.88, -RI p=0.38, -PI p=0.52). As expected, a significant correlation between scintigraphic 99mTc uptake and volume, length, width and depth of the autonomic adenoma was found (p<0.0002). Conclusion: In cds neither periphery nor intranodular flow showed any significant differences between cold and hot nodes. The fundamental failing of cds is the high intra-observer variability and intra-observer variation. Therefore, an exact reproducibility is not possible. Further disadvantages of the cds are for example that not all vessel sections can be displayed (so called black spots) and the fact that vessels with tight lumen are not ascertainable authentic. Therefore cds can not replace tsi in the diagnostics of focal thyroid autonomy.

P0606
Analysis of Critical Parameters for Radioiodine Remnant Ablation in Patients with Differentiated Thyroid Carcinoma

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Aim: to assess the required amount of radioiodine (RAI) in patients with differentiated thyroid carcinoma (DTC) after thyroidectomy depending on the pathohistological findings and TNM classification. ***Materials and Methods*:** From 2003 to 2010 a total of 140 patients with DTC were treated, 114 women and 26 men, median age of 52 (range 22-82). All patients underwent total or near-total thyroidectomy. They were divided with regard to their tumor size into ≤ 1 cm and > 1 cm tumors. Considering pathohistological findings, patients were classified into four groups: A- presence of peritumoral *connective* tissue; B - presence of connective tissue sheath with vascular invasion; C- presence of extrathyroidal invasion; D - multicentric tumor. The administered RAI dose to the residual tissue after thyroidectomy depended on the tumor size, pathohistological findings and spread of disease. ***Results*:** papillary carcinoma was diagnosed in 117 patients (83.6%), follicular carcinoma in 17 (12.1%), and Hürthle cell carcinoma in 6 patients (4.3%). Papillary carcinoma ≤ 1 cm was found in 22 (18.8%) patients (N0M0), in 95 patients (81.2%) the carcinoma was >1 cm (n=68 N0M0; n=23 N1M0; n=4 N1M1 stage). Among patients with papillary carcinoma in group A (n=33) 11 received RAI ablation. In groups B (n=48), C (n=23) and D (n=13) all patients received RAI ablation. Thirteen patients with papillary carcinoma ≤ 1 cm received a single RAI ablation with a mean dose of 3110 MBq. Among patients with papillary carcinoma > 1cm, 82 received RAI ablation with a mean dose of 3378,6 MBq. Radioiodine ablation with 3700 MBq was administered to one female patient with follicular carcinoma ≤ 1 cm (N0M0 stage). Connective tissue sheath with vascular invasion was found in all follicular carcinomas > 1cm (n=16), extrathyroidal invasion in one patient, and one patient had regional lymph node metastasis (N1M0). Fourteen patients with follicular carcinoma >1 cm, received RAI ablation with a mean dose of 3246 MBq. All Hürthle cell carcinomas were > 1 cm, one patient had extrathyroidal invasion (N1M0), and 5 patients received RAI ablation with a mean dose of 3700 MBq. ***Conclusion*:** The obtained results indicate the value of tumor size assessment, detailed pathohistological analysis, and evaluation of disease spread when deciding on the dose of RAI after total thyroidectomy in patients with DTC. Administration of radioiodine after total thyroidectomy in DTC is a safe and effective therapy requiring individual approach when tailoring treatment.

P0607
The role of 99mTc-DTPA orbital SPECT in the management of patients with Graves' orbitopathy

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Objectives: Measurement of retrobulbar inflammatory activity (RIA) is crucial in Graves' orbitopathy (GO) for staging, prognosis, treatment decisions and follow-up. The current imaging methods characterizing disease activity are expensive (Somatostatins), or do not provide data on the connective tissue (MRI). Previously we showed that ^{99m}Tc-DTPA SPECT is a suitable tool for measuring RIA in GO, based on 252 orbital SPECTs performed in the last 3 years (2008-11). In the present work we compared orbital SPECT studies of patients before and after either steroid treatment or orbital irradiation, to measure the effectiveness of treatments. We also compared the results of the same patients obtained with 4 and 2-headed SPECT cameras. **Patients groups:** 57 pts with active GO undergoing immunosuppressive therapy, and 32 patients treated with standard external irradiation were involved in our retrospective study. In a third group (10 patients) SPECTs were performed on both a 4-headed and a 2-headed SPECT device to compare their image quality and the measured activity uptake (AU) values. **Methods**: SPECTs were performed on a Nucline Xring/4R camera before and 2 to 9 months after the initiation of immunosuppressive therapy, and before and 12 weeks after irradiation. 400 MBq ^{99m}Tc-DTPA was administered intravenously. In addition to visual assessment of the SPECT images, we also calculated the orbital activity uptake (AU, reference range: $4.7\text{-}12.0 \cdot 10^{-6}$ ID /cm^3). Data acquisition was performed first with the 4-headed, and then with the 2-headed SPECT camera in case of another 10 patients. **Results:** After steroid and irradiation therapies, improvement was observed only at higher initial AU values (mean AU $>12.3 \cdot 10^{-6}$ ID /cm^3). In the steroid therapy group the positive and negative predictive values of an initial AU >12.3 MBq/cm^3 were 76 % and 78%, respectively. We obtained comparable AU values with the 4-headed and 2-headed SPECTs, but the AU with the 2-headed SPECT tended to be lower.**Conclusion**: At a higher initial AU, both steroid or irradiation therapies are more effective in GO. In our hands ^{99m}Tc-DTPA

orbital SPECT is a suitable technique for selecting those GO patients who may benefit from steroid or irradiation therapy. Two- and four-headed SPECTs provide the same information, and both may be used for the staging and follow-up of patients.

P0608

What Happens to Normal Extra-nodular Tissue Uptake in Pre-toxic and Toxic Hot Thyroid Nodules?

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Aim: TSH regulates pertechnetate or iodine uptake by controlling thyroid function. Therefore, in patients with subnormal TSH levels due to the presence of hyperfunctional nodules, normal parenchyma should exhibit reduced functional activity. The aim of this study was to evaluate the relationship between the level of decrease in TSH and the functional inhibition degree of extra-nodular normal tissue, assessed by scintigraphy, in patients with overt or subclinical hyperthyroidism, in the presence of hot nodules. Materials and Methods: 129 patients (18 men and 111 women, age 26-91 years, mean 65.8 years) referred to our department for thyroid scintigraphy, either with ^{99m}Tc or ^{131}I, between January 2010 and December 2011, presenting hot nodules and low TSH levels (<0,4uUI/ml) were included in this study. In all cases, iatrogenic interference (amiodarone, anti-thyroid drugs, iodine contrast media, etc.) and diffuse thyroid hyperfunction were ruled out. After visual analysis, scintigraphic studies were divided in three categories, according to functional inhibition's degree of extra-nodular normal thyroid tissue: 1) no inhibition (29 patients); 2) partial inhibition (28 patients) and 3) complete or nearly complete inhibition (72 patients). Patients were also divided in three groups according to TSH levels: Group A - between 0.4 and 0.1uUI/ml (34 patients), Group B - between 0.1 and 0.01uUI/ml (42 patients) and Group C - <0.01uUI/ml (53 patients). For correlation of scintigraphic results with TSH values, a Pearson Chi-square test was used for statistical analysis. Results: Twelve cases of complete or nearly complete inhibition were found in Group A (16.7%), 17 in Group B (23.6%) and 43 cases in Group C (59.7%). The absence of inhibition was observed in 15 patients in Group A (51.7%), 10 in Group B (34.5%) and 4 patients in Group C (13.8%). In partial inhibition cases, 7 patients were included in Group A (25%), 15 in Group B (53.6%) and 6 patients in Group C (21.4%). Statistically significant differences in the degree of suppressed thyroid tissue were observed among the 3 groups ($p<0.001$). Conclusion: A strong correlation between TSH values and the level of functional inhibition of extra-nodular tissue was found. Nevertheless, in some cases there was no match between the level of sub-normal TSH and normal parenchyma inhibition degree; this may be a problem when ^{131}I treatment is proposed to preserve normal parenchyma in such situations.

P0609

Correlation of Scintigraphy and IIAB in the Evolution of Thyroid Nodules Malignity

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Purpose: In recent years, scintigraphy usage became limited in the evaluation of thyroid nodules with the development of different imaging methods. Especially as malignity incidence is high in hypoactive nodules, scintigraphy keeps its determinative role in choosing nodules for IIAB application. In this study, it is aimed to indicate scintigraphy is a valuable and still current method in the determination of hypoactive nodules with high malignity incidence. Material and Method: 500 patients underwent thyroid scintigraphy in 2009-2010 April in Bagcilar Training and Research Hospital Department of Nuclear Medicine. 146 patients had hypoactive thyroid nodule/nodules. 40 out of these 146 patients underwent fine needle aspiration biopsy. 37 female (age 19-70) and three male patients (age 36, 55, 56) were evaluated with thyroid scintigraphy and IIAB / postop. histopathology. Results Six malign cytology, 29 benign cytology, two papillary cytology and clinical control, three nondiagnostic cytology cases were observed. Four patients had papillary carcinoma (age 19, 27, 31, 68), one patient (age 19) had papillary carcinoma in follicular variant, and one patient had malign cytology (age 39). All of the patients were female. 29 patients were observed with benign cytology which consisted of cystic degenerate nodules, adenomatous nodules, hyperplastic nodules and lenfositic thyroiditis. Conclusion In this retrospective study, it was observed that ten to twenty five percent of hypoactive nodules have malign character which is concordant with the literature. In differentiating benign and malign hypoactive thyroid nodules, scintigraphy and fine needle aspiration biopsy are valuable and meaningful methods.

P0610

The clinical role of radioiodine therapy for Graves' disease in Japan after Fukushima radiological emergency

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Aim: Graves' disease (GD) is still important clinical problem, which is the most common cause of hyperthyroidism. In North America, the radioiodine therapy is adapted as the initial treatment for GD. However, Japanese and European patients usually choose the antithyroid drugs (ATDs) at first. In March 2011, tsunami disaster and Fukushima radiological emergency occurred, and mass media emphasize the risk of I-131 radiation exposure. The aim of this study is to investigate the clinical role of radioiodine therapy for GD in Japan after Fukushima radiological emergency. Materials and methods: A total of 21 patients with GD were treated in our department between April 2011 and April 2012. We retrospectively analyzed therapeutic method (ATDs, surgery and radioiodine therapy), their reason, clinical data and functional outcome. Results: Patients were 4 males and 17 females. Eight patients were treated with ATDs, mainly methimazole. Surgery and radioiodine therapy were performed in 11 patients and 2 patients, respectively. All surgery was subtotal thyroidectomy. Two patients with radioiodine therapy were administrated 3mCi I-131 radioactive iodine. Twelve of 13 GD patients, which performed surgery or radioiodine, were adapted ATDs therapy, initially. The other one was not performed ATDs therapy because of lactation. Two patients with radioiodine therapy were selected by ergasiophobia and inoperable neck condition of the cervical cord injury with quadriplegia. Otherwise, 11 patients with surgery were selected by side effect of ATDs in 4, long time administration of ATDs in 4, planned pregnancy in 2 and lactation in 1. Three of 4 patients with long time administration of ATDs have Graves' ophthalmopathy (GO), which should be avoid radioiodine therapy because of worsen of GO. Therapeutic complications of surgery and radioiodine was not occurred any patients. ATDs and surgery rapidly provide euthyroidism, but radioiodine therapy needs to ATDs after administration. Conclusions: According to our result, Japanese patients with GD after Fukushima radiological emergency treated the ATDs as initial treatment as same as previous report. The radioiodine therapy was adapted fewer patients than surgery.

P0611

Subacute thyroiditis management - diagnostics and follow-up using 99m-Tc-tetrofosmin

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Purpose of this study was to find out the relationship between accumulation of Technetium-99m (Tc-99m) tetrofosmin (Myoview) in thyroid gland, which may represent the floridity of subacute thyroiditis (SAT) as well as response to therapy. Material and methods: We performed 136 studies in 81 patients with SAT using 99mTc-pertechnetate scintigraphy and 99mTc-tetrofosmin imaging in acute disease before therapeutic induction, during the treatment and recovery. The final images were obtained and evaluated upon completion of therapy. Tc-99m tetrofosmin scans were interpreted both visually and quantitatively. Results: In all cases patients had the signs of thyrotoxicosis: fever, tremor of extremities, unexplainable fears and painful goitre. During the acute stage of SAT patients had a significantly poorer uptake of 99mTc-pertechnetate in the thyroid. While 99mTc-Myoview thyroid images at the same time showed diffuse increased uptake at 10 min and 1,5-2 hours p.i. The thyroid-to-background uptake ratio of tetrofosmin was associated with the stage of SAT: the slope of clearance curves in the acute stage and in the recovery we different. The uptake ratio assessed as thyroid-to-background uptake correlated with the serum concentrations of biochemical substances and immunological data. Conclusion: Stage of the inflammatory process and treatment assessment as the diagnostic and prognostic factors are significantly related to Tc-99m-Myoview thyroid scan findings in patients with SAT. Consequently, 99mTc-tetrofosmin may serve as an indicator of SAT's activity and help to monitor the severity of the inflammation process during the treatment.

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Conventional & Specialised Nuclear Medicine: Pulmonology

P0613

Role of V/Q scan (V/Q) as an initial imaging study in patients with chronic co-morbid cardiopulmonary diseases; approach by combining with the revised Geneva score (RGS).

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CTA became the most frequently performed diagnostic imaging tool for the evaluation of pulmonary embolism (PE) because of reduced invasiveness and greater availability. V/Q is performed when CTA is contraindicated, technically unsatisfactory or inconclusive. Often physicians ordered V/Q as the initial imaging

study when patients have multiple chronic co-morbid cardiopulmonary diseases. Authors try to find whether the combination of initial V/Q and RGS could make a guideline of the necessity of additional CTA without affecting diagnostic accuracy as well as patient care and management. Between Aug. 1st and Dec. 31st, 2011, 150 (51 M/99 F; 20-100 years old; median 65.2) patients had V/Q as the initial diagnostic imaging study for the evaluation of PE. 96 of 150 patients had underlying heart diseases while 58 with lung, 20 with renal and 10 with hematological diseases. Preset clinical probability of RGS for PE was categorized as high, intermediate and low. V/Q findings were categorized as high, intermediate, low and very low/normal. Additional CTA's were performed in 28 patients whom were carefully selected with strong clinical necessity and no absolute contraindications; 4 of them were technically unsatisfactory or inconclusive, so were eliminated from the evaluation. Preset clinical probability of RGS for PE was high in 1, intermediate in 91 and low in 58 patients. V/Q findings were high in 19, intermediate in 10, low in 62 and very low/normal in 59. CTA's were all negative for PE in 6 patients with "very low/normal" V/Q, regardless of preset clinical probability of RGS for PE. 54 of 58 "low" RGS patients had "low or very low/normal" V/Q; 3 patients in this group had CTA's which were all negative for PE. V/Q could be less diagnostic than a CTA. However, when V/Q is done as the initial imaging study, CTA could be avoided when 1) "very low/normal" V/Q, regardless of RGS; 2) the combination of "low" RGS and "low or very low/normal" V/Q. Overall, RGS has a low specificity in diagnosing PE but the combination of "low" RGS and "low or very low/normal" V/Q becomes very sensitive to exclude PE. V/Q is a vital initial imaging study for the patients with chronic co-morbid cardiopulmonary diseases in whom CTA would frequently be contraindicated. Proper combination of V/Q and RGS could not only lead to exclude PE effectively, but also reduce additional radiation and other morbidities in the patients who already have multiple chronic co-morbidities.

P0614

Lung Perfusion Scintigraphy: Diagnostic utility of Pulmonary Embolism during Pregnancy

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Introduction :Pregnancy is associated with an increase in the prevalence of venous thromboembolism, and pulmonary embolism (PE) is a major preventable cause of maternal mortality. However, the diagnosis of pulmonary embolism during pregnancy is challenging. The aim of this study was to determine the efficacy of lung perfusion scintigraphy as the first line investigation in pregnant women with suspected PE. Patients and Methods: We reviewed the perfusion scintigraphy of one hundred and five consecutive pregnant women referred to our institution for suspected PE, over the last 2 years. Exclusion criteria were history of PE or chronic lung disease. The age of the patient, duration of pregnancy and the clinical probability score (Geneva model) were recoeded. Lung perfusion scan (anterior, posterior, right and left posterior oblique views) was performed using an intravenous injection of 40 MBq of technetium 99m macro-aggregated albumin (Tc99m-MAA). Ventilation scintigraphy was not performed. Results: Mean maternal age at the time of investigation was 28.8 years (range 17- 42 years). Most patients presented in the third trimester of pregnancy (59%); 37% of patients were in the second trimester and 4% were in the first. The clinical probability of PE was high in two of the 105 patients (2%), intermediate in 37 (35%), and low in 66 (63%). Lung perfusion scans demonstrared four high probability scan (4%), 97 normal scans (92%) and four non-diagnostic (low or intermediate probability) scintigrams (4%). Among the 4 patients with high probability scan, 1 had high clinical probability and the 3 others had low clinical probability. There were no technical failures and all scans were of acceptable diagnostic quality. Perfusion scintigraphy achieved diagnostic results in 96% of patients. Conclusion: Lung perfusion scintigraphy performed for suspected PE in pregnant patients is diagnostically helpful in most cases, being predominantly normal. The use of perfusion scan as the primary investigation seems entirely warranted.

P0615

Tomographic Images Contribution of Pulmonary Ventilation and Perfusion Ratio and Images to Diagnosis of Pulmonary Embolism

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Aim: To analyze the contribution of SPECT ventilation-perfusion studies for the diagnosis of pulmonary thromboembolism (PET). **Material and Methods:** We acquired planar images of pulmonary ventilation and perfusion and SPECT images of ventilation and perfusion too. From tomographic images we obtained V / P ratio, subtracting the projections of ventilation to perfusion. After normalizing the count rate of ventilation to perfusion, we calculate the ratio V / P for each projection by the formula ***Q = V / (P-rV)***, where **r** is the result of dividing the acquisition time of ventilation study between the perfusion study. The Q ratio is calculated on the pixels obtained from the segmentation of the lungs in both studies. Before reconstructing the study quotient, the "erode" function was applied twice in order to reduce artefacts in the edge of the lungs. We analyzed visually the obtained images, both planar and tomographic including ratio images, describing the possible findings in the different projections, to give a positive or negative diagnosis of PET. **Results:** We included 13 patients of whom 10 (77%) were referred for diagnosis of acute PET and 3 (23%) for reassessment of old PET. Of the 13 studies, 7 (54%) were negative for pulmonary embolism and 6 (46%) were positive, according to the planar images. With tomographic images, negative diagnosis PET was changed to positive in 1 case (7.6%) and in 4 patients (57%), with positive PET, the number of affected segments increased, compared to planar images. **Conclusion:** The addition of SPECT image and the ratio V / P to the diagnosis of pulmonary embolism provides better assessment of the affected segments and increases diagnostic accuracy over planar imaging.

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Conventional & Specialised Nuclear Medicine: Gastroenterology

P0616

99mTechnetium-Labeled Red Blood Cell Scintigraphy in the Investigations of Gastrointestinal Bleeding

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Aim: Localization of the bleeding source is an important challenge in the management of the active gastrointestinal bleeding. 99mTechnetium-labelled red blood cell scintigraphy is a method that has been used for this purpose. The advantages of this investigation are its sensitivity for bleeding even at low flow rates, its non-invasive nature, no need for bowel preparation, detection of venous or arterial bleeding. It is also used not only for active gastrointestinal bleeding but also for recurrent one. The aim of this study was to evaluate the contribution of this examination to the diagnosis, localization and quantification of gastrointestinal bleeding. Materials and methods: Forty-four patients (36 children, 8 adults), were sent to our department for 99mTechnetium-labelled red blood cell scintigraphy to explore gastrointestinal bleeding. Thirty six patients had gastrointestinal bleeding: rectal bleeding in 30 patients, hematemesis in 7 patients and melena in 5 patients. The other 8 patients had anemia without exteriorized bleeding. Red cells were labelled in vivo: patients underwent an injection of a reconstituted solution of a Sn2+ agent (pyrophosphate) followed by injection of sodium 99mTc-pertechnetate 20 min later. Immediately after injection, abdominal dynamic acquisition was acquired for 40 min. Then static acquisitions were acquired every 30 min up 5-6 years and 24 hours after the injection. Results: Children were aged from 3.5 months to 16 years (mean ± SD = 4.92 ± 4.61 years, median 3 years). Adults were aged from 24 to 75 years (mean ± SD = 53.5 ± 18.23 years, median 60.5 years). 99mTc-labelled red blood cell scintigraphy was positive in 23 cases. The bleeding was localized in the small intestine in 12 patients, in the colon in 5 patients and in the stomach in one patient. In 3 cases, the bleeding was diffuse. In 2 cases, early images up to 6 hours not objectified intestinal bleeding but the delayed images 24 hours post radionuclide injection have shown a colonic abnormal activity; this does not allow locating the starting site of bleeding. In 21 cases, the examination was negative. Conclusion: Red blood cell scintigraphy remains a simple yet powerful method of localizing sites of gastrointestinal hemorrhage. It is safe, sensitive, noninvasive, and a useful mean to select patients for angiography and segmental resection. It should be the primary tool used in the diagnosis of patients with active gastrointestinal bleeding.

P0617

Comparison of liver scintigraphy and X-ray imaging in the patients with inflammation of liver.

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Aim: The aim of the study to evaluate the level of disease in patients with inflammation of liver using of scintigraphy and X-ray imaging. Material and method. 68 patients with inflammation of liver were imaged by a method of liver scintigraphy. Intestinal uptake was observed visually 30 min. after the intravenous administration of 500 MBq 99mTc MIBI. The scintigraphy was organized in anterior, posterior, oblique spot views of the liver region were obtained. The data of scintigraphy were compared with X-ray imaging. Results. Total number of 68 patients with scintigraphy of liver and X-ray imaging was statistically evaluated. 47/68 pts (69 %) with liver scans had in the field of liver cirrhosis process. However, on X-ray imaging, cirrhosis was identified in 6/62 pts (9 %) events only. In total there were 68 matching scans and statistical data showed overall good correlation

r=0,57. Within the group of different matching regions correlation varied: r=0,51 for hepatitis; r=0,47 for hepatitis with transition in cirrosis. Conclusion. Scintigraphy of liver is more sensitive and specific method of the determination to stabilities of the liver than X-ray imaging in the patients with inflammation of liver.

P0618

Frequent clinical dilemma; chronic dyspepsia. Role of HB scan with Cholecystokinin (HB-CCK)

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Dyspepsia is one of the most common symptoms in the general population that requires frequent visits to doctors and repeated tests. Quite often structural diseases responsible for patients' symptoms could not be found and also the most of available therapies are not effective for the relief of chronic dyspepsia. HB-CCK provides good qualitative information and also adds quantitative evaluation as the gallbladder ejection fraction (GBEF). Authors try to evaluate the role of HB-CCK and its significance for the work-up of chronic dyspepsia in patients with negative US/CT and upper and lower endoscopy. We reviewed the medical records of all patients who had HB-CCK between Oct. 2009 and Dec. 2011 for the retrospective analysis. Among 60 patients with chronic dyspeptic symptoms (Gp1), we excluded 21 patients who did not have both upper and lower endoscopy or had previous sphincterotomy, any biliary surgery, or on prokinetic medications (Gp1A). With a slow intravenous administration of CCK, GBEF was calculated and below 35% was considered abnormal. The presence of the late regurgitation of the radioactivity into the gallbladder or late duodenogastric regurgetation was also evaluated. Data were analyzed using SPSS; parametric methods were employed. During the above period, 83 patients had HB-CCK. 60 (19 M/41 F) patients had chronic dyspeptic symptoms while 23 had acute symptoms (Gp2). US/CT, upper and lower endoscopy were all negative in 39 (Gp1B; 12 M/27 F) of 60 Gp1 patients. Patients' median age in Gp1B was 51.2 (range 21-89). 22 of 39 Gp1B patients had a low GBEF (3-34 %; median 20.3%) (Gp1B1). The rest 17 had normal GBEF (Gp1B2); 3 patients showed significant late regurgitation of the radioactivity into the gallbladder; 2 patients showed late duodenogastric regurgitation. There was no significant difference between Gp1B1 and Gp1B2 in terms of age (p=0.714) or gender (p=0.708). Among 39 Gp1B patients with chronic dyspeptic symptoms but negative US/CT, upper and lower endoscopy, 22 (56.4%) patients exhibit a low GBEF (Gp1B1; gallbladder dyskinesia) and 3 of 17 Gp1B2 patients with normal GBEF showed significant late regurgitation of the radioactivity into the gallbladder (Sphincter of Oddi dysfunction). HB-CCK is a non-invasive and safe procedure. Recognizing gallbladder dyskinesia and Sphincter of Oddi dysfunction by the HB-CCK could lead to a suitable and effective treatment, resulting in the relief or cure of the patients' chronic dyspeptic symptoms.

P0619

Normal Values of Gallbladder Ejection Fraction In INDIAN Population Using ^{99m}Tc-sestamibi.

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Background & Aims. Sincalide, in conjunction with cholescintigraphy, is necessary to evaluate the gall-bladder ejection fraction, needed to diagnose cholecystitis (especially chronic acalculous type). However sincalide is not widely available and is expensive too. This study investigates the use of a simple easily available meal (comprising bread slices and sufficient & known amount of butter) as an inexpensive alternative to sincalide; to determine normal gallbladder ejection fraction (GBEF) values for the INDIAN referred population (no previous study) and usefulness of sestamibi in cholescintigraphy. **Methods**. We studied 55 patients aged 59.4 ± 13.5 years with body mass index 27.21 ± 4.5 who were referred for 99mTc-sestamibi myocardial perfusion imaging. These patients were examined to rule out any abdominal symptoms and absence of intake of any medicines known to affect the biliary tract. All were pre-screened with an ultrasound examination to exclude any abnormality. After 5 hours fasting, 20 mCi of 99mTc-sestamibi was injected intravenously during the stress phase of Myocardial Perfusion Imaging and 45 minutes later the subjects ingested the test meal (containing10 g fat).GBEF was calculated at 30 and 60 minutes after fatty meal ingestion. **Results.** GBEF at 30 minutes and at 60 minutes after fatty meal ingestion were 65.29 ± 22.51 % and 84.55 ± 17.36%, respectively. There was no statistically significant correlation between BMI/gender and GBEF. **Conclusion.** This study shows the usefulness of easily available fatty meal and the Tc- sestamibi in calculation of the gall-bladder ejection fraction. Lower limit of normal GBEF values was 20.27% at 30 min and 49.82% at 60 min using our "easily available" fatty meal, in the INDIAN population. However, in the clinical setting, potential overlap in the lower range of GBEF measurement between the healthy subjects and patients may happen, so pronouncing the result in terms of percentile rank, taken along with clinical picture of patient, may be the apt way of planning the management.

P0620

The impact of H. Pylori eradication therapy to the frequency of positive C-14 urea breath test results in patients with dyspeptic complaints

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The aim of this study was to evaluate the impact of H. Pylori eradication therapy to the frequency of positive C-14 urea breath test results in patients with dyspeptic complaints. Method: 283 patients (mean age: 37.3 ± 17.3, range:8-87) having dyspeptic complaints underwent C14 urea breath test for H. pylori positivity. Patients were grouped as; group1: patients who previously treated with H. pylori eradication triple therapy for 14- 28 days (n: 86) and group 2: untreated patients for H. pylori eradication (n:197). C14 urea breath test results for H. pylori positivity were compared between patient groups. C14 urea breath tests were performed 2 months after the completion of eradication therapy. Results: We observed no correlations between H.pylori positivity and clinical factors such as patient age, gender, ABO blood groups, Rhesus blood subgroups and smoking history for the patients. The frequency of H.pylori positivity was 48% in our patient population. 114 of 197 patients (58 %) had positive C14 test result among untreated patients (group 2). H. pylori positivity was significantly higher in untreated patient group compared to patients who received eradication therapy (group 1), p= 0.0001. However, C14 test result was still positive in 18 of 86 patients (21 %) who previously treated for H pylori eradication. Conclusion: In this study, we observed that, positivity of C14 urea breath test for H pylori infection is 21 % in patients who previously had H. pylori eradication therapy. C14 urea breath test is a sensitive, reliable and non-invasive method that can successfully detect early H.pylori re-infection following H. Pylori eradication triple therapy and/or therapy failure in patients with dyspeptic complaints.

P0621

Usefulness of dynamic hepatobiliary scintigraphy in Wilson's disease

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Wilson disease (WD) is an autosomal recessive disorder of copper transport due to defective hepatocyte-biliary copper excretion, resulting in pathological accumulation of copper in many organs and tissues, primarily in the liver and brain. Clinical manifestations related to copper accumulation in the liver include hepatic disease ranging from mild hepatitis to acute liver failure or cirrhosis. The aim of this study was to investigate the potential role of dynamic hepatobiliary scintigraphy (DHBS) in the evaluation of liver dysfunction in patient with Wilson's disease. Material and Methods: DHBS with 99mTc Mebrofenin were performed in 39 consecutive WD patients treated with zinc and/or penicillamine (19 males e 20 females; mean age 39±4 years) with clinical evidence of hepatic disease. All patients underwent standard biochemical liver function tests including ALT, AST,GGT,AP, TOT BIL, ALB, serum copper and caeruloplasmin, and 24-h urinary copper excretion. Liver biopsies were performed in all WD patients. Liver tissue was examined for routine liver histology (grading and staging of fibrosis) and hepatic copper content. DHBS was performed after 110 MBq99mTc Mebrofenin i.v. injection by time/frame acquisition 30 sec for 60 min. Time-activity curves were recorded from regions of interest placed over hepatic parenchyma (H) and main intra-hepatic biliary ducts (B). Quantitative analysis of the curves was performed using deconvolutional analysis and non-linear regression measuring the time to maximum peak counts intra-parenchimal (HTmax) and intra-ductal (B Tmax) and the time to T½ excretion (HT1/2 ;BT1/2) . Results: All patients had low serum caeruplasmin and copper levels, respectively (3.05±0.2mg/dl and 57±18µg/dl) and high 24h urinary copper excretion (201±42µg/24h). According to Metavir fibrosis staging 16 patients (41%) was classified as F1, 7 as F2 (18%), 10 as F3 (25%) and remaining 6 as F4 (16%) The analysis of DHBS quantitative data showed in almost patients slow hepatic uptake (>HTmax) and hepatobiliary excretion (>HT1/2). A positive correlation was observed between histological findings and Htmax (p=0,001), HT1/2 (p=0.006) and BTmax (p=0.02) values. Furthermore, in multivariate analysis, significative correlation was found between HTmax, HT1/2 BT1/2 and high fibrosis degree (F4) vs the other grading of fibrosis. No correlation was found between biochemical liver function tests, but bilirubin; (p < 0.01) and DHBS parameters. Conclusion: This study showed the clinical utility of the DHBS as noninvasive diagnostic modality to evaluate the liver fibrosis degree allowing to reduce the number of liver biopsy in the long-term follow-up in Wilson disease patients.

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Conventional & Specialised Nuclear Medicine: Haematology

P0622

Isotope lymphography for the evaluation of autologous stem cell transplantation in patients with chronic lymphedema.

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Aim:To determine the usefulness of isotopic lymphography for evaluating the efficacy of autologous stem cell implantation in patients with chronic lymphedema of the upper and lower limbs. Material and Method: Were studied thirteen patients from the Institute of Hematology and Immunology of Havana with the diagnosis of unilateral chronic lymphoedema (ten of the lower extremities and three of upper extremities). Were performed clinical evaluation and isotopic lymphography, before and six months after autologous stem cell transplantation. Were performed multiple injections in the course of the superficial and profound lymphatic torrents. The Axillary and inguinal region was injected depending on the affected limb. At each site of injection was given a volume of 0.75 to 1 ml of cell suspension. The isotopic lymphography was performed after simultaneous administrationsubcutaneously of 185 MBq (5 mCi) of ^{99m}Tc rhenium sulphur colloid in the interdigital space of both limb. Was acquired a dynamic image the first 20 minutes. Planar images were acquired (anterior and posterior views) at thirty minutes, an hour and three hours after the radiopharmaceutical administered. The healthylimb was considered as control for each individual. The anatomy and function of the lymphatic system were evaluated. Results: The mean age of patients was 34 ± 14 years. The 69.2% were secondary lymphedema. The 100% of upper limb lymphedema were secondary surgery and radiation for breast cancer. Anatomic evaluation by isotopic lymphography before treatment showed: 61.5% of case with absence of lymphatic vessels and 34.5% with lymphatic hypoplasia. The functional evaluation revealed: 7.7% with mild lymphatic insufficiency, 23.1% with moderate lymphatic insufficiency and 69.2% with severe lymphatic insufficiency. The comparison between the results of isotopic lymphography before and six months after of the autologous stem cell treatment showed: 15.4% of patients with mild improvement (n = 2) and 46.1% evident improvement (n = 6). In 38% of cases showed no changes (n = 5). The cross-comparison between the response to treatment and type of lymphedema demonstrated improvement in the 25% of the primary lymphedema and in the 77.8% of the secondary lymphedema. The 61.5% of all patients included in the study (n = 13) showed clinical improvement that was confirmed by the results of isotopic lymphography. The technique permitted the evaluation of therapeutic response. Conclusions: Isotope lymphography was useful for the evaluation of the therapeutic response in autologous stem cell transplantation of patients with chronic lymphedema of lower and upper limbs.

P0623

99mTc-Sulphur Colloid Scintigraphy in the Detection of Accessory or Residual Splenic Tissue

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Aim: Accessory spleen is the duplication of splenic tissues occurring in approximately 10% of the population. It is a common congenital anomaly but it may be diagnosed following spenectomy, in this case we have to separate it from splenosis who is an heterotopic tissue autograft after trauma or splenectomy. Most diagnostic questions about splenic location are readily answered by 99mTc-sulphur colloid scintigraphy. However, selective spleen scintigraphy with 99mTc-labelled red blood cells is especially important in the investigations of splenosis, asplena, polysplenia or accessory spleen syndromes. The aim of this study was to evaluate the contribution of 99mTc-sulphur colloid scintigraphy to the diagnosis of accessory spleen or splenosis. Patients and Methods: We conducted a retrospective study on 18 patients among them 6 children (1 male, 5 females) and 12 adults (3 males, 9 females) aged from 4 to 70 years, referred to our institution for suspected accessory spleen. Exclusion criteria were history of splenic trauma. Seven patients (38.9%) presented with idiopathic thrombocytopenic purpura (ITP), 3 with spherocytosis (16.7%) and 4 with thrombocytopenia (22.2%). The other indications were polycythemia vera in 1 patient (5.6%), beta-thalassemia major in another patient (5.6%) and different pathologies in the 2 last patients. Spleen scintigraphy was performed 15 minutes after intravenous injection of 180 MBq of 99mTc-sulphur colloid. Abdominal static images in the anterior, posterior, left profile oblique and left posterior oblique positions were acquired under a large field of view dual head gamma camera, coupled with low-energy general purpose collimator. Results: In the 2 cases after splenectomy we don't find any accessory spleen or splenosis. Among the other preoparative cases, 99mTc-sulphur colloid scintigraphy objectified splenomegaly in 8 patients (50%), normal spleen volume in 7 cases (43.75%) and decreased spleen size in the last case (6.25%). In all cases, 99mTc-sulphur colloid scintigraphy has formally rule out the diagnosis of a functional accessory spleen, thus guiding the surgical procedure to a simple splenectomy. Conclusion: 99mTc-sulphur colloid scintigraphy remains a simple yet powerful method for the detection of accessory spleen. It is safe, sensitive, noninvasive, and a useful mean for the detection of residual splenic tissue in splenectomised patients mainly if there is diagnosis difficulties. In fact, accessory spleen or splenosis may, when the seat or form are atypical especially at a distance of splenectomy, simulate disease neoplastic (primary tumors, tumor recurrence, carcinomatosis peritoneal ...), which may lead to an invasive procedure (biopsy, surgery).

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Conventional & Specialised Nuclear Medicine: Paediatrics

P0624

Radionuclide diagnosis of vesico-ureteral reflux.

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Aim: explore the diagnostic value of direct radionuclide cystography, indirect dynamic nephroscintigraphy with voiding sample and voiding cystography radiopaque in detecting vesico-ureteral reflux (VUR). Materials and methods: in order to detect vesico-ureteral reflux, a study involving two patient groups was conducted. The first group included 72 patients (42 boys and 30 girls) aged from 4 months to 17 years 11 months; the second group included 20 patients aged from 5 months to 8 years (5 girls and 15 boys). The first group was evaluated comparatively according to the results of dynamic nephroscintigraphy with avoiding sample and voiding cystography radiopaque; the second group - according to direct radionuclide cystography and voiding cystography radiopaque. Results: in the first group of patients out of 72 observations VUR was detected in: 23 patients according to voiding cystography radiopaque; 33 patients according to dynamic nephroscintigraphy with voiding sample; 16 patients there were detected matching results for both methods. It should be noted that the discrepancy between the results was found in 59.7% of children aged from 6 months to 3 years. In the second group of patients out of 20 observations: 16 patients demonstrated matching results for both methods; 4 patients showed a discrepancy between the results: in 3 patients two-sided VUR was detected by direct radionuclide cystography, and one-sided VUR - by voiding cystography radiopaque; in one patient one-side VUR was detected by indirect radionuclide cystography, while voiding cystography radiopaque detected none. Conclusion: 1) the method of diagnosing VUR in children older than 3 years old is an indirect dynamic nephroscintigraphy with voiding sample, as it is carried out under conditions as close as possible to physiological, and does not require a catheterization of the bladder or use of radiopaque agents. 2)the method of diagnosing VUR in children younger than 3 years old, with the immature type of urination, is a direct radionuclide cystography. This technique, in contrast with an indirect dynamic nephroscintigraphy with voiding sample, provides a reliable and objective assessment of the presence of VUR in both filling and emptying phases of the bladder, as well as allowing to determine the functional capacity which causes VUR, its intensity and duration. 3) In the absence of symptoms of VUR according to radionuclide studies (direct or indirect) a repeated urinary tract scintigraphy with an alternative method of introduction of radioisotope is recommended.

P0625

Renal cortical scintigraphy in children with first episode of febrile UTI

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Aim: Urinary tract infection (UTI) is a second most common infection in infants and young children. Renal infection may cause parenchimal scarring and requires more aggressive investigation and follow-up monitoring. The purpose of this study was to assess the role of initial cortical scintigraphy in young children with the first symptomatic UTI comparing scintigraphic findings with commonly required diagnostic tests and to investigate the diagnostic value of serum procalcitonin (PCT) level in prediction of renal parenchimal involvement. Material and Methods: A prospective study was conducted in 34 infants and young children (18 boys, 16 girls), aged 1.5-36 months (mean 9.8 ± 8.7 months), hospitalized with a first episode of clinically suspected APN. Within the first 5 days after admission, Tc-99m

DMSA renal scintigraphy, ultrasonography (US), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), white blood cell count (WBC), PCT levels and urine analyses were performed. Control DMSA scan was performed 6 month later. Results: The baseline DMSA scintigraphy showed changes consistent with APN in 27/34 (79%) patients, mean age of 10.9 months, 44% males and 56% females. At follow-up, 11 children (41%) were found to have cortical lesions. There were no statistically significant correlations between the frequency or size of the initial scintigraphic abnormalities and age, sex, body temperature, CRP levels or ESR. A CRP level of >54mg/L and a WBC of > 13.300/mm3 had sensitivities of 56 and 59% and specificities of 86 and 71%, respectively. US showed changes consistent with APN in 7/34 (21%) in the whole group and in 7/27 (26%) patients with positive cortical scan ($p<0.05$). The mean PCT level was significantly higher in children with APN than in those without renal lesions (2.45 ± 3.01 ng/ml vs 0.45 ± 0.20 ng/ml, $p<0.01$). For the prediction of APN the sensitivity and specificity of PCT measurements were 93.5% and 60.9%, respectively. No correlation was found between elevated PCT level and renal scarring. Conclusion: In the absence of specific symptomatology in infants and young children, initial DMSA renal scintigraphy is a sensitive method for the early diagnosis of APN. Clinical, biological and ultrasound parameters do not identify children with renal damage. Normal DMSA study, excluding parenchymal involvement and late sequelae, could minimize the use of scintigraphy in the follow up. Serum PCT level is an sensitive marker for early diagnosis of APN, but inadequate for prediction of permanent renal damage.

P0626

Role of quantitative parameters of renal output in the analysis of F+0 diuresis renography in children

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The objectives of our study are to evaluate the significance of parameters describing renal output: NORA 20/2, NORA PM/2 and ROE 20 in distinguishing between obstruction and non obstructive dilatation in case of early Furosemide stimulation in children, and to determine the role of these parameters in decreasing the number of equivocal findings. Materials and methods: investigation was carried out in 33 children aged two months to 12 years (median 19 months). 63 kidneys were analyzed. Dynamic scintigraphy was done 22 minutes after Tc-99m MAG3 bolus injection. Minimal dose was 15 MBq. 132 images of 10 seconds were recorded. Furosemide was injected at the end of second minute. Post void static image of 60 seconds was performed in 60 minute. Renograms were analyzed and according to Tmax, T½ and visual assessment of dynamic and post void images were classified in four groups: Group A: 35 normal curves; Group B: 11 obstructive curves; group C: 9 hypotonic non obstructive curves and group D: 8 equivocal findings. For the quantitative analysis, "The International Atomic Energy Agency Software Package for the Analysis of Scintigraphic Renal Dynamic Studies" was used. Results: Values of NORA 20/2 were: Group A: Mean: 0.21; Min. 0.12; Max. 0.40; Group B: Mean: 1.59; Min. 0.72; Max. 2.39; Group C: Mean : 0.45; Min. 0.31; Max. 0.68; Group D: Mean: 0.82 Min. 0.42; Max. 2.01. Results of ROE 20 were: Group A: Mean: 96%; Min 91%; Max. 98%; Group B: Mean: 69%; Min. 54%; Max. 84%; Group C: Mean: 89%; Min. 85%; Max. 94%; Group D: Mean: 81% Min. 52%; Max. 94%. Values of NORA PM/2 were: Group A: Mean: 0.01; Min. 0.0; Max. 0.03; Group B: Mean: 0.20; Min. 0.03; Max. 0.95; Group C: Mean : 0.02; Min. 0.01; Max. 0.04; and Group D: Mean: 0.03 Min. 0.01; Max. 0.09. Statistical difference was significant between Group B and C for all three parameters ($p<0.01$). Of 8 kidneys with equivocal finding, 6 were found to be non obstructive and 2 obstructive. Two kidneys that were classified as obstructive were found to be non obstructive. Significant linear correlation between NORA 20/2 and ROE 20 was found ($r=-0.93$). Conclusion: NORA 20/2, ROE 20 and NORA PM/2 are sensitive parameters of renal output. They help to reduce the number of equivocal results. Cut off values for NORA 20/2, ROE 20 and NORA PM/2 that exclude obstruction are: ≤0.7; ≥84% and ≤0.05, respectively.

P77-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Conventional & Specialised Nuclear Medicine: Uronephrology

P0627

The superiority of Cr-51-EDTA glomerular filtration rate (GFR) measurement for the proper evaluation of the living renal donor candidate

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INTRODUCTION: GFR is the best measure of overall renal function. Since urinary clearance of inulin is a difficult technique, it has been replaced as the clinical gold standard by the measurement of plasma clearance following bolus injection of alternative filtration markers, most commonly Cr-51-EDTA. The Modification of Diet in Renal Disease (MDRD), the Mayo Clinic Quadratic (MCQ), the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) and Cockcroft-Gault (CG) equations have also been proposed to estimate GFR. The aim of our study was to test the accuracy of several GFR estimations in healthy living renal donor candidates. ***MATERIALS & METHODS***: A total of 127 healthy adults (100 F, 27 M, mean age 56.5 y.o.) underwent Cr-51-EDTA GFR measurement as part of a routine work-up for potential kidney donation. All of them had sufficient clinical and laboratory data to estimate GFR, including age, gender, weight, height, and serum creatinine (SCr). As healthy adults were characterized those donors that had SCr<1.3 mg/dl. A protocol of GFR measurement by 3.7 MBq of Cr-51-EDTA injection, three blood samples at 2, 3 and 4 hrs p.i. was performed. Volume of distribution was obtained by extrapolation of the clearance curve to zero time. GFR was scaled to a body surface area of 1.73 m^2. ***RESULTS***: The mean measured GFR was 98.8 ml/min/1.73 m^2 (range, 48.6 to 148.2 ml/min/1.73 m^2). In 12/100 females and 4/27 males GFR was found to be decreased (mean GFR 62.3 and 71.8 ml/min/1.73 m^2 respectively) and they were not suitable for donation. The mean estimated GFR values performed from CG, MDRD, MCQ AND CKD-EPI equations were respectively: 90.8, 84.1, 93.1 and 83.6 ml/min/1.73 m^2 respectively. Using current recommendations suggesting that living kidney donors should have a GFR of at least 80 ml/min/1.73m^2, 66, 79, 34 and 71 donor candidates would have been excluded, using the above equations. Using Cr-51-EDTA GFR as gold standard, sensitivity specificity and accuracy were respectively: 56%, 49% and 50% for CG, 81%, 40% and 46% for MDRD, 56%, 22% and 75% for MCQ and 69%, 37% and 49% for CKD-EPI equations. ***CONCLUSION***: Because of the increasing demand for organs, the suitability of the evaluated kidney donor is crucial. Performing this critical step using GFR estimations with several inaccurate equations, leads to unjustifiable donor candidates' exclusion. Our data suggest that Cr-51-EDTA GFR measurement is superior to other methods for evaluation of the living renal donor candidate.

P0628

Obese kidney donors: Should they be excluded from donation?

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INTRODUCTION: Kidney transplantation is the treatment of choice for selected patients with end-stage kidney disease. Kidney donors undergo evaluation with the central goal of confirming suspected health instead of suspected disease. Most transplant programs evaluate them by endogenous creatinine clearance and GFR-estimating equations. However, these equations are not so accurate and underestimate GFR especially in people with normal renal function. Higher baseline body mass index (BMI) is associated with lower GFR and most transplant programs exclude obese individuals. The aim of our study was to evaluate the measured Cr-51-EDTA GFR of living renal donor candidates according to their BMI and to verify if obesity should be an exclusion criterion for donation. MATERIALS & METHODS: A total of 204 adults (150 F, 54 M, mean age 58.3 y.o.) underwent Cr-51-EDTA GFR measurement. All of them had serum creatinine <1.3 mg/dl, regarded as being 'healthy' or 'normal'. A protocol of GFR measurement by 3.7 MBq of Cr-51-EDTA injection, three blood samples at 2, 3 and 4 hrs p.i., was performed. Volume of distribution was obtained by extrapolation of the clearance curve to zero time. GFR was scaled to a body surface area of 1.73 m2. According to their BMI, they were classified as normal (BMI<25, group I), overweight (BMI=25.0-29.9, group II) and obese (BMI>30, group III) individuals. RESULTS: Group I was consisted of 57 individuals (43 F, 14 M, mean age 57.4 y.o.), group II of 79 (53 F, 26 M, mean age 57.7 y.o.) and group III of 68 (54 F, 14 M, mean age 59.8 y.o.). Mean age was not differed statistically between these groups as well as mean values of serum creatinine (0.98 vs. 0.5 vs. 0.9 mg/dl, respectively). GFR measurements (mean±SD) were 97±20.8 ml/min/1.73 m2 for gr I individuals, 97.1±25 ml/min/1.73 m2 (gr II) and 96.2±21.8 ml/min/1.73 m2 (gr III), [p=n.s.]. Twenty-seven individuals were excluded from kidney donation due to decreased GFR (5/57 from gr I, 15/79 gr II and 7/68 gr III). CONCLUSION: In the literature, commonly used estimating equations for creatinine clearance and GFR perform poorly as donor BMI increases. However, radioisotope techniques have a better assessment of GFR. In our study increased BMI doesn't seem to play critical role in the decision of kidney donation suggesting that obese donors shouldn't be 'de facto' excluded. Cr-51-EDTA should be used as a confirmatory test to enhance clinical decision making in these circumstances.

P0629

The incidence of impaired kidney function in "healthy" donors. A Cr-51-EDTA GFR measurement study.

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Introduction: Living donor kidney transplantation is considered the best treatment for end stage renal disease. The accurate assessment of renal function of kidney donors in our hospital always includes the critical step of measuring GFR using 51Cr-EDTA. GFR is the volume of fluid in ml that is filtered by renal glomerular capillaries per min adjusted to the body surface area (BSA). The aim of our study was to evaluate the incidence of abnormal kidney function, measured by Cr-51-EDTA GFR, in healthy kidney donors. **Materials and Methods**: Among candidate kidney donors who evaluated in our hospital from September 2007 to December 2010, 209 individuals (157 women, 52 men, age 18-78 y.o.), had normal serum creatinine (sCr) levels (sCr<1.3 mg/dl in the 12 months period prior to GFR). For the measurement of GFR, 100 μCi Cr-51-EDTA were injected intravenously to each donor and three blood samples were taken at 2, 3 and 4 hours post injection expressing the Cr-51-EDTA clearance Volume of distribution was obtained by extrapolation of the clearance curve to zero time. GFR was scaled to a body surface area of 1.73 m^2. GFR normal values were classified according age, gender and BMI. **Results**: The mean measured GFR was 98.8 ml/min/1.73 m^2 (range 47.1 to 148.2 ml/min/1.73 m^2). In 24/209 (11.5 %) individuals, GFR was found to be decreased (mean GFR 63.8 ml/min/1.73 m^2, range 47.1 - 78 ml/min/1.73 m^2). Seventeen out of 24 individuals were females (10.8% of the total female population) and 7/24 were males (13.5% of the total males). No statistically significant difference was found between them and the rest of the study population according age (59.5 v.s. 58 y.o. for women and 61.3 v.s. 58.5 y.o. for men). **Conclusion**: Impaired renal function proved by Cr-51-EDTA GFR, despite normal sCr levels, is not rare situation. Since the central goal in the evaluation of kidney donors is to confirm suspected health instead of suspected disease, the accurate measurement of GFR with Cr-51-EDTA improves classification between normal kidneys and kidneys with disease.

P0630

Is Diurectic Renal Scintigraphy unfairly Neglected in Antenatally Hydronephrosis?

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OBJECTIVES: Postnatal approach toward antenatally diagnosed hydronephrosis (ANH) remains controversial. Algorithm of diagnostic procedures for hydronephrosis confirmed postnatally by ultrasound, recommended voiding cystouretrogram (VCUG) as first examination. Aim of this study was to determine the place of diuretic renal scintigraphy in diagnostic procedures. METHODS: In 37 infants with ANH (bilateral in 11 and unilateral in 26, comprising 48 renal units (RU) confirmed by postnatal ultrasound, diuretic renal scintigraphy (F+20 with ^{99m}Tc-MAG3 in 28 infants and ^{99m}Tc-DTPA in 9 infants) was performed. Diuretic response on renographic curve was assessed as good emptying, no emptying and partial emptying and findings were compared with VCUG. RESULTS: In total, morphologically normal kidneys were found in 20 (41.7%) and normal diuretic response in 23 (47.9%) RU. In infants with bilateral hydronephrosis characteristic scintigraphic morphological changes were found in 6 out of 22 (27.3%) RU. The pathological diuretic response was found in 6 RU too (1 with obstruction, and 5 with intermediate response). In infants with unilateral hydronephrosis morphological changes were found in 22 of 26 (84.6%) RU. The pathological diuretic response was registered in 19 of 26 (73.1%) of them (12 with obstruction, and with 7 intermediate response). Among all infants we found 5 VUR, none bilateral and 4 of them have morphological changes and 2 pathological diuretic respond. CONCLUSION: We consider diuretic renal scintigraphy unfairly neglected in algorithm of antenatally diagnosed hydronephrosis because of small number of refluxes as a cause of dilatation. Diuretic renal scintigraphy has no contraindications, is easily performed and most important has low radiation exposure which should be considered when choosing a study for kidney evaluation in infants. Higher pathological diuretic respond and more morphological changes recognised unilateral hydronephrosis as more serious condition than bilateral hydronephrosis.

P0631

Technetium99m DMSA scan as first investigation in identifying children at risk for vesicoureteral reflux and renal defects

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Objectives: To analyze and evaluate the results and relationships of DMSA renal scan and VCUG; to determine whether a negative DMSA renal scanning result can be used to replace VCUG to rule out the possibility of VUR in children with a first febrile UTI; to determine whether DMSA scans can predict the prevalence of VUR in children as well as predict those who will need VCUG. Materials and Methods: The medical records of 302 patients less than 5 years old who presented with a first febrile urinary tract infection and underwent VCUG and DMSA scan during a ten year period starting from 2000 to 2010 were reviewed retrospectively in a tertiary hospital in the Philippines. Patients with systemic diseases other than acute pyelonephritis/VUR and those with other concomitant anatomic or neurological abnormalities were dropped from the study. Included participants were then grouped according to age range: 1 day to 1 month, 1 to 12 months, 13 to 24 months, and 2 to 5 years. Results: The study consisted of 302 patients and 604 renal units. Males were 45.3% and females were 54.6% of the population. Computed odds ratio and relative risk associated with positive VUR and DMSA scan was at 4.15 [CI 2.93-5.908] and 2.398 [CI 1.924-2.989] respectively. This suggests that patients with positive DMSA scans are 4.15 times more likely to have VUR, or conversely, the risk of developing VUR with a positive DMSA scan is approximately 2.398 times than if DMSA results were negative. In this study, DMSA scan was found to be 96.6% sensitive in detecting VUR among patients with the condition and is 89.82% specific in detecting the absence of VUR among normal individuals [PPV 55.8% and NPV 76.7%]. Conclusion: The purpose of detecting VUR is not for the detection per se, but to protect the kidney from the harm that VUR might cause. We conclude that VCUG may not be necessary in all young children with first febrile UTI when the DMSA renal scan is negative. Avoiding VCUGs in children with negative DMSA renal scans could significantly reduce the use of this potentially traumatic test.

P0632

Quantitative analysis of diuresis renography: the role of NORA 20/2, ROE 20, ROE F+20 and NORA PM/2

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Aim of our study was to evaluate the significance of parameters describing renal output: NORA 20/2, NORA PM/2, ROE 20 and ROE F+20 in distinguishing between obstruction and non obstructive dilatation and in decreasing the number of equivocal findings of diuresis renography. Materials and methods: investigation was carried out in 111 patients aged 20 to 77 years (mean: 51.6 years). 198 kidneys were analyzed. Dynamic scintigraphy was done 40 minutes after bolus injection of 75-150 MBq Tc-99m DTPA. 240 images of 10 seconds were recorded. Furosemide was injected in 20 minute. Post void static image of 60 seconds was performed in 50 minute. All renograms were analyzed and according to Tmax, T½ and visual assessment of dynamic and post void images were classified in four groups: Group A: 51 obstructive curves; Group B: 67 hypotonic non obstructive curves; group C: 27 normal curves and group D: 53 curves with equivocal response to diuretic. For quantitative analysis, "The International Atomic Energy Agency Software Package for the Analysis of Scintigraphic Renal Dynamic Studies" was used. Results: For all parameters, mean value as well as lower and upper bound of 95% confidence interval were calculated. Values of NORA 20/2 were: Group A: 2.05; 1.89; 2.22; Group B: 0.94; 0.82; 1.05; Group C: 0.53; 0.50; 0.56; Group D: 1.02; 0.86; 1.19. Results of ROE 20 were: Group A: 63%; 60%; 66%; Group B: 83%; 81%; 85%; Group C: 90%; 89%; 91%; Group D: 81%; 78%; 85%. Results of ROE F+20 were: Group A: 79%; 76%; 81%; Group B: 93%; 92%; 93%; Group C: 94%; 94%; 95%; Group D: 91%; 90%; 92%. Values of NORA PM/2 were: Group A: 0.23; 0.21; 0.26; Group B: 0.08; 0.08; 0.09; Group C: 0.07; 0.06; 0.07; Group D: 0.10; 0.09; 0.10. Statistical difference was significant between Group A and B for all parameters ($p<0.01$). Significant linear correlation between NORA 20/2 and ROE 20 was found ($r= -0.98$). Conclusion: NORA 20/2, ROE 20, ROE F+20 and NORA PM/2 are sensitive and specific parameters of renal output. They decrease the percent of equivocal findings: 41 out of 53 equivocal renograms were shown to be non obstructive. The sensitivity and specificity of ROE F+20 and NORA PM/2 is higher in comparison with NORA 20/2 and ROE 20. Cut off values for NORA 20/2, ROE 20, ROE F+20 and NORA PM/2 that exclude obstruction are: ≤1.5; ≥75%; ≥89%; and ≤0.11, respectively.

P0633

Analysis of ^{51}Cr-EDTA measurements of the glomerular filtration rate (GFR); the dependence of patient type, relation of potential live kidney donor to recipient, and contrast-enhanced CT

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Purpose: ^{51}Cr-EDTA is used to estimate GFR to assess renal function. The dependence of GFR on the type of patient and whether live kidney donors are related to the intended recipient is reported. We determine whether renal function is reduced after contrast-enhanced CT. **Methods:** This retrospective study consisted of 355 subjects; 260 required a bone marrow transplant (BMT), 67 were undergoing assessment as potential kidney donors (PDs); the remaining cases had neuroendocrine cancer or required a liver transplant. GFR was estimated from the ^{51}Cr-EDTA plasma clearance using the 3 sample slope-intercept method; the results were normalised to a standard body surface area of 1.73 m^2 using Haycock's formula. Results were compared with the normal range. The cases were then split according to the type of patient. The difference between PDs that were related to the recipient and those that were unrelated was assessed. PDs were also split according to whether they had recently undergone a contrast-enhanced CT examination; since iodinated CT contrast is nephrotoxic it causes reduced kidney function and a lower GFR result. **Results:** There was statistically significant difference (p=0.001) between those patients that were representative of the normal population (PDs) and those requiring BMT. 9% of PDs were outside the normal range, this increased to 46% and 31% of those cases with neuroendocrine cancer and prior to a BMT respectively. Of the 67 PDs, no difference (p = 0.68) was found between those that were closely related to the intended recipient and those that weren't. 50% of PDs who had contrast-enhanced CT less than 24 hours prior to GFR assessment fell below the normal range. This decreased to 17% for those who had contrast between 1-5 days prior and 8% for those that had contrast less than 5 days before. Multivariate analysis revealed that of PDs that had contrast less than 5 days prior, 0% (n = 14) of unrelated PDs fell below the normal range, increasing to 15% (n = 34) for PDs that were related to the intended recipient. **Conclusion:** GFR results of PDs are within the normal range and are statistically different from patients who require treatment. It's recommended that GFR studies are performed at least five days after contrast-enhanced CT. Although the results of PDs appear to be independent of the relation of the donor to the recipient, multivariate analysis indicates that this may not be the case.

P0634

Performance evaluation of Schwartz (SE) and Updated Bedside Schwartz (UBSE) Glomerular Filtration Rate (GFR) prediction equations in a cohort of children and adolescents with neoplastic disease.

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Introduction : GFR predicting equations, based on endogenous renal function markers measurement, are widely accepted as a convenient substitute for the accurate, exogenous tracer plasma clearance methods of GFR measurement. The SE and the UBSE, validated against iohexol-GFR measurement, have been recently proposed as improved GFR estimators (eGFR-S and eGFR-UBS respectively) in children and adolescents with chronic kidney disease. Accurate GFR measurement is important in paediatric oncology for both chemotherapy dosing and nephrotoxicity assessment. As iohexol- and Cr-51-EDTA-GFR measurements are closely related, the present study is aiming to evaluate the suitability of eGFR-S and eGFR-UBS in paediatric oncology patients, using Cr-51-EDTA-GFR (mGFR) as reference. **Subjects and methods :** One hundred fourteen studies (30 baseline), were performed in 83 patients (age range 7 months-18 years; 41 females; 32/13/13/10/7/8 with leukemias/sarcomas/Wlim's tumor/lymphomas/neuroblastoma/other neoplasms respectively). mGFR was measured by the slope-intercept, 2 and 4 hours p.i. blood sample technique after i.v. administration of Cr-51-EDTA, indexed by body surface area calculated according to Haycock formula and expressed in ml/min/1.73 m^2. Serum Creatinine (SCr, in mg/dl), blood urea nitrogen (BUN, in mg/dl) and cystatin C (CysC, in mg/l) were measured by an enzymatic, NIST-IDMS calibrated method, a routine colorimetric assay and an immunoturbidometric assay respectively. eGFR-S was estimated from body height, sex, SCr, BUN and CysC and eGFR-UBS from body height and SCr according to SE and UBSE respectively. The differences between mGFR and eGFRs were evaluated with the Wilcoxon test, their correlation by linear regression analysis and their agreement by Bland-Altman analysis. Statistical significance was accepted at p<0.05 level. **Results :** Values represent mean±SD. SCr, BUN and Cys-C levels were 0.44±0.27 mg/dl, 25.0±11.1 mg/dl and 1.10±0.35 mg/l respectively. mGFR, eGFR-S and eGFR-UBS were 102.5±25.3, 92.2±26.4 and 135.7±50.7 ml/min/1.73 m^2 respectively. The differences mGFR-eGFR-S and mGFR-eGFR-UBS were 10.4±21.8 and -33.2±43.4 ml/min/1.73 m^2 respectively (p<0.0001 for both) and their 95% confidence intervals were -33.4 - 53.2 and -113.3 - 46.9 ml/min/1.73 m^2 respectively. The mGFR/eGFR-S and mGFR/eGFR-UBS correlations were moderate with r = 0.67 and 0.56 respectively, p<0.0001 for both. Within 10%/30% of the mGFR, 33.3%/ 84.2% and 27.2%/59.6% of the eGFR-S and e-GFR-UBS values respectively were found. **Conclusion :** Schwartz and updated bedside Schwartz GFR prediction equations significantly under- and overestimate respectively GFR as measured by the Cr-51-EDTA plasma clearance, showing a loose relationship and a poor agreement with the later and they are therefore clearly improper GFR estimators in the pediatric oncology population.

P0635

Simultaneous glomerular filtration rate (GFR) and extracellular fluid volume (ECV) measurement by Cr-51-EDTA plasma clearance study : is this accurate with six plasma samples only?

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Introduction : GFR measured by exogenous tracer plasma clearance is the gold standard for renal function assessment. In this context, simultaneous ECV measurement is both clinically relevant and also offers a meaningful GFR indexator. A 2-compartment model of tracer distribution is assumed and the multiple plasma sampling data are approximated by a biexponential function allowing for both GFR and ECV calculation. Typically, 10-12 plasma samples obtained during 4-5 hours p.i. adequate for accurate GFR and ECV measurement. Multisampling however is inconvenient to the patient and counting time consuming. The aim of the present study is the evaluation of GFR and ECV measurement with 6 blood samples only during 4 hours p.i. in comparison to 10 samples reference study. **Patients and methods :** Sixty-seven patients aged 59.8±15.0 years, submitted to GFR measurement for clinical purposes. After bolus i.v. injection of 3.7 MBq Cr-51-EDTA , 10 blood samples were drawn at 5/10/15/30/45/60/90/120/180/240 min p.i. through a closed, 2-syringe, system attached to patient's arm, invented to secure painless and sterile procedure. GFR and ECV were calculated after counting of 1 ml plasma samples for 60 min/sample in a 5-detector γ-counter (Wallac 1470 Wizard, Finland) and biexponential kinetic analysis for all the 10 plasma samples (GFR10, ECV10) and separately for 6 samples at 5/15/30/60/120/240 min p.i. (GFR6, ECV6). GFR, indexed by body surface area according to Haycock was expressed in ml/min/1.73 m^2 and ECV in l. GFR10, GFR6 and ECV10, ECV6 values were compared with paired t-test, their correlation was assessed by linear regression analysis and their agreement by Bland-Altman analysis. Statistical significance was accepted at the p<0.05 level. **Results :** Values and differences (D) as mean±SD, of GFR10, GFR6, DGFR10-6 and ECV10, ECV6, DECV10-6 were 55.8±28.9, 54.8±28.9, 1.0±1.5 (p<0.0001) ml/min/1.73 m^2, and 15.0±3.7, 15.2±4.0, -0.2±0.5 (p<0.0001) l. The GFR10-GFR6 and ECV10-ECV6 correlations were strong with r=0.999 and r=0.995 (p<0.0001 for both) respectively. The 95% confidence intervals of the differences DGFR10-6 and DECV10-6 were -1.9 - 3.8 ml/min/1.73 m^2 and -1.0- 0,7 l respectively. Conclusion **:** GFR and ECV resulting from 6 samples only analysis between 5 min-4 hours p.i. show strong correlation, close agreement and minimal differences (GFR underestimation by 1.0 ml/min/1.73 m^2 and ECV overestimation by 0.2 l) compared with the corresponding values resulting from 10 sample analysis. Six sample analysis should be preferred over the 10-sample one for simultaneous GFR and ECV measurement as being less bloody and cumbersome.

P78-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Conventional & Specialised Nuclear Medicine: Infection & Inflammation

P0636

Is leukocyte scan always necessary in patients with inflammatory bowel disease?

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Aim: Leukocyte scan is non-invasive procedure increasingly used in detection and follow-up of patients with inflammatory bowel disease (IBD), especially to decide whether the medical or surgical treatment should be undertaken. The aim of our study was to determine whether the inflammation markers (leukocyte count (WBC), C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR)), along with clinical parameters, could prove effective in identifying patients with IBD appropriate for leukocyte scanning. Materials and methods: A total of 61 patients, 51 with Crohn's disease (CD) and 10 with ulcerous colitis (UC), (31 males, 30 females, mean age 36.26 years), were examined from April 2010 till November 2011. Out of total participants, 40 were tested for follow-up to detect suspected relapses, while in 21 surgery was considered due to intestinal stenosis, established

by previous endoscopy and/or barium contrast radiology. Scintigraphy was performed using Tc-99m-HMPAO labelled leukocytes. Planar abdominal images were acquired at 1/2, 1, 2, 3, 4, and 24 h p.i. Scans with abnormal bowel uptake were considered positive in terms of active intestinal inflammation. The results were assessed qualitatively by experienced nuclear physicians and compared both with inflammation markers and with clinical parameters, according either to Crohn's disease activity index (CDAI) for CD or Truelove-Witt's score (TWS) for UC. Inflammation markers were considered to be elevated when WBC>10x109/L and/or CRP>10 mg/L, and ESR>20 mm/h. Active disease was defined as symptomatic with a CDAI score greater than 150 points and Truelove-Witts score greater than 6 points. Results: Out of 32 patients with normal inflammation markers, 27 (84%) had negative scans. In 29 patients with elevated markers scintigraphy was positive in 21 (72%). Among 27 patients with normal clinical scores, scans were negative in 23 (85%). Out of 34 participants with pathological clinical scores, 22 (65%) had positive scintigraphy. Significant correlations ($p<0.05$) were found both between positive scintigraphy and elevated inflammation markers, and between positive scintigraphy and pathological clinical scores. When laboratory and clinical parameters were both normal, only one patient had positive scintigraphy (5%). Only 3, out of 21 (14%) of those with elevated inflammation markers accompanied with pathological clinical scores had negative scans. Conclusion: Inflammatory markers (WBC, CRP, ESR) associated with CDAI/TWS scores can serve as valuable indicators to predict the leukocyte scintigraphy results in IBD. When inflammation markers and clinical scores are both normal, leukocyte scintigraphy is not necessarily indicated, not even preoperatively if surgery is considered due to IBD complications.

P0637

To explore the role of FDG-PET in evaluation of disease activity status in large vessel vasculitis and it's correlation with inflammatory markers

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Background and Objective: In addition to it's established role in oncology, the metabolic information provided by PET imaging is increasingly being explored in a host of non-oncological applications, one of them being inflammatory conditions like vasculitis. The disease activity status is estimated from the levels of general inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate. However, the non specific nature of these markers limits their potential role as good surrogate markers for evaluation of disease activity. In addition, the diagnosis of Takayasu arteritis often takes timebecausethe discernible appearance of vascular lesions is a long process. Early identification of the vascular inflammation may facilitate timely intervention before vascular deformities are established. We explored the potential use of F-18 FDG PET/ CECT in identifying and localizing large vessel arteritis and correlation acute phase reactants and clinical symptoms **Materials and methods:** 10 patients underwent F-18 FDG PET/ CECT examination for evaluating disease activity status of suspected/ known Takayasu arteritis. Patients fasted for 4 hrs. prior to imaging and all anti-inlammatory medications (if any) were withheld preceding 24 hrs. **Findings:** F-18 FDG PET images coregistered with CECT images demonstrated inflammatory activity in the aorta and it's branches, in 6 patients. Rest of the 4 patients didn't show any abnormal hypermetabolism on the PET-CT imaging. Two of these 4 cases were known cases of Takayasu arteritis while rest 2 were suspected in view of clinical profile and raised inflammatory markers. Among the 6 positive cases, 1 had normal levels of inflammatory markers. **Conclusion:** FDG PET was useful in correctly identifying identifying active disease , even when serology was normal, signifying incremental benefit of PET. In the subset of patients with normal PET findings, abnormal serology was eventually ascribed to other conditions like arthritis and tubercuolus synovitis, underlying the importance of PET in differentiating active disease in known cases from the chronic/ quiescent phase of the disease.

P0638

The role of the SPECT/CT in bone scintigraphy for osteomyelitis

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Aim:Early diagnosis of osteomyelitis(OM) is essential for successful therapy and prevention of complications. OM, may be diagnosis by 3-phase bone scintigraphy (PBS). PBS has high sensitivity but lacks specificity. The aim of our study was evaluated the role of SPECT/CT in PBS for the assessment of OM.Materialsand Methods : Eighty-five patients (34 female, 51 male; 16-82 years)with suspected OM with clinical and laboratory findings were included for examination. The anatomic regions of suspected bone infections; 41 foot, 14 knee, 10 tibia, 6 hip, 5 vertebra, 4 femur, 2 hand and 5 others. Perfusion images were started immediately after bolus injection of the 740 MBq Tc 99m MDP. After blood pool images were acquired. Whole body and static images were performed at 3 hours postinjection. Subsequently SPECT/CT was performed from the region of suspected OM. Once PBS and SPECT images were assessed together by two nuclear medicine physicians. SPECT/CT were evaluated and findings were compared with PBS and SPECT. Findings were categorized as normal, OM (acute or chronic), soft tissue infection (STI), others (tumor, cyst, fracture, degenerative, postoperative) and equivocal. The final diagnosis was verified by radiological imaging (MRI, CT), tissue culture, surgery and clinical -laboratory follow up. Results:PBS and SPECT: Normal in 5 patients, OM in 41 patients, STI in 2 patients, others in 21 patients, equivocal in 16 patients. PBS and SPECT were true positive for OM in 35 patients, true negative in 29 patients. False positive result was found in 5 patients (sensitivity 100%, specificity 85,2%). SPECT/CT : Normal in 5 patients, OM in 42 patients, STI in 8 patients, others 27 patients, equivocal in 3 patients. SPECT/CT was true positive for 0M in 41 patients (25 acute OM, 16 chronic OM), true negative in 39 patients. False positive result was found in 2 patients (sensitivity 100%, specificity 95,2%). SPECT/CT changed the diagnosis of 6 patients.Thirteen equivocal findings (PBS +SPECT)were confirmed 5 patients as OM, 2 patients as STI, 6 patients as others by SPECT/CT.Conclusion:SPECT/CT provides exact anatomical localization of increased radiactive uptake and allows differentiation between OM and STI. SPECT/CT differentiated chronic OM from acute OM with morphological changes. These are important for the choice of therapy. SPECT/CT changes the diagnosis of PBS and SPECT, decreased equivocal results.

P0639

Photopenic defects on Tc-99m-HMPAO-labeled leucocyte scan at sites of axial skeleton osteomyelitis

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Introduction-Aim: Scintigraphy with labeled autologous leucocytes is an established method for diagnosing osteomyelitis (OM) in the appendicular skeleton. Sites of active OM typically demonstrate increased labeled leucocyte accumulation. However, in some cases of OM of the axial skeleton a photopenic defect pattern on labeled leucocyte scan has been described. The aim of the study was to estimate the frequency of photopenic defects on Tc99m-HMPAO-labelled leucocyte scan (LS) at sites of proven OM, not associated with orthopedic implants, in the axial and proximal appendicular skeleton. Patients and methods: We reviewed LS performed on 356 patients referred to our department for clinical suspicion of bone infection, over a 5-year period. We selected LS performed on 20 patients with suspected infection of the axial and proximal appendicular skeleton, not associated with orthopedic implants. The sites of suspected infection included: sternum (n=3), hip/proximal femur (n=8), sacrum (n=2) and lumbar spine (n=7). LS images were acquired 4 hours p.i. SPECT imaging was additionally performed in 5 patients. We analysed the pattern of leucocyte uptake at the site of suspected infection and determined the frequency of photopenic defects. Seven patients additionally underwent bone scan, 2 gallium scan and 7 MRI. Final diagnosis was based on surgical, histological and bacteriological data or clinical follow-up. Results: Photopenic defects on LS were identified at 15 of the 20 sites of suspected axial skeleton OM and were associated with active OM in 11/15 sites. Among the 20 sites of suspected axial skeleton OM investigated, 13 sites of OM were finally diagnosed. Eleven of them (84.6%) presented photopenic defects on LS, 1/13 increased leucocyte uptake and 1/13 equivocal findings on LS. SPECT imaging improved the localization of photopenic defects. All pts with OM who underwent bone scan demonstrated increased osteoblastic activity at the site of photopenic defect on LS and 2/2 pts with OM who underwent gallium scan showed increased gallium accumulation at the site of decreased uptake on LS (mismatch pattern). MRI demonstrated bone marrow oedema compatible with OM in 7 pts with proven OM. Conclusion: In our study the incidence of axial skeleton OM presenting as photopenic defect on LS was high (84.6% of OM sites). Consequently, we suggest that the possibility of OM should be seriously considered when a photopenic defect is presented on LS at the site of suspected axial skeleton OM.

P0640

(18)F-FDG uptake in the root apex of teeth on PET/CT

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OBJECTIVE: The objective of this study is to investigate the relationship between high accumulation of 2-deoxy-2-[(18)F] fluoro-D: -glucose (FDG) in the root apex of teeth and CT findings on PET/CT. **METHODS:**Consecutive FDG-PET/CT scans of 2431 patients including cancer screening in Dec. 2011- Mar.2012 were evaluated. FDG uptake in the apical area that was higher than that in the liver was collected, and SUVmax was measured. Teeth were classified into four blocks: Anterior block (A), Middle block (M), Posterior block (P), and Third molar (T). The comparison of SUVmax and CT image was performed. **RESULTS:**Of 2431, 99 patients (4.07%) and 115 teeth showed PET positive findings in the apical area. Mean SUVmax was

4.01±0.84. On a block-based analysis, frequency of positive findings is the highest at P block (58/115, 50.4%). There was no significant difference in the value of SUVmax between blocks. On a detailed tooth-based analysis, the frequency of apical uptake was the highest at tooth #3 (n=21), and next tooth #14 (n=17). All PET positive teeth except third molar (106 teeth) showed widening of apical peridontal space and filling materials after endodontic therapy (root canal therapy) in root canal on CT. These findings strongly suggested apical periodontitis. PET positive third molars did not necessarily have the history of endodontic therapy, but the widening of periodontal space was seen in all third molars. Not only apical periodontitis but also pericoronitis should be taken into consideration in the case of third molar. Of 99 patients who showed PET positive findings, 45 people (55 teeth) underwent delayed scans 120 min after administration. The mean delayed SUV max (4.51±1.13) **was significantly higher than that of SUVmax (3.77±0.71 : p<0.0001). CONCLUSIONS:**FDG uptake in the root apex of teeth except third molar is considered to be based on apical periodontitis, but not dental caries. This finding should be taken into account when a head and neck FDG-PET image is interpreted.

P0641

Role of 18F -FDG PET/CT in the Diagnosis and Follow-Up of Patients affected by Chronic Pulmonary Aspergillosis

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Aim. Aspergillosis is a serious pathologic condition caused by *Aspergillus*. The aim of our study was to evaluate the role of the ^{18}F-FDG PET/CT in estimating the metabolic activity of the disease and in monitoring the response to time course. **MATERIALS and METHODS.** 81 cases of patients (50 males and 31 females, age range, 45-70 years), between 2004-2011, suspected for aspergillosis infection, were selected and underwent PET/CT using ^{18}F-FDG. All patients had serologic tests(identification of *Aspergillus*-specific IgE and IgG antibodies using immunofluorescence and radial immunodiffusion methods) and in 49 patients were compared with CT performed within 6 months. PET/CT was repeated in 38 of 81 patients. Suv max≥ 1.90 was considered as threshold for positive PET finding. PET findings were compared the specifics serologic tests findings. Minor criteria for diagnosis included culture findings for *Aspergillus* in sputum (variable sensitivity) and lung biopsies (commonly requested in aggressive disease). **RESULTS** PET findings were positive in 64/81 patients, in agreement to serologic test; the remaining 17/81 were negative. In 12/17 patients the PET / CT serological markers were also negative, 2/17 were operated on for pulmonary aspergilloma and serological markers increased, only 3/17 had increased PRIST (sensitivity 96%, PPV 93%). 49/81 patients had undergone CT within 6 months from PET study. In 42/49 there was agreement between PET and CT findings; in 7/49 were discordant for localization of disease (CT sensitivity 93%, PPV 85%). CT did not show localization of disease in 14% of cases. In follow up 39 patients were evaluated. In 29/39 serological markers were consistent with analysis PET/CT SUV max (sensitivity 97%, P<0.001). **Conclusion.** The PET / CT with 18F-FDG has revealed the presence and / or the quiescence of the aspergillosis. PET/CT is more sensitive and has higher PPV than CT. In follow-up is correlated with the microbiological data and allows to evaluate the time course of the metabolic activity of disease.

P0642

Detection of Abdominal Infections using 99mTc-antigranulocyte antibodies

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Purpose: The aim of the study was detection of abdominal infections by 99mTc-antigranulocyte antibodies. Methods and Materials: Total of 72 patients with clinical suspicion on abdominal or gastrointestinal infections was investigated. Results: There were 46 true positive (TP) findings (two lung abscesses, 3 subhepatic abscesses after surgery, 5 perianal fistulas, 3 chronic and 9 acute appendicitis, 12 abdominal and 4 pelvic abscesses, 6 M.Crohn, two ulcerative colitis), 18 true negative (TN) (10 hepatobiliary tumors, 4 gastric carcinoma, 4 colon carcinoma), and 8 false negative (FN) (4 abscesses subphrenic and 4 enterocolic fistula). False positive (FP) findings were not observed. The smallest lesion found was 18x17 mm. SPECT increased the number of TP findings from 34 to 46. Thirty of 46 infectious of inflammatory lesions could be detected in the early scan. Sensitivity was 85%, specificity 100%, positive predictive value 100%, negative predictive value 69% and accuracy 89%. Conclusion: According to our results, scintigraphy with 99mTc-antigranulocyte antibodies is a useful method for detection and assessment of exact localization abdominal infections, which is very important for the prompt and appropriate therapy.

P79-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Conventional & Specialised Nuclear Medicine: Bone & Musculoskeletal

P0643

Clinical utility of 18F-fluoride PET/CT in temporomandibular disorder with osteoarthritis: comparisons with 99mTc-MDP bone scan

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Purpose: The purpose of this study was to compare the clinical utility of ^{18}F-fluoride PET/CT with that of conventional ^{99m}Tc- methylene diphosphonate (MDP) bone scan in temporomandibular disorder (TMD) with osteoarthritis. **Methods**: Twenty-four patients with TMD who underwent both ^{18}F-fluoride PET/CT and ^{99m}Tc-MDP bone scans were enrolled. The temporomandibular joint (TMJ)-to-skull uptake ratio, TMJ-to-muscle uptake ratio, and TMJ-to-spine uptake ratio on ^{18}F-fluoride PET/CT and the TMJ uptake ratio on bone scan were measured. **Results**: Of the 48 TMJs in 24 patients, 35 TMJs were diagnosed as TMD with osteoarthritis, 8 TMJs as TMD with anterior disc displacement (ADD), and the remaining 5 TMJs showed no evidence of TMD (NED). The skull, spine, and muscle uptake on ^{18}F-fluoride PET/CT, which were used to determine the background uptake values, were varied among the patients and muscle uptake showed the least variability. All 3 uptake ratios on ^{18}F-fluoride PET/CT and the TMJ uptake ratio on the bone scan tended to be higher in TMD with osteoarthritis than in TMD with ADD or NED. Furthermore, all 3 uptake ratios on PET/CT showed significant correlations with the TMJ uptake ratio on the bone scan. Receiver operating characteristic (ROC) curve analysis for detecting TMD with osteoarthritis indicated that the TMJ-to-skull uptake ratio, TMJ-to-muscle uptake ratio, and TMJ-to-spine uptake ratio on PET/CT (0.819, 0.771, and 0.813, respectively) showed higher area under the ROC curve value than the TMJ ratio on bone scan (0.714). The TMJ-to-skull uptake ratio on PET/CT showed the highest sensitivity (89%) and accuracy (81%) of all uptake ratios. **Conclusions**: ^{18}F-fluoride PET/CT can help diagnose TMD with osteoarthritis with superior diagnostic ability and is a suitable alternative modality to a conventional ^{99m}Tc-MDP bone scan.

P0644

Efficacy of Yttrium-90 Synovectomy Across a Spectrum of Arthropathies Including Haemophilic Arthropathy in an era of Improved Disease Modifiying Anti-Rheumatic Drugs and Prophylactic Clotting Factor Administration

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Background To evaluate clinical response rates, duration of response and complication rates of yttrium 90 radiosynovectomy across a variety of arthropathies including haemophilic arthropathy in an era of improved disease modifying medication and readily accessible clotting factor replacement therapy. Methods Clinical response, duration of response and complication rates in 167 joints (119 consecutive patients 45F;74M mean age 52) with varying arthropathies refractory to conventional therapy treated with Yttrium 90 radiosynovectomy between January 2000 and December 2010 were retrospectively reviewed. Clinical response was classified as complete, moderate, mild or nil based on changes in pain score, size of effusion and range of movement. A complete or moderate response was considered satisfactory. Appropriate use of Chi squared tests and Pearson correlation were used to evaluate findings. Results Of the 167 joints treated, rheumatoid arthropathy comprised 46 joints, psoriatic arthropathy 37 joints, haemophilic arthropathy 38 joints, large joint mono-arthropathy 21 joints and miscellaneous arthropathy 25 joints. Satisfactory clinical response rate was significantly higher for large joint mono-arthropathy (85%) and lower for other arthropathy types (47-64%). A complete response was achieved in 49/167 (29%) of all joints treated. Strong correlation was demonstrated between degree and duration of response across all arthropathies (r=0.93-0.99). For completely responding joints, 90% had sustained symptom relief at 36 months compared to 41% for incompletely responding joints (p=<0.0001). Complication rates were low (2/167, 1.2%) and comprised one extra-articular injection and one intra-articular haemorrhage in a haemophilic joint. Conclusion In an era of improved disease modifying anti-rheumatic drugs and readily available clotting factor replacement therapy, yttrium 90 synovectomy remains a safe and effective procedure across a broad spectrum of arthropathies including haemophilic arthropathy and should continue to be considered when symptoms are refractory to conventional therapies. The procedure appears particularly effective in large joint mono-arthropathies which probably relates to differences in underlying pathophysiology between arthropathies.

P0645

Higher scrotal uptake ratio of ^{99m}Tc-MDP on bone scans in newly diagnosed prostate cancer: a reliable indicator of pelvic node metastasis

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Objective: Pelvic lymph node dissection (PLND) is the gold standard procedure for nodal staging in prostate cancer (PC) but less commonly used due to its invasiveness. More commonly computerized tomography (CT) and magnetic resonance imaging (MRI) are used although these have limited sensitivities and specificities. The aim of this study was to find out correlation between higher scrotal uptake ratio (SUR) of ^{99m}Tc- methylene diphosphonate (MDP) on bone scan and pelvic node metastasis in recently diagnosed patients with PC. **Methods**: This was a retrospective study which included 119 biopsy proven newly diagnosed PC patients who had bone scan from January 2008 till January 2012. MRI pelvis, Prostate specific antigen (PSA) and Gleason's score was available in all patients. Whole body bone scan was performed in all patients and SUR was calculated by dividing mean counts over scrotum and soft tissue over lateral aspect of right thigh. PLND was carried out within 2-3 weeks of MRI study in 68 patients. **Results:** Mean age of studied males was 70 ± 09 years with a mean PSA level of 56 ± 198 ng/ml. Prostate biopsy revealed adenocarcinoma in all patients with a mean Gleason's score 7 ± 1. Mean SUR was 2.86 ± 0.459. MRI was positive for pelvic lymphadenopathy in 50/119 (42%). PLND revealed evidence of nodal metastasis in 16/68 (24%) patients. Receiver operating characteristic (ROC) analysis revealed good diagnostic strength of SUR for nodal metastasis with a cut off value of > 2.99 with an area under curve (AUC) 0.708 [95% CI: 0.533-0.847, p value <0.05] and a mean sensitivity of 68.75% and mean specificity of 80%. Diagnostic strength of MRI for nodal metastasis was found to be low [AUC 0.566, 95% CI: 0.047-0.657, non-significant p value]. No significant correlation was found between SUR and PSA in 119 patients. **Conclusion:** We conclude that in newly diagnosed PC patients, higher SUR on bone scan has a high diagnostic accuracy for pelvic node metastasis. Furthermore, a bone scan with a SUR <2.99 and negative for bone metastasis can stratify newly diagnosed PC patients as low risk.

P0646

The Incidence of Hepatic Uptake on Bone Scintigraphy

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Introduction Bone scintigraphy is considered to be a very important imaging modality in daily practice for the investigation of bone pathology and occasionally for soft-tissue abnormalities, such as myositis ossificans, myositis, cellulitis and so on. However, the extraskeletal uptake of bone-seeking radiotracers is still an unexpected finding in most cases, with extra-osseous hepatic localization not being unusual. The recognition of specific conditions of this kind of tracer accumulation might greatly contribute to the overall clinical evaluation of the patient. The aim of our study was to describe the incidence of hepatic uptake on bone scintigraphy. Methods One thousand two hundred patients were retrospectively evaluated for hepatic uptake on bone scans. Six hundred and fifty three patients (54.4 %) underwent a bone scan for orthopedic reasons, 490 (40.8 %) for staging malignancies and 57 (4.8 %) for other reasons. Patients with hepatocellular carcinoma were not included. Scintigraphy was performed 3-4 h after the administration of the radiopharmaceutical. A whole-body bone scan and various spot views were done. Co-relative imaging and/or further studies were also obtained in selected cases. Results In 14/1200 patients' bone scans (1.2 %), hepatic tracer localization was recognized. The causes of this uptake were: liver metastases (6/14 pts, 42.8%), faulty radiopharmaceutical preparation (4/14 pts, 28.6%), hypercalcaemia (3/14 pts, 21.4 %), unidentified cause (1/14 pt, 7.2%). Conclusion Extra-osseous, hepatic uptake of bone seeking agents is not an unusual finding on bone scintigraphy. According to the literature, most common causes are considered to be faulty radiopharmaceutical preparation, previous 99mTc-SC liver scan and presence of metastatic deposits. Less common causes include altered calcium metabolism, diffuse hepatic necrosis, ischemic hepatopathy and amyloidosis. In our study the most common cause was liver metastases, while faulty radiopharmaceutical preparation is not unusual. Awareness of the underlying pathophysiologic basis of such uptake is of great significance, because not only provides important clinical information but it also enhances the diagnostic value of the study._

P0647

Clinical impact of ^{99m} Tc DPD 3D-SPECT-CT in single suspicious metastatic bone lesions

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Aim This study covers a sample of 52 patients, suffering from a malignant primary disease in the clinical history, where planar scintigraphy has no clear diagnosis. The impact of 3D-SPECT- CT in suspicious single bone lesions, for differential diagnosis and impact to further patient treatment, was reviewed. Materials and methods This study covers 52 patients (30 male, 22 female with an average age of 59 years). Each patient suffered from a histological proven malignant primary disease in the clinical history. One had a bladder cancer, 18 a prostatic cancer, 16 a lung cancer, 1 a testis cancer, 1 a carcinoid of the lung, 13 a mamma cancer, 1 a renal cell carcinoma and 1 an osteosarcoma. An Siemens Symbia T16 SPECT- CT (Siemens Medical Solutions USA, Inc., Malvern, PA) whole body bone scintigraphy was performed three hours after an intravenous application of 700MBq ^{99m} Tc DPD. Planar images were done (LEHR, 256 matrix, 2 detectors 15cm/minute); additionally a SPECT (120 positions 30seconds 2 detectors) and a low dose CT (120keV 30mA-effective) of the region of interest was performed. Results: The planar images detected 16 suspicious lesions within the ribs; using SPECT-CT 7/16 patients were visually diagnosed as metastatic infested and 9/16 as posttraumatic. The planar images detected 30 suspicious lesions in the vertebral bodies or near the vertebral joints; Synoptic diagnosis results in 11/30 metastatic infested and 19/30 as degenerative. The planar images detected 4 suspicious lesions in the femur; based on SPECT-CT 2/4 it was diagnosed as enchondroma and 2/4 as osteophytic. The planar images detected 2 suspicious lesions in the pelvis; 2/2 were diagnosed as degenerative changes, one metastatic lesion was additionally diagnosed in the sacrum with the SPECT- CT. In total 19/52 suspected lesions, discovered in the planar scintigraphy could be clarified as bone metastasis with the SPECT-CT. In one case SPECT-CT discovered one additional bone metastasis in comparison to planar scintigraphy. Conclusion: In suspected single bone metastases, that are detected by the planar scintigraphy, the additional SPECT-CT gains additional benefit in detecting metabolic lesions. This method is also capable to distinguish between benign and malignant bone lesions and therefore plays an important role for further patient treatment.

P0648

The value of radionuclide bone scintigraphy in patients with histiocytosis X

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Introduction: Langerhans' cell histiocytosis, also called histiocytosis X (HX), is a rare disease. Its frequency is estimated at 2-5 cases per 1 million per year. Head and neck localization of HX occurs in about 70% of cases; males are more frequently affected than females, age at presentation varies from a few months to 15 years. Diagnosis is usually based on radiographic demonstration of a destructive bone lesion arising from the marrow cavity and on characteristic morphologic findings. The purpose of our study is to evaluate the value of bone scintigraphy in HX. In 11 patients (8 males and 3 females; age range: 13 years) with different types of HX and skeletal lesions, whole body bone scintigraphy was performed at the time of diagnosis and /or during follow up, ± SPECT-CT. In 7 patients bone scintigraphy revealed areas with increased uptake which were associated to decreased radiotracer uptake in 3 cases. For 1 case no lesion was visualized scintigraphically. The predilection site of lesions was localized to the skull (unifocal frontal bone localization in 2 cases and multifocal in 3 cases). When SPECT-CT is performed, the fusion of CT and scintigraphy images showed that "cold" foci correspond to osteolytic area and the "hot" foci to osseous reconstruction shown in CT. Conclusion: In cases of HX, skeletal scintigraphy and CT are complementary methods that enable one to make an assessment of the extent of the disease. SPECT-CT if done provided additional information and seems to be a most valuable tool and it increases the certainty of the diagnosis.

P0649

Age-related changes in pre- and postmenopausal women as demonstrated by ^{18}F-fluoride PET

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Objective: To evaluate the relationship between age and regional skeletal uptakes at sites consisting of either predominantly trabecular or cortical bone using ^{18}F-fluoride positron emission tomography (PET) in pre- and postmenopausal women. **Materials and Methods:** Thirty-six women (40.6±13.9 years; age range, 16-72 years) were assigned to one of two groups: group 1 comprised 24 premenopausal women (32.3±7.6 years; age range, 16-48 years) and group 2 comprised 12 postmenopausal women (57.2±6.8 years; age range, 49-72 years). The maximum

standardized uptake value (SUVmax) was determined from the lumbar spine and the humeral shaft. The Student's *t*-test for each unpaired dataset was used to evaluate statistical differences between the two groups. The SUVmax values for the humeral shaft and the lumbar spine were compared with aging. **Results:** The SUVmax (mean±SD) was 1.3±0.5 in the humeral shaft and 4.9±1.3 in the lumbar spine. The SUVmax in the humeral shaft correlated significantly with advancing age (r=0.70, *P*<0.01). The SUVmax in the lumbar spine declined significantly with advancing age (r=-0.65, *P*<0.01). The humeral shaft of women in group 1 exhibited a significantly lower SUVmax compared to that in group 2 (1.0±0.4 versus 1.7±0.6; *P*<0.05). On the other hand, the lumbar spine of women in group 1 exhibited a significantly higher SUVmax compared to that in group 2 (5.4±1.2 versus 3.8±1.0; *P*<0.05). The mean SUVmax in the lumbar spine was 2.2 times greater than that in the humeral shaft in group 2. **Conclusion:** Semiquantitative analysis with ^{18}F-fluoride PET might be a useful tool for analyzing age-related changes in pre- and postmenopausal women.

P0650

Does increased weight lead to degenerative spine disease? An evaluation with bone scintigraphy

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AIM: Increased body weight is considered a causative factor for the development of degenerative bone disease. Its association, however, to degenerative spinal changes has not been established. This study aimed at evaluating the correlation between body weight and degenerative spine disease (DSD) with the use of bone scintigraphy. **MATERIALS AND METHODS:** A prospective study was conducted from December 2008 to February 2010 involving 116 patients, 64 men and 52 women, aged 27-92 years (average age of 68 years), who underwent bone scintigraphy. Patients were asked to complete a questionnaire providing the following information: age, profession, location of pain, reason for referral, history of orthopaedic interventions, surgeries, and other major medical history. Weight and height were measured in the clinic. Patients received 740 MBq (20mCi) of ^{99m}Tc MDP intravenously. Whole-body anterior and posterior images were performed at 2-4 hours post injection. Experts identified all image regions suggesting degenerative spine disease and classified them in terms of intensity on a 3-point scale. The body mass index (BMI) was calculated for all patients and was correlated to their level of activity, age, weight, height, and sex. Data were characterized with classical statistics while correlations between pairs of variables were investigated with linear and nonlinear correlation coefficients. **RESULTS:** Fifty three patients (46%) had DSD. In men, there was statistically significant correlation between DSD and activity level as well as age but not between DSD and body weight. In contrast, in women, although not statistically significant, there was a trend suggestive of a possible correlation between body weight and DSD. **CONCLUSION:** Increased body weight did not seem to be a risk factor for the development of DSD in men but a weak correlation was identified in women. The differences suggested that male and female patients may have to be evaluated with different criteria when back problem causes are investigated.

P80-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Conventional & Specialised Nuclear Medicine: SLN (Sentinel Lymph Node)

P0651

The Value of SPECT Lymphoscintiography for Sentinel Lymph Node mapping in Breast Cancer

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Introduction: Sentinel lymph node (SLN) biopsy is currently used for the axillary staging of breast cancer patients with clinically and radiologically negative regional lymph nodes. SLN mapping enables surgeons to determine the number and site of SLNs in the axilla; this contributes to the accurate staging and the utilization of minimally invasive excisional techniques that minimize lateral surgical damage. Lymphoscintigraphy is a non-invasive imaging modality that allows SLN identification. Several techniques have been described: planar imaging (PL), tomographic imaging (SPECT) and more recently (where available) SPECT/CT imaging. The aim of our study was to assess the value of SPECT in the preoperative SLN mapping of breast cancer patients. Materials and method: We studied 28 breast cancer women (age 30 to 80) with clinically and radiologically negative axilla. The technique involved the peritumoral injection of 1-2 mCi Tc-99m-nanocolloid. Anterior, anterior oblique and lateral planar images were obtained and the first hot spot first to appear along the lymphatic drainage system was identified as SLN; a skin mark was drawn over it as a guide to the surgeon. The same procedure was followed if more SLNs were detected. Sequentially SPECT imaging was performed and the number of the SLNs detected from the reconstructed images was evaluated. PL and SPECT results were compared to the intraoperative findings. Results: A total of 55 SLNs were surgically resected from 28 pts (1 SLN in 10 pts, 2 in 11 pts, 3 in 5 pts and 4 in 2 pts). Both PL and SPECT identified at least 1 SLNs in all 28 patients (identification rate 100%). The total number of SLNs identified by PL was 44 and by SPECT imaging 52. Agreement between surgery and PL on the number of SLNs was achieved in 13/28 pts, while SPECT accurately predicted the number of surgically identified SLNs in 21/28 pts. The surgically removed SLNs outnumbered the SLNs predicted by PL and SPECT in 12/28 and 5/28 cases respectively. Sensitivity for PL and SPECT regarding the number of intraoperatively identified SLNs was 52% and 81% respectively. Conclusion: SPECT imaging adds information on the number of breast SLNs in the majority of breast cancer patients. Even in the absence of SPECT/CT system, SPECT imaging alone can be used for the preoperative determination of the number and site of SLNs in order to avoid incomplete removal, contributing to the accurate axillary staging.

P0652

Planar Scintigraphy and SPECT/CT of SLN in Various Types of Tumours. Estimation of Some Factors Influencing Detection.

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Aim. Assess the role of planar lymphoscintigraphy and fusion imaging of SPECT/CT in sentinel lymph node (SLN) detection in patients with different tumours and estimation of some factors influencing of detection success - age and BMI. Methods. Planar scintigraphy and SPECT/CT were performed in 550 consecutive patients: 69 pts with gynecological tumours (37 with cervical cancer, 25 pts with endometrial cancer, 7 pts with vulvar carcinoma), in 161 patients with melanomas, and in 320 women with breast cancer. The radiopharmaceutical was injected around the tumour, subareolar or around the scar. Planar and SPECT/CT images were interpreted separately by two nuclear medicine physicians. Efficacy of these two techniques to image SLN were compared. We have estimated the influence of the age and BMI on the succes rate of SLN detection. Results. Planar scintigraphy did not image SLN in 77 patients in total (14,0 %); in 8 pts with gynecologic tumours, in 23 pts with melanomas and in 46 pts with breast cancer. SPECT/CT was negative in 49 patients (8,9 %); in 4 pts with gynecologic tumours, in 12 pts with melanomas and in 33 pts with breast cancer. In 199 (36,2 %) patients the number of SLNs captured on SPECT/CT was higher than on planar imaging. 35 foci of uptake (3,1 % from totally visible 1134 foci on planar images) interpreted on planar images as hot LNs were found to be false positive non-nodal sites of uptake when further assessed on SPECT/CT. SPECT/CT showed the exact anatomical location of all visualized sentinel nodes. Influence of the age and BMI: The group of patients with higher number of detected SLN on SPECT/CT than on planar scintigraphy had lower average age than the group of patients with the same number of detected SLN on SPECT/CT and on planar scintigraphy, the difference was statistically significant (P=0,008). BMI did not differ in these two groups. Conclusion. In some patients with gynecologic and breast cancers and melanomas SPECT/CT improves detection of sentinel lymph nodes. It can image nodes not visible on planar scintigrams, exclude false positive uptake and exactly localize axillary, inguinal, pelvic and paraaortal SLNs. It improves anatomical localization of SLNs. We have found the influence of the age on the difference of detected numbers of SLNs by the fusion of SPECT/CT and planar lymphoscintigraphy. On the other hand this difference was not influenced by BMI.

P0654

Clinical Relevance of Non-visualized Sentinel Lymph Nodes in Early Breast Cancer Patients during Lymphoscintigraphy

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The aim of this study was to define the clinical and pathological factors associated with non-visualization of sentinel lymph node (SLN) in the axilla during preoperative lymphoscintigraphy. **Method:** 249 patients (mean age: 49.2±10.8, range: 20-80) with early stage breast cancer underwent preoperative lymphoscintigraphy with intradermal and peritumoral deep injection of 37 MBq 99mTc-nanocolloid on the day of or day-before surgery. Serial anterior and lateral dynamic images and subsequent planar images were obtained. No hot spot detection at two or three hours after injection was defined as non-visualized SLN. All patients underwent bludye and gamma probe guided SLN biopsy during mastectomy. **Results:** Axillary SLN was successfully visualized on the preoperative lymphoscintigraphy in 212 of 249 patients (%86). In 37 patients (%14), scintigraphy

revealed no definite visualization of SLNs for up to two or three hours after injection. Patients with detected SLN and others were comparable in terms of tumor size (2.5 vs. 2.3 cm respectively), histological type and frequency of a previous surgical biopsy. Mean age and the frequency of axillary metastasis were slightly higher in patients with non-visualized SLN compared to patients with detected SLN (54 vs. 49 yr, and 57% vs. 42% respectively) however both did not reach statistical significance. Tumor locations were comparable between patients with detected SLN and others. The frequency of non-visualization of SLN was 17 % in patients with outer quadrant tumors and 6% in patients with inner quadrant tumors, p=0.05. **Conclusion:** Breast cancer patients with non-visualized SLN during lymphoscintigraphy have a slightly increased risk of axillary involvement compared to detected SLN in lymphoscintigraphy. Non-visualization of SLN may be caused by the shine through effect of the injection site especially from outer quadrant tumors. SPECT/CT can detect hot nodes missed by planar imaging and may help overcome this difficulty.

P0655

Comparison of 1-day and 2-day protocols for lymphatic mapping and sentinel lymph node biopsy results in patients with early stage breast cancer

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The purpose of this study was to compare the results of isotope injection the morning of surgery (1-d protocol) with isotope injection the day before surgery (2-d protocol) in early stage breast cancer patients undergoing sentinel lymph node biopsy (SLNB) and axillary dissection. Methods: 249 patients (mean age: 49.2±10.8) with early stage breast cancer (DCIS, T1 and T2 tumors) were included in this study. The 1-d protocol and 2-d protocol included 139 and 110 patients, respectively. 37 MBq Tc99m-nanocolloid was administered via intradermal and peritumoral deep injections for both protocols. All patients had preoperative lymphoscintigraphy and SLNB using both blue dye and Tc99m -nanocolloid. All patients underwent SLNB followed by axillary dissection. The results and false negative (FN) rates of SLNB was compared in between protocols. Results: The patients in 1-d protocol and 2-d protocol were comparable in terms of age, tumor size, tumor location, histological type, node positivity, and frequency of a previous surgical biopsy. 17 patients had negative SLNB despite metastatic axillary lymph nodes (FN). 5 of 17 patients (30%) had 1-d protocol whereas 12/17 (70%) patients had 2-d protocol. FN results were significantly higher in patients receiving 2-d protocol (p=0.02). Conclusion: False negative results affect the success of SLNB**.** Tumor size, histological type and localizations, patient age were not associated to FN results. 1-d protocol is found to be superior to 2-d protocol in the identification of SLN. We considered that this result may be caused by; 1) the long time interval between the injection and the SLNB, which may lead to lymphatic drainage to distal/non-sentinel LN, 2) the decay of the radioactivity, which may result in insufficient detection of the SLN by less experienced surgeons.

P0656

Radio-Guided Localization of Clinically Occult Breast Lesions (Roll and Snoll): Our Experience

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AIM: The purpose of this study was to determine the feasibility and effectiveness of Radioguided Occult Lesion Localization (ROLL) and Sentinel Node and Occult Lesion Localization and (SNOLL) techniques for identification and excision of nonpalpable breast lesions. MATERIALS AND METHODS: This is a retrospective study performed from January 2005 to December 2010. A total of 184 patients with occult breast lesions were studied (179 woman, mean age 53,8 years). An intralesional dose of 99mTc-labeled macroaggregated human albumin (AMA) (activity of 1 mCi and 0,2-0,5 ml volume) was inyected for ROLL on the day of surgery. SNOLL were carried out using standar 99mTc sulfur colloid (activity of 3 mCi and 0,2-0,5 ml volumen) injected directly into the lesion and in the cases of no lymphatic migration, realised subdermal injection, up to 24 hours prior to the surgical procedure. In both technique the intralesional dose was guided by ultrasound or computer tomography. The site of injection and lymphatic mapping were confirmed by scintigraphy image. Intraoperative lesion detection was carried out using a gamma-probe. An intraoperative macroscopic examination of the specimen with margins evaluation was always performed. The Sentinel Lymp Node (SLN) were analysed by routine histological investigacion or One-Step Nucleic Acid Amplification (OSNA). RESULTS: In all 77 lesions were defined with ROLL (ROLL Group) and 107 with SNOLL (SNOLL Group). Twenty-one patients in the ROLL group were found to have benign disease. ROLL technique detected breast lesion in 74 out of 77 patients, 48/74 had clear margins and 24 underwent a re-excision of the margins. In the SNOLL group the targeted lesion was localized and removed in 100 out 107 patients, 50 of the 100 patients with involved margins and 44 required a re-excision procedure. In the SNOLL group, lymphocistingraphy showed drainage in 104 patients and lymph nodes were histologically negative in 84 patients and positive in 20 patients. CONCLUSION: In our experience, the advantages of the ROLL and SNOLL techniques are a precise localization of breast lesion and an increased probability of a complete excision with free margins.

P0657

Assesment of lymphatic drainage through lymphoscintigraphy, after free flap breast reconstruction

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Objetive: Assess changes in drainage pattern before and after free flap breat reconstruction, in patients with previous mastectomy and lymphadenectomy. **Material and methods:** Eight patients were included between November 2010 and May 2011, they had had a radical mastectomy and axillar limphadenectomy, previously, and were scheduled to have a free flap breast reconstruction (11-168 months, average: 45.5+/-48.1 months between mastectomy and reconstruction). Two lymphoscintigraphies (one breast, one arm) were made to each patient, before reconstruction and at one and six months after surgery. Arm and breast lymphoscintigraphies were made in two consecutive days, (148MBq, ^{99m}TcNanocoll®, planars images and SPECT/CT were made 2-4 hours after injection of tracer, GE Infinia Hawkeye4). Set of images were evaluate for two observers; dermal backflow, numbar and localization of lymph nodes axillars and extra-axillars, follow up and comparision of lymph nodes from arm and breast. **Results:** In arm lymphoscintigraphies before reconstruction, we see dermal backflow in a 37,5% (3/8 patients), the more frecuent lymph nodes were axillars (62.5%) and arm (50%), others locations such as neck, scapulae and contralateral axilla were observed Pre-surgical breast lymphoscintigraphies showed axillar, supraclavicular and internal mammary lymph nodes (2/8 patients, each). None drainage was observed in 50% of patients. In the post-operative drainage images showed an improvement of dermal backflow in 2 of 3 patients, and changes in drainage in four of eight patients, with apparition of new drainage paths, being in-transit lymph nodes (2 patients). Four patients presented changes in breast drainage, two of them showed a decrease in the number of lymph nodes and apparition of supraclavicular and internal mammary nodes, one in each patient. A supraclavicular lymph node was observed in a patient, who had no breast pre-surgical drainage. **Conclusion:** Lymphoscintigraphy identified changes in pre and post-operative drainage in breast and arm in 50% of patients. Two out of three patients had an improvement in dermal backflow in arm drainage.

P81-1 - Sunday, October 28, 2012, 16:00 - 16:30

Conventional & Specialised Nuclear Medicine: Miscellaneous

P0658

Association between pathologic salivary gland scintigraphy and impaired saliva production in primary Sjögren´s syndrome

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Aim: To investigate the relationship between sialoscintigraphy results and saliva production in patients with primary Sjögren´s syndrome (pSS). Materials and Methods: Prospective study on 37 pSS patients fulfilling the American-European consensus group criteria [mean age 59 years; 92% female; median disease duration 3.1 years]. Salivary gland scintigraphy was performed according to a routine protocol: Dynamic scintigraphy was recorded for 25 minutes with pilocarpine stimulation applied 11 minutes after injection of 99mTc-pertechnetate. Scintigraphy results were semiquantitatively scored according to Shizukuishi K et al. Each gland was graded into: severe dysfunction=3 (excretion fraction <25 %), moderate dysfunction=2 (excretion fraction: 25 % to 40 %), mild dysfunction=1 (excretion fraction: 40-50 %), and normal function=0 (excretion fraction > 50 %). The total score ranged from 0 to 12. Saxon test was performed on the same day to clinically objectify saliva secretion. Results of Saxon tests were divided into terciles [<1241 ml (A), 1241-2364ml (B), >2364ml (C)] because a grading for the test is not yet available. Statistical analysis was performed using SPSS program (v18.0) and the Kruskal-Wallis test and the Mann-Whitney-U test were applied as appropriate. Results: Scintigraphy result was normal 11 (29.7%) patients, whereas impaired function of 2, 3 or 4 glands was observed in 10 (27.0%), 3 (8.1%) and 13 (35.1%) patients, respectively. The median semiquantitative score of scintigraphy was 6 (range 0-12) and the median salivary flow rate was 1.66 g/2min (range 0.31-3.79). An inverse correlation was found between the result of the Saxon test and sialoscintigraphy score ($corr_{coeff}$ -0.674, p<0.001). Accordingly, patients in the

lowest tercile of the Saxon test had a significantly higher grading (median 11, range 0-12) compared to patients in the middle (5, 0-12; p=0.030) and highest tercile(2, 0-6; p=0.001; comparison between group B and C resulted in a p=0.091). Conclusion: Pathologic results of sialoscintigraphy correlate with the impairment of saliva secretion in patients with pSS.

P0659

Bone marrow uptake during parathyroid scintigraphy is a consequence of extremely high parathyroid hormone levels

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Purpose: Incidental bone marrow uptake of various agents (Tc-99m MIBI or Tl-201) has been reported previously and in some reports it has been verified to be a result of malignant diseases (like multiple myeloma). We retrospectively evaluated patients with end stage renal disease (ESRD) who were referred to our department for parathyroid scintigraphy. Materials & methods: Eighteen patients (10 F, 8 M; 45-59, mean; 52±13 years old) were included to the study. The follow up period of patients with ESRD were mean 7,7±4,7 years. Mean Ca and PTH levels of patients were 9,7±1,4 mg/dL and 1553,3±691,7 pg/mL respectively. Dual phase Tc-99m MIBI parathyroid imaging were performed. Quantification of dual planar early phase parathyroid images were performed from various regions (sternum, humerus, ribs) with same size rectangular region of interest (176 piksel). Average counts were compared by Paired Samples Students T test and P<0.05 considered statistically significant. Results: Tc-99m MIBI parathyroid imaging revealed parathyroid hyperplasia in seven, adenoma in three, ectopic adenoma in two patients; other patients' scintigraphies were normal regarding parathyroid pathologies. Bone marrow uptake at sternum, ribs and humerus were observed in six patients. Difference between quantitative values obtained from sternum and humerus ROI's were also statistically significant compared to patients without bone marrow uptake (p<0.05). All of these six patients' PTH levels were also extremely high (>2000 pg/mL). Conclusion: Our results show that bone marrow uptake during parathyroid scintigraphy can be attributed to extremely high PTH levels and PTH's effect on bone turnover although the patient group is relatively small. Key Words: parathyroid scintigraphy, Tc-99m MIBI, PTH, bone marrow.

P0660

The role of scintigraphic evaluation of the gastrointestinal system on the understanding of Sleeve Gastrectomy physiology.

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THE CLINICAL IMPACT OF THE SCINTIGRAPHIC EVALUATION OF SLEEVE GASTRECTOMY IN MORBIDLY OBESE PATIENTS. **Aim:** The qualitative and semiquantitative evaluation of gastric emptying (GE) and small bowel transit changes after sleeve gastrectomy in morbidly obese patients. **Materials- Methods :** in a period of one year, 21 morbidly obese patients who underwent sleeve gastrectomy were evaluated by receiving a radioisotopic meal. Using a tomographic γ camera, static images were acquired immediately after the meal completion and every 10 min for 6 hrs. Qualitative and semiquantitative analysis was performed before and 4 months after the bariatric surgery. Qualitative analysis was based on visual evaluation of the scintigraphic images. Semiquantitative analysis was performed by drawing a manual ROI on the stomach, ileum and on the cecum images. Values of : 50% GE (TG1/2), 10% GE (TG lag), Maximal Intestinal filling (Tint max), 10% Terminal Ileum filling (Tileum 10%), Duodenal to Terminal Ileum transit (DTI Tt 10%), Cecal filling (T CFl) and Ileocecal valve transit time ICV Tt (TCFl - T 10% ileum) were evaluated. Motility changes were compared to BMI changes. **Results:** TG 1/2 and TG lag were accelerated after surgery from 61,7 min to 49,1 min (p<0,05) and from 15,5 min to 8,4 min, (p<0,05) respectively . Tint max was also faster postoperatively (from 141,5 to 110,5 min (p<0,05)). DTI Tt decreased and small bowel transit time was accelerated. Meal reached the terminal ileum faster: Tileum 10% decreased: 95 to 78 min (p<0,05), and ICV Tt was delayed from 102 to 126 min (-32 to 238),(P<0,05). BMI loss was related only to the percentage of TG1/2. **Conclusions:** 99mTc SC scintigraphy can be used as a non invasive method for the evaluation of GE and small bowel transit in morbidly obese patients after sleeve gastrectomy. This technique proves the acceleration of both parameters mentioned above and the delay of initiation T CFl and ICV Tt..This may cause the metabolic effects preceding weight loss.

P0661

Low Dose I125 seeds in Radioguided Surgery of Non-Palpable Breast Lesions.

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Background Approximately 25%-35% of breast cancers are nonpalpable at diagnosis and require a localization procedure to guide intraoperative identification and surgical resection. Wire-guided localization (WL) has been the standard technique. Radioguided localization (RGL) or Radioguided Occult Lesion Localization (ROLL) was described in 1998; multiple publications have suggested improved positive margin rates and decreased reoperation rates. In 2001, Gray et al. reported on a refinement of the technique: Radiactive Seed Localization (RSL), consisting in placement in the area to be removed a I-125 radioactive seed guided by ultrasound or mamography. RSL is an alternative WL or ROLL for nonpalpable breast lesions, with reported lower rates of positive surgical margins. Material and methods Data on use of the I-125 seed localization technique in 54 consecutive women with confirmed invasive o ductal carcinoma in situ were collected prospectively between June 2011 and March 2012. Results The mean (s.d.) age of women was 59.5 (11.9) years. Localization was guided ultrasonographically in 46 procedures, and stereotactically in 8. The I-125 seed, with mean (s.d.) activity of 132 ±11 microCi, was removed by surgery the day after insertion. Surgeons had large experience in radioguided surgery but no previous experience in RSL. Three procedures failed: the first one because an error in planning, other caused by a needle´s failure and the third one because microcalcifications were so extended that it was decided to avoid the RSL. In those three cases WL was placed secondly. Complete tumor removal with safe margins was achieved in 44/51 procedures (86.3%). Four patients (7.8%) had new foci of tumor not detected previously and required a new intervention for removing them. Only three patients (5.88%) had near margins and went into another surgery. Conclusions Localization of impalpable breast cancer using a I-125 seed was safe and led to a high proportion of radical lumpectomies. Technical problems of first cases are easily solved and surgical approach is easy to achieve for surgeons with experience in radioguided surgery. Rates of removal with safe margins are better to the achieved with WL or ROLL. Comfort for the patient is higher. The surgeon is also more comfortable: lesser possibility of displacing than with WL or with high diffusion in ROLL, possibility of planning best cosmetic incision, short learning curve and better scheduling (seed could be placed even weeks prior to surgery). Cost is similar or less than WL.

P82-1 - Sunday, October 28, 2012, 16:00 - 16:30, Poster Exhibition Area

Therapy & Clinical Trials

P0662

Predictive Value of 18F-FDG-PET/CT in Locally Advanced Cervical Carcinoma Treated with Neoadjuvant Chemotherapy

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Background: To evaluate the predictive value of SUV (standardized uptake value) for locally advanced cervical cancer treated with neoadjuvant chemotherapy. Methods: Patients aged 18 to 75 years, with FIGO stage IB2-IIB cervical cancer, treated with 3 cycles of neoadjuvant paclitaxel, ifosfamide and cisplatin (TIP) chemotherapy, followed by radical surgery, were evalutated by 18F-FDG-PET/TC scan 1 week before the start of chemotherapy and 21 days after the third cycle. SUV max and delta SUV were measured. For tumor response assessment, a comparison with abdomen MRI and post-surgical histopathology was performed. Results: Twenty-five patients (median age 53 years, range 28-75) were assessed from January 2008 to March 2009. Fifteen out of 25 patients (60%) showed a correlation with clinical FIGO stage; 9 (36%) were ruled out for the detection of node and distant metastasis; 1 (4%) did not show 18F-FDG uptake. A complete response was observed in 5 patients (33%) (average SUV max pre-TIP 9.8; delta SUV -100); a partial response in 8 (53%), 5 (33%) with minimal residual disease (>3 mm, <7mm) (average SUV max pre-TIP 13; delta SUV -95.8) and 3 (20%) with more than minimal residual disease (average SUV max pre-TIP 9.9; delta SUV -38); a stable disease in 2 (13%) (average SUV max pre-TIP 8.2; delta SUV -5.7). Conclusions: Delta SUV by 18F-FDG-PET, but not SUV max value at the baseline, showed good correlation with histological response to neoadjuvant chemotherapy, thus supporting the role of 18F-FDG-PET in the assessment of tumor response for locally advanced cervical cancer. The 18F-FDG-PET may also have an important role for initial disease staging.

P0663

The importance of curve parameters of renography in following of nephrotoxicity caused by radiotherapy in gastric cancer patients

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Introduction: postoperative chemoradiotherapy improves locoregional control and survival in gastric cancer patients. Renal toxicity is one of the most serious complications of upper abdominal radiotherapy, which should be reduced as low as possible. The aim of this study was to analyse the changes of separate kidney function and the assessment of damage based on curve parameters in patients undergoing postoperative chemoradiotherapy in gastric cancer. Methods: between 2006 and 2011 baseline radiorenography (99mTc-ethylene-dicysteine) was performed in 33 patients with gastric cancer (age: 60.51±11.60 years) after surgery, but before postoperative chemotherapy and conformal radiotherapy. The in-damage kidney to in-safe kidney (D/S) ratio was used as an index of relative kidney function and curve parameters (T1/2 and Tmax values) were examined, which were taken in account during the planning of radiotherapy. In-damage kidneys received an average of 26.5±10.1Gy, while in-safe kidneys received an average of 5.6±3.0Gy dose. Control renography was performed within 6-24 months in 23 patients after postoperative radiotherapy (group I.), in-damage kidney of 8 patients received less than 20Gy (group I./a), 15 patients more than 20Gy (group II./b). Control renography was performed within 24-60 months in 13 patients (group II.), absorbed dose was less than 20Gy in 4 patients (group II./a), more than 20Gy in 6 patient (group II./b). Results: In group I. T1/2 values became significantly elongated after radiotherapy (p=0.032) indicating mild impairment of renal function. The change was the greatest in group I./b. In group II. the decrease of the D/S ratio dominated (p=0.001). The decrease depended on received dose, and it was the most significant in group II./b. Tmax value of the in-damage kidney was significantly deviated from Tmax value of in-safe kidney (p=0.005) in the whole patient group. The change of Tmax value proved to be independent of received dose. Curve parameters of in-safe kidney did not show change compared with baseline study (harmful effect of chemotherapy was not detected). Conclusion: Despite receiving some radiation dose, the function of in-safe kidney did not worsen. The relative function impairment of the in-damaged kidney in patients following postoperative radiotherapy for gastric cancer is demonstrated. After postoperative radiotherapy renography is useful to monitor the condition of the damaged kidney in case of long survival. Curve parameters indicate neprotoxicity caused by radiotherapy earlier than decrease of D/S ratio, which can be interpreted by early deterioration of tubular cell function and latter cell-death. The radiotherapy planning could be improved by our investigation.

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Comparison of usefulness of FDG-PET/CT and colonoscopy in evaluating the local efficacy of preoperative neoadjuvant chemoradiotherapy for locally advanced rectal cancer

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Purpose: The aim of this study was to investigate the usefulness of FDG-PET/CT in comparison with colonoscopy in evaluating the local efficacy of preoperative neoadjuvant chemoradiotherapy (NACRT) for locally advanced rectal cancer (LARC). Materials and Methods: The subjects were 56 patients with LARC who received NACRT between July 2008 and April 2011. Regarding radiotherapy, 40 Gy were delivered to the lesser pelvis at 20 fractions. The concurrent chemotherapy consisted of 5-fluorouracil and Leucovorin. Of the 56 patients, 31 underwent FDG-PET/CT before NACRT, while 47 underwent PET/CT after NACRT to evaluate the efficacy of NACRT before surgery. Colonoscopy was conducted for all patients to preoperatively evaluate the efficacy of NACRT. In sequential PET/CT, we analyzed the SUVmax of the local tumor and considered the percentage of SUVmax reduction as the response index (RI) (RI = Pre-CRT SUVmax - Post-CRT SUVmax / Pre-CRT SUVmax×100). While considering the final pathological response as the gold standard, we compared the sensitivity and specificity of RI with the colonoscopic findings. Results: Colonoscopy revealed that the clinical responders (CR+PR) were 50 cases (89.3%), while the pathological assessment indicated that the pathological responders (G2+G3) were 25 cases (44.6%). In colonoscopy, the sensitivity and specificity were 100% and 19.4%, respectively. In 22 patients who underwent PET/CT before and after CRT, the mean RI was 63.9. The mean RI was significantly higher in the responders than in the non-responders (74.9±13.2% vs. 50.7±14.7%, p=0.006). Using an RI cutoff value of 65% for defining the response to therapy, the sensitivity was 75% and the specificity was 80%. Conclusions: In evaluating the efficacy of NACRT for LARC, colonoscopy showed higher sensitivity while FDG-PET/CT (represented by the parameter RI)showed higher specificity. RI value seems to be a useful predictive factor for the efficacy of NACRT.

P0665

A simplified approach to define the Biological Target Volume for radiotherapy planning based on 18F FDG-PET/CT. Results on 44 patients.

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Aim: Clinical implementation of a particular procedure to contour the Biological Target Volume (BTV) on the 18F-FDG PET/CT acquisition for planning a personalized radiotherapy treatment. Materials and Methods: During 2011, 44 patients (age range: 30-80 years) were referred to our centre to perform 18F FDG-PET/CT for radiotherapy treatment planning. In 18 patients the “target” was localized in the thorax (mediastinum, lung, oesophagus), in 4 in the abdomen (pancreas, stomach, liver) and in 22 in the pelvis (rectum, uterus, pelvic lymph nodes). FDG PET scans were performed following standard procedures: i.v. administration of 2.2 MBq/kg/bw followed by a whole body acquisition 1 hour later using a flat radiotherapic bed. A BTV was contoured on the PET/CT hybrid images through a SUV (Standard Uptake Value) segmentation process using a dedicated workstation for the analysis of metabolic images. The BTV, associated only to the CT image set of the hybrid PET/CT scanner, was exported as a DICOMRT structure to the Treatment Planning System (TPS), where the image registration between this study and the primary CT series (used for dose calculation) was performed. The primary CT series were acquired using a big-bore scanner to accommodate the immobilization devices used during radiotherapy and to perform the virtual simulation procedure through a dedicated software. Results: This contouring approach allowed, in all 44 patients, to overcome limitations on PET window/level representation in the TPS workstation, due to the different pixel value dynamics of PET and CT data and, at the same time, to obtain an accurate target volume based on SUV distribution. Moreover, in 11 patients with thoracic pathology, the PET/CT data were utilized not only to accurately contour BTV and Planning Target Volume (PTV) but also to evaluate the treatment effectiveness after the standard radiotherapy sessions, by observing the tumour reduction and thus to plan a subsequent boost; in these cases the image coregistration between CT series derived from PET/CT before and after treatment was used to calculate the target reduction in cm3. Conclusions: The BTV contouring procedure developed in our centre allowed an accurate definition of sub-volumes of PTV in which maximum dose or a boost was applied. Moreover the comparison of PET/CT images before and after the radiotherapic treatment resulted very useful for an accurate management of the patients to whom conseguent radiotherapic treatments were planned in reduced volumes.

P0666

Use of Four-Dimensional - Fluorodeoxyglucose - Positron Emission Tomography for Radiotherapy Planning in Lung Cancers: Preliminary Results

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Aim: The main objective is to assess prospectively the impact of four-dimensional (4D) [18F]-fluorodeoxyglucose positron emission tomography (FDG-PET) on the radiotherapy target volumes for lung cancers when using automatically PET segmented volumes previously corrected for respiratory motion and partial volume effects (PVE). Materials and methods: Four patients with histologically proven lung cancers, treated by thoracic irradiation without surgery and without initial chemotherapy underwent computed tomography (CT) simulation followed by 4D-FDG-PET/CT in treatment position. Prior to the automatic volume delineation using the fuzzy locally adaptive Bayesian (FLAB) method, PET images were first corrected for motion (phase rebinning associated to a non-rigid transformation) and PVE (deconvolution algorithm associated to a wavelet-based denoising). Several volumes comparisons were performed: (1) between PET segmented volumes before and after respiratory motion correction, (2) between PET segmented volumes before and after PVE correction and (3) between CT simulation volumes and PET segmented and corrected volumes. For the first two comparisons, the maximal activity (Amax) inside the tumor was analyzed. Results: For three patients, the tumor was located in the left upper lobe with attachment to the chest and for one patient in the middle lobe. The stages were two T1N0M0, one T2N3M0 and one T4N0M0. For the first comparison, between PET segmented volumes without or with respiratory motion correction, no difference was observed with a mean volume without and with correction of 45,5 and 45,2ml respectively and a mean Amax of 29328 and 29154 Bq/ml respectively. For the second comparison, the

mean volumes were 45,2 and 40,7ml before and after PVE correction respectively (volume reduction of 10%) and the mean Amax were of 29154 and 36542 Bq/ml respectively (activity increase of 25%). The mean CT simulation volume was 83,2ml versus 40,7ml for the mean PET segmented and corrected volume, corresponding to a volume reduction of 51%. Conclusion: For all four patients, with moderate respiratory movements due to tumor location in upper pulmonary lobes, no impact of the respiratory motion correction was observed. However the PVE correction seems to have a huge impact with a mean increase of Amax of 25% and a mean volume reduction of 10%. The PET segmented volumes are on average 51% smaller than the CT simulation volumes. These preliminary results tend to demonstrate the impact of FDG-PET with PVE correction for radiotherapy planning. However 4D PET acquisitions may be reserved to specific cases with important respiratory movements.

P0667

The Added Value of Whole Body 18F-FDG PET-CT in Radiotherapy Planning

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AIM We assess the percentage of cases in which findings of distant disease through 18F-FDG PET-CT for radiotherapy planning lead to changes in the modality and/or intent of the treatment. MATERIALS AND METHOD All the studies derived from the Radiotherapy department were retrospectively analysed. Those performed for radiotherapy planning were selected. Cases with distant disease findings were assessed, investigating changes in the modality or intent of treatment. RESULTS Six hundred and sixty seven studies were derived from the Radiotherapy department between April/09 and January/12. One hundred and ninety three (28,9%) were performed for radiotherapy planning. One hundred and thirty two were males, 61 females; the ages ranged from 15 to 87 years old (mean 62,2). The primary tumours included were as follows: 72 head and neck, 65 lung, 20 gastrointestinal system, 11 lymphomas, 7 mesotheliomas, 6 gynecologic malignancies, 5 urinary system malignancies, 5 breast tumours and 3 sarcomas. In 21 of these studies (10,9%) the findings of 18F-FDG PET-CT suggested an upstage of the patients to a clinical stage IV (9 lung, 9 head and neck, 1 gastrointestinal system, 1 lymphoma and 1 ginecologic malignancy). The unexpected disease was located more frequently in lungs (9 patients), followed by bone (6 patients), liver (3 patients), distant adenopathy (2 patients), brain (2 patients), adrenal glands (2 patients) and spleen (1 patient). In eleven patients the findings of 18F-FDG PET-CT were confirmed as true positive for distant metastases, in seven of which the modality of treatment was change and in the other four patients, the intent of treatment was changed from curative to palliative. In one patient a second primary tumour was confirmed. In nine patients, the results of 18F-FDG PET-CT could not be initially confirmed, three of them because of patient death and six because of the location or the small size of the lesions. In four cases, a second 18F-FDG PET-CT study showed progressive disease in the sites of the lesions and in one case there were no changes. One patient stills unevaluated. CONCLUSIONS Besides being useful for delimitating volumes, 18F-FDG PET-CT studies in radiotherapy planning improve the staging of patients, leading to an upstage in a significant number of patients. Based upon the findings of 18F-FDG PET-CT, the modality or the intent of treatment may radically change.

P0668

Comparison of tumor volume, glucose metabolism and proliferation, measured by 18F-FLT-PET and 18F-FDG-PET in primary cervical cancer in radiotherapy planning

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PURPOSE: The assessment of metabolic activity and the extend of the tumor mass has been reported to have a major role in radiotherapy planning and patients prognosis. Positron emission tomography is a non-invasive imaging tool that may be helpful in the evaluation of metabolic activity of tumor mass in patients with cervical cancer. The aim of the work was to compare the molecular activity of cervical tumor before radiotherapy planning, based on glucose metabolism and proliferation image. MATERIAL AND METHODS: The study population comprised on 11pts (aged 57±14years) with histologically confirmed cervical cancer. All pts were injected with 185MBq of [(18)F]-fluoro-3'-deoxy-L-thymidine ([(18)F]FLT) (IASON, Austria) and 370MBq of 2-[(18)F]-fluoro-2-deoxy-D-glucose ([(18)F]FDG) (FCON, Germany) on two separated days. The acquisitions over abdomen and pelvis were performed twice using PET/CT scanner (Gemini TF Philips, USA). The collected data was reconstructed using dedicated Philips workstation. On reconstructed images the tumor borders are drawn using semiautomatic dedicated software based on 30 % threshold method (other methods were also evaluated). Metabolic parameters of the tumor tissue and the tumor volume were evaluated on each nuclear image. For statistic analysis T-test was used. RESULTS: There was no significant difference ($p>0.05$) in the tumor volume calculated on FDG images (79.9±59.4cc) and FLT images (81.4±65.7cc). The maximum standardized uptake values (SUV) of the tumor were similar in both examination - SUVmaxFDG=10.1±2.5, SUVmaxFLT=8.3±3.4; $p>0.05$. However the mean SUV values in FDG images showed significantly higher values than on FLT images (SUVmeanFDG=5.0±1.3, SUVmeanFLT=3.5±1.0; $p<0.05$). No correlation was observed between glucose metabolism and proliferation activity in the evaluated patients ($r=0.3$). CONCLUSION: The proliferation activity in cervical cancer did not correlate with glucose metabolism in the tumor mass and this phenomenon should be further evaluated in radiotherapy strategy planning and prognosis. There are no significant differences in tumor volume calculation based on FLT and FDG image data.

P0669

PET/TC and MR in the staging and image guided EBRT of uterine cervical cancer

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AIM The objective of the current study is the comparison between MR and PET/CT with 18F-FDG in preoperative detection of lymph node metastases in patients with uterine cervical cancer and the use of PET/CT as a guidance for external radiotherapy (EBRT). METHODS 47 patients with FIGO Stage IIB-IV cervical carcinoma who underwent both MR and PET/CT within one week and from one to four weeks before EBRT, were enrolled in this prospective study. Histotypes were: 37/47 squamous Ca., 8/47 adenocarcinoma, 1/47 clear cell and 1/47 serous papillary ca.. Patients were treated with a combination of EBRT (45Gy), intracavitary brachiterapy and concurrent chemotherapy with Cisplatin (except three patients). PET/CT images were acquired with patients in treatment position, on a flat couch top and with appropriate immobilization devices. Both PET/CT and MRI have been used to guide the EBRT. PET/CT contour was performed manually using a 45% threshold of SUVmax. After EBRT, patients were followed with subsequent PET/CT and/or MR for a period that ranged from 3 to 62 months. RESULTS PET\CT and MR nodal staging was identical in 33 cases (70%); PET/CT showed positive lymph nodes, not detected by MR in 9 cases (19%): internal iliac (2pts), external iliac (5 pts), common iliac (4 pts), and para-aortic (3 pts); in 4 cases (8.5%) the two methods showed positive lymph nodes but in different sites and in one case nodal involvement was more extensive according to MR. Six out of nine patients showing PET/CT positive findings only, received additional EBRT boost at the dose that ranged from 4 to 14 Gy. In the remaining 3/9 patients PET/CT positive nodes received an additional dose, because they were located in the field of irradiation of brachytherapy treatment. Repeated PET/CT and/or MR during follow up showed: 30 patients in CR, 6 in PR and 11 in PD. All patients but one, treated with additional PET-guided boost, did not show progression of the disease. CONCLUSION The results of this preliminary study highlight the role of 18F-FDG PET/CT in order to stage and guide EBRT in cervical cancer patients. In nine out of 47 patients (19%) PET/CT had a major impact on RT planning leading to an administration of additional dose in metastatic lymph nodes detected by PET/CT only.