

General Clinical Specialties

MTA II: Outcomes/Comparative Effectiveness Research & Radiation Safety Posters

Occupational radiation dosimetry evaluation using an automated injection device

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Objectives: Shielded automated infusion devices can potentially standardize and reduce radiation exposures during the administration of radiopharmaceuticals, though loading the devices adds incremental radiation exposure which may mitigate dose savings. We measured and compared staff radiation dose from the use of an automated infusion device vs. manual preparation and injection of 18F radiotracers using protective shields and vials.

Methods: Patients received 18F-FDG or 18F-FLT prior to 3-D PET whole body or brain imaging. For 27 manual injections the mean administered dosage to patients = 480.7±66.2 MBq. For 34 infusions using the **INTEGO** (MEDRAD, Pittsburgh) shielded injection device, the mean dosage = 431.9±22.7 MBq. Staff wore electronic dosimeters (EPD) at the wrist and trunk during dosage preparation and administration. EPDs were also worn while changing multi-dose 18F-FDG vials. In 34 vial loads, mean vial radioactivity = 20174.3±1298.9 MBq, and for 3 unloading procedures = 382.3±149.5 MBq. Background radiation determined with a pressurized ion chamber and traceable timer was subtracted from EPD values.

Results: The mean administered dosage between injection methods was statistically significant (two-tailed t-test, $\alpha=0.05$; $p<0.001$). This was controlled by deriving a standardized dose per unit of activity. Mean extremity dose from automated infusion = 0.003±0.002 $\mu\text{Sv}/\text{MBq}$ vs. manual injection = 0.027±0.017 $\mu\text{Sv}/\text{MBq}$. For the mean body dose the automated injections = 0.001±0.002 $\mu\text{Sv}/\text{MBq}$ vs. 0.011±0.005 $\mu\text{Sv}/\text{MBq}$ by manual injection. These were statistically significant (2-sided Mann-Whitney, $\alpha = 0.05$; $p<0.001$). Bulk 18F-FDG vial change added a mean staff dose to extremities = 0.89±1.3 μSv , and body = 0.47±2.0 μSv .

Conclusions: The shielded placement of bulk vials into the device added minimal additional radiation exposure. Compared to manual injections, significant (~ten-fold) occupational dose reductions result from

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