

Based On The Possible Radiation Dose That Radioactive Patients May Emit, Radiation Safety Precautions In Diagnostic Nuclear Medicine

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Abstract:

To determine the ideal radiation safety protocols for diagnostic nuclear medicine procedures by measuring the possible radiation dose released by patients who have recently had such procedures.

Materials and Procedures: Using a radiation detector, we measured the radiation doses released by 175 adult patients who received technetium-99m, iodine-131, and fluorine-18 radionuclides for scans of their bones, kidneys, hearts, brains, and entire bodies. Based on the amount of time that had passed since the radiopharmaceutical was administered, those values were used to assess the whole-body radiopharmaceutical clearance and the risk of radiation exposure to others. In conclusion : Precautionary steps to prevent radiation exposure are not necessary following diagnostic nuclear medicine procedures because the cumulative radiation doses that patients emit right after the procedure are significantly less than the limits set by the International Atomic Energy Agency and the International Commission on Radiological Protection.

Keywords: Diagnostic Imaging, Radiation Exposure, Radiotherapy Dosage, Radiation Protection.

Introduction:

Because of the high levels of activity of the radionuclides that are usually used in therapeutic nuclear medicine procedures, precautions are taken to monitor and limit radiation exposure for patients, healthcare professionals, and other people, including

family members, caregivers, and coworkers (Willegaignon , 2006). However, since whole-body excretion of the radionuclides is faster and the amount of whole-body radiation emitted is lower during diagnostic procedures, which call for the administration of much smaller quantities of radionuclides, those precautions may be skipped (Gomez, 2005). The actual risk of exposure from radioactive patients following such diagnostic procedures has, regrettably, not been thoroughly studied (American , 2011). In addition to other related risks, the public and medical personnel may be exposed to more radiation if nuclear medicine techniques are widely used for human disease diagnosis. The purpose of this study was to ascertain the possible risks of radioactive patients exposing medical personnel and others following their receipt of radiopharmaceuticals during diagnostic nuclear medicine procedures, taking into account the previously mentioned factors (Stenstad , 2014). Our research may serve as a foundation for developing the best radiation safety protocols to implement in those situations (Liu , 2014).

Diagnostic processes and patients in nuclear medicine: From the range of tests offered at our facility, the nuclear medicine diagnostic procedures assessed in this study were chosen. Being at least 18 years old and not having any problems urinating were prerequisites for inclusion. Patients in hospitals, those receiving dialysis, and those utilizing urinary catheters were not included.

Whole-body radiation dose monitoring for patients: clearance of radiopharmaceuticals, a Geiger-Müller detector that had been calibrated beforehand was used to measure the radiation doses (in $\mu\text{Sv}\cdot\text{h}^{-1}$) that radioactive patients at 1.0 and 2.0 meters emitted. In order to detect changes in the remaining whole-body radiopharmaceutical activity at different times following radiopharmaceutical administration, such as immediately after radiopharmaceutical administration, immediately before micturition and image acquisition, immediately after micturition but before image acquisition, and after image acquisition but before patient release from the Department of Nuclear Medicine (DNM), periodic measurement was selected as the method for tracking patient radiation dose rates (Bartlett , 2013).

The examination of the progressive decrease in radiation

emissions into the environment was made easier by evaluating the patients at those four intervals. All dose rate measurements were conducted inside a 2.0 × 2.5 m radiopharmaceutical administration room with 27 cm-thick concrete walls to reduce the impact of background radiation. The average of three measurements was used to calculate each data point for the dose that the patients released over time (Khanal , 2014).

Recommendations:

- Adult patients usually do not need radiation protection measures to prevent internal contamination during diagnostic nuclear medicine procedures, and nursing patients only slightly need them. Furthermore, the development of new radiation detection technologies and clinical materials will make it easier to indicate lower dosages of radiopharmaceuticals while still producing clinical images of the same or higher quality, which will reduce radiation exposure overall.
- The goal of the current study was to show the actual risk that patients undergoing diagnostic nuclear medicine procedures could expose others to radiation doses following their administration of radiopharmaceuticals. Additionally, dosimetric data was presented to help establish suitable radiation safety protocols during medical procedures. However, we have shown that, with the exception of cases in which lactating patients receive , such measures are rarely required.

Conclusion:

The amount of activity injected, the radiopharmaceutical given, and the biokinetics of the drug's excretion from the body all affect the radiation doses that radioactive patients release into their environment. We conclude that precautionary measures to avoid radiation exposure are not necessary during diagnostic nuclear medicine procedures, especially after the patient has been released from the nuclear medicine facility, because cumulative radiation doses emitted by these patients are significantly lower than the limits advised by the ICRP and IAEA.

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