Exposure Doses to Medical Workers Concerning Positron Emission Tomography

YAMAGUCHI Ichiro (1), NARITA Hiroto (2), KOBAYASHI Kazumi (3)
(1) NIPH, (2) Jikei Univ. Hospital, (3)IMCJ

Purpose

The applications of positron emission tomography (PET) in clinical medicine are expanding rapidly, posing greater risks for inadvertent radiation exposure. Currently, the most widely used radiopharmaceutical in PET imaging is F-18 fluorodeoxyglucose (FDG). This study estimated radiation dose exposures to healthcare workers and the general public from patients having undergone FDG-PET imaging, toward developing more effective protective measures against radionuclide exposure.

Method

Radiation exposure doses from FDG-PET were calculated using a Monte Carlo simulation method to estimate:

1) Radiation doses to healthcare workers caring for nonambulatory FDG-PET patients;
2) Radiation doses to general hospital staff working at institutes employing FDG-PET;
3) Radiation doses to public transportation workers and the general public in contact with patients following PET imaging;
4) Radiation doses to healthcare workers from the radionuclide dispersed in air at PET imaging facilities.

Results

The radiation dose for healthcare workers continuously outside the controlled area exceeded the dose limit for general public, when patients were exposed to 400MBq, and when healthcare workers cared for 20 patients/day spending at least 5 minutes per patient. Therefore, the radiation doses for a nurse, for example, obliged to care for many FDG-PET patients may exceed safe exposure limits, unless suitably protected.

Radiation dose in passageways did not exceed the standard dose limit for controlled areas, unless patients remained there for long periods. Therefore, radiation doses for general workers, e.g., a receptionist, would not exceed the dose limit for the general public.

The radiation dose for public transportation workers also exceeded the dose limit for the public, when nine patients are seated near a driver each week. For this reason, patient who leaves control areas should be instructed to follow restrictive actions of contact with others.

The contribution of internal and external exposure from air-dispersed FDG in PET imaging facilities was comparatively small. For this reason, if radionuclides are properly stored and managed, measures for monitoring air concentrations of FDG in PET facilities are largely unnecessary.