

Evaluation of staff dose for the medical cyclotron

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Abstract

Recently, the Positron Emission Tomography (PET) has developed quite fast in the medical industry. In Taiwan, there are now nine medical cyclotrons to produce PET radiation pharmaceuticals. The staffs easily received the highest radiation exposure dose in the production environment of the radiation pharmaceuticals. This study was performed in order to evaluate the radiation dose exposed to the technicians as a function of the cyclotron measuring device used in the technicians' drawing out of ¹⁸F fluorodeoxyglucose (¹⁸F -FDG) when processing and transporting the radiation pharmaceuticals. The main evaluation is to measure the radiation exposure dose accumulated in the technologists' finger and whole body. In order to measure the staffs' exposure, the technologist wore different badges containing thermoluminescent dosimeter (TLD) and their monthly whole body TLD and finger-ring TLD accumulated were recorded the TLDs accumulated in their whole body as well as in their finger-ring were recorded every month. For this study, six technicians worked from January 2003 until December 2004 transporting and drawing out the radiation pharmaceuticals, and their monthly whole body TLD and finger-ring TLD accumulated were recorded. The statistic data were derived from the evaluation and analysis. The result showed that the drawing out pharmaceutical group and the quality control group staffs received an average effective dose of 0.51 mSv/y and 0.13 mSv/y respectively. The hands of the former group apparently received exposure a much higher than a much higher exposure than the latter group, with an average equivalent dose of 148.33 mSv/y and 40.37 mSv/y respectively. However their exposure dose did not exceed the limits regulated in law. In conclusion, reducing excessive radiation exposure to workers by minimizing the time spent in close contact with the radiation pharmaceuticals, increasing the distance from the source and providing suitable protective shielding devices would be the most effective approaches.

Key words: medical cyclotron, thermoluminescent dosimeter (TLD), finger-ring TLD