

# Activation-evaluation for radioactive waste of medical linear accelerator

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In the case of using X-ray energy above 10 MV, photoneutrons are generated by the photonuclear reaction which in turn causes the activation of the components of the linear accelerator(linac). Although it is necessary to conduct a dosimetric analysis when disposing of linac equipment or replacing components, as the standards for the management of radioactive waste(RW) are not clear in Korea, there are difficulties to safely manage and dispose of RW. In this study, we investigated the management status of RW in domestic medical linac and analyzed the activation of discarded equipment.

A survey was conducted on 48 domestic radiation oncology departments in order to understand the current status of the management of RW from medical linac. The survey contents were as follow: whether they have experience of disposing of the linac, the method of disposal, the reason for disposal, whether the disposal was measured, and lastly, whether the reports were wrote. In addition, we measured the activation for each part of the discarded Elekta linac using a survey meter and a portable HPGe detector.

The survey found that most medical institutions did not perform radiation measurements when disposing of RW, and since the disposal criteria did not exist, the RW from linac were either stored within the institution or collected by the manufacturer.

The surface dose rate measurements of the discarded linac showed that the parts with high surface dose rates were the target, primary collimator, and MLC which were 3.318, 27.10, and 2.032  $\mu\text{Sv/h}$  respectively, and 45 days later, the dose rates were reduced to 0.459, 0.152 and 0.153  $\mu\text{Sv/h}$ , respectively. As a result of measurement with the HPGe detector, Co-60 (half-life 5.271 y) nuclide was detected mainly in most of the parts, and in the case of the target, Co-60 and Re-184 (38.19 d) nuclides were detected. Apart from these, it was confirmed that most of the detected nuclides were long-lived nuclides.

Our study showed that most of the domestic institutions did not have regulations related to radioactive waste from linac, and even for those who had regulations, the management procedures and standards were unclear. Further studies are underway to evaluate short-lived radionuclides in consideration of decay over time for disposal equipment and to lay the foundation for the management of radioactive waste from medical linac.

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