

Dosimetry in Interventional Radiology Examinations for Occupational Exposure Monitoring

Authors : Ava Zarif Sanayei, Sedigheh Sina

Abstract : Interventional radiology (IR) uses imaging guidance, including X-rays and CT scans, to deliver therapy precisely. Most IR procedures are performed under local anesthesia and start with a small needle being inserted through the skin, which may be called pinhole surgery or image-guided surgery. There is increasing concern about radiation exposure during interventional radiology procedures due to procedure complexity. The basic aim of optimizing radiation protection as outlined in ICRP 139, is to strike a balance between image quality and radiation dose while maximizing benefits, ensuring that diagnostic interpretation is satisfactory. This study aims to estimate the equivalent doses to the main trunk of the body for the Interventional radiologist and Superintendent using LiF: Mg, Ti (TLD-100) chips at the IR department of a hospital in Shiraz, Iran. In the initial stage, the dosimeters were calibrated with the use of various phantoms. Afterward, a group of dosimeters was prepared, following which they were used for three months. To measure the personal equivalent dose to the body, three TLD chips were put in a tissue-equivalent batch and used under a protective lead apron. After the completion of the duration, TLDs were read out by a TLD reader. The results revealed that these individuals received equivalent doses of 387.39 and 145.11 μSv , respectively. The findings of this investigation revealed that the total radiation exposure to the staff was less than the annual limit of occupational exposure. However, it's imperative to implement appropriate radiation protection measures. Although the dose received by the interventional radiologist is a bit noticeable, it may be due to the reason for using conventional equipment with over-couch x-ray tubes for interventional procedures. It is therefore important to use dedicated equipment and protective means such as glasses and screens whenever compatible with the intervention when they are available or have them fitted to equipment if they are not present. Based on the results, the placement of staff in an appropriate location led to increasing the dose to the radiologist. Manufacturing and installation of moveable lead curtains with a thickness of 0.25 millimeters can effectively minimize the radiation dose to the body. Providing adequate training on radiation safety principles, particularly for technologists, can be an optimal approach to further decreasing exposure.

Keywords : interventional radiology, personal monitoring, radiation protection, thermoluminescence dosimetry

Conference Title : ICRHERP 2024 : International Conference on Radiation Health Effects and Radiation Protection

Conference Location : New York, United States

Conference Dates : March 18-19, 2024