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Estimation of Entrance Surface Doses (ESDs) for common medical X-ray diagnostic examinations in Radiological Departments in Mashhad-IRAN

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Background: The British national radiological protection board (NRPB) introduced the use of diagnostic reference levels (DRLs) as an efficient standard for optimizing the radiation protection of patients. The physical parameter recommended for monitoring the (DRLs) in conventional radiography is the entrance skin dose (ESD) and methods for measuring it is clearly described in NRPB standard protocol.

Method: The data were collected for 1183 radiographs of adult patients. The sample of patients was chosen so that the weight of patients was between 50-80 kg. Eight conventional X-ray examinations were chosen for this study. Entrance surface dose (ESD) of individual patient was directly measured by thermoluminescence dosimeter, TLD chips sealed in a plastic sachet were stuck on the skin of patient at the center of X-ray beam axis.

Results: In this study, 3rd quartiles of measured ESDs for patients undertaking a particular examination were selected as ESD for study sample, based on this assumption ESDs for X-ray examination included in this study are as follows: Chest PA- 0.37 mGy, Chest Lat- 1.8 mGy, Lumbar Spine AP- 3.6 mGy, Lumbar Spine Lat- 5.6 mGy, Pelvis AP- 3.5 mGy, Abdomen AP- 3.7 mGy, Skull PA- 2.96 and Skull Lat- 1.79 mGy.

Conclusion: The data were analysed statistically, and the minimum, median, mean, maximum, first and third quartile values of ESDs are reported. Finally, our results were compared with the proposed Iranian DRLs, the international reference dose values reported by the European Commission, the International Atomic Energy Agency and the National Radiological Protection Board. It is evident that ESDs obtained in this work for Abdomen AP, Pelvis AP, Lumbar AP and Lumbar Lat examination do not exceed DRLs values worked out by NPRB. On the contrary for Chest PA, Chest Lat, Skull PA and Skull Lat higher ESDs were acquired in this study compared with DRLs suggested by NRPB. There is no single reason for dose variations, but, the reasons are complex, in general, low filtration, high mAs and low tube potential are associated with higher doses arising from application of various X-ray machines.

Keywords: ESD, Quality control, TLD, DRL.

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