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Establishment of Facility Reference Level for Computed Tomography in Radiotherapy Simulation Examinations at National Cancer Institute Sri Lanka

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Abstract

Computed Tomography (CT) plays a crucial role in radiotherapy treatment planning. The optimization of radiation dose to patient during CT simulation is not a matter of concern so far in most of the countries but it cannot be since even after the primary cancer is treated, patient may have a long-life expectancy. The additional imaging doses should be as low as reasonably achievable. Therefore, this study aimed to evaluate radiation dose to patients during CT simulation for radiotherapy treatment planning. A total of 350 patient data were collected from October 2022 to November 2022 with the Toshiba Aquilion large bore CT scanner at Apeksha Hospital, Maharagama, Sri Lanka. The study focused on commonly performed simulations for different protocols (abdomen, chest, head and pelvis) and used Computed Tomography Dose Index (CTDI) and Dose-Length Product (DLP) parameters to establish Diagnostic Reference Levels (DRLs). Analysing the data for descriptive statistics and the 25th, 50th, and 75th quartiles of the dose metrics were calculated using SPSS software. According to the recommendation of the International Commission on Radiological Protection (ICRP), the DRL values are defined as the median (50th percentile) of the CTDI volume and DLP values. The established typical values of CTDI volume and DLP respectively are 7.4 mGy, 394 mGy.cm for abdomen; 15.5 mGy, 455 mGy.cm for chest; 58.2 mGy, 2632 mGy.cm for head; 9.3 mGy, 339 mGy.cm for pelvis. The developed DRL values were relatively lower for most anatomical regions compared to other countries and institutions, except for the chest region where the values were higher. Further evaluation is needed to assess the appropriateness of these lower DRL values in ensuring patient safety and minimizing radiation exposure during CT simulation procedures for radiotherapy. The study emphasizes the importance of optimizing radiation dose to patients, considering their potential long-term life expectancy even after primary cancer treatment.

Keywords: *CT simulation, Diagnostic reference level, DLP, Optimization of radiation dose*