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Implementation of quality control procedure for Computed Tomography imaging modalities in radiology departments in Albania

CT scanning examination is rapidly increased in Albania especially during and after coronavirus pandemic crisis. Having the highest dose procedures encountered in medical imaging, radiation dose in CT scans is of crucial consideration so, by prioritizing quality control (QC) of these x-ray medical devices all healthcare professionals can ensure not only optimal image quality but also protection of patients from radiation risks. QC of radiological medical devices in Albania has started only during the last ten years and is applicated every three years from the Institute of Applied Nuclear Physics (IANP) according to our national radiation protection regulation. Procedure of QC testing for CT scanners in our country includes the measurements of CT numbers and uniformity expressed in Hounsfield unit (HU), Volume Computed Tomography Dose Index (CTDI vol) and irradiated slice thickness. Measurements are carried out using an ACR Gammex 464 phantom containing five inserts of different tissue materials (polyethylene, solid water, air, acrylic, bone) equivalent to human tissue, a pencil ionization chamber together with a standard body and head phantoms with 32 and 16 cm diameter respectively. The aim of this study was to investigate the QC implementation on 13 CT scanners used in different radiology departments in Albania. All the data are taken during the performance of quality control tests for the first time and based on the analysis of the results it was found that CT number accuracy tests were within tolerance for 92% of CT scanners. CT number uniformity for water values and irradiated slice thickness tests were within the tolerances for all the CT scanners. CTDI volume measurements for body phantom ranged from 8.1 mGy to 24.6 mGy while CTDI volume for head phantom ranged from 24.3 mGy to 66.1 mGy. Deviations of measured dose from indicated dose in CT scanner display were also within tolerance being lower than 20 % for all CT scanners included in this study. The results of this study will be used to establish baselines, providing in this way a standard for comparison which can help in tracking changes of CT equipment performance over time, optimization of imaging protocol and as a guidance on establishing national diagnostic reference levels.

Key wards; Quality control, CT scanner, radiation dose, CT number, uniformity, slice thickness

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