ABSTRACT

Head Computed Tomography (CT) examinations are diagnostic procedures that involve exposure to ionizing radiation, which poses significant risks to radiosensitive organs such as the eye lens and thyroid gland. This study aims to compare the radiation doses received by these organs under axial and helical scanning modes using two methodological approaches: direct measurement with Optically Stimulated Luminescence Dosimeters (OSLD) and dose estimation via the IndoseCT software. The study was conducted using an anthropomorphic head phantom and a Siemens Somatom go.Top CT scanner, with tube current variations of 100, 200, and 300 mAs. The results demonstrated that the axial scanning mode produced higher CTDIvol and SSDE values compared to the helical mode, both when based on effective diameter (Deff) and water-equivalent diameter (Dw). Radiation doses measured directly using OSLDs and those estimated with IndoseCT exhibited a consistent increase with higher tube current settings, with an average dose discrepancy of 0.42 between the two methods. The helical mode consistently yielded lower radiation doses to the eye lens and thyroid, attributed to the automated current modulation system (CARE Dose4D) and a more efficient exposure distribution. Validation of the IndoseCT estimations against direct OSLD measurements indicates the software's potential as a predictive tool for organ dose assessment in clinical settings, although further calibration against empirical data remains necessary. This study is expected to contribute to the optimization of safer CT imaging protocols and to enhance radiation protection for critical patient organs.

Keywords: head CT scan, OSLD, IndoseCT, radiation dose, eye lens, thyroid gland, axial, helical, radiation protection.