

Evaluation of organ dose and image quality metrics of pediatric CT Chest-Abdomen-Pelvis (CAP) examination: an anthropomorphic phantom study

ABSTRACT

The aim of this study is to investigate the impact of CT acquisition parameter setting on organ dose and its influence on image quality metrics in pediatric phantom during CT examination. The study was performed on 64-slice multidetector CT scanner (MDCT) Siemens Definition AS (Siemens Sector Healthcare, Forchheim, Germany) using various CT CAP protocols (P1–P9). Tube potential for P1, P2, and P3 protocols were fixed at 100 kVp while P4, P5, and P6 were fixed at 80 kVp with used of various reference noise values. P7, P8, and P9 were the modification of P1 with changes on slice collimation, pitch factor, and tube current modulation (TCM), respectively. TLD-100 chips were inserted into the phantom slab number 7, 9, 10, 12, 13, and 14 to represent thyroid, lung, liver, stomach, gonads, and skin, respectively. The image quality metrics, signal to noise ratio (SNR) and contrast to noise ratio (CNR) values were obtained from the CT console. As a result, this study indicates a potential reduction in the absorbed dose up to 20% to 50% along with reducing tube voltage, tube current, and increasing the slice collimation. There is no significant difference ($p > 0.05$) observed between the protocols and image metrics.

Keyword: Computed tomography; Absorbed dose; Signal–noise ratio; Contrast–noise ratio; Figure of merit