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Title of Abstract: **Radiation Dose and Image Quality in Pediatric Dual Energy CT: Phantom Study**

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Modality: CT

Organ System: Multi

Intro: In spite of growing investigation in dual energy CT in adults, research for its applications in pediatric populations has not followed. This abstract describes a phantom study investigating the radiation dose and image quality of simulated contrast-enhanced dual Energy CT of pediatric examinations using a dual-source CT system.

Purpose: To evaluate radiation dose and image quality in phantoms simulating pediatric patients undergoing conventional single energy CT (SECT) and dual energy CT (DECT).

Methods Used: Pediatric anthropomorphic (N=2, simulating 1 and 5 year olds) and tissue-equivalent oval torso phantoms (N=3, small S, medium M, large L) underwent contrast-enhanced abdomen examinations using SECT at 80, 100 and 120 kVp and DECT at 80/140 kVp on a dual-source system. Milliamperage was adjusted such that volume CT dose index (CTDIvol) was matched for all kVp combinations. The oval phantoms were used to compare CTDIvol, size specific dose estimate (SSDE), and contrast to noise ratio (CNR). Anthropomorphic phantoms were used to assess organ and effective doses at 80 kVp and 80/140 kVp.

Results of Abstract: For the S, M, L phantoms, CTDIvol values were 0.63, 2.70 and 3.30 mGy with SSDEs of 1.64, 5.97, and 5.45 mGy, respectively. CNR values of DECT and SECT were similar at 80 kVp (17 vs 17, 14 vs 11, 9 vs 9, respectively [$P>0.05$]) while the values were higher for DECT than for SECT at 100 and 120 kVp [$P<0.05$]). There was no significant difference in organ dose for DECT and SECT at 80 kVp [$P<0.05$] or effective doses (1.0 mSv, 1 year-old, and 3.0 mSv, 5 year-old).

Discussion: At matched scanner output, DECT organ and effective doses are comparable to those of conventional SECT at appropriately adjusted tube potential (80 to 120 kVp). DECT image quality, measured by CNR, is comparable to that achievable at 80 kVp and superior to that at 100 and 120 kVp.

Scientific and/or Clinical Significance? DECT appears to have the potential to be implemented clinically without additional radiation dose penalty while maintaining high image quality.

Relationship to existing work To our knowledge, this is the first work to address the relationship between radiation dose and image quality in DECT in a pediatric sized population.

N/A