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Title of Abstract: Detection of urolithiasis in 99 patients: Comparison between full dose scans with filtered-back projection reconstruction and ½ dose scans with iterative reconstruction using dual-source CT scan data

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Modality: CT

Organ System: GU

Intro: Pathology with high contrast differentials from background such as renal stones do not require as much dose for diagnosis as objects with low-contrast differentials. This study compares the detection rate for urolithiasis by stones size and location between standard dose protocols and proctocols using 50% dose combined with iterative reconstruction techniques from same patient same scan data.

Purpose: To assess the effect of CT dose reduction on detection of urolithiasis.

Methods Used: 99 patients with 192 kidneys imaged for urolithiasis on a dual energy scanner [Definition Flash (Siemens Healthcare)] in dual-source mode using 120 kVp, 128x0.6 collimation & pitch 0.9. Dose modulation was applied. Data from both tubes was reconstructed with standard filtered back projection (100%-FBP). Data from primary tube (50% total dose) was reconstructed using sonogram-affirmed iterative reconstruction i31 (50%-IR). 7 readers evaluated images in a randomized fashion for calculi (5-pt confidence scale) in 9 regions (pyelocalyceal, proximal, mid, distal ureter, & bladder). Largest stone diameter per region was categorized as ≤1, 2-3, 4-5, 6-7, ≥8mm. Ancillary findings and alternative diagnosis were recorded. Truth was determined by 2 senior uroradiologists in consensus fashion. ROC areas for each reader were estimated from nonparametric methods for clustered data.

Results of Abstract: 112 locations with (86 pyelocalyceal, 7 proximal, 4 mid, 15 distal ureter) and 754 without stones; Mean ROC area was 0.879 (range 0.607-0.967) for 100%-FBP and 0.883 (0.646-0.971) for 50%-IR; 50% dose with IR was not inferior to 100%-FBP [p=0.001]. Sensitivity was significantly greater for larger stones (p<0.001). Hydronephrosis and stranding [N=22] were better detected with 50%-IR [74.0% v 68.2%, p=0.048]. Alternate diagnoses [N=1] were similar (p=1.0). Unrelated findings were clinically unimportant in 37, likely unimportant in 5, and potentially significant in 9 patients.

Discussion: 50% CT dose reconstructed with IR was equivalent to standard dose reconstructed with conventional FBP to detect urolithiasis.

Scientific and/or Clinical Significance? For the vast majority of stone detection, lowering dose by 50% had no significant affect on detection rate when combined with iterative reconstruction.

Relationship to existing work Several studies have looked at detection rate for urolithiasis using low-dose techniques and different reconstruction methods showing equivalence, but few have used a dual-source scanner data by splitting the tube data allowing same-patient comparisons.

N/A