AbstractID: 7034 Title: The use of CT dual-energy subtraction imaging to detect kidney stones amid iodinated contrast material

Purpose: Iodinated contrast excreted into the renal collecting systems and ureters is of similar CT attenuation as kidney stones, making stones difficult or impossible to detect in contrast-enhanced CT scans. This necessitates precontrast imaging for kidney stone work-up. Our purpose was to determine the ability of CT dual-energy subtraction imaging to selectively remove iodine signal while preserving the signal from kidney stones.

Method and Materials: A phantom containing twenty kidney stones with different composition (calcium oxalate monohydrate, calcium hydroxyapatite, uric acid) and size (2 – 6 mm) was scanned with the stones surrounded by water or an iodine/water solution (500, 1000, 1400, 1900, 2300 HU at 120 kV) using a dual-source CT system (Siemens Definition) and 80/140 kV tube potentials. Iodine calibration curves were generated to determine the CT-number ratio between the low and high-kV images and energy subtraction images created. Patients with known stone disease were scanned using the same radiation dose as for single-energy CT as part of clinically-indicated examinations. Subtraction images were created and compared to images of the known stone location.

Results: Image subtraction performed using the empirical calibration curves was successful in removing iodine signal and preserving stone signal for all evaluated stones. One calibration factor to remove iodine signal was successful for all concentrations below the saturation limit, demonstrating independence of the technique on iodine concentration. In initial patient studies, the stone(s) remained visible after subtraction of the iodine signal, demonstrating the potential of the technique *in vivo*.

Conclusion: Dual energy CT can successfully remove iodine while preserving the signal associated with renal stones. This capability may allow the elimination of the non-contrast phase of CT urogram studies, which may decrease the radiation dose to the patient by 50%.

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