

Dual-Energy CT Aids in Renal Stone Classification

Two scientific sessions yesterday revealed the promise of dual-energy CT (DECT) for non-invasively classifying renal stones, potentially aiding more precise therapeutic planning.

RECENTLY, first generation DECT demonstrated its ability to differentiate urinary stones, said Paul Stolzmann, M.D., an assistant professor at University Hospital Zurich.

"All of these studies showed high diagnostic performance, but the examination of large phantom sizes and virtual non-enhanced images in obese patients was hampered by increased image mottle and reduced sensitivities," Dr. Stolzmann explained. "The new DECT scanner has been equipped with a tin filter, which reduces the spectral overlap of the high and low kVp tubes."

Dr. Stolzmann and colleagues examined 110 urinary stones of 15 different compositions enclosed in acrylic spheres and placed at random within a saline-filled plastic phantom. Using the tin filter in addition to 80 to 140 kVp tube voltage settings significantly improved discrimination between uric acid-containing and non-uric acid-containing stones, yielding 100 percent diagnostic accuracy.

"The low kVp tube operated at 100 kVp has a higher power reserve than when operated at 80 kVp, potentially permitting DE application in obese patients," Dr. Stolzmann said. "Reducing the increased image noise of low kVp imaging directly improves the quality of dual-source and dual-kVp material classification, potentially allowing reductions in radiation dose."

Patients with uric acid-containing uri-



Paul Stolzmann, M.D.



Mingliang Qu, M.D.

nary calculi often benefit from management with medication rather than with shock wave lithotripsy or other interventions, Dr. Stolzmann explained. Differentiation will be important for determining the appropriate therapeutic strategy.

"Stone differentiation by DECT will become more reliable and robust in the coming years, and obese patients will potentially be able to undergo DE examinations," he said.

Beyond Uric Acid

Mingliang Qu, M.D., and colleagues built on Dr. Stolzmann's research, exploring the possibility of differentiation beyond "uric acid" and "non-uric acid."

"The first generation of commercial dual energy CT gave us a simple tool to identify uric acid stones, but it is limited to separating out just that one stone type. We wanted to find a way to do better than

that," said Dr. Qu.

Dr. Qu and his team examined 60 human renal stones of 10 different types embedded in porcine kidneys and placed in a water phantom with a cadaver spine. Their equipment was more home-grown, "Our CT scanner did not have a tin filter, so we added a tin filter ourselves with the help of the manufacturers," Dr. Qu explained.

The key to better separation of kidney stone types using DECT lies in better separation of the two energy spectra, Dr. Qu continued. "Previous work by our lab successfully demonstrated that the use of an additional beam filter could give better separation of high- and low-energy spectra."

Dr. Qu's team found that they could distinguish not two but four renal stone

categories. The first category includes uric acid, uric acid dihydrate and ammonium acid urate stones. The second includes cystine and struvite stones. In the third category are calcium oxalate monohydrate, calcium oxalate dihydrate, carbonate apatite and brushite. In the fourth category, the researchers placed hydroxyapatite stones.

The differences on DECT images can be coded into different colors, Dr. Qu demonstrated. "We are very happy to propose this color-coding system," he said.

This information can be obtained quickly with a non-invasive, non-contrast DECT scan, Dr. Qu concluded. "It requires no more radiation dose than the routine non-contrast CT of the abdomen and pelvis used to detect and localize renal stones," he said.

Residents Worldwide Attend Reception



More than 400 residents from around the world attended the RSNA/ACR Residents Reception Monday night at the Hyatt McCormick Place. Radiology leaders from RSNA and ACR mingled with the residents, discussing current and future opportunities in radiology.



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Top 5 #RSNA09 Tweets of the Day

Congratulations to top tweeter *imagingBiz*, who wins a pair of Bistro RSNA tickets that can be picked up from the myRSNA booth in RSNA Services by 12:00 p.m. today. Keep tweeting each day—using #RSNA09—to see if your post is picked.

- 1 Hearing lots of foreign languages at #rsna09 and loving it! Is int'l attendance up this year? *imagingBiz (imagingBiz team)*
- 2 Didnt expect so muc international attention. People are truly wow'd by the Vistatrak RFID technology. Bayer booth 5604. #rsna09 *suneilmandava (Suneil Mandava)*
- 3 One more day @ RSNA today - exhibitors seem upbeat about 2010 #RSNA09 *dpons_aloft (Dustin Pons)*
- 4 Loving the Italian style at the Bracco booth 2829 South Hall A #RSNA09 *EternalFooFan (Joan Vander Valk)*
- 5 lots of #rsna09 goodness happening on Everything Rad: <http://blog.carestreamhealth.com...> check it out! *Carestream (Carestream Health)*

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