

transitional cell carcinoma in patients with hematuria and in patients with history of urothelial cancer. In this retrospective study the authors shows that positive predictive value (PPV) of abnormal findings suspicious for upper tract urothelial cancer on CT urography was only moderate, that is 53% (of 76 patients with either minimally or highly suspicious findings, only 40 had pathologically proved upper tract urothelial cancer). CT urography findings suspicious for urothelial carcinoma were classified in three main categories: large mass (lesions > 5 mm in maximum diameter), small mass (lesions 5 mm in maximum diameter), or urothelial thickening. For findings classified as large masses, the PPV was 83% and for small masses was 0%. We have to consider however, the large number and the variety of false-positive findings in this study. This was probably related to the retrospective analysis of reported findings. False positive findings were caused mainly by normal or hypertrophied papilla, blood clot and inflammation. Usually nonenhancing blood clots may be differentiated from enhancing urothelial tumor by comparing the findings between non-contrast phase and nephrographic phase. Presence of mild, homogeneously enhanced and thickened pelvicalyceal urothelium is relatively frequent feature of patients with symptomatic or asymptotically urinary tract infection. Normal prominent renal papillae may occasionally invaginate deeply into the calices and thus simulate urothelial tumor. The awareness of such anatomic variation and the search for this finding in other papillae in the same patient, are helpful for the adequate diagnosis.

The authors of this manuscript, however, offered important information regarding the value of urine cytology studies, which were available in 80% of patients. Urine cytology was very important for the adequate characterization of pelvicalyceal abnormalities, such as urothelial tumor. When urine cytology was suspicious or malignant and an upper tract urothelial abnormality was found at CT urography, the PPV for upper tract urothelial carcinoma was 92%.

Dr. Adilson Prando

*Head, Department of Radiology and
Diagnostic Imaging, Vera Cruz Hospital
Campinas, São Paulo, Brazil
E-mail: adilson.prando@gmail.com*

doi: 10.1590/S1677-55382010000700020

Urinary calculi composed of uric acid, cystine, and mineral salts: differentiation with dual-energy CT at a radiation dose comparable to that of intravenous pyelography

Thomas C, Heuschmid M, Schilling D, Ketelsen D, Tsiflikas I, Stenzl A, Claussen CD, Schlemmer HP
Department of Diagnostic and Interventional Radiology, University of Tübingen, Tübingen, Germany
Radiology. 2010; 257: 402-9

Purpose: To retrospectively evaluate radiation dose, image quality, and the ability to differentiate urinary calculi of differing compositions by using low-dose dual-energy computed tomography (CT).

Materials and Methods: The institutional review board approved this retrospective study; informed consent was waived. A low-dose dual-energy CT protocol (tube voltage and reference effective tube current-time product, 140 kV and 23 mAs and 80 kV and 105 mAs; collimation, 64 × 0.6 mm; pitch, 0.7) for the detection of urinary calculi was implemented into routine clinical care. All patients (n = 112) who were examined with this protocol from July 2008 to August 2009 were included. The composition of urinary calculi was assessed by using

commercially available postprocessing software and was compared with results of the reference standard (ex vivo infrared spectroscopy) in 40 patients for whom the reference standard was available. Effective doses were calculated. Image quality was rated subjectively and objectively and was correlated with patient size expressed as body cross-sectional area at the level of acquisition by using Spearman correlation coefficients.

Results: One calcified concrement in the distal ureter of an obese patient was mistakenly interpreted as mixed calcified and uric acid. One struvite calculus was falsely interpreted as cystine. All other uric acid, cystine, and calcium-containing calculi were correctly identified by using dual-energy CT. The mean radiation dose was 2.7 mSv. The average image quality was rated as acceptable, with a decrease in image quality in larger patients.

Conclusion: Low-dose unenhanced dual-source dual-energy CT can help differentiate between calcified, uric acid, and cystine calculi at a radiation dose comparable to that of conventional intravenous pyelography. Because of decreased image quality in obese patients, only nonobese patients should be examined with this protocol.

Editorial Comment

Nowadays multi-detector computed tomography (MDCT) is used in attempt to determine the chemical composition of urinary tract stones. However, the attenuations values given in Hounsfield units of different types of calculi obtained with current technique overlap, making reliable distinction of chemical composition of urinary calculi very difficult. With the advent of new dual-source CT systems, CT scans are simultaneously and quickly obtained using two orthogonally positioned x-ray tubes and detector sets (double source at 80 and 140 kV); both helical acquisitions run simultaneously and are not limited by changes between the two scans in contrast enhancement or patient motion (1). Dual-energy CT may be used to distinguish pure uric acid, mixed uric acid, and calcified stones. However, dual-source CT imaging delivery a higher radiation dose to the patient than the currently recommended lower-dose MDCT protocols.

The authors of this manuscript offer a great contribution to this subject by developing a low-dose unenhanced dual-source dual-energy CT protocol that can help differentiate between calcified, uric acid, and cystine calculi at a radiation dose comparable to that of conventional intravenous pyelography (mean 2.7 mSv). This protocol however was useful only in nonobese patients. New variation in dual-source CT protocols, are still in progress in an attempt to further decrease the radiation dose to the patients while keeping the ability to differentiate chemical composition of urinary tract calculi (1).

Reference

1. Ascenti G, Siragusa C, Racchiusa S, Ielo I, Privitera G, Midili F, et al.: Stone-targeted dual-energy CT: a new diagnostic approach to urinary calculosis. *AJR Am J Roentgenol.* 2010; 195: 953-8.

Dr. Adilson Prando

*Head, Department of Radiology and
Diagnostic Imaging, Vera Cruz Hospital
Campinas, São Paulo, Brazil
E-mail: adilson.prando@gmail.com*