

ing BOO, the positive predict value of others sonographic measurements such detrusor wall thickness (DWT), bladder weight and intravesical prostatic protrusion (IPP) has been investigated. In this study the authors evaluated a group of 100 patients with lower urinary tract symptoms due to benign prostatic hyperplasia. They found that the AUC for IPP was 0.835 with a cutoff of 12 mm having 0.65 sensitivity and 0.77 specificity and 88% positive predictive value. The AUC for DWT was 0.845 and at a 6 mm cutoff they noted 0.73 sensitivity and 0.82 specificity. Patients with 1 of the 2 tests positive (IPP 12 mm or more, or DWT 7 mm or more) have an approximately 90% chance of bladder prostatic obstruction on pressure flow study. In the evaluation of IPP, the authors excluded men with a median lobe, which may cause ball valve type of obstruction and can be easily determined by suprapubic US in the sagittal plane. Special attention was given to the role of protrusion of lateral lobes into the bladder. Radiologists and urologists, who perform urological ultrasound, should be aware of the technical aspects of how to obtain these measurements. The estimative of DWT, is yet the only one of these two parameters which has been recommended by the “American College of Radiology 2008 - Appropriateness Criteria”, requires adequate maximum bladder volume, adequate place of the transducer for bladder wall measurement and optimized ultrasound transducer frequency.

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Renal cell carcinoma: diffusion-weighted MR imaging for subtype differentiation at 3.0 T

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Purpose: To assess the usefulness of apparent diffusion coefficients (ADCs) for characterizing renal cell carcinoma (RCC) subtypes at 3.0 T.

Materials and Methods: The Institutional Review Board approved this retrospective study, and informed consent was waived. Eighty-three patients underwent diffusion-weighted (DW) magnetic resonance (MR) imaging of 85 renal masses. In each patient, precontrast single-shot spin-echo echo-planar DW imaging was performed with b values of 0 and 500 and 0 and 800 sec/mm² by using a 3.0-T MR imaging system. Differences in ADCs between the RCC lesions and uninvolved renal parenchyma were tested by using a paired-samples t test. One-way analysis of variance was used to compare ADCs of the various RCC subtypes. Receiver operating characteristic (ROC) curve analysis was used to test the ability of ADCs in differentiating clear cell from non-clear cell RCCs.

Results: Pathologic diagnoses of the 85 tumors (median diameter, 4.4 cm) in the 83 patients (54 men, 29 women; age range, 23-75 years; mean age, 49.4 years) were clear cell RCC for 49 tumors, papillary RCC for 22 tumors, and chromophobic RCC for 14 tumors. With b values of 0 and 500 sec/mm², clear cell RCCs showed a significantly higher mean ADC (1.849×10^{-3} mm²/sec) than papillary (1.087×10^{-3} mm²/sec) and chromophobic (1.307×10^{-3} mm²/sec) RCCs ($P < .001$); however, the difference between papillary and chromophobic RCCs was not significant ($P = .068$). With b values of 0 and 800 sec/mm², clear cell RCC showed the largest mean ADC (1.698×10^{-3} mm²/sec) of the three subtypes, and the difference between each pair of

subtypes was significant ($P < .001$). ADCs obtained with b values of 0 and 800 sec/mm² were more effective for distinguishing clear cell from non-clear cell RCC (area under the ROC curve, 0.973): A threshold value of 1.281×10^{-3} mm²/sec permitted distinction with high sensitivity (95.9%) and specificity (94.4%).

Conclusion: DW imaging with b values of 0 and 800 sec/mm² allows sensitive and specific differentiation of clear cell, papillary, and chromophobic RCCs, suggesting that DW imaging may be useful in the preoperative characterization of RCC.

Editorial Comment

Diffusion-weighted imaging (DWI) is a magnetic resonance technique where the contrast between tissues derives from the regional differences in the mobility of water molecules. The diffusion data can be presented as signal intensity on pure DWI or as an image map of the apparent diffusion coefficient (ADC). Calculation of the ADC requires 2 or more acquisitions with different diffusion weightings (“b values”). A low ADC corresponds to high signal intensity in pure DWI (restricted diffusion usually found in more compact tissues), and a high ADC to low signal intensity on pure DWI (found in less compact tissue). The authors of this study evaluated with DWI 85 tumors (49 clear cells RCC, 22 papillary RCC and 14 chromophobic RCC. ADCs obtained with b values of 0 and 800 sec/mm², were more effective for distinguishing clear cell from non-clear cell RCC (area under the ROC curve, 0.973), and for distinguishing RCC sub types.

DWI has also been shown to be useful to distinguish benign from malignant renal tumors (1). Statistically significant differences exist between the ADC values of normal kidney, renal carcinomas, renal angiomyolipomas and renal cysts when the “b value” is the same. In our opinion however further studies are necessary to confirm the reported higher accuracy in distinguishing benign from malignant renal tumors and in distinguishing RCC subtypes. Until now, there is no consensus regarding which are the best “b values” for renal masses characterization. Do we need just a pair of b values (example: 0 and 800 sec/mm²) or do we need a multi-b-values technique (example: b values of 0, 50, 100, 300, 500, 800, 1000, etc) in order to obtain a discriminatory characteristic curve of ADC values?. Another point to consider is that in the majority of situations, radiologists use only visual assessment of DWI; in other words normal or benign, less compact tissues, usually present as an area with lower signal intensity on DWI and with higher ADC values. Contrary, tumoral compact tissue, due its restricted diffusion, appears as an area with higher signal intensity on DWI and lower ADC values. However in our preliminary experience we have been seen benign angiomyolipoma with lower ADC values than RCC.

Reference

1. Zhang Y, Sun Xingwang, Quan G, Qiang Y, Li C: Value of apparent diffusion coefficient (ADC) of diffusion weighted magnetic resonance imaging in common renal disease diagnosis. Journal of Nanjing Medical University 2008; 22: 362-365.

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