Similarly since 2005, we have been using the multiparametric evaluation for the detection of prostate cancer in patients with elevated PSA and negative prostate biopsies. Multiparametric evaluation is a combination of conventional endorectal T2-weighted image, spectroscopy, diffusion-weighted image and perfusion study (dynamic contrast-enhanced MRI). Using only MRI and MRSI results to target an endorectal sonographically guided biopsy in men with highly suspicious spectral trace for prostate cancer the sensitivity, specificity, positive and negative predictive values, and accuracy were 71%, 84%, 75%, 81%, and 79%, respectively (2). In this group of patients with at least two negative biopsies the finding of more than one focal area with low-signal intensity on T2-weighted image, suspicious for cancer, is not infrequent. These focal areas with reduced T2 signal intensity in peripheral zone are probably related to post-biopsies scarring. In our experience these abnormalities may be disregarded as a suspicious lesions based on spectroscopic imaging alone or combined with diffusion-weighted image and perfusion study. Based on this complete MRI work-up an similarly to cancer of transition zone (3), we feel that the best results for the detection of cancer of the peripheral zone in patients with negative biopsies, will be accomplished by the combination of the results of these 4 techniques (a retrospective analysis of this materials and methods has already been initiated). It is interesting to emphasize that these techniques are complimentary since they are based in different biologic principles. In view of the results of this well designed multicenter trial, perhaps in the near future, it will be interesting to confirm if multiparametric MRI evaluation is of incremental value for the detection of prostate cancer in the larger group of patients without previous biopsy.

References

1. Yu KK, Scheidler J, Hricak H, Vigneron DB, Zaloudek CJ, Males RG, et al.: Prostate cancer: prediction of extracapsular extension with endorectal MR imaging and three-dimensional proton MR spectroscopic imaging. Radiology. 1999; 213: 481-8.
2. Prando A, Kurhanewicz J, Borges AP, Oliveira EM Jr, Figueiredo E: Prostatic biopsy directed with endorectal MR spectroscopic imaging findings in patients with elevated prostate specific antigen levels and prior negative biopsy findings: early experience. Radiology. 2005; 236: 903-10.
3. Prando A, Borges AP, Oliveira EM: Detection of Transition Zone Prostate Cancer: The Role of Color Doppler Transrectal Ultrasound and MR Imaging with Conventional and Functional Studies. Educational Exhibit, RSNA 2007. LL-UR2682. Available at: http://rsna2007.rsna.org/V2007/documents/content_brochures/SSC_Ultrasound.pdf

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Urinary bladder cancer: diffusion-weighted MR imaging--accuracy for diagnosing T stage and estimating histologic grade

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Purpose: To prospectively evaluate the ability of diffusion-weighted (DW) magnetic resonance (MR) imaging to be used to determine the T stage of bladder cancer and to measure the correlation between the apparent diffusion coefficient (ADC) and histologic grade.
Materials and Methods: This study was approved by the local institutional review board. All patients gave written informed consent. Forty patients with a total of 52 bladder tumors underwent MR imaging that included

DW imaging. Histologic grade was determined for all tumors. Two radiologists interpreted four image sets (ie, T2-weighted images alone, T2-weighted plus DW images, T2-weighted plus dynamic contrast agent-enhanced images, all three image types together). Conventional criteria were used for interpreting T2-weighted and contrast-enhanced images. For DW images, new staging criterion developed on the basis of the hypothesis that tumors, submucosal tissue, and muscles show high, low, and intermediate signal intensity, respectively, was used. The McNemar test was used to examine differences in accuracy, sensitivity, and specificity. Differences in the performance were analyzed by comparing the areas under the receiver operating characteristic curves (A(z) values). To compare ADCs between three histologic grades, analysis of variance was used.
Results: The overall accuracy of T stage diagnosis was 67% for T2-weighted images alone, 88% for T2-weighted plus DW images, 79% for T2-weighted plus contrast-enhanced images, and 92% for all three image types together. The overall accuracy, specificity, and A(z) for diagnosing T2 or higher stages were significantly improved by adding DW images ($P < .01$). The mean ADC of G3 tumors was significantly lower than that of G1 and G2 tumors ($P < .01$).
Conclusion: DW images provided useful information for evaluating the T stage of bladder cancer, particularly in differentiating T1 or lower tumors from T2 or higher tumors. The ADC may in part predict the histologic grade of bladder cancer.

Editorial Comment

Local staging of bladder cancer can be performed either by CT or by MRI. Sensitivity and specificity for detecting perivesical invasion with multidetector CT are 92% and 98% respectively, with an accuracy of 96%. These results are obtained, if MDCT is performed more than 7 days after biopsy (1).

The high intrinsic contrast of MR imaging permits distinction of bladder wall layers (2). With fast dynamic contrast-enhanced imaging, bladder cancer enhances more intense and earlier than normal bladder wall and post biopsy changes. This characteristic enhancement may allow differentiation of tumor from fibrosis or edema, although this is still difficult soon after transurethral resection. MR imaging has a reported staging accuracy of 72%-96% and is superior to CT for differentiation of superficial versus deep muscle invasion, unfortunately, overstaging occurs in about 20% patients.

Although based on relative small series, the authors present interesting results showing that diffusion-weighted imaging (DWI) may significantly reduce overstaging of bladder cancer observed with conventional MRI techniques. This sequence is relatively fast and easy to accomplish and can be performed routinely. Radiologists should include DWI in the protocol of MRI staging of bladder cancer. Further studies are warranted to confirm that this sequence has higher accuracy than conventional sequences (T2-weighted images + fast dynamic contrast enhanced), for the demonstration of invasion of perivesical tissues. Another potential utility of this sequence would be its ability to differentiate scars and reactive tissue after biopsy from tumor tissue.

References

1. Kim JK, Park SY, Ahn HJ, Kim CS, Cho KS: Bladder cancer: analysis of multi-detector row helical CT enhancement pattern and accuracy in tumor detection and perivesical staging. Radiology. 2004; 231: 725-31.
2. Barentsz JO, Witjes JA, Ruijs JH: What is new in bladder cancer imaging. Urol Clin North Am. 1997; 24: 583-602.
3. Watanabe H, Kanematsu M, Kondo H, Goshima S, Tsuge Y, Onozuka M, et al.: Preoperative T staging of urinary bladder cancer: does diffusion-weighted MRI have supplementary value? AJR Am J Roentgenol. 2009; 192: 1361-6.

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