IMAGING

Prostate cancer: sextant localization at MR imaging and MR spectroscopic imaging before prostatectomy--results of ACRIN prospective multi-institutional clinicopathologic study

Weinreb JC, Blume JD, Coakley FV, Wheeler TM, Cormack JB, Sotto CK, Cho H, Kawashima A, Tempany-Afdhal CM, Macura KJ, Rosen M, Gerst SR, Kurhanewicz J

Department of Radiology, Yale University School of Medicine, New Haven, CT, USA

Purpose: To determine the incremental benefit of combined endorectal magnetic resonance (MR) imaging and MR spectroscopic imaging, as compared with endorectal MR imaging alone, for sextant localization of peripheral zone (PZ) prostate cancer.

Materials and Methods: This prospective multicenter study, conducted by the American College of Radiology Imaging Network (ACRIN) from February 2004 to June 2005, was institutional review board approved and HIPAA compliant. Research associates were required to follow consent guidelines approved by the Office for Human Research Protection and established by the institutional review boards. One hundred thirty-four patients with biopsy-proved prostate adenocarcinoma and scheduled to undergo radical prostatectomy were recruited at seven institutions. T1-weighted, T2-weighted, and spectroscopic MR sequences were performed at 1.5 T by using a pelvic phased-array coil in combination with an endorectal coil. Eight readers independently rated the likelihood of the presence of PZ cancer in each sextant by using a five-point scale-first on MR images alone and later on combined MR-MR spectroscopic images. Areas under the receiver operating characteristic curve (AUCs) were calculated with sextant as the unit of analysis. The presence or absence of cancer at centralized histopathologic evaluation of prostate specimens was the reference standard. Reader-specific receiver operating characteristic curves for values obtained with MR imaging alone and with combined MR imaging-MR spectroscopic imaging were developed. The AUCs were estimated by using Mann-Whitney statistics and appropriate 95% confidence intervals.

Results: Complete data were available for 110 patients (mean age, 58 years; range, 45-72 years). MR imaging alone and combined MR imaging-MR spectroscopic imaging had similar accuracy in PZ cancer localization (AUC, 0.60 vs. 0.58, respectively; $P > .05$). AUCs for individual readers were 0.57-0.63 for MR imaging alone and 0.54-0.61 for combined MR imaging-MR spectroscopic imaging.

Conclusion: In patients who undergo radical prostatectomy, the accuracy of combined 1.5-T endorectal MR imaging-MR spectroscopic imaging for sextant localization of PZ prostate cancer is equal to that of MR imaging alone.

Editorial Comment

Endorectal prostate cancer imaging protocols remain subject of much debate, and undergo continuous evaluation and review. The results of this multi-institutional trial showed that magnetic resonance spectroscopic imaging (MRSI) shows no advantages over conventional magnetic resonance imaging (MRI) alone, for localization of peripheral zone prostate cancer. Similarly to other radiologic centers, since 2005, combined conventional endorectal MRI + MRSI has become routinely practice in our institution, in two main clinical situations. First, in the preoperative staging work-up for patients with moderate or high risk of extraprostatic extension and second in patients with negative biopsies and elevated or rising PSA.

Patients without signs of extraprostatic extension on conventional endorectal MRI, are usually further evaluated with spectroscopy since the number of voxels per section, highly suspicious for cancer on the basis of an elevated ratio choline + creatine / citrate is useful to predict extra-prostatic extension (1). Presence of more than four, contiguous highly suspicious voxels located adjacent to the capsule in an otherwise confined tumor on T2-weighted image, may be associated with extra-prostatic extension on microscopic analysis.

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

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

Urinary bladder cancer: diffusion-weighted MR imaging--accuracy for diagnosing T stage and estimating histologic grade
Takeuchi M, Sasaki S, Ito M, Okada S, Takahashi S, Kawai T, Suzuki K, Oshima H, Hara M, Shibamoto Y
Department of Radiology, Nagoya City University Graduate School of Medical Sciences, Nagoya, Japan
Radiology. 2009; 251: 112-21

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