

Areas suspicious for prostate cancer: MR-guided biopsy in patients with at least one transrectal US-guided biopsy with a negative finding-multiparametric MR imaging for detection and biopsy planning

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Purpose: To prospectively investigate the incremental value of multiparametric magnetic resonance (MR) imaging compared with standard T2-weighted imaging for biopsy planning.

Materials and Methods: The study was approved by the institutional review board; informed consent was obtained. Consecutive patients underwent T2-weighted imaging supplemented with multiparametric 1.5-T MR imaging, consisting of hydrogen 1 (^1H) MR spectroscopy, diffusion-weighted (DW) imaging, and contrast material-enhanced MR imaging. Quantitative parameters were calculated: (choline plus creatine)-to-citrate ratio, apparent diffusion coefficient, and volume transfer constant and exchange rate constant. The prostate was divided into 20 standardized areas. Each area was classified as benign, inconclusive, or suspicious at T2-weighted imaging, followed by quantitative evaluation of all inconclusive and suspicious areas with multiparametric MR imaging. MR-guided biopsy was performed in lesions classified as suspicious for cancer with at least one of the techniques after transfer to three-dimensional T2-weighted images. Diagnostic parameters were calculated on a per-lesion and per-patient basis for all combinations of T2-weighted imaging with multiparametric MR imaging.

Results: Fifty-four patients had a median of two prior transrectal ultrasonographic biopsies with negative findings. Each patient had a median of three suspicious lesions. Prostate cancer was demonstrated in 21 of 54 patients. Biopsy was performed in 178 lesions; 53 were positive for prostate cancer. Detection rates and test negative results, respectively, were as follows: T2-weighted imaging, 70% and 50%; T2-weighted imaging and (1)H MR spectroscopy, 81% and 32%; T2-weighted imaging and contrast-enhanced MR imaging, 83% and 29%; T2-weighted imaging and DW imaging, 85% and 30%; T2-weighted imaging, (1)H MR spectroscopy, and contrast-enhanced MR imaging, 91% and 13%; T2-weighted imaging, (1)H MR spectroscopy, and DW imaging, 94% and 15%; T2-weighted imaging, DW imaging, and contrast-enhanced MR imaging, 94% and 13%; T2-weighted imaging, (1)H MR spectroscopy, DW imaging, and contrast-enhanced MR imaging, 100% and 0%.

Conclusion: Only the combination of T2-weighted imaging with all three multiparametric techniques depicts all identifiable prostate cancers; a double combination with DW imaging and (1)H MR spectroscopy or contrast-enhanced MR imaging misses 6%, while reasonably reducing the number of areas needing biopsy.

Editorial Comment

This is a prospective study looking at the incremental value of multiparametric MR imaging representing the integration of spectroscopy (MRSI), diffusion-weighted imaging (DWI) and dynamic-contrast enhanced MR imaging (DCE) in comparison with conventional T2-weighted imaging for the detection of prostate cancer. The authors enrolled 54 patients with at least one negative transrectal US-guided prostate biopsy and elevated or rising PSA. Their results show that in this selected group of patients MRI-guided biopsy oriented by findings obtained with the combinations of T2-weighted imaging, DWI, and DCE and T2-weighted imaging, MRSI and DWI depicted cancer in 21 out 54 patients (39%) representing 94% of all prostate cancer areas (19% higher than if biopsy were oriented by the results of anyone isolated technique).

Recently several methods have been used to orient the rebiopsy of prostate based on suspicious areas of cancer found in multiparametric MR imaging. In our institution, suspicious areas detected on multiparametric MRI have been sampled by transrectal US-guided biopsy. Since 2004 we have been using a visual method of overlaying suspicious multiparametric MRI findings onto axial US scans (1). Internal and external prostatic and periprostatic anatomic landmarks are used to project suspicious MRI findings on US scans. Our method has limitations since demands high level of expertise in prostate imaging. Recently however electronic real-time fusion of endorectal MR images with endorectal US images and the use of specially designed MRI-guided biopsy device, have been implemented and this task has been facilitated as shown by the authors of this manuscript. However in any of these circumstances, a close relationship between radiologist and urologist is mandatory.

Reference

1. 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.

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