Differentiation between BPH and prostatic cancer using diffusion-weighted MR imaging and 3D 1H-MR spectroscopy

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PURPOSE: To assess the usefulness of diffusion-weighted MR imaging and 3D 1H-MR spectroscopy (H-MRS) in differentiating between BPH and prostatic cancer.

METHOD AND MATERIALS: Diffusion-weighted MR imaging and 3D 1H-MR spectroscopy was performed with GE 1.5 Tesla Signa Twinspeed Infinity with Excite MR scanner in 23 consecutive patients with prostatic cancers. The spin-echo diffusion-weighted images comprised 128×128 pixels (field of view of 18 cm, TR/TE = 4000/120 msec, b=1000 s/mm2) with a body phased-array coil and 3D H1-MR spectroscopy was followed with PRESS excitation (field of view of 11cm, TR/TE = 4300/124 msec, 3D phase encoding 16×8×8) using a endorectal coil in combination with ATD torso coil for signal reception.

RESULTS: The ADC values averaged over all patients in non-cancerous and malignant peripheral zone (PZ) tissues were 1.46±0.52×10-3mm2/sec(mean ± SD) and 0.81±0.36×10-3mm2/sec (high signal intensity on diffusion-weighted images), respectively. The ADC values were found to be lower in the malignant PZ than in the non-cancerous PZ and in the benign prostatic hyperplasia central gland (BPH-CG) region (1.34±0.42×10-3mm2/sec). There was very significant difference for ADC values between the benign and malignant prostatic tissues ($p<0.01$)(**Fig.1**). On 3D 1H- MR spectroscopy, increased creatine+choline peaks and decreased citrate peaks with resultant increases in the Cho+Cr/Cit (2.95±0.76) were observed in the malignant PZ(**Fig.2**), Whereas the Cho+Cr/Cit ratio was significant lower (0.67±0.11) in the non-cancerous PZ and in the benign prostatic hyperplasia CG . There was well significant difference for Cho+Cr/Cit ratio between tumorous and nontumorous lesions in prostate ($p<0.001$). The overall accuracy, sensitivity and specificity of tumor detection, using DWI and H-MRS, was 92.7%, 88.9% and 97.6% respectively.

CONCLUSIONS: The BPH and prostatic cancer can be differentiated based on diffusion-weighted MR imaging and 3D H1-MR spectroscopy.

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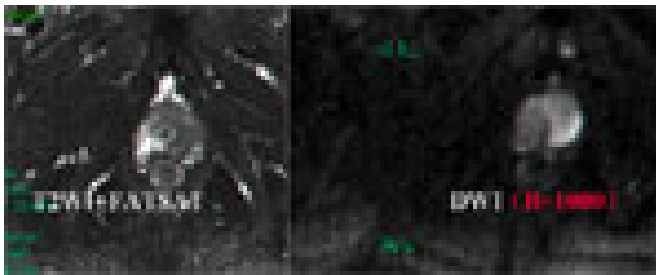
FIG.1   The ADC values were found to be lower in the malignant PZ which demonstrated increasing signal than in the non-cancerous PZ and in the benign prostatic hyperplasia central gland (BPH-CG) region which central gland (BPH-CG) region which demonstrated low signal.

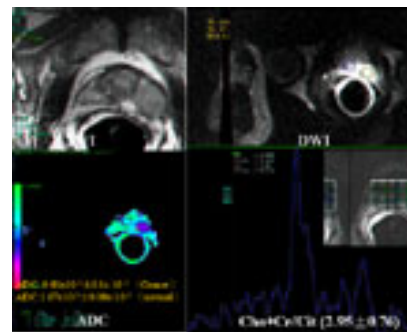
Fig.2   On 3D 1H- MR spectroscopy, increased creatine+choline peaks and decreased citrate peaks with resultant increases in the Cho+Cr/Cit (2.95±0.76) were observed in the malignant PZ.