Potential of ^{1}H MR Spectroscopic Imaging to predict Negative Biopsy in men with PSA < 10 ng/mL

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Objective: Cancer can be detected in only 30% men with an indication for prostate biopsy and serum prostate specific antigen (PSA) less than 10 ng/mL. There are no markers to identify patients who are unlikely to have cancer and can thus avoid a biopsy. Magnetic resonance spectroscopic imaging (MRSI) identifies areas of abnormal metabolism that may harbor cancer. We prospectively evaluated the use of MRSI to identify patients who are unlikely to have a cancer detected on their biopsy.

Materials and Methods: Men (n = 72, mean age = 62.9 ± 8.4 years) with serum PSA < 10 ng/mL (mean PSA = 6.3 ± 2.3 ng/mL) were investigated prior to a transrectal ultrasound (TRUS) guided biopsy of prostate at 1.5 Tesla whole body scanner (Sonata, Siemens). MR investigations were carried out using pelvic phased array coil and/or with endorectal coil. T2-weighted images in transverse, sagittal and coronal planes were acquired covering the entire prostate (TR = 5000 ms, TE = 98 ms, slice thickness = 4 or 5 mm, without inter-slice gap. PRESS localized 3D-MRSI sequence was used with simultaneous suppression of lipid and water. The parameters used for MRSI were: TR = 1300 ms, TE = 120 ms, Average = 3, acquisition time = 17 min. MRSI spectral map was overlaid on corresponding T2-weighted image. Voxels suspicious of prostate cancer were identified as indicated by increased metabolite [(Choline+Creatine)/(Citrate)] ratio. [(Cho+Cr)/Cit] ratio < 0.7 was considered as normal, while the ratio in the range 0.7 – 0.85 was classified as equivocal, and a value > 0.86 was taken as indicative of malignancy [1]. Men with metabolite ratio < 0.7 underwent a standard TRUS guided sextant biopsy. In patients with a biopsy negative for cancer, PSA was repeated six monthly and a biopsy was performed if the levels rose.

Results: MRSI showed no evidence of cancer based on metabolite ratio in 26 (36%) out of 72 patients. 10 patients had chronic prostatitis and rest of the patients showed normal histology. None of these patients was subsequently found to have a cancer on the sextant TRUS guided biopsy. Thus, it is highly unlikely that patients whose MRSI show metabolite ratio in normal range, will have cancer. PSA decreased in all these men at 6 months. Only one patient showed a rise in PSA at 6 months from 6.3 to 6.9, however, his repeat TRUS guided (11 core) biopsy was negative for cancer.

Conclusions: Our study shows that patients with PSA < 10 ng/mL but no indication of malignancy in MRSI may not harbor clinically relevant cancer prostate. Therefore, MRSI may have the potential to segregate patients who may not need biopsy procedure. Further study with longer follow up may help to clarify the use of MRSI in avoiding biopsies in this group of men is required and such a study is in progress.

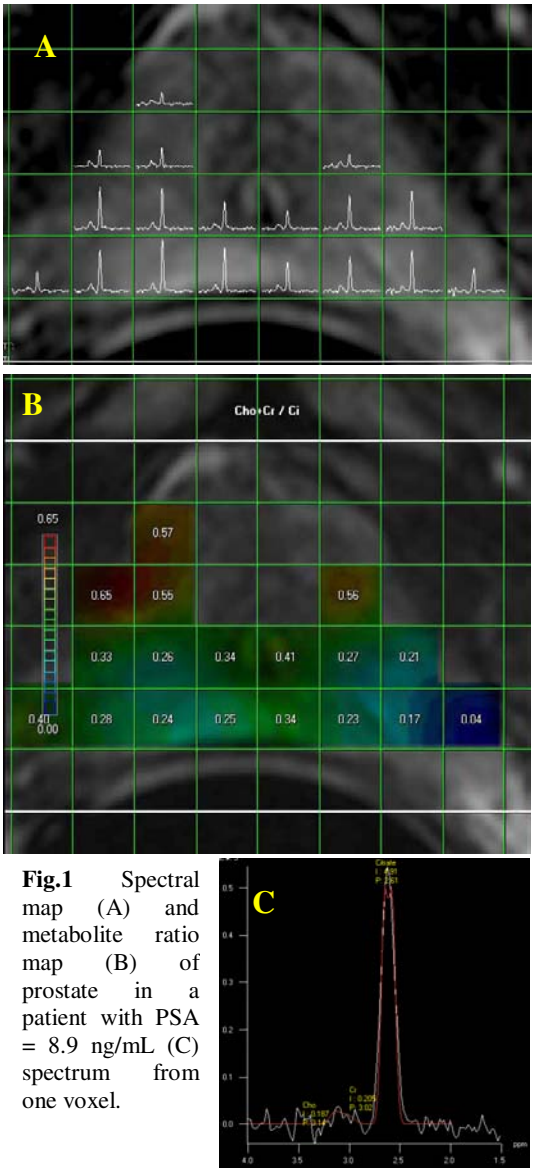

Fig.1 Spectral map (A) and metabolite ratio map (B) of prostate in a patient with PSA = 8.9 ng/mL (C) spectrum from one voxel.

References:

1. Scheidler J, Hricak H, Vigneron DB et al. Radiology 1999 213:473-80.