Feasibility of quadrature body coil in prostate spectroscopic MR Imaging

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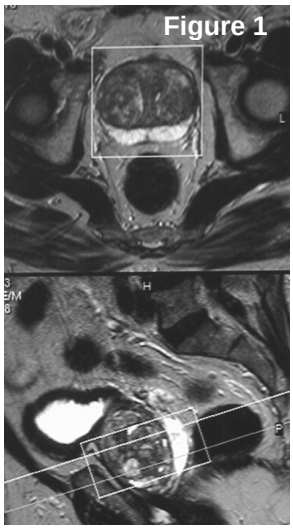
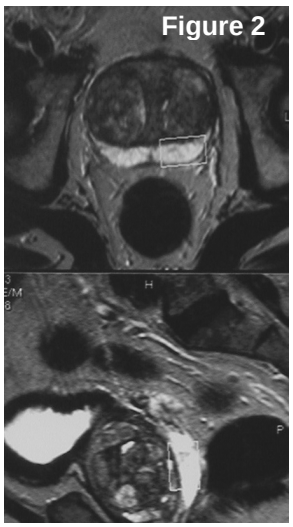
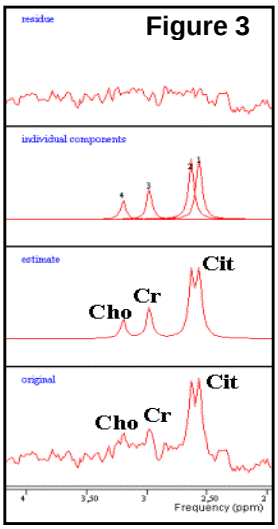
Purpose: PSA measurements, transrectal ultrasonography, CT, and MRI often cannot reliably differentiate early prostate cancer from BPH and normal tissue. Proton spectroscopic imaging (^{1}H-MRSI) can evaluate the prostate with an appropriate matrix size and field homogenisation. In most centres spectroscopic images are obtained with an endorectal coil. We present our results with ^{1}H-MRSI obtained using the quadrature body coil, ensuring faster and reliable clinical application and lower patient disturbances.

Subjects and Methods: 25 male patients were studied (1.5 T system) with a sagittal and transverse T2W images orthogonal to the prostate central gland axis. Transverse images were used to localize 2 ^{1}H-MRSI slices (TE 272 ms, thickness 20x22 mm, ROI 65x65 mm) including both the central and peripheral glands (Figure 1). When necessary, a single volume (TE 136 ms) was also acquired in peripheral regions or regions with abnormal ^{1}H-MRSI findings (Figure 2). Spectra were analysed with jMRUI and SIView (Figure 3 and 4). For each single volume spectra the ratio (Cho+Cr)/Cit was calculated and compared with the ratios in the references with (Cho+Cr)/Cit < 0.75 for normal tissue, 0.75 < (Cho+Cr)/Cit < 0.86 for possible cancer and (Cho+Cr)/Cit > 0.86 for tumour (Table 1). Only subjects with pathological data (surgery or biopsy) were included.



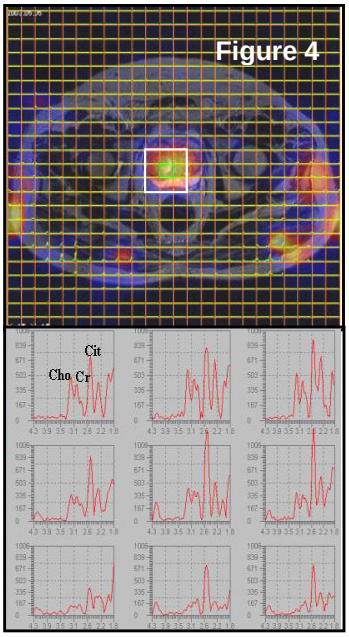




Results: Higher Cho (Choline) and lower Cit (Citrate) were found in those patients with cancer in all pathological areas (Table 1). ^{1}H-MRSI (Figure 4) allowed the location of higher cellular regions in the central and peripheral portions. The spatial resolution was considered adequate by radiologists and urologic surgeons.

Table 1

n	Age	PSA	SV (Cho+Cr)/Cit PPG R	SV (Cho+Cr)/Cit PPG L	SV (Cho+Cr)/Cit CG	SV (Cho+Cr)/Cit Lesion	MV 2SL SL 1	MV 2SL SL 2	AP
1	77	17.3	0.30	0.43	-	-	R Cho ↑ Cit ↓	Cho ↑ Cit ↓	Not tumour
2	74	5.9	0.13	Art.	-	-	NA	R P Cho ↑↑ Cit -	No prostate tumour Vesical Tumour
3	66	8.2	0.32	0.22	-	-	Cho ≅ Cit ↓	Cho ≅ Cit ↓	Not tumour
4	73	23.5	-	-	-	1.15	R Cho ≅ Cit ↓	Cho ≅ Cit ↓	Not tumour
5	63	5	-	-	Art.	-	Cho ↑ Cit ↓	Art.	Not tumour
6	72	7.5	-	-	0.53	-	NA	NA	Not tumour
7	56	-	-	-	-	0.79	L Cit ↓	P Cho ↑ Cit ↓	Not tumour
10	64	8.9	0.41	0.23	-	-	NA	P Cho↑↑ Cit ↓	Adenocarcinoma G-2+2
11	71	-	0.38	0.24	-	-	A C Cit ↓	R P Cho↑↑ Cit ↓	Adenocarcinoma G-2+2
12	60	15.5	-	-	-	2.44	R Cho ↑	A Cho ↑	Adenocarcinoma G-2+3
13	65	10.8	1.10	0.45	-	-	Cho ↑ Cit ↓	Cho ↑ Cit ↓	Adenocarcinoma G-3+3
14	71	6	0.30	Art.	-	-	Art.	Art.	Adenocarcinoma G-3+3
15	63	9.1	Art.	Art.	-	-	Cho ↑ Cit ↓	P Cho ↑↑ Cit -	Adenocarcinoma G 3+3
16	65	-	0.92	1.16	-	-	Cho ↑ Cit ↓	Art.	Adenocarcinoma G-3+3
17	65	11.4	-	-	0.75	1.96	R Cho ↑ Cit ↓	P Cho ↑ Cit ↓	Adenocarcinoma G 3+4
18	71	64.0	-	-	-	0.95	L Cho ↑ Cit ↓	Art.	Adenocarcinoma G-4+3
19	59	-	-	-	Art.	-	Art.	Art.	Adenocarcinoma B-Dif



Conclusion: In general, clear modifications in the Cho and Cit MRS signals can be observed in the tumour prostate patients. The combined information of both, single volume and MRSI spectra, allows the identification of tumoral tissue. ^{1}H-MRSI and single voxel MRS with a 1.5 T unit using the quadrature body coil is an easily accepted technique useful in the diagnosis of prostate cancer. Patient conformance is high; it is non-invasive; and allows patient follow up.

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