

Differences in prostate ADC values in patients with a positive biopsy compared to those with a negative biopsy.

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Background:

Multiparametric prostate MRI has the potential of becoming an imaging requirement before prostate biopsy. One of its main drawbacks is its elevated cost due to long time studies and the use of paramagnetic contrast.

Aims and objectives:

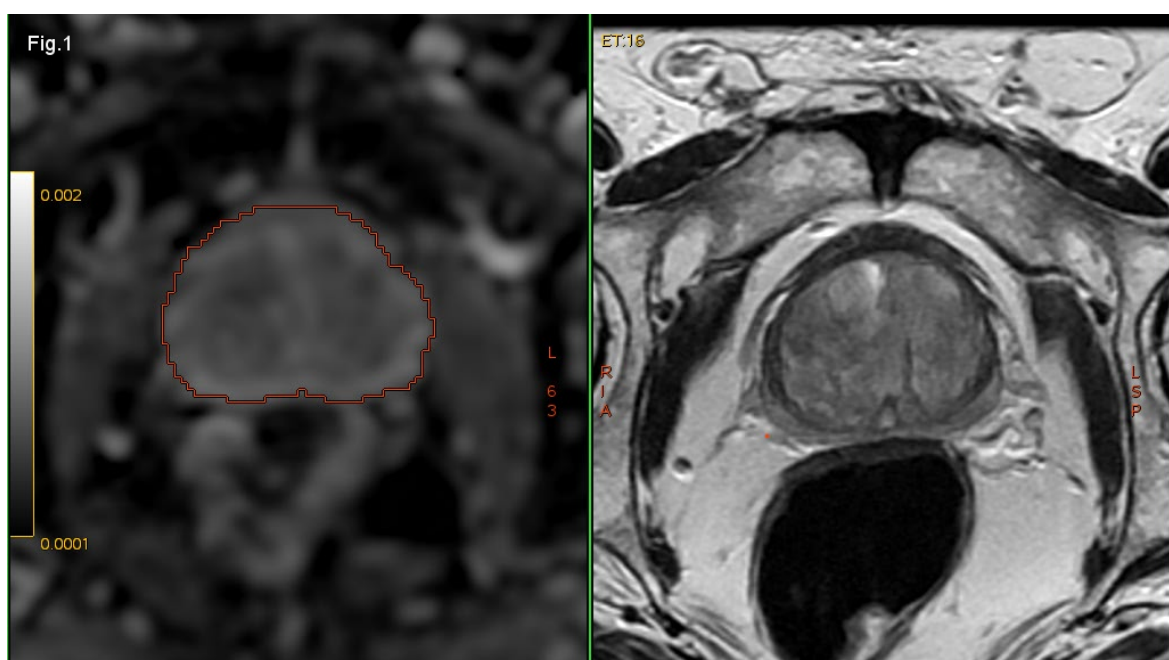
The objective of this study is to evaluate the potential of diffusion-weighted imaging and ADC values on their own, to predict transrectal ultrasound (TRUS) biopsy outcome.

Materials and Methods:

60 patients underwent multiparametric prostate MRI. 19 patients had at least one previous negative TRUS biopsy and 41 patients had a previous positive TRUS biopsy.

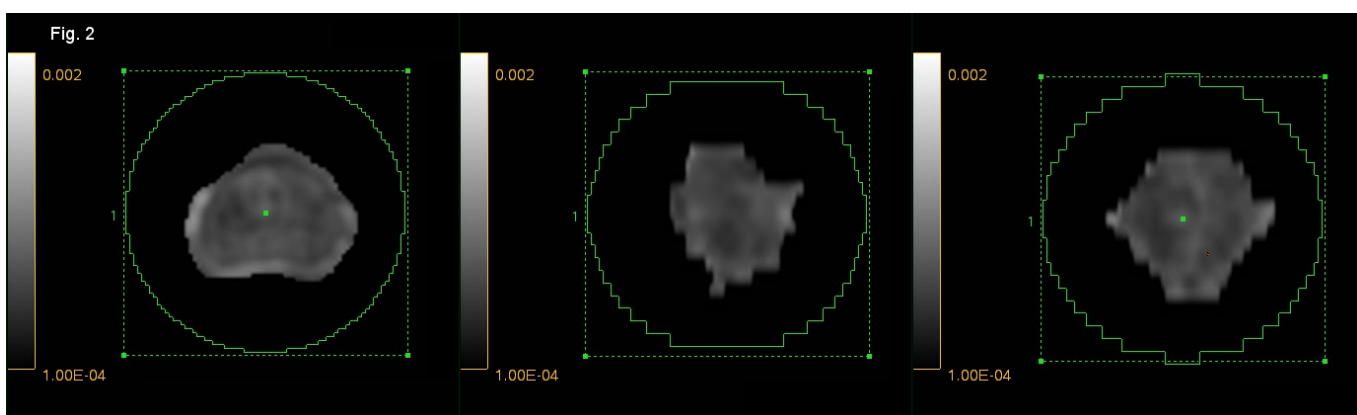
All MRI scans were performed on a 1.5 T GE Signa scanner (GE Healthcare). The parameters for the diffusion weighted sequences were TR /TE: 7000/70ms; field of view/slice thickness/gap: 360x360/4/0.5 mm; at 2 b-values (0, 800 s/mm²).

Figure 1. ROI is drawn along the border of the prostate in ADC map images (left) using T2WI (right) as a guide.



Prostate segmentation on ADC maps was obtained by drawing regions of interest (ROIs) along the boundary of the prostate for all slices where the prostate was visible, using T2 weighted images as a guide (Figure 1). Once the prostate was isolated, a volumetric ROI was drawn including all the prostate volume, and minimum, maximum and mean ADC values were obtained (Figure 2).

Figure 2. Volumetric ROI is obtained from prostate segmentation. Axial (left), sagittal (centre) and coronal (right) ADC images of the prostate.



Differences between the two groups in PSA and PSA density before the MRI scan and in minimum, maximum and mean ADC values were assessed using Students t-tests. A p value of <0.05 was considered statistically significant.

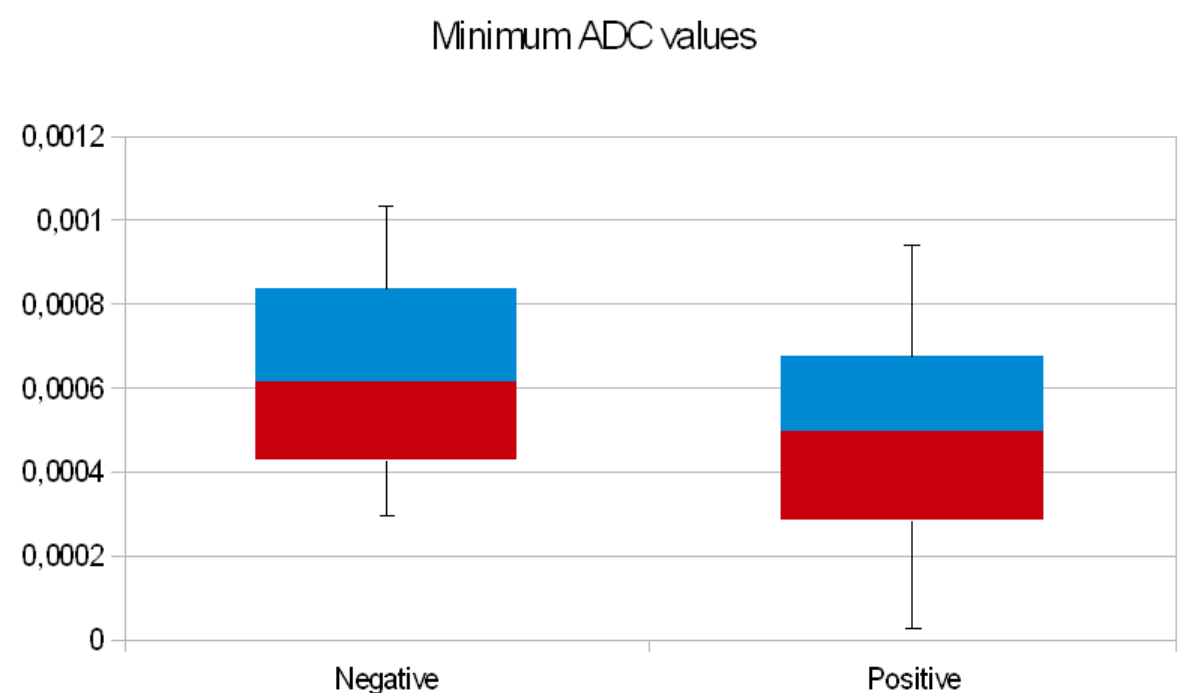
Results:

Table 1. Average and standard deviation of PSA, PSA density, minimum, maximum and mean ADC values for each group. Student's t test value is shown for each variable.

	NEGATIVE	POSITIVE	p
PSA (ng/ml)	16.6 ± 21.32	11.2 ± 9.91	0.09
PSA density (ng/ml/ml)	0.24 ± 0.26	0.35 ± 0.50	0.19
Minimum ADC (x 10 ⁻³ mm ² /s)	0.613 ± 0.221	0.494 ± 0.234	0.03
Maximum ADC (x 10 ⁻³ mm ² /s)	2.085 ± 0.635	1.953 ± 0.583	0.22
Mean ADC (x 10 ⁻³ mm ² /s)	1.224 ± 0.393	1.125 ± 0.371	0.17

There were no statistical significant differences in PSA, PSA density, maximum and mean ADC values between the two groups. The positive biopsy group showed a lower minimum ADC value compared to the negative group (p=0.03).

Graph 1. Box plot distribution of minimum ADC values.



Conclusion:

The group of patients with positive TRUS biopsies showed lower minimum ADC values of the whole prostate compared to the group with negative TRUS biopsies. No significant differences were found in mean and maximum ADC values.

However, our results show some overlap in minimum ADC values in both groups. A larger population study, a study excluding apical tumors in the negative group and a study carried out in a 3T scan may show greater differences.