

Comparison of Apparent Diffusion Coefficient values between normal prostatic tissue and clinically significant prostate cancer with different Gleason scores in patients submitted to radical prostatectomy

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HYPOTHESIS: We evaluated the apparent diffusion coefficient (ADC) values obtained from diffusion-weighted images (DWI) in patients submitted to magnetic resonance imaging (MRI) of the prostate, comparing clinically significant cancer (using Epstein criteria) and normal areas in the peripheral zone (PZ) and central zone (CZ). Since it is known that the lower the ADC value of a lesion the higher its cellularity, we also correlated those values with tumor Gleason scores obtained from prostatectomy specimens.

METHODS: Eight-nine patients (mean age 63 years; mean serum prostate-specific antigen = 5.2 ng/mL) who underwent 3-Tesla MRI scanner without an endorectal coil were included in this retrospective study. ADC maps obtained from DWI using progressive b-values were derived by drawing 12 regions of interest of the prostate PZ and 6 regions of the CZ, added by measurements of suspicious lesions and were compared with surgical specimens. The radiologist that performed the measurements was blinded of pathological results. The median ADC of tumors was correlated with Gleason scores. Tumors were divided in three groups of cancer aggressiveness based on Gleasons scores: group 1- Gleason 3+4, group 2- Gleason 4+3 and group 3- Gleasons 4+4, 4+5 and 5+4. Multivariate analysis was performed to evaluate the ADC differences between benign and malignant prostate regions, and the association between ADCs and tumor Gleason scores. Significance was considered for $p < 0.05$.

RESULTS: A total of 105 lesions were studied (mean size 11.2 mm, median Gleason score = 7, ranging from 7 to 9). There were 36 lesions in group 1, 54 lesions in group 2 and 15 lesions in group 3. The mean ADC value of normal peripheral zone was $1.63 \times 10^{-3} \text{ mm}^2/\text{s}$ ($\pm 0.29 \times 10^{-3}$) and of all peripheral zone cancers was $0.88 \times 10^{-3} \text{ mm}^2/\text{s}$ ($\pm 0.26 \times 10^{-3}$) ($p < 0.001$). Normal CZ had mean ADC of $1.26 \times 10^{-3} \text{ mm}^2/\text{s}$ ($\pm 0.21 \times 10^{-3}$) and on CZ lesion it was $0.58 \times 10^{-3} \text{ mm}^2/\text{s}$ ($\pm 0.16 \times 10^{-3}$). Lower mean ADCs were associated with higher tumor Gleason scores: mean ADC values were $1.10 \times 10^{-3} \text{ mm}^2/\text{s}$ ($\pm 0.24 \times 10^{-3}$) for Gleason 3+4 (group 1); $0.96 \times 10^{-3} \text{ mm}^2/\text{s}$ ($\pm 0.25 \times 10^{-3}$) for Gleason 4+3 (group 2) and $0.69 \text{ mm}^2/\text{s}$ ($\pm 0.14 \times 10^{-3}$) for Gleason 4+4, 4+5 and 5+4 (group 3) ($p = 0.002$). **Conclusions:** There are significant differences in ADC values of the normal PZ and normal CZ, being lower on CZ, and those values were clinically significant higher than of values of prostate cancer (on CZ or PZ). More aggressive tumors with higher Gleason scores demonstrated lower ADC values, which reflect differences in tissue cellularity. Also, know that the ADC of central gland is lower is important to avoid misinterpreting normal CZ as suspicious for tumor. DWI may help to detect suspicious areas prior to biopsy.