

Feasibility and Preliminary Experience of Quantitative T2* mapping at 3.0 T for Detection and Assessment of Aggressiveness of Prostate Cancer

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Target audience:

Urologist and radiologist

Purpose:

To assess the feasibility of quantitative T2* mapping at 3.0 T for prostate cancer detection and to investigate the use of T2* values to characterize tumor aggressiveness.

Methods:

A multi-echo fast field echo (mFFE) sequence was performed for fifty-five consecutive patients that suffered from prostate cancer and underwent radical prostatectomy at a 3.0T MR scanner. T2* mapping was obtained by exponentially fitting the pixel-vise signal intensity at different echo times for each slice. ROIs were extracted on T2* map with whole mount step-section pathologic analysis as the reference standard.

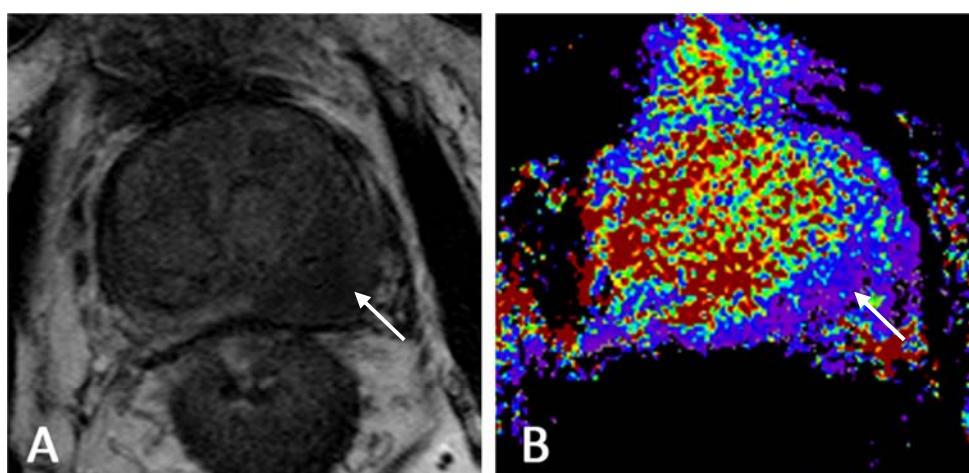


Fig 1. 82-year-old man with prostate cancer, presurgical prostate-specific antigen level of 19.40 ng/mL, and surgical Gleason grade of 8 (4 + 4). A and B, Axial T2-weighted image (TR/TE, 2280/80) (A) and T2* map (B) calculated using TR/TE=1200/2, 4, 7, 10, 13, 15ms show conspicuous focus of low signal intensity in right peripheral zone in A (arrow) that matched with a focus of lower T2* value in B (arrow, T2* value of 23.59 ms).

Results and Discussion:

Generalized estimating equations were used to test the T2* value difference between benign and malignant prostate regions and the association between T2* value and tumor Gleason scores. The T2* values of the cancerous prostatic regions (mean: 42.51 + 0.65 ms) were significantly lower ($P < 0.001$) than those of the benign prostatic regions (mean: 74.87 + 0.99 ms). Adopting a threshold value of 59.27 ms, T2* mapping resulted in 94.8% sensitivity, 77.3% specificity in the identification of prostate cancer. A lower mean T2* value was significantly associated with a higher tumor Gleason score (mean T2* values of [53.53, 43.75, 33.66, and 22.95] ms were associated with Gleason score of 3 + 3, 3 + 4, 4 + 3, and 8 or higher, respectively $p < 0.05$).

Conclusion:

From these preliminary data quantitative T2* mapping seems to be a potentially useful method in the characterization of prostate cancer. T2* mapping provided additional quantitative information that significantly correlated with prostate cancer aggressiveness.