Quantitative Analysis of Benign Prostate Hyperplasia with Apparent Diffusion Coefficient

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PURPOSE: In some cases benign prostate hyperplasia (BPH) cannot be distinguished from prostate cancer (Pca) with T2W images or MRS. It was reported that ADC would help the determination of normal tissue and cancerous tissue. But it remained unclear about the impact of BPH on the ADC value. The purpose of our study is to quantitatively analyze the ADC values of different types of BPH, and to compare them with ADC values of Pca.

METHODS AND MATERIALS: Seventeen BPH patients (mean age 69.1 ± 4.3 years, range 62-77 years) who were scanned with the sequence of DWI underwent TURP (transurethral resection of prostate) in this study. DWI (TR 3000 ms, TE 50 ms, field of view 24×24 cm, matrix size 96×96, section thickness 6 mm, no intersection gap, b-values = 0 and 800 s/mm^2) was performed at 1.5-T system (Twinspeed, GE Medical Systems). The hyperplasia tissues resected from central gland were divided into two types pathologically: glandular BPH and stromal BPH. ADC maps were calculated using the manufacturer's software. According to the pathological results, ROIs were placed on central gland and the ADC values of two types of BPH were measured. In addition, fifteen patients (mean age 74.1 ± 5.2 years, range 62-87 years) with biopsy-proved Pca were evaluated and the ADC values of Pca regions were measured.

RESULT: The mean ADC values of glandular BPH, stromal BPH and Pca were $1.80 \pm 0.20 \times 10^{-3}$ mm^2/s, $1.56 \pm 0.18 \times 10^{-3}$ mm^2/s and $1.27 \pm 0.21 \times 10^{-3}$ mm^2/s, respectively. Statistically significant difference (F=47.366, P<0.01, one-way ANOVA) was detected. Furthermore, statistically significant difference also existed between any two groups. About 60% ADC values overlapped between two types of BPH, and about 22% of values overlapped between glandular BPH and Pca, which was 57% between stromal BPH and Pca.

CONCLUSIONS: Quantitative evaluation of ADC shows difference among glandular BPH, stromal BPH and Pca, but there is overlapping between BPH and Pca, especially in the type of stromal BPH.
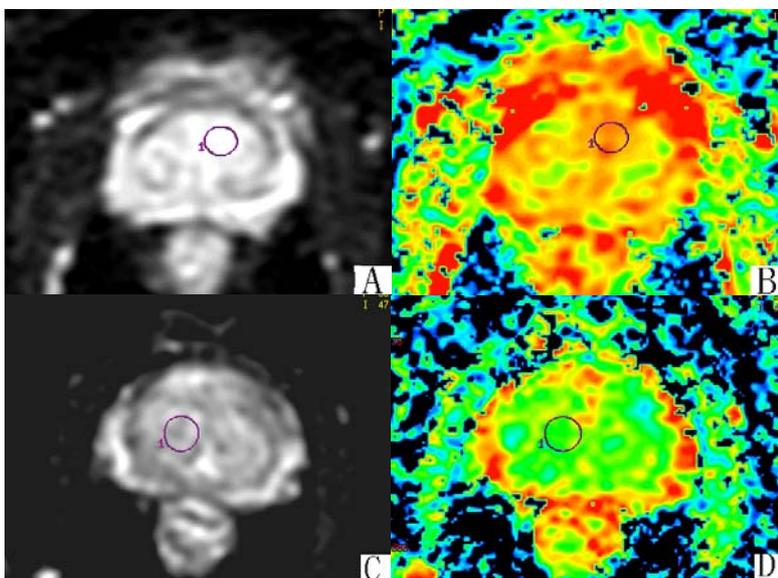

Fig 1: The hyperintensive hyperplasia node could be detected in central gland (A), which was proved glandular BPH pathologically after TURP. The ADC value in ROI was 1.93×10^{-3} mm^2/s (B). In another patient, there was low signal in most central gland (C), which was proved stromal BPH pathologically, and the ADC value was 1.50×10^{-3} mm^2/s (D).
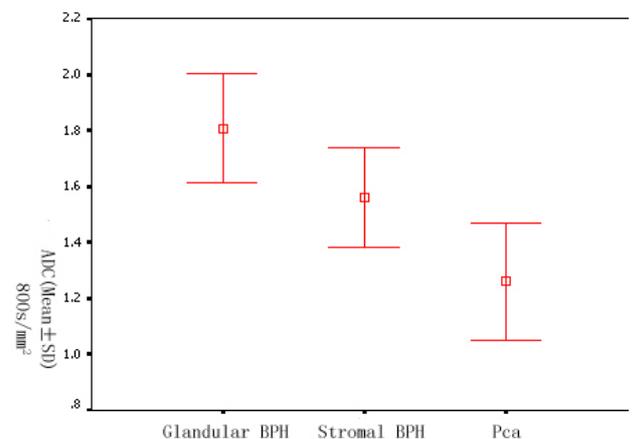

Fig 2: Comparison of ADC values in glandular BPH, stromal BPH and Pca when b-value was 800 s/mm^2.