

Diffusion tensor MR imaging of the prostate adenocarcinoma

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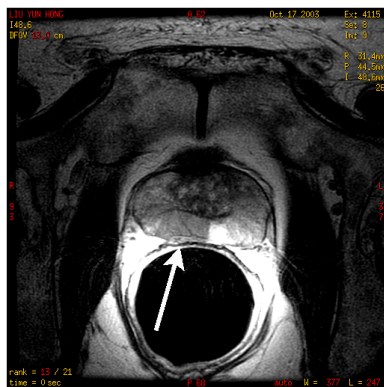
Purpose: To evaluate whether apparent diffusion coefficient (ADC) and fraction anisotropy (FA) values calculated from EPI diffusion tensor images can be used to differentiate prostate adenocarcinoma (PCa) from normal prostate peripheral zone.

Material and methods: Diffusion tensor imaging was performed with a 1.5T MR unit in 16 healthy male volunteers and 28 PCa patients. In the group of normal volunteers (age: 41.2±8.9), 16 males were examined without any symptom of prostate and seminal vesicle diseases after provided inform consent. In the group of PCa patients (age: 63.5±10.1), 4 were proved by radical prostatectomy, 24 by ultrasound guided biopsy. The locations of the tumor were marked by the pathologist. The ADC and FA values were measured in the corresponding area. Images were obtained with a diffusion tensor factor, factor b, of 0 and 1000sec/mm², and the number of directions was 13. Diffusion tensor study was performed with a Echo-planar sequence with the following parameters: TR=8000ms; TE=79.2ms; matrix 128*128; slice: n=18; slice thickness: 3mm with no gap; FOV 13*13cm; acquisition time: 3min 44s. Two experienced radiologists evaluated the quality of diffusion tensor MR images and determined by consensus whether they were acceptable for further analyses. One radiologist measured the ADC and FA values of the normal peripheral zone of the volunteers, and the marked foci of the PCa patients. The ADC and FA values of the bladder were also measured to assess the validity of the method. Each area was measured 3 times randomly, and the mean values were calculated.

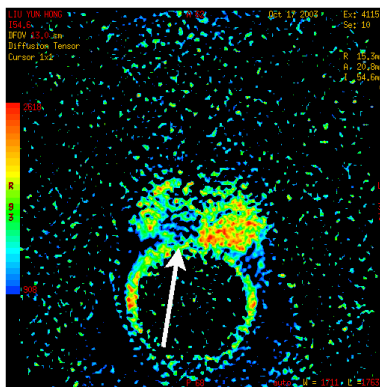
Results: Acceptable images for ADC and FA measurement were obtained in 38 (86%) patients. The mean ADC of PCa foci (0.45±0.16 [mean±SD])×10⁻³mm²/sec (n=24), was significantly smaller (P<0.001) than that of normal peripheral zone of the prostate (1.43±0.27)×10⁻³mm²/sec (n=14). The mean FA of PCa foci (0.67±0.09 (n=24), was significantly greater (P<0.001) than that of normal peripheral zone of the prostate (0.37±0.08) (n=14). No significant difference was seen in the mean ADC values of the bladder between the normal group (1.66±0.30)×10⁻³mm²/sec and the PCa group (1.57±0.21)×10⁻³mm²/sec (P>0.05). And also no significant difference was seen in the mean FA values of the bladder between the normal group (0.37±0.07) and the PCa group (0.39±0.06) (P>0.05).

Conclusion: The ADC and FA values may be used to differentiate the prostate adenocarcinoma from the normal prostate peripheral zone.

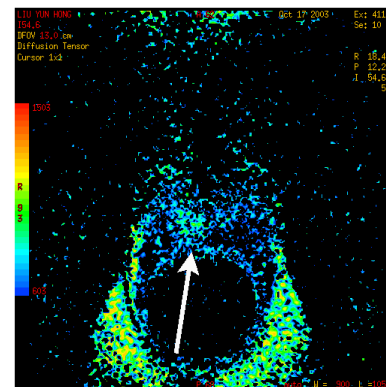
Key Words: prostate, neoplasm, diffusion tensor imaging



T2WI



ADC map



FA map

The above images demonstrated that the signal of PCa focus was low in T2 weighted image and ADC map, and high in FA map.