Diffusion-weighted MR imaging of seminal vesicle and prostate gland in normal volunteers

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Purpose: To evaluate whether there was any difference between the apparent diffusion coefficients (ADCs) calculated from different diffusion-weighted images using different b values.

Material and methods: Diffusion-weighted echo-planar imaging (EPI) sequences with different b values were performed with a 1.5T MR unit in 15 male volunteers, age 23 to 42. The examinees had no symptom of prostate and seminal vesicle diseases and after provided inform consent were examined by conventional MR T1WI and T2WI scan. Then images were obtained with a diffusion-weighted factor, factor b, of 0, 300, 600, 800 and 1000sec/mm^2, and ADC maps were constructed using EPI sequences. EPI diffusion study was performed with the sequence with the following parameters: TR 8000ms; TE 79.2ms; matrix 128×128; slice: 18; slice thickness: 3mm with no gap; FOV 13×13cm. The MR signal was received by the body coil. One radiologist measured the ADC values of seminal vesicle, the central zone and peripheral zone of prostate gland, bladder, pelvic fat and muscle.

Results: Acceptable images for ADC measurement were obtained in all cases of different sequences. There was statistically difference of the mean ADC of the seminal vesicle, the central zone and peripheral zone of prostate gland, bladder, pelvic fat and muscle ($P>0.05$) among the different sequences. The ADC values obtained with lower b values were larger than that obtained with higher b values. The ADC contrast between the peripheral zone and central zone of the prostate (PzADC/CzADC) was statistically different ($F=1.636$, $P=0.000$) among the different sequences. As the b value went higher, the ADC contrast between the Pz and Cz became clearer.

Conclusion: ADCs of seminal vesicle and prostate gland measured with different sequence may be different depending on the different b values. Higher b values is recommended to be used to obtain higher contrast of ADC values between the peripheral zone and central zone of the prostate gland.

Key Words: Prostate; Magnetic resonance imaging; Diffusion-weighted imaging; Apparent diffusion coefficient

Table 1   ADC values($\times 10^{-3}$mm^2/sec) of different organs measured by EPI-DWI sequences with different b values

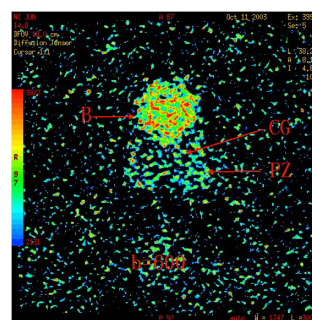| B value (s/mm^2)	Peripheral zone	Central zone	Seminal vesicle	Bladder	Muscle	Pelvic fat
1000	1.61±0.13	1.42±0.22	1.83±0.22	2.35±0.18	0.60±0.08	0.45±0.07
800	1.80±0.15	1.72±0.14	2.03±0.26	2.78±0.18	0.7±0.08	0.59±0.08
600	2.05±0.16	2.01±0.07	2.29±0.24	3.21±0.21	1.1±0.15	0.82±0.12
300	3.00±0.14	3.04±0.13	3.17±0.34	4.02±0.34	1.9±0.28	1.45±0.10
F value	256.72	556.96	69.65	133.07	71.90	69.73
P value	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*

*statistically different
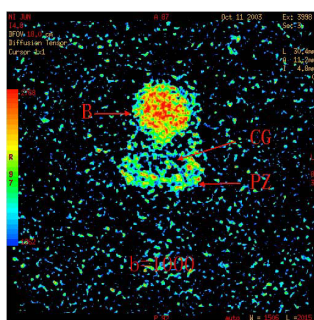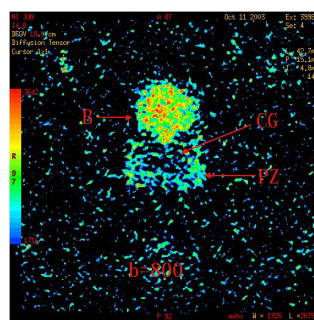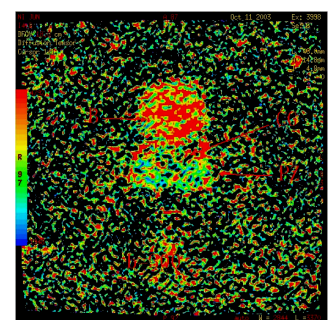

b=1000   b=800   b=600   b=300

The above images demonstrate the ADC maps of the prostate in the same patient. It seems that as the b value goes up, the contrast between the peripheral zone and the central zone becomes clearer in ADC map.