

# Comparison of ADCs measured by DWI with GFR measured by <sup>99</sup>Tc<sup>m</sup>-DTPA scintigraphy

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**Introduction:** Water transport is the predominant phenomenon throughout the kidney and has important effect on renal function. Diffusion-weighted imaging (DWI) can detect the Brownian motion of water molecular in vivo and has recently been used in kidney. The purpose of this study is to evaluate whether ADC values correlate with GFR measured by scintigraphy.

**Methods:** Diffusion-weighted echo-planar imaging (EPI) sequences with different b-values were performed with a 1.5 T MR unit in 55 patients (32 male, 23 female, aged 23-77years, mean age 54±10.2 years) with no local renal disease and hydronephrosis in a nonfasting and normal hydration status. This sequence completes in a breath-hold and scan time was no more than 24s. DWI sequences with different b values (0,500 sec/mm<sup>2</sup>; 0,800 sec/mm<sup>2</sup>) were performed in each patient. The scan parameters were as following: TR 8000ms; TE 79.2ms; matrix 128×128; slice thickness 8mm with no gap; NEX 2; FOV 32×32cm. The ADC values of bilateral kidneys were measured. The glomerular filtration rate ( GFR) of each kidney was measured by renal <sup>99</sup>Tc<sup>m</sup>-DTPA scintigraphy in all patients and the 110 kidneys were divided into 3 groups : group1 (normal renal function), GFR>40 ml•min<sup>-1</sup>, n=44; group2 (mild renal impairment), 40≥GFR≥20 ml•min<sup>-1</sup>, n=36; group3 (severe renal impairment), GFR<20 ml•min<sup>-1</sup>, n=30. All data were analyzed with SPSS11.5 program for Windows. Differences between 3 groups respect to the mean renal ADCs were assessed by a one-way analysis of variance (ANOVA) and the differences of ADC values calculated from different b-values were assessed by two-tailed paired Student t-test. A P-value <0.05 was considered statistically significant. The correlation of the renal ADC value and GFR was analyzed using Pearson's correlation test.

**Results:** Acceptable images for ADC measurement were obtained in all patients. The mean ADCs of kidneys measured by DWI with different b-values of 3 groups were showed in table 1. There was statistically significant difference in renal ADCs among 3 groups. The highest ADCs were observed in normal group. The mean ADC values of kidneys in group2 and group3 were significantly lower than those in group1 and the ADCs in group3 also were significantly lower than those in group2. The ADC values of kidneys measured with low b-value (0, 500 s/mm<sup>2</sup>) were significantly higher than those with high b-value (0, 800s/mm<sup>2</sup>) (t=32.87, P<0.001). As is indicated in Fig. 1, the ADC of kidney showed positive linear correlation with GFR (b=800 s/mm<sup>2</sup>, r=0.717; b=500 s/mm<sup>2</sup>, r=0.709) The ADC value of kidney measured with different b values decreased with GFR.

**Conclusion:** Diffusion-weighted imaging (DWI) that can detect the Brownian motion of water molecular in vivo may also be able to provide information about renal function.

Table 1: ADC values (×10<sup>-3</sup> mm<sup>2</sup>/sec) of kidney in 3 groups

Group	Mean ADC(b1)	Mean ADC(b2)			
Group1	2.87±0.15	2.47±0.13	] P<0.001 ]	] P<0.001 ]	] P<0.001 ]
Group2	2.59±0.20	2.21±0.20			
Group3	2.35±0.24	1.91±0.25			
F	67.16	77.57			
P	<0.001	<0.001			

Note: b1: 0,500s/mm<sup>2</sup>, b2: 0, 800s/mm<sup>2</sup>

**Fig.1.** The correlation of renal ADC (\*×10<sup>-3</sup> mm<sup>2</sup>/sec) and GFR (\*\*ml•min<sup>-1</sup>):

**A,** b1: 0,500s/mm<sup>2</sup>, r=0.709, P<0.001; **B,** b2: 0, 800s/mm<sup>2</sup>, r=0.717, P<0.001.

*References*

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