

Diffusion Weighted MR Imaging of Gastric Cancer: Comparison with Conventional MRI Sequences

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Purpose: To explore the optimal b -value for the diffusion-weighted MR imaging (DWI) of gastric cancer, and investigate the value of DWI in the diagnosis of gastric cancer.

Materials and methods: Thirty-one patients with gastric cancer underwent single-shot echo-planar DWI with parallel imaging technique (Reduction factor=2). The parameters were: TR/TE, 3000ms/65ms; matrix, 128×128; slice thickness, 5mm; intersection gap, 1mm; FOV, 38cm×38cm; four signal acquired combined with segmented breath-holds. Three diffusion-weighted MR sequences were designed with different b values, which were 0,300s/mm² (low); 0,600s/mm² (Intermediate); and 0,1000s/mm² (high). Free water grade was used to evaluate the suppression of signal in gastric lumen. The ADC of gastric cancer, normal gastric wall, and free water in gastric lumen were measured. Signal-to-noise ratio (SNR) and signal intensity ratio (SIR) of DWI and routine MRI sequences were calculated and compared.

Results: The signal intensity of free water in gastric lumen raised as b -value decreased, and the difference of SIR_{Water-BN} had statistical significance ($P<0.05$). As b -value increased, the SIR_{Ca-GW} increased ($P<0.05$), and the SNR decreased ($P<0.05$). High b -value could demonstrate signal differences better in the precondition of adequate SNR. The ADCs of gastric cancer and free water in lumen were decreased following the increase of b -value ($P<0.05$). The SIR of high b -value DWI was higher than that of T1WI and T2WI (table 1), which meant a better contrast acquired by DWI.

Conclusion: High b -value ($b=1000$ s/mm²) is suitable for DWI of gastric cancer, it can suppress the signal of content in gastric lumen and has better tissue contrast. Also, high b -value can reflect more exact diffusion condition of water molecules. DWI can be an additional sequence for routine MRI examination to demonstrate gastric cancer better.

Table 1 Image quality evaluation of gastric cancer on DWI with different b values

b value (s/mm ²)	Imaging quality			ADC ($\times 10^{-3}$ mm ² /s)		
	SNR	SIR _{Ca-GW}	SIR _{Water-BN}	cancer	gastric wall	free water
1000	27.23±11.42	2.45	1.13±0.22	1.18±0.25	1.90±0.23	3.51±0.24
600	39.99±16.08	2.29	2.70±0.35	1.43±0.41	2.46±0.45	3.71±0.33
300	55.97±24.56	1.90	8.11±0.77	1.96±0.91	3.40±1.27	3.88±0.34
F value	17.227	9.923	55.368	12.066	23.992	11.152
P value	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05

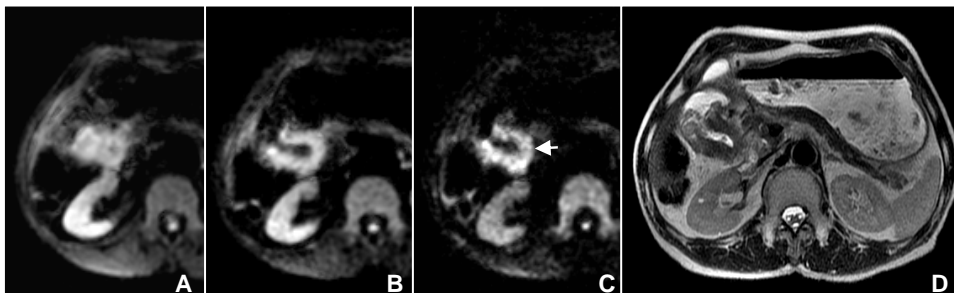


Fig.1 Gastric cancer of antrum. The signal of cancer and water in gastric lumen cannot be discriminated on low b -value DWI (Fig A), while it can be demonstrated clearly on high b -value DWI (Fig B).

Fig A: $b=300$ s/mm²; Fig B: $b=600$ s/mm²
Fig C: $b=1000$ s/mm²; Fig D: SSFSE

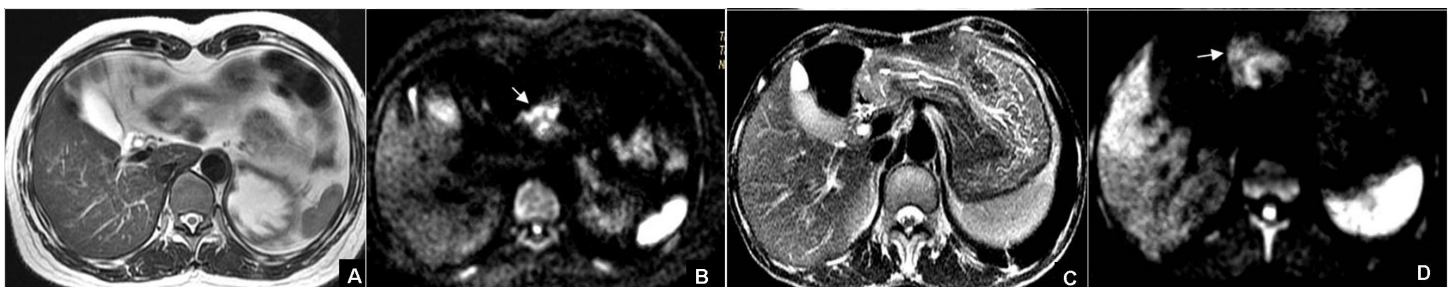


Fig.2 A, FRFSE T2WI, the cancer was blurred because of gastric peristalsis, which was overcome by DWI and displayed high signal (Fig 2B, white arrow). Fig 2C, SSFSE T2WI, the tumor border was not clear; Fig 2D, same case as Fig 2C, the cancer appeared high signal on DWI (white arrow).