

Diffusion-Weighted MR Imaging of Gastric Cancer: Preliminary Studies

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Purpose: To investigate whether diffusion-weighted MR imaging (DW-MRI) can be used to identify gastric cancer, measure the apparent diffusion coefficient (ADC) of gastric cancer and explore the optimal b values for clinical use.

Materials and methods: Twenty-six patients with advanced gastric cancer were examined with a 1.5T MR scanner and 8-channel body phase-array coil. Diffusion-weighted single-shot echo-planar sequences were performed combined with sensitivity encoding technique (ASSET). The parameters were: TR/TE, 2575ms/65ms; matrix, 128×128; section thickness/ intersection gap, 5mm/1mm; slice number, 12; NEX, 4; FOV, 36cm×36cm. The b values were 0, 300, 600 and 1000s/mm², and the MPG pulses were placed in 3 directions. Conventional T1WI and T2WI were also performed. Two radiologists evaluated image quality according to the signal-to-noise ratio (SNR) of tumors, and the ADCs of tumors and water in gastric lumen were measured.

Results: All tumors appeared high signal compared with nearby gastric wall. Two cases demonstrated severe artifacts and image distortion, which influenced lesion identification and ADC measurement, while the other 24 cases were all acceptable. There was statistical difference of ADCs in different b value sequences ($P<0.01$). The larger the b values, the lower the ADCs. The SNR of tumors reduced as b values went higher ($P<0.01$), and the signal difference between tumors and gastric wall couldn't be identified in 2 cases with $b=1000$ s/mm² because of low SNR.

Conclusion: DW-MRI can be used to identify gastric cancer. The ADCs are different among sequences with different b values. High- b -value images have better contrast and produce more accurate ADCs, and low- b -value images can be an alternate when the SNR with high- b -value is too low to identify tumor signals.

Key words: Stomach; Neoplasm; Diffusion-weighted; Magnetic resonance imaging

Table 1 Image quality and ADC measurement of DW-MRI sequences with different b values

b value (s/mm ²)	Cancer identification (case, n=)	SNR	ADC ($\times 10^{-3}$ mm ² /s)	
			Cancer	Water
300	24	55.39±20.65	2.08±0.65	4.00±0.15
600	24	38.67±14.20	1.47±0.36	3.76±0.21
1000	22	27.83±12.28	1.16±0.26	3.53±0.20
P value	—	<0.01	<0.01	<0.01

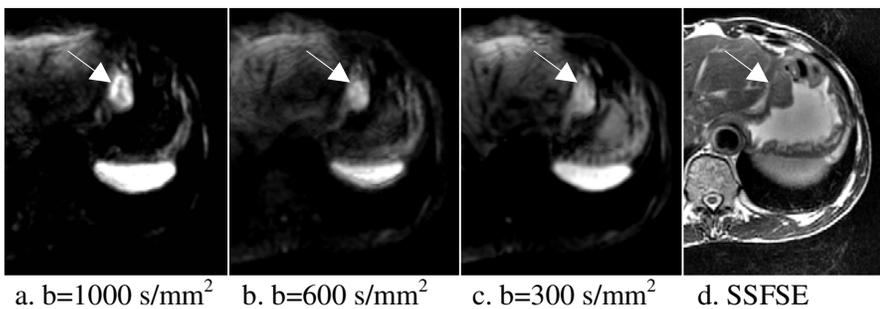


Fig.1 Gastric cancer of corpus. The contrast between tumor and normal gastric wall was higher in high- b -value DW-MRI images (a) than low- b -value ones (b, c).

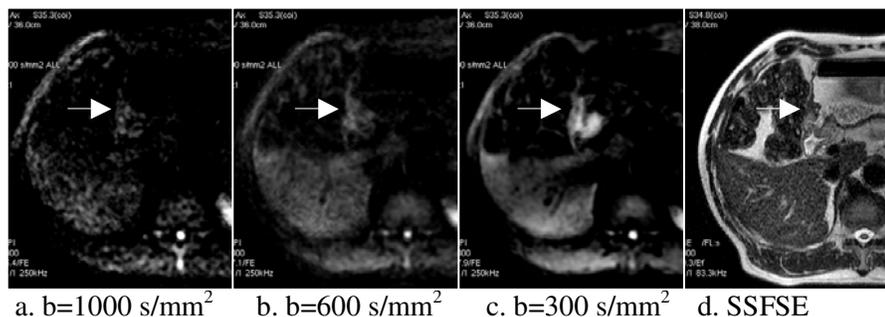


Fig.2 Gastric cancer of antrum. The low SNR of high- b -value DW-MRI images produced poor image quality (a), which was improved by low- b -value images (c).