

# Respiratory-triggered High-b-value Diffusion-weighted Imaging for the Assessment of Inflammatory Activity in Crohn's Disease: A Preliminary Study

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**Purpose** To determine the utility of higher b value diffusion weighted image (DWI) in the evaluation of inflammation activity in patients with Crohn's disease (CD) and to define optimal b values for intestinal examination.

**Materials and method** Twenty-four consecutive CD patients clinically diagnosed with active inflammation were referred for MR examination [1]. The MR imaging examinations were performed using a 3.0-T MR scanner with respiratory-triggered high-b-value diffusion-weighted imaging with four different b values (800, 1500, 2000 and 2500) [2]. The lesion detection in DWI sequences were compared with traditional MR findings. Apparent diffusion coefficients (ADCs) were measured for both normal and inflammatory intestinal segments. The SNR and CNR of DWI were also measured. **Results** DWI sequences at all four b values could identify disease-active and inactive intestinal segments clearly. The very high b values (2000

or 2500) could not satisfy the image quality for diagnostic requirements. A b value of 800 had high sensitivity but low specificity.

**Conclusion** A b value of 1500 offered the best balance of diagnostic sensitivity and specificity in this current study.

Table 1. Results of Quantitative Assessment of DWI

b value (s/mm <sup>2</sup> )	ADC value(×10 <sup>-3</sup> mm <sup>2</sup> /s)		Accuracy
	active	inactive	
800	1.37 ± 0.28	2.01 ± 0.38	p = 0.000
1500	1.08 ± 0.19	1.48 ± 0.27	p = 0.000
2000	0.95 ± 0.18	1.33 ± 0.28	p = 0.000
2500	0.87 ± 0.14	1.17 ± 0.19	p = 0.000

Table 2. Results of Visual Assessment of DWI (n = 24)

Location	LAVA	Score on DWI (Sensitivity and Specificity)			
		b (0,800)	b (0,1500)	b (0,2000)	b (0,2500)
jejunum	13	22 (100%, 18.2%)	13 (100%, 100%)	10 (76.9%, 100%)	10 (76.9%, 100%)
ileum	19	21 (100%, 60%)	21 (100%, 60%)	21 (100%, 60%)	21 (100%, 60%)
ascending colon	12	14 (100%, 83.3%)	12 (100%, 100%)	12 (100%, 100%)	12 (100%, 100%)
transverse colon	7	6 (85.7%, 100%)	6 (85.7%, 100%)	6 (85.7%, 100%)	6 (85.7%, 100%)
descending colon	14	17(100%, 66.7%)	17 (100%, 66.7%)	15 (100%, 88.9%)	15 (100%, 88.9%)
sigmoid colon	13	14(100%, 90.9%)	13 (100%, 100%)	13 (100%, 100%)	13 (100%, 100%)
rectum	12	15 (100%, 75%)	12 (100%, 100%)	12 (100%, 100%)	12 (100%, 100%)

**Reference:** Damian J M et al. Radiographics 2010;30:367-384 2. Oto A et al. Acad Radiol 2009;16(5):597-603

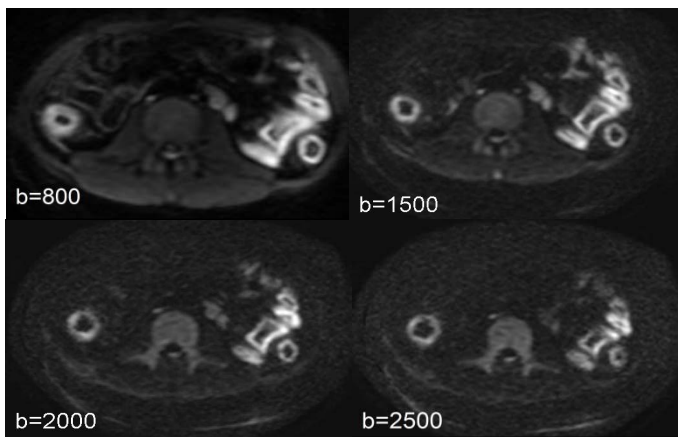


Figure 1: The DWI images were obtained in a 28-year-old man. There were high signal intensity in ascending colon, descending colon and jejunum on all four DWI sequences and retroperitoneal lymph nodes enlarged and the signal intensity were also increased. The intestinal structure was clear when b value 800 was chosen but when b value 2000 or 2500 was chosen, the intestinal structure adjacent to lesions was quite vague.

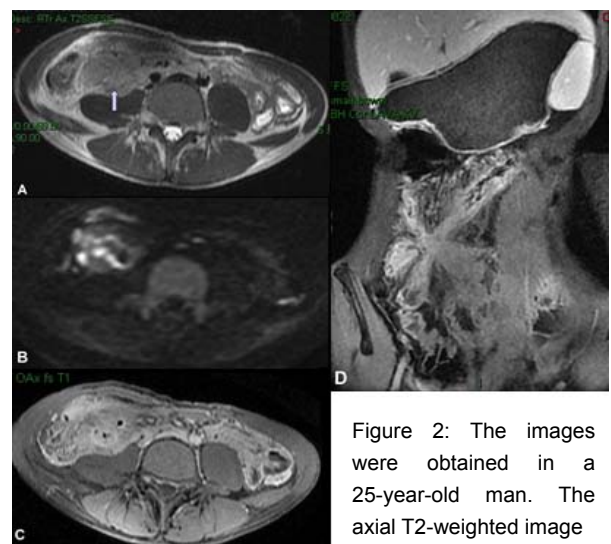


Figure 2: The images were obtained in a 25-year-old man. The axial T2-weighted image

(A) demonstrated focal lesion without intestinal wall structure in right-lower abdomen. The DWI image demonstrated it clearly as focal abscess, which was confirmed by LAVA image after enhancement (C, D) and inner fistula was also formed nearby.