

Diffusion-weighted MR Imaging of Ulcerative Colitis with the sensitivity encoding technique for monitoring Inflammatory Activity: Initial Experience

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INTRODUCTION

Ulcerative Colitis (UC), which is an idiopathic, inflammatory disease of colonic mucosa, with continuous spreading, presents as a chronic relapsing/remitting course. Therefore, monitoring degree of inflammatory activity and assessing its site and extent is much essential to decide therapeutic planning. For this purpose, endoscopic colonoscopy alone can evaluate precise extent and severity of the disease, however, it is sometime incomplete due to tight strictures or patient's complaint of severe pain, and has high risk of perforation in severely acute disease. By using with recent MR unit, conventional MR imaging, such as T2-weighted imaging or gadolinium enhanced-fat-suppressed T1-weighted imaging, allows the identification of abnormalities in inflammatory bowel disease (IBD) (1). Moreover, the combination of diffusion-weighted imaging (DWI) with parallel imaging has been also applicable to IBD. Worsening inflammation leads to increasing inflammatory cell density and may cause restrict water diffusion. Thus, DWI is more sensitive to inflammatory status of the tissue, than conventional MR imaging (2). The purpose of this study was to evaluate the usefulness of diffusion-weighted MR imaging with the sensitivity encoding technique (SENSE-DWI) for detecting and monitoring colonic inflammatory activity in patients with UC.

MATERIALS AND METHODS

21 patients with histopathologically-confirmed 60 colonic UC segments were included in this study. All MR images were obtained with 1.5-T superconducting MR units (Intera, Philips medical systems). The each imaging parameters of SENSE-DWI under breath-holding were as follows: TR/TE=1873/70, matrix=160x128, FOV=30x30cm, acquisition time=18sec, slice thickness/gap=8mm/2mm, NEX=2, acceleration factor of 2, b value of 0 and 700sec/mm². The degree of inflammatory activity of UC was classified in four grades (normal, mild, moderate, severe) based on endoscopic colonoscopy scoring by three endoscopists in consensus. Two abdominal radiologists evaluated the wall conspicuity, degree of wall signal intensity (SI) with a three-grading system (high, moderate, hypo), and mural thickening. The apparent diffusion coefficients (ADCs) on the each colonic segment were also measured on the workstation.

RESULTS

The 17 segments classified as severe (16/17, 94%) showed high SI with marked mural thickening. The 16 segments classified as moderate showed moderate SI with mild mural thickening in 12 (12/16, 75%) and mixture of high and moderate SI with marked mural thickening in 2 (4/16, 12%). The 12 segments classified as mild showed moderate SI with mild mural thickening in 7 (7/12, 58%), however, rest of segments showed hypo SI without mural thickening and were not distinguished from normal segments. Mean colonic wall thickness of segments of severe stage inflammation was 4.86 ± 0.23 mm and there was statistically difference to normal ($P < 0.01$)/mild ($P < 0.05$) segments. Mean ADCs (10^{-3} mm²/sec) of the segments as severe (1.09 ± 0.12) was statistically lower than those of the segments as moderate (1.45 ± 0.09), mild (1.80 ± 0.11), and normal (2.24 ± 0.07) ($p < 0.05$). In all patients presenting as a remitting course by successful steroid therapy, ADC values of the affected bowel walls were significantly increasing and high SI with marked mural thickening of these were decreased (Fig 1).

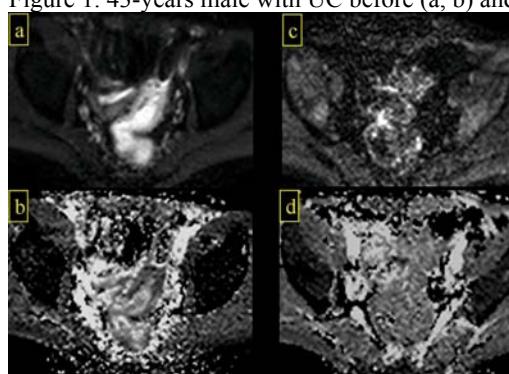
CONCLUSION

Preliminary experience suggests that SENSE-DWI enables to estimate site and degree of active inflammation in UC and may be useful for monitoring UC activity or assessing its therapeutic effectiveness.

REFERENCES:

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Figure 1. 43-years male with UC before (a, b) and after (c, d) steroid therapy.



SENSE-DWI: a, c ADC maps: b, d