

Comparison study on differentiating active from remissive Crohn's Disease by 3.0T and 1.0T MRI

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Introduction: The prevalence of Crohn's disease (CD), has been on the rise and currently affects an estimated 31% of the United States population (1). CD is characterized by transmural inflammation that can affect the entire gastrointestinal tract, mainly the terminal ileum. Both magnetic resonance (MR) and computed tomography (CT) techniques have proven to be excellent methods for assessing inflammatory activity in CD (2). The aim of this study is to investigate whether 3.0T MRI can offer better diagnostic value over 1.0T MRI for evaluating the activity of Crohn's disease.

Materials and Methods: 36 patients were examined with a 3.0T MR system and 30 patients were examined with a 1.0T MR system to evaluate the activity of Crohn's disease. All patients that participated in this study had a clinical diagnosis of CD (defined as Crohn's Disease Activity Index (CDAI) >150, and/or colonoscopic lesions suggestive of active CD). Pre and post contrast images were obtained on both 3T and 1T Magnet. All MR images were evaluated on a post-processing workstation by two radiologists who were blinded to the clinical notes. MRI findings were characterized on basis of bowel wall thickening, increased enhancement, stenosis, "comb sign," enlarged lymph node, fistula, ulceration, and abscess. Compared with clinical diagnostic criteria, the sensitivity, specificity, positive and negative predictive values of MRI diagnosis of active CD was statistically analyzed. Correlation between 1.0T, and 3.0T, in predicting disease activity was tested by McNemar Test and Kappa Value.

Results: Sensitivity of 3.0T MR for the depiction of the disease activity of Crohn's disease was 68.0%, specificity was 90.9%, positive predictive value was 94.4%, negative predictive value was 55.6%. $P=0.001$, kappa=0.500. Sensitivity of 1.0T MR for the depiction of the disease activity of Crohn's disease was 47.4%, specificity was 100%, positive predictive value was 100%, negative predictive value was 52.4%. $P=0.006$, kappa=0.389. There was significant difference in measuring bowel wall thickness, bowel wall enhancement and "comb" sign between 3T and 1T MRI. There was no significant difference in enlarged lymph node, fistula, ulceration, and abscess with 3T and 1T MRI.

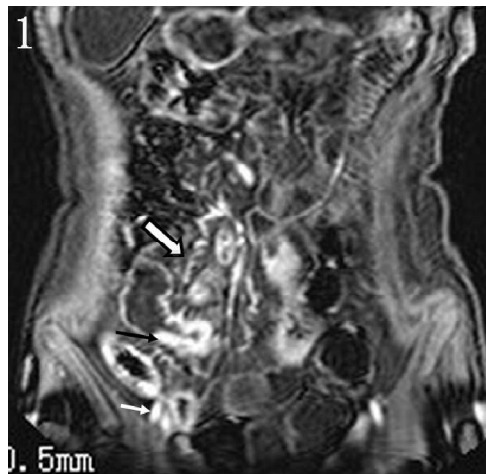


Figure 1:

Coronal_Gd-enhanced fat-suppressed T1W image showed obvious enhancement of bowel wall (black arrow) on 3.0T MR. The signal was as high as the external iliac artery (white arrow). The "comb sign" (hollowed arrow) was well seen.

Discussion and conclusion: Bowel MRI has the capability to detect eight signs of active CD: wall thickening, increased enhancement, stenosis, "comb sign," enlarged lymph node, fistula, ulceration, and abscess. Most bowel MRI, however, have been performed at 1.5T and 1.0T. Our study has demonstrated 3.0T MRI offers improved differentiation between active and remissive CD over 1.0T MRI. The improved result comes from several aspects, including the

superior ability to measure bowel wall thickness, to detect significant enhancement of the bowel wall, and to show increased mesenteric vascularity ("comb sign"). In conclusion, our results have shown that 3.0T MRI is more effective in differentiating active and remissive CD than 1.0T MRI. The correlation between 3.0T evaluation and clinical diagnosis is stronger than that of 1.0T. Specifically, 3.0T MRI is more accurate than 1.0T MRI in measuring bowel thickness, showing increased bowel wall enhancement and the "comb sign", which are three key MRI criteria for determining active inflammatory bowel disease.

References:

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2. Gourtsoyiannis NC, Grammatikakis J, Papamastorakis G, et al. Imaging of small intestinal Crohn's disease: comparison between MR enteroclysis and conventional enteroclysis. *Eur Radiol* 2006;16(9):1915-1925.