

Diagnostic Magnetic Resonance Imaging in Crohn's disease of small intestine: Comparison air-infused MR enteroclysis with hydro-MRI

X. J. Yu^{1,2}, X. J. Ren¹, and S. Z. Zhang¹

¹Department of Radiology, Sir Run Run Shaw Hospital, Medical College of Zhejiang University, Hangzhou City, Zhejiang Province, China, People's Republic of,

²Department of Radiology, Wujing Hospital, Hangzhou City, Zhejiang Province, China, People's Republic of

Introduction

Technological developments have extended the role of MRI in the evaluation of the gastrointestinal tract. MRI has potential to evaluate disease activity in Crohn's disease, as MRI has intrinsic advantages over other techniques, including noninvasiveness and the absence of ionizing radiation. Because it's reported that water-infused MR enteroclysis could lead to defecation during scan (Umschaden FW et al. 2000), we try to compare air-infused MR enteroclysis with hydro-MRI to investigate the value of magnetic resonance imaging (MRI) in diagnosis of small intestinal Crohn's disease.

Methods

The MRI findings of 13 cases of small intestinal Crohn's disease proved by surgery and pathology were analyzed retrospectively. The patients were 12 men and 1 woman with ages range from 17 years to 64 years. 6 patients received air-infused MR enteroclysis after about 1000ml of air was infused into small bowel through a nasoenteric catheter. Another 7 patients received small intestinal hydro-MRI after oral 1500 ml of iso-osmotic mannitol. The followed MRI sequences were included: ① For group of air-inflated MR enteroclysis, fat-saturated Gd-DTPA enhanced coronal and axial T1-weighted spin-echo (SE) and fast spoiled gradient echo (FSPGR) sequence were used. ② For group of hydro-MRI, fat-saturated unenhanced coronal T2-weighted single-shot FSE (SSFSE), T1-weighted coronal FSPGR, enhanced coronal and axial FSPGR as well as SE sequence were performed. 20mg of IV anisodamine was given to reduce peristalsis in all patients. The MRI images were reviewed for the number, location and mural thickness of diseased bowel segments, for the ratio of signal intensity of diseased bowel wall to normal bowel wall after the IV administration of Gd-DTPA or enhanced ratio of diseased bowel wall, and for the complication (phlegmon, inflammatory mass, abscess and fistula).

Results

The diseased bowel segment of every case was demonstrated in MRI. The sensitivity was 100%. 36 inflammatory segments were revealed in all (mean 2.8 segments per patient). The MRI findings of small intestinal Crohn's disease were that the enhancement of diseased bowel wall increased significantly. The ratios of signal intensity of diseased bowel wall to normal bowel wall were 1.9~2.5 (mean, 2.1) in the group of air-infused enteroclysis. The ratios of signal intensity of diseased bowel wall to normal bowel wall were 1.3~2.9 (mean, 1.9) and the enhanced ratios of diseased bowel wall were 96%~223% (mean, 133%), but the enhanced ratios of normal bowel wall were 31%~78% (mean, 59%).

33 segments (92%) of diseased bowel wall thickened (the thickness is between 5mm~27mm), and the thickness of other 3 segments (8%) of diseased bowel wall is normal. In the thickened bowel wall, the wall thickness of 24 segments was less 10 mm (mildly, moderately thickened), in which 21 segmental bowel wall (87.5%) thickened more severely in mesenteric side (asymmetric); and the wall thickness of the other 9 segments was larger than or equal to 10mm (severely thickened), in which 8 segmental bowel wall (89%) thickened roundly.

The sixth group of small bowel (distal ileum) was involved in 10 cases (77%); The fourth, fifth and third group of small bowel were involved in 7, 6 and 3 cases, respectively; ileocecum area was involved in 3 cases, and ileum was involved in all cases. 2 or more than 2 groups of small bowel were involved in 11 cases (85%) and showed skip lesions. Only 1 segment was involved continuously in 2 cases (15%). 9 cases (69%) of phlegmon, 6 cases (46%) of inflammatory mass, 2 cases of fistula, and 0 case of abscess was found in perientric area.

In the air-infused MR enteroclysis, the bowel lumen acquired adequate distension and it facilitated demonstration of morphological changes caused by Crohn's disease and allowed identification of subtle abnormalities. But because the FSPGR Sequence was sensitive to magnetic susceptibility and SE sequence led to motion artifact, the quality of image decreased. In addition, this technique was uncomfortable for patients. Hydro-MRI had good quality of image, without motion artifact and magnetic susceptibility artifact, but with less distention of the bowel lumen.

Conclusion

Small bowel MRI (air inflated MR enteroclysis and hydro-MRI) plays an important role in the diagnosis of small intestinal Crohn's disease. In comparison to air-inflated MR enteroclysis, hydro-MRI seems to be more practical and superior. The MRI findings of small intestinal Crohn's disease are that ileum, especially the distal ileum was involved with segmental mural thickening. From the present data, we found that mild and moderate mural thickening is asymmetric, thickened more severely in mesenteric side, but severe mural thickening is round. The diseased bowel wall enhances significantly after the IV administration of Gd-DTPA, and inflammatory bowel wall tends to perforate to form perientric phlegmon and inflammatory mass.

Reference:

Umschaden FW, et al. Radiology 2000, 215:717-725

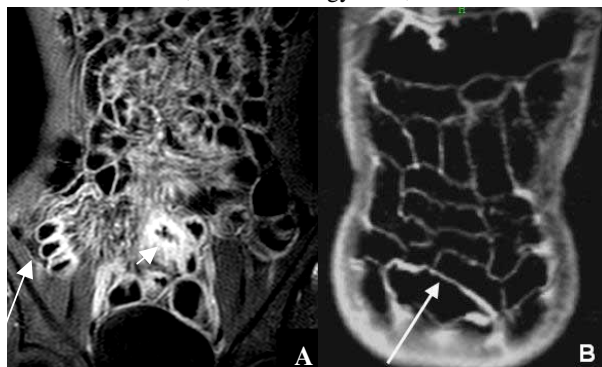


Fig A: Hydro-MRI. Coronal plane. Gadolinium-enhanced FSPGR Sequence with fat saturation. It is showed that the ileums on the right low quadrant thicken more severely in the mesenteric side, with increasing enhancement (long arrow) and the ileums in the low abdomen thicken roundly, with blur margin (short arrow).

Fig B: Air-infused MR enteroclysis. Coronal plane. Gadolinium-enhanced SE T1-weighted Sequence with fat saturation. It is showed that the lumen distends well and the ileum thickens more severely in the mesenteric side, with increasing enhancement (arrow).