COMBINED MRI OF THE SMALL AND LARGE BOWEL : A FEASIBILITY STUDY

T. C. Lauenstein[1], C. A. Kühle[1], W. Ajaj[1], S. Massing[1], J. Barkhausen[1]
[1]Department of Radiology, University Hospital Essen, Essen, Germany

Introduction

Crohn's disease is a chronic inflammatory pathology potentially affecting the entire GI tract. The terminal ileum and proximal colon are the parts of the intestine that are mostly affected. MRI both of the small and large bowel has become an established method for the assessment of inflammatory bowel diseases [1, 2]. A good distension of the intestine is crucial for bowel imaging. Regarding the colon it can be easily accomplished by the administration of a rectal enema consisting of liquid or gasiform contrast agents. For the visualization of the small bowel, several oral contrast agents have been introduced. Aim of the present study was to evaluate the practicability of combining an oral and rectal contrast agent for MR imaging in patients with Crohn´s disease and to assess the accuracy of the method for the detection of inflammatory processes.

Methods

53 patients with known or suspected Crohn`s disease were included (31 men and 22 women; mean age 39.5 years, age range 11-78 years). To provide sufficient small bowel distension, patients ingested 1500 ml of the contrast solution containing 2.5 % of Mannitol and 0.2 % of Locust Bean Gum (LBG) over 45 minutes at a steady, evenly distributed rate. MR-examinations were performed on a 1.5T MR scanner (Magnetom Sonata, Siemens Medical Systems). Following the placement of a rectal tube (E-Z-Em, Westbury, NY) an enema consisting of 1000-1500ml of warm tap water was administered. MR imaging was based on the acquisition of a 2D TrueFISP sequence (TR/TE = 4.3/2.1ms, flip angle = 70°, slice thickness = 3.0 mm) in coronal plane. Before and 75s after the intravenous administration of gadolinium, a 3D T1w gradient echo sequence was acquired in coronal plane (TR/TE = 3.1/1.1 ms, flip angle = 12°, slice thickness = 1.4 mm, matrix size = 336 x 512). MR data were classified regarding increased bowel wall thickening, (b) narrowing of the bowel lumen and (c) increased contrast enhancement of the bowel wall following i.v. gadolinium. As a standard of reference, all patients underwent conventional colonoscopy within six days after MRI.

Results

In seven patients, a complete colonoscopy was not possible due to elongated bowel segments and/or stenoses. Since a sufficient standard of reference was lacking, these seven patients were excluded from the study analysis. Hence, data of forty-six patients were included. Four patients were not able to ingest the entire 1500ml of the oral contrast agent which led to only moderate small bowel distension. Slight respiratory motion artifacts were present in four different patients. However, the jejunum and ileum was visualized in all 46 examinations and a simultaneous assessment of small and large bowel was possible. By means of MRI, thirty-eight segments of bowel wall inflammation were diagnosed. Ten of these segments were located in the colon (fig. 1), nineteen in the terminal ileum (fig. 2) and another nine in the upper ileum or jejunum (fig. 3). All segments rated by MRI to be inflammatorily changed showed a higher SNR value compared to the non-affected ileum ($p < .0001$). However, only nineteen of theses thirty-eight inflamed segments were detected by endoscopy and subsequent biopsy (seven in the colon, twelve in the terminal ileum and none in the upper small bowel). Presence of extramural abscesses was seen in 4 patients and inter-intestinal fistulae were detected in another 4 patients by MRI. Furthermore, enlarged mesenteric lymph nodes were displayed in fifteen patients. Except one fistula, none of these extra-intestinal findings had been detected by endoscopy.

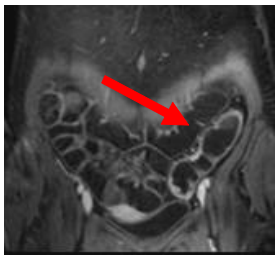

Fig 1: 39 year-old male patient with inflammatory changes of the descending colon. Contrast-enhanced T1w MRI shows increased signal intensity of the affected bowel segment (arrow). Note the good distension of the adjacent small bowel loops.

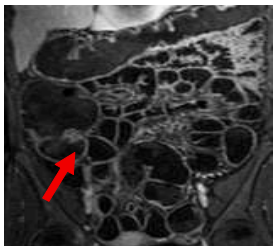

Fig 2: 22 year-old female patient with known Crohn´s disease. Contrast enhanced T1 MRI shows a thickened ileo-cecal valve (arrow) with an increased contrast enhancement due to the inflammatory process.

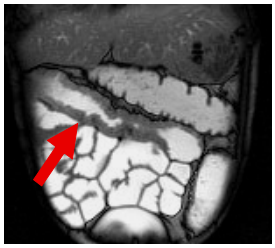

Fig 3: 14 year-old male patient with suspected Crohn´s disease. Endoscopy did not find any affected bowel segments in the colon or terminal ileum. However, TrueFISP images proved an avidly thickened bowel wall in the proximal ileum (arrow).

Discussion

MR imaging in conjunction with the oral application of a solution containing locust bean gum and mannitol is feasible. The additional rectal administration of water allows the visualization of both small and large bowel at the same time. Not only inflammatory lesions in the colon and terminal ileum could be detected, but also affected bowel segments in the upper small bowel, which cannot be reached by endoscopic procedures. Hence, MRI is a promising technique for the diagnosis and follow-up of patients with inflammatory bowel diseases.

References

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2. Schunk K. Small bowel magnetic resonance imaging for inflammatory bowel disease. Top Magn Reson Imaging. 2002;13:409-425.