

# The Role of Magnetic Resonance Enterography (MRE) in Detecting Features of Inflammatory Bowel Disease (IBD)

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## Abstract

Magnetic resonance enterography MRE is a clinically useful technique for the evaluation of intraluminal and extraluminal small bowel disease, particularly in younger patients with Crohn disease (CD). MRE offers the advantages of multiplanar capability and lack of ionizing radiation. It allows evaluation of bowel wall contrast enhancement, wall thickening, and edema, findings useful for the assessment of CD activity. MRE can also depict other pathologic findings such as lymphadenopathy, fistula and sinus formation, abscesses, and abnormal fold patterns.

**Objective:** to enhance the use of MRE in the diagnosis of IBD in the Middle East area especially in Jordan.

**Keywords:** Magnetic resonance enterography, inflammatory bowel disease, Crohn disease, Jordan University Hospital.

*(J Med J 2015; Vol. 49 (1):45- 51)*

Received

April 28, 2014

Accepted

Oct. 12, 2014

## Introduction

The inflammatory bowel diseases (IBD) include ulcerative colitis and Crohn's disease (CD) are chronic, progressive inflammatory disorders of the gastrointestinal tract. The pathogenesis of IBD involves environmental, genetic and immunological factors. During the last decades, the incidence of CD has continued to increase worldwide (1).

Barium imaging of the gut is now rarely used in the diagnosis of IBD and has been replaced by colonoscopy. Small bowel barium studies are too insensitive and unreliable and have been replaced by enterography (where

contrast is swallowed) or enteroclysis (where the contrast is infused via a nasogastric tube) with imaging via computerized tomography (CT) or magnetic resonance (MR) (2, 3).

MRI of the small bowel with oral contrast, referred to in the literature as MR enterography (MRE), is a method that has been established in numerous studies, is well tolerated, and can visualize all relevant pathologies in patients with CD with high sensitivity and specificity (4,5,6).

Crohn's disease is the primary indication for MR imaging of the small bowel because many patients require multiple follow-up

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examinations. Findings suggestive of active inflammation include bowel wall thickening and hyper enhancement, ulcerations, increased mesenteric vascularity, and perienteric inflammation. Complications are well depicted and may include penetrating disease and small-bowel obstruction (7). MRE is well suited for children because of its lack of radiation. The most common indication for MRE is inflammatory bowel disease, with Crohn's disease being much more common than ulcerative colitis. About 25-30% of patients affected with Crohn's disease are children (8).

### **Materials and Methods**

This prospective study was performed in the radiology department of Jordan University Hospital between January 2010 and December 2012.

Twenty five consecutive patients with clinically suspect diagnosis of inflammatory bowel disease, either having clinical symptoms or had endoscopies were included in the study. Pregnant ladies or those who expect to be pregnant, patients diagnosed to have renal failure, hemodynamic instability, and those allergic to the contrast were excluded. MRE obtained from the patients were evaluated. Duodenum, jejunum, ileal loops, ascending, transverse, descending colon, sigmoid colon and rectum were evaluated in that order as for general imaging quality, luminal distension and adequate visualization of the intestinal wall.

Protocol of MRE at the department of radiology of Jordan Hospital University is as follows:

Preparation of patients includes: twenty

four hours of clear fluid diet and twelve hours of fasting before the procedure. Medications given twenty minutes before the procedure includes: Plasil per mouth 5mg, diluted Bascopan 20mg intra venous (IV) half of it 20 minutes before the procedure and the rest during it, 60 mg Mannitol (100ml in 4 L water) and Gadolinium contrast. (Omniscan (gadodiamide), given I.V 20 cc)

Imaging MRE protocol, by Siemens Verio 3t MRI scanner (Earlgin-Germany), includes two parts, pre- IV contrast and post contrast, pre-contrast (T1 Vibe FATSAT coronal, T2 HASTE coronal and axial, TRSE dynamic coronal and axial)

And post-contrast (T1 Vibe coronal and axial), imaging of patients in prone position to reduce the motion artifact.

The author had collected the data and reviewed the MR examination.

Since only one researcher performed the task, the MR examination was held twice, to decrease the possible intra examiner errors.

### **Results:**

SPSS software was used issue (17) to analyze the data. Statistical analysis was used to bring out the results Cross tabs, Chi-square test, was used to find the relationship between the variables. Significant relation was obtained when probability (P) equal or < 0.05.

Features of CD like abscess formation, enhanced mesenteric lymph nodes, fibrofatty changes, stenosis or stricture were studied. Patients age ranged from 15-57 years, 65% of patients were females. Table [1]

**Table 1. Factors associated with MRE finding of Crohns Disease**

Factor	No.	%	P*
<b>Age:</b> 15	3	12	< 0.01
18	1	4	
19	4	16	
32	2	8	
42	4	16	
45	1	4	
52	7	28	
57	3	12	
<b>Gender:</b>			< 0.01
Female	14	56	
Male	11	44	
<b>Place:</b>			< 0.01
Amman	13	52	
Aqaba	4	16	
Karak	4	16	
Maan	3	12	
Salt	1	4	

\* P value of Chi square.

Pattern of enhancement was significant  $p < .01$ . Table [2], Also 72% of patients had congested vessels  $p < .01$ . table [3], MRE was significant  $p < .01$  regarding enhanced mesenteric lymph nodes, where 64% of

patients had present ileac or mesenteric nodes. Table [4].

Distal illium was mostly affected, figure [a]; most patients had fibro fatty changes. figure [b].

**Table 2. Factors associated with MRE finding of Crohns Disease**

**Pattern of enhancement**

Factor	No.	%	P*
<b>Age:</b> 19	1	4	< 0.01
48	19	76	
57	5	20	
<b>Place:</b>			< 0.01
Amman	19	76	
Karak	5	20	
Maan	1	4	

\* P value of Chi square.

**Discussion:**

MRE is currently being used as a diagnostic, and a follow up tool for the patients of Crohn's disease, for the advantages of improved soft tissue contrast, which is

important for detecting subtle pathologic areas. Staging and follow-up of patients without ionizing radiation.

Findings of Crohn's disease on MRE in this study, were similar to those of Tolan et al and

Leyendecker et al, regarding bowel wall thickening, hyper-enhancement, mesenteric hyper vascularity, and inflammatory changes,

fibrofatty proliferation, enlarged and/or increased number of lymph nodes, and fistula (9,10).

**Table 3. Factors associated with MRE finding of Crohns Disease**  
**Mesenteric vessels involvement**

Factor	No.	%	P*
Gender:			< 0.01
Female (Congested)	14	56	
Male (Non-congestion)	11	44	
Place: per site involved			< 0.01
Amman (Congested)	18	72	
Aqaba (Non-congestion)	11	44	

\* P value of Chi square.

**Table 4. Factors associated with MRE finding of Crohns Disease**  
**Enhanced Mesenteric and Iliac Lymph Nodes**

Factor	No.	%	
Age:			< 0.01
21 (Absence)	9	36	
26 (Presence)	16	64	
Gender:			< 0.01
Female (Presence) (2 groups, or more of regional lymph nodes)	16	64	
Male (Absence)	11	44	
Place:			< 0.01
Karak (Absence)	9	36	
Tafela (Presence)	16	64	

\* P value of Chi square.

Increased mucosal hyper enhancement as found in this study (compared with that seen in normal surrounding loops with similar distention) may be one of the earliest signs of active inflammation, even in the absence of substantial wall thickening (11, 12).

Bowel obstruction may result from active inflammation or fibrostenotic disease.

Multiple sequences and multiphasic acquisitions allow assessment of distention, and T2-weighted sequences and contrast enhancement may allow differentiation of

active inflammatory disease from fibrostenotic disease. Also MRE has been shown to be valuable in detecting active ileitis, for the

assessment of disease activity and the identification of extra enteric complications (13).

Figure a: site of involvement

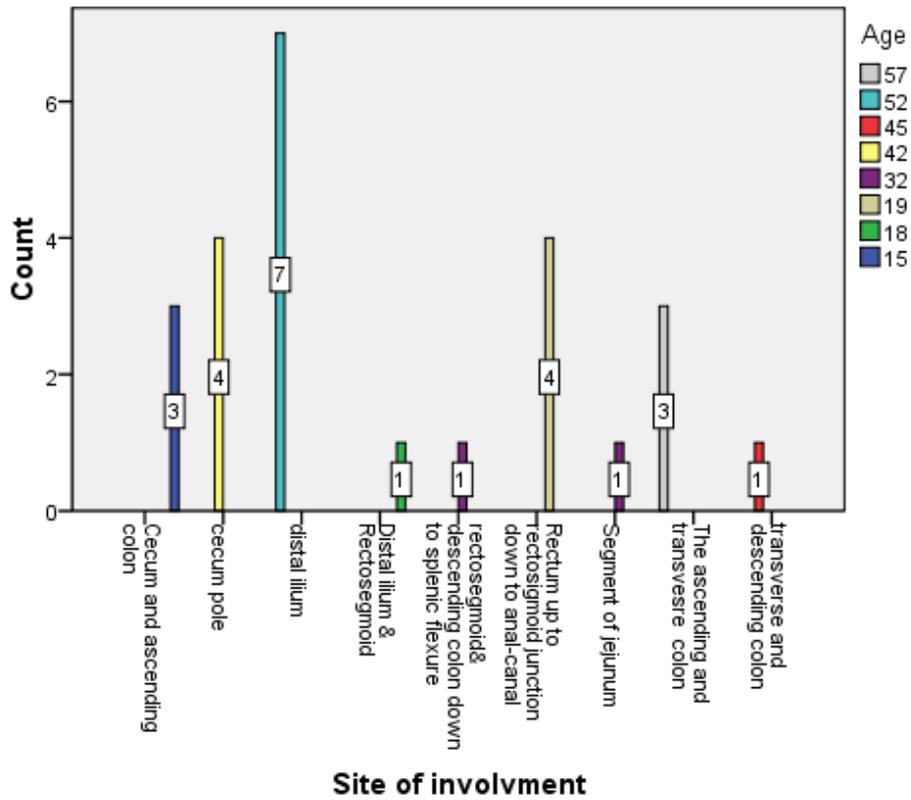
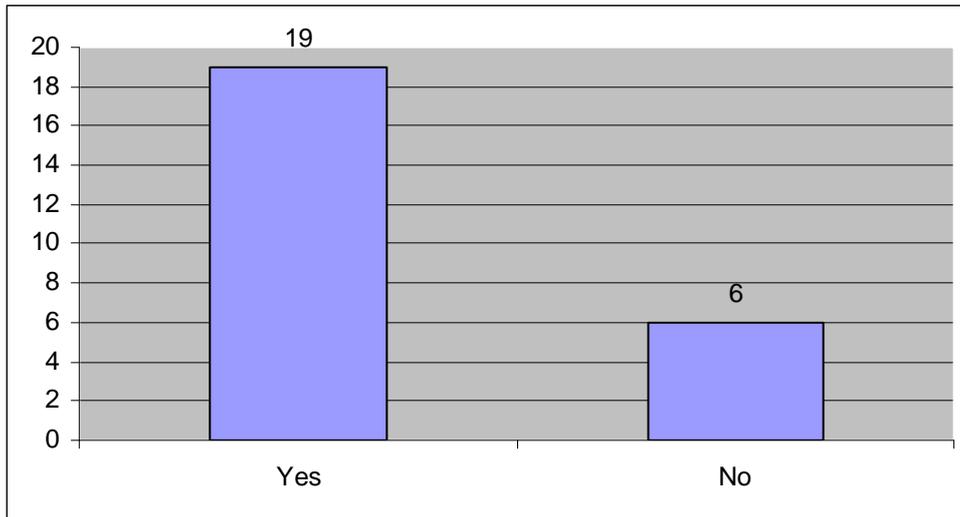


Figure b: fibrofatty changes



A recent study by Desmond et al (14) showed that certain subgroups of patients with Crohn's disease may be exposed to high life time doses of radiation, those diagnosed at an early age, those with upper gastrointestinal tract inflammation or penetrating disease, and those who undergo multiple surgeries.

That's all as well as in this study, a recent systematic review in pediatric CD showed that MR enterography is a sensitive and specific tool for diagnosis in pediatric inflammatory bowel disease as an alternative method (15).

Coinciding to this study, Intestinal stricturing and aberrant small bowel motility are common complications in patients with CD leading to significant morbidity. A retrospective study by Menys A et al, was performed quantifying small bowel motility within and upstream of strictures in CD patients using MRE (16).

A further point, to be considered in this study and for further research is the high percent of symptomatic patients, about 44%, coming from south of Jordan.

### **Conclusion:**

Finally, especially in children, selected patient groups like those experiencing frequent recurrences and in whom history of IBS, drug allergy were elicited during routine controls, in order to avoid radiation risk and potential drug reactions DW-MRI is an alternative method which can be used effectively to obtain useful information. In line with advances cited in the literature and improvements in technical ultra structure, in patients with proper indications, it is a primary imaging modality to be selected.

MRE should be adopted in the Jordan University hospital for patients of IBD, for its value in diagnosis and beneficial role of reducing amount of radiation.

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## دور التصوير المعوي باستخدام الرنين المغناطيسي في كشف ملامح مرض التهاب الأمعاء

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### الملخص

إن تصوير الأمعاء باستخدام الرنين المغناطيسي تعد تقنية مفيدة سريرياً حيث تسمح بتقييم الأمراض المعوية من داخل اللمعة ومن خارج اللمعة المعوية K بشكل خاص لدى المرضى الشباب المصابين بداء كرون (داء الورم الحبيبي الالتهابي الهضمي المزمن) من مميزات التصوير المعوي باستخدام الرنين المغناطيسي أن لديه القدرة على التصوير بمختلف المستويات وأنه لا يستخدم الأشعة المؤينة، كما أنه يسمح بتقييم استعزاز جدار الأمعاء باستخدام صبغات التباين أو ثخانتها المرضية أو الودمة، حيث يتم الاعتماد على هذه الموجودات لتقييم نشاط داء كرون. كما أن تصوير الأمعاء باستخدام الرنين المغناطيسي قادر على إظهار موجودات مرضية أخرى مثل ضخامة الغدد اللمفاوية أو الناسور أو الجيب أو الخراج أو الثنيات المعوية الدائرية غير الطبيعية.

**الهدف:** تعزيز استخدام الرنين المغناطيسي في التصوير المعوي لغايات تشخيص أمراض الأمعاء الالتهابية في منطقة الشرق الأوسط وبشكل خاص في الأردن.

**الكلمات الدالة:** التصوير المعوي باستخدام الرنين المغناطيسي، داء التهاب الأمعاء، داء كرون (داء الورم الحبيبي الالتهابي الهضمي المزمن)، مستشفى الجامعة الأردنية.