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Efficacy of MR enterography in the diagnosis of small bowel disease and crohn's disease

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Abstract

Small bowel disease and crohn's disease are inflammatory disorders occurs in bowel wall. MR enterography (MRE) of small bowel is becoming gold standard imaging modality in the diagnosis of small bowel disease and crohn's disease. This study was performed to assess the sensitivity and appecificity of MR enterography in the diagnosis of small bowel disease and crohn's disease. A total 100 cases with clinical findings and symptoms of small bowel disease were recruited. The radiological examination was performed by using 1.5 tesla MRI using abdomen coil in supine position & instructed for breathing instructions. Among 100 participants, 56% cases had abnormal and 44% had normal findings by MRE enterography. In the MRE diagnosed abnormal cases, 32.1% cases had tuberculosis to intestine, 28.5% cases diagnosed with crohn's diasese, 7.14% had small bowel neoplasms, 8.9% cases had ulcerative colitis and 7.14% cases had large bowel disease. The sensitivity and specificity for MR enterography in the diagnosis of crohn's disese was 77.77% and 97.56% respectively. MR enterography is the efficient non invasive diagnostic modality in the diagnosis of suspected intra luminal, parietal and extra luminal small bowel disease and crohn's disease.

Keywords: MR enterography (MRE), small bowel disease, crohn's disease, sensitivity

Introduction

Small bowel disease is a chronic inflammatory condition, characterized by the involvement of layers of bowel wall ^[1]. Crohn's disease is a chronic inflammatory disorder that occur throught the GI tract, which is manifested by episodes of relapse and remission ^[2]. Radiological investigation of Small bowel is difficult due to its extension and motility ^[3]. In past decades, conventional method is the traditional imaging investigation modality. Endoscopy and barium studies are basic diagnostic modalities in the diagnosis of small bowel diseases in its early stages with endoscopic huded niopsy and HPE ^[4]. Whereas at present CT enterography (CTE) and MR enterography (MRE) have gained significant sensitivity and specificity in the diagnosis and staging of Crohn's disease ^[5].

MR enterography is effective in the evaluation of intermittent and low-grade small bowel obstructions. MRE has high contrast resolution, minimal exposure to the ionizing radiation, able to provide multiplanar images in sequential image series over long period of time, multiphasic image capability and use of intravenous contrast media with better safety profiles. It is also efficient in the evaluation of small bowel peristalsis and distensibility of areas of luminal narrowing ^[6]. MRE developed with fast sequences like KASTE, TruFISP for the diagnosis of small bowel disease which can be performed without artefact from peristalsis ^[7]. This study was designed to assess the sensitivity and appecificity of MR enterography in the diagnosis of small bowel disease and crohn's disease.

Materials and Methods

This prospective observational study was conducted in Department of Radiology, MNR Medical College and Hospital, Sangareddy during April 2018 to June 2019. A total 100 cases with clinical findings and symptoms of small bowel disease were recruited. Cases with small bowel disease, inflammatory bowel disease, low grade small intestinal obstruction, history of malabsorption, chronic right iliac fossa pain were included, cases with contraindication for MRI, not willing to participate, with complete bowel obstruction, severe vomiting were excluded.

Informed consent was obtained from all the cases and study protocol was approved by institution ethics committee. Clinical profile of cases was collected in prescribed proforma. Cases was instructed to be in fast minimum 6 hrs before the study. Metoclopramide tablet 20mg to promotegastric emptying; 1mg i.v.buscopan is administered just prior to the study to minimize movement artifact from peristalsis. Polyethylene glycol (PEG LEC) solution is prepared in 1.5 liters of water; Patient is instructed to drink the solution gradually for one hour for even distension of the entire small bowel and images on 1.5 tesla MRI using abdomen coil in supine position & instructed for breathing instructions. Before running the sequences 1mg of i.v.buscopan is given to minimize movement artifact from peristalsis. Images are obtained and evaluated. Results are followed up with clinical follow up and histopathological

findings.

Changes in bowel luminal diameter was graded as

Absent	No change in luminal diameter
Mild	One third decrease in luminal distension
Moderate	Two third decrease in luminal distension
Severe	Total obstruction of bowel lumen

Bowel distension grading was measure as

Grade 1	Less distension and less opacification
Grade 2	Well distended, but few loops are unopacified
Grade 3	Well distended

Results

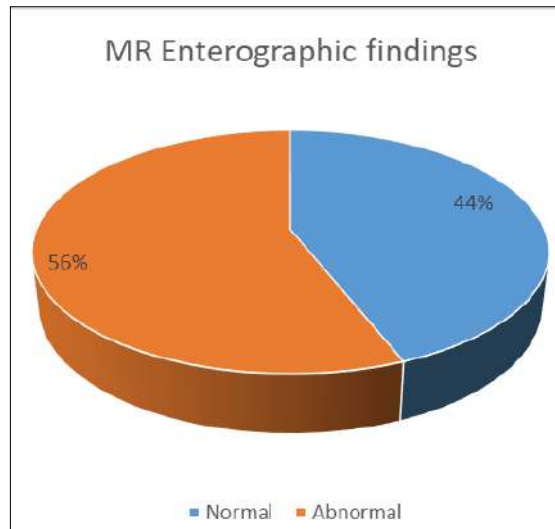


Fig 1: MR enterographic findings in the study participants.

Among the total cases, 56% cases had abnormal findings and 44% cases had normal findings by MR enterography (Figure 1). Tuberculosis (32.1%) highly prevalent,

followed by crohn’s disease (28.5%), large bowel disease (8.9%) and ulcerative colitis (8.9%). (Table 1)

Table 1: disease status in MR enterographic confirmed abnormal cases.

Disease type	Total abnormal cases (n=56)	
	Number	Percentage
Crohn’s disease	16	28.5%
Carcinoid	03	5.3%
Large bowel disease	04	7.14%
Small bowel neoplasm	05	8.9%
Tuberculosis	18	32.1%
Ulcerative colitis	05	8.9%
Fistula	03	5.3%
Inconclusive	02	3.5%

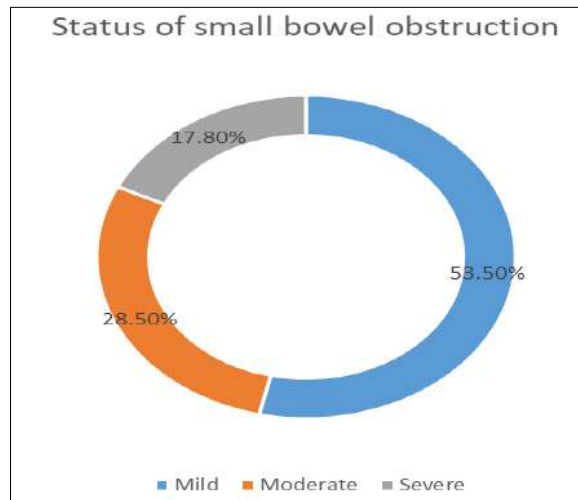


Fig 2: Status of small bowel obstruction in MR enterographic confirmed abnormal cases.

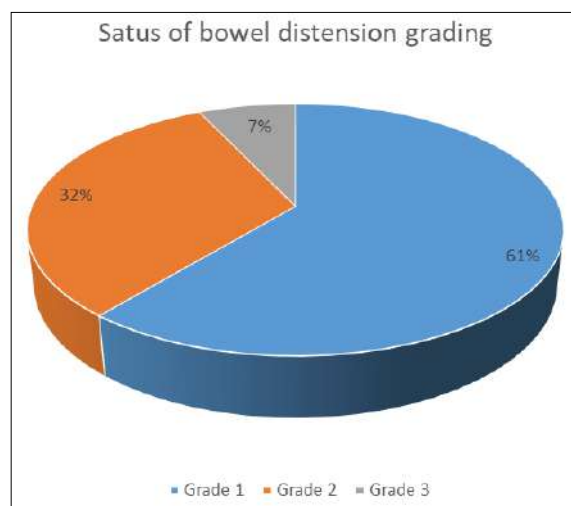


Fig 3: Status of bowel distension grading among study participants.

Table 2: validity of MR enterographic findings with HPE findings in small bowel disease.

MR enterographic findings	HPE findings	
	Present	Absent
Positive	52	04
Negative	04	40
Sensitivity	93.18%	
Specificity	91.54%	

The sensitivity and specificity for MR enterography in the diagnosis of small bowel disease was 93.18% and 91.54% respectively. Whereas, sensitivity and specificity for MR

enterography in the diagnosis of crohn’s diseas was 77.77% and 97.56% respectively. (Table 2 & Table 3)

Table 3: Validity of MRenterographic findings with HPE findings in crohn’s disease diagnosis.

MR enterographic findings	HPE findings	
	Present	Absent
Positive	42	02
Negative	02	54
Sensitivity	79.26%	
Specificity	98.12%	

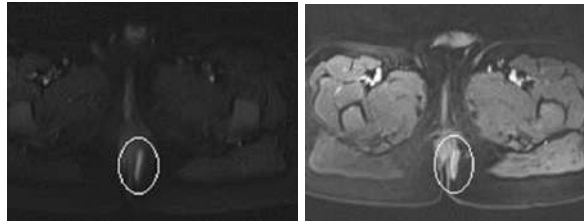


Fig 4: Intersphincteric fistula in cases with crohn's disease.

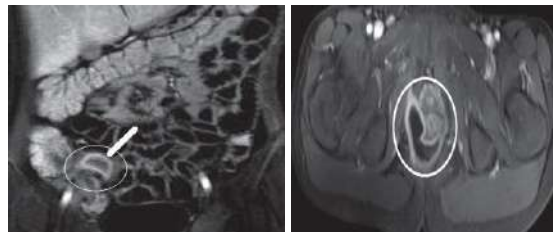


Fig 5: Perianal fistula in cases with crohn's disease.0



Fig 6: Axial T1 Weighted MR image shows thickened wall of ileum in Crohn's disease.

Discussion

Crohn's disease management either medical or surgical is depends on the presence of inflammatory activity. In the past, endoscopy was the gold standard technique in the detection of crohn's disease and its activity^[8,9]. Whereas at present, CT enterography (CTE) and MR enterography (MRE) have gained significant sensitivity and specificity in the diagnosis and staging of Crohn's disease. This study was designed to assess the sensitivity and apecificity of MR enterography in the diagnosis of small bowel disease and crohn's disease. In this study among 100 participants, 56% cases had abnormal findings and 44% had normal findings by MR enterography (Figure 1). In the MRE diagnosed abnormal cases, 32.1% cases diagnosed with tuberculosis to intestine, 28.5% cases diagnosed with crohn's diasese, 7.14% had small bowel neoplasms, 8.9% cases had ulcerative colitis and 7.14% cases had large bowel disease (Table 1). Foad Serag El-Dein *et al.*, in their study on 24 participants, 15 cases had neoplastic and 9 cases had inflammatory. Among 9 inflammatory cases, 7 cases had crohn's disease, one case had tuberculosis of small bowel and one case had chronic non specific iliocolitis^[10].

The sensitivity and specificity for MR enterography in the diagnosis of crohn's diseas in this study was 77.77% and 97.56% respectively. Study by Stuart A Taylor, assessed diagnostic accuracy of MRE and ultrasound for the extent and activity of crohn's disease found that MRE had 80% sensitivity for small bowel disease extent and 97% for disease presence^[11]. Study by Umaschaden *et al.*, and Albert *et al.*, stated that MRE has gained notable sensitivity and specificity in the diagnosis of active inflammation. This method is effective than conventional barium follow through and conventional enterolysis^[12, 13]. Literature suggested that sensitivity and specificity of MRE is higher

than CTE. A meta analysis study stated that there is no difference in the sensitivity and specificity between MRE and CTE^[14, 15]. MRE with oral contrast administration has been used as primary MR imaging method in the diagnosis of crohn's disease with high sensitivity, specificity^[16]. Grand *et al.*, found 85% sensitivity in the diagnosis of crohn's disease^[17]. Rahab Yasin *et al.*, compared MRE with endoscopy, found sensitivity 97.1%, specificity 81.3%, positive predictive value 91.7%, negative predictive value 92.9% and accuracy 92%. The study concluded that MRE has high significant sensitivity and specificity when compared to the endoscopy in the diagnosis of crohn's disease^[8].

The sensitivity and specificity for MR enterography in the diagnosis of small bowel disease was 93.18% and 91.54% respectively. Study by Foriano *et al* found sensitivity, specificity 88% and 88% respectively^[18]. Gaurav Gupta *et al.*, in their study stated that MRE has 100% diagnostic accuracy in small bowel pathologies except in crohn's disease where diagnostic accuracy was 80%^[19].

Conclusion

The results concluded that, MR enterography is the efficient non invasive diagnostic modality in the diagnosis of suspected intra luminal, parietal and extra luminal small bowel disease and crohn's disease. The MRE has superior tissue characterization, extramural lesions detection, disease activity demonstration with using ionizing radiation. MRE is providing adequate transmural visualization of small bowel, its etiology, location, extent, distribution, disease activity and associated omplications if the condition. Thus, MRE has become method of choice for the non invasive evaluation of small bowel disorders.

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