

Comparison of Mannitol, Water and Positive Oral Contrast for Evaluation of Bowel Pathology by Computed Tomography

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ABSTRACT

Aim: To compare the excellent abdominal distension with mannitol, water and positive oral contrast in patient undergoing CT enterography for the diagnosis of bowel pathology.

Methods: In this randomized controlled trial, we included 90 patients who were planned for CT enterography due to any cause such as recurrent abdominal pain, irritating bowel disease (IBD) and irritating bowel syndrome (IBS) having age 20-70 years and having history of abdominal discomfort for >3 months. The study duration was June-2020 to Feb-2021. These 90 patients were divided into three equal groups; Group M: these patients received 3% mannitol solution. Group P; these patients received positive contrast, Group W: these patients received 1500 ml of plain water 20 minutes before CT imaging. Quality of abdominal distension was noted during CT examination.

Results: Mean age of the patients was 46.99±12.98 years. Mean duration of abdominal discomfort was 10.37±5.22 months. There were 49(54.44%) male patients and 41(45.56%) female patients. There were 30 (33.33%) patients who presented with IBS, 34(37.78%) patients with IBD and 26 (28.89%) patients with recurrent abdominal pain. Excellent abdominal distension was found in 12(40%) patients in group M, in 4(13.3%) patients in group P and in no patient in group W, with p-value <0.001.

Conclusion: Mannitol Proved to be the superior endoluminal contrast agent as compared to other studied agents. Moreover, it is a cheaper and well tolerated drug and have minimal adverse effects.

Keywords: Bowel pathology, CT enterography, Mannitol, Water, Positive contrast agents.

INTRODUCTION

Diagnosis of small bowel diseases such as inflammatory bowel disease (IBD) is always challenging because of the length and location of small bowel. Computed tomography enterography (CTE) and magnetic resonance enterography (MRE) are two non-invasive imaging techniques of evaluation of small bowel using contrast agents.¹ MRE is superior to CTE as it provides better contrast and without the risk of radiation exposure, its major drawback is being costly and requires prolonged imaging time.² Because of this CTE is the preferred method of evaluation of bowel diseases.^{3,4}

The excellence of CTE images is greatly relied on the degree of abdominal distension and folds visualization, for this purpose different contrast agents are given orally which can produce uniform intra-luminal attenuation, can provide high quality contrast between the bowel wall and luminal contents and minimum absorption and with minimum adverse effects.^{5,6}

Three commonly used oral contrast agents for abdominal distension are water, mannitol and +ve contrast agents. Different studies have found varying results regarding the quality of abdominal distension with these agents. And there is still an ongoing debate regarding the

quality of distension using these agents. So, the purpose of the proposed study is to compare the frequency of abdominal distension using mannitol, water and positive oral contrast in patients undergoing CT enterography for the diagnosis of bowel pathology.

METHODS

In this randomized controlled trial, we included 90 patients who were planned for CT enterography due to any cause such as recurrent abdominal pain, irritating bowel disease (IBD) and irritating bowel syndrome (IBS) having age 20-70 years and having history of abdominal discomfort for >3 months. Patients with high grade abdominal obstruction (Diagnosed on ultra-sonography) and patients with visible gastro-intestinal bleeding (diagnosed by presence of blood in stool) were excluded from this study. The study duration was June-2020 to Feb-2021 and was arranged in Ibae-e-Sieena Hospital Multan after obtaining approval from Institution review board (IRB) of the hospital.

Data regarding baseline patient variables e.g. age, gender, BMI, presetting complaint, duration of abdominal discomfort. These 90 patients were divided into three equal groups (each containing 30 patients) using draw randomization. Group M: these patients received 3% mannitol solution. Group P; these patients received positive contrast containing 65% megluminediatrizoate (20ml dissolved in 1500 ml of water). Group W: these patients received 1500 ml of plain water 20 minutes before CT

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imaging. Plain CT images were gained first to evaluate the degree of abdominal distension and patients were divided into three categories on the basis of abdominal distension.

Evaluation of quality of abdominal distension was done and divided into three grades; **Grade I (Poor)**; Collapsed bowel/poor contrast between the wall and intraluminal contents was graded as grade I. **Grade II (Good)**; Endo-luminal contrast agent seen within the bowel loops with distension of ≤ 1.5 cm and incomplete fold visibility will be labelled as grade II distension. **Grade III (Excellent)**; abdominal distension > 1.5 cm and complete visibility of fold will be graded as grade III.

Data analysis was carried out using SPSS v20.0. Chi-square test was used to compare the quality of abdominal distension between the three groups. P-value < 0.05 was taken as significant difference.

RESULTS

Mean age of the patients included in this study was 46.99 ± 12.98 years. Minimum age was 20 years and maximum age was 70 years. Mean duration of abdominal discomfort in studied patients was 10.37 ± 5.22 months. Minimum duration was 04 months and maximum duration was 24 months. There were more males as compared to the female patients. There were 49(54.44%) male patients and 41 (45.56%) female patients.

Regarding frequency of presenting complaint, there were 30(33.33%) patients who presented with IBS,

34(37.78%) patients with IBD and 26 (28.89%) patients with recurrent abdominal pain (Figure 1).

Excellent abdominal distension was occurred in 16(78.78%) patients and it was not occurred in 74(82.22%) patients (Figure 1).

On comparison of excellent abdominal distension among the groups, excellent abdominal distension was found in 12(40%) patients in group M, in 4(13.3%) patients in group P and in no patient in group W, with p-value < 0.001 (Table 1).

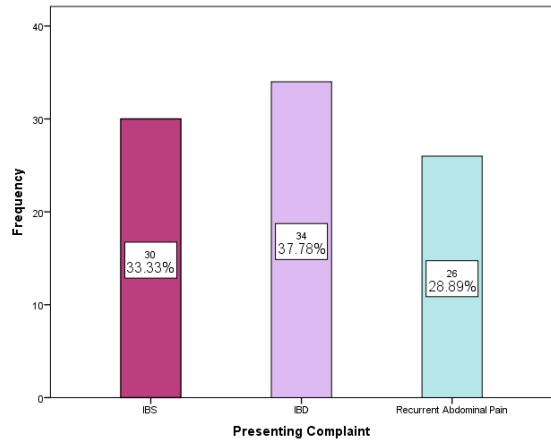


Figure 1: Frequency of Presenting Complaints.

Table 1. Comparison of Quality of Distension among the Groups.

Excellent Abdominal Distension	Study Group			P-value
	Group M	Group P	Group W	
Yes	12 (40.00%)	04 (13.30%)	0 (0%)	< 0.001
No	18 (60.00%)	26 (86.70%)	30 (40.50%)	

DISCUSSION

With advances of CTE such as 3D image reconstruction now the CTE provides more reliable and better diagnosis of intestinal diseases^{7,8}. However, the quality of CTE imaging depends largely on the degree of distension and mural folds prominence. Previously +ve contrast was thought to be the best agent for distension. The disadvantage of this agent is that it provides obscured mucosal details especially at ileocecal junction that is the commonest site of pathology formation.^{8,9} Other commonly used contrast agents are; water, milk, and mannitol to get the abdominal distension and to visualize the intraluminal contrasts. An ideal oral contrast should have minimum attenuation, uniform and good distension and excellent mural-folds visibility^{10,11}. Some research has reported superiority of neutral contrasts over +ve contrasts in terms of better visualization and abdomino-pelvic diseases. However, the neutral contrast are limited in cases of differentiation of cystic lesions which are better differentiated using +Ve contrast agents¹².

In present study, we compared the three contrast agents such as +ve contrast agent, mannitol and water for CTE evaluation of small bowel diseases. The abdominal distention quality was better using mannitol and was the

poorest using the water. Excellent distension was achieved in 12(40%) patients in group M, in 4(13.3%) patients in group P and in no patient in group W.

Elamparidhi et al. in a comparative study involving 75 patients compared the abdominal distension quality using mannitol, water and +ve contrast agents containing 25 patients in each group, reported excellent abdominal distension in 52% of patients with mannitol, in 0.0% patients with water and in 4% patients with positive oral contrast¹³.

While another study by Prakashini et al. containing 300 patients (100 patients in each group), compared the abdominal distension using mannitol, +ve contrast agents and water found excellent bowel distension in 26% patients with Mannitol, in 8% patients with positive oral contrast and in 0.0% patients with water¹⁴.

CONCLUSION

Mannitol is an excellent endoluminal contrast agent in comparison to water and positive contrast agent. It is also a cheap, effective, and well-tolerated endoluminal contrast agent with minimal adverse effects and could produce CT enteroclysis equivalent bowel distension.

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