Original Research Article

Role of Single Balloon Enteroscopy in Patients with suspected Small Bowel Disease

Manjunath[1], Kilari Mounika[2], Mandalapu Narendra Babu[3], B S Satyaprakash[4*]

[1]Assistant Professor, Department of Gastroenterology, M S Ramaiah Medical College, Bangalore, India
[2]Consultant Gastroenterologist, KM Gastro Center, Whitefield, Bangalore, India
[3]Serior Resident, Department of Gastroenterology, M S Ramaiah Medical College, Bangalore, India
[4]Professor and HOD, Department of Gastroenterology, M S Ramaiah Medical College, Bangalore, India

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Abstract

Back ground: Single Balloon Enteroscopy (SBE) is a novel method of balloon assisted enterosocpy which allows deeper intubation of small bowel and has therapeutic potentials in addition to establishing a diagnosis. The current study was carried out to study the spectrum of various diseases involving the small bowel and study its role of therapeutic intervention. **Material and Methods:** This is a cross-sectional study conducted in the Department of Medical Gastroenterology, M S Ramaiah Medical College, Bangalore. A total of 80 patients were included in the study with suspected small bowel disease.**Results:** A total of 80 patients have undergone entreroscopy procedures. Approach was per oral in 41.25%, per rectal in 27.5% and both in 31.25%. The predominant presenting symptoms were pain abdomen in 75%, loose stools in 27% and suspected GI bleed in 25%. Positive findings on CT Abdomen were seen in 40%. Enteroscopy showed Ileal lesions in 26.25%, Jejunal lesions in 23.75%, GIST in 3.75% and Dielafoy's lesion in 2.5%. Compiling Jejunal&Ileal findings Crohn's diseases was seen in 57.5%. Interventions performed in 13.75% and were CRE dilatation in 5%, APC in 3.75%, Hemoclips in 3.75% and EVL in 1.25%. The overall diagnostic yield was 64% and diagnostic yield for pain abdomen was 61.76%, loose stools was 62.9%, vomiting was 77.77%, weight loss was 86.66%, suspected crohn's was 68.25% and Abnormal CT findings was 71.87%.**Conclusion:** SBE appears to be safe and effective method for diagnosis and treatment of small bowel diseases. It demonstrates a high diagnostic yield, avoids cumbersome surgeries and provides easy way of performing therapeutic interventions even in the deeper loops of the small bowel.

Keywords: Small bowel disease, Single balloon enteroscopy, abdominal pain, gastrointestinal haemorrhage, Crohn's disease.

Introduction

The small bowel has long been considered as a black box for endoscopists because of its long length and presence of multiple complex loops. Endoscopy using the standard gastroscopes can reach only up to the second or third portion of the duodenum. Colonoscopy can reach 10cm to 20 cm beyond the ileocecal valve. Most of the non-surgical endoscopic techniques were unsatisfactory and managing small bowel diseases often required surgical intra operative endoscopy[1-4].Therefore small bowel has long been considered as the final frontier for the gastrointestinal endoscopists[5-7].

The invention of Enteroscopy has created a major breakthrough in the examination of small bowel and permits the evaluation of small bowel mucosa[8-12].In the hands of expert endoscopists the entire small bowel can be visualized, with combined approach of per oral and per rectal intubation. This not only allows full length inspection of small bowel but has therapeutic capabilities also.

The burden of small bowel disease is significant in the population, however there are various limitation in diagnosing and treating the disease. One among them is that only very few centres have the facility of small bowel Enteroscopy. Having the opportunity to use this instrument, the present study was conducted to evaluate the spectrum of small bowel disease and highlight the role of Single Balloon Enteroscopy in diagnosis and therapy.

**Correspondence*
Dr. B S Satyaprakash
Professor and HOD, Department of Gastroenterology, M S Ramaiah Medical College, Bangalore, India.
E-mail: satyaprakashbs@gmail.com

Methodology

This is a cross-sectional study conducted in the Department of Medical Gastroenterology, M S Ramaiah Medical College , Bangalore. A total of 80 patients were included in the study with suspected small bowel disease.

Inclusion criteria

- Suspected small bowel disease after negative or inconclusive Endoscopy and Colonoscopy.
- Localization of small bowel pathology by imaging studies.
- Suspected small bowel Crohn's Disease.
- Suspected Obscure GI bleed.
- Small bowel tumors.
- Any age groups.
- Patients/ patient's attenders willing to give informed consent to take part in the study.

Exclusion criteria

- Multiple co morbid conditions / medically instable.
- Large Esophageal varices.
- Severe active Crohn's disease.
- Fresh surgical stoma.
- Severe ulcerative Esophagitis.
- Inability to provide informed consent.
- Non-GI malignancy who is unfit to undergo this procedure.

Method of collection of Data

A detailed history related to the suspected small bowel disease and the duration of complaints were noted. The patients were then subjected to undergo certain routine blood investigations, Ultra

sound abdomen, Endoscopy and Colonoscopy. In case of strong suspicion of small bowel disease, they are further subjected to CECT Abdomen.

Depending upon the results obtained from the above investigations, patient underwent Enteroscopy. The route of approach was determined by the localization of pathology. In certain patients where the localization was not confirmed or one route of approach could not obtain a diagnosis, the second route was opted to complete the enterosocpic evaluation of the small bowel.

Statistical analysis

The data obtained was coded and entered into Microsoft Excel worksheet. All qualitative variables were expressed as frequencies and percentages. All quantitative variables were expressed as Mean ± Standard Deviation (SD).

Results

A total of 80 patients presenting to the OPD as well as admitted in the IPD in the Dept. of Medical Gastroenterology were studied. The data was analysed and the final results were tabulated and interpreted as below. The total number of patients included in the study were 80, out of which 56 (70%) were male and 24 (30%) were female. The mean age of the study population was 40.5 and standard deviation of 15.03

Table 1: **Distribution of patients according to sex**

Sex Wise Distribution of Patients	Number (n)	Percentage (%)
Male	56	70
Female	24	30
Total	80	100

Table 2:Distribution of patients according to route of enteroscopy

Route ofEnterosocpy	Number (n)	Percentage (%)
Per orally	33	41.25
Per Rectally	22	27.5
Both per orally and per rectally	25	31.25
Total	80	100

Enteroscopy was performed per orally in 33 (41.25%), per rectally in 22 (27.5%) and both per orally – per rectally in 25 (31.25%) of patients.

Table 3:Presenting symptoms among the study population

Prsenting Symptoms	Number (n)	Percentage (%)
Pain abdomen	68	75
Loose stools	27	33
Weight loss	15	18.75
Repeated blood transfusions	11	13.75
Melena	9	11.25
Vomiting	9	11.25
Decreased appetite	5	6.25
Wheat intolerance	2	2.5
Hematemesis	1	1.25
Fever	1	1.25
Migrated CBD stent	1	1.25

The various symptoms with which the patients presented were pain abdomen in 68 (75%) being most common followed by loose stools in 27 (33%), weight loss in 15 (18.75%), repeated blood transfusions in 11 (13.75%), melena in 9 (11.25%), vomiting in 9 (11.25%), decreased appetite in 5 (6.25%), wheat intolerance in 2 (2.5%) and hematemesis in 1 (1.25%).

Table 4:Blood investigations abnormalities in the study population

BloodInvestigations	Number (n)	Percentage (%)
Hemoglobin (< 12 gm/dl)	10	12.5
Elevated ESR	Male (> 22 mm /hr) 33	41.25
	Female (> 30 mm/hr) 14	17.5
Elevated CRP (>0.8 mg/dl)	Male 26	32.5
	Female 12	15

Blood investigation showed abnormalities like decreased haemoglobin of <12 gm/dl in 10 (12.5%), elevated ESR in 47 (58.75%) and elevated CRP in 38 (47.5%). Elevated ESR was calculated in Males as >22 mm/hr and was found to be elevated in 33 (41.25%) whereas females it was considered as >30 mm/hr and found in 14 (17.5%). Elevated CRP was calculated as > 0.8 mg/dl and was found elevated in 26 (32.5%) male patients and 12 (15%) female patients.

Table 5:CT Abdomen findings in the study population

CT Abdomen Findings	Number (n)	Percentage (%)
Ileal findings	16	20
Jejunal findings	13	16.25
Possible jejunal polyp	1	1.25
Hepato splenomegaly	1	1.25
Migrated CBD stent	1	1.25
Mesenteric lymphadenopathy	1	1.25
Normal	43	53.75
Not done	4	3.75
Total	80	100

CT Abdomen showed positive findings in 32 (40%) and they are Ileal findings in 16 (20%) and Jejunal findings in 13 (16.25%) which are the maximum number of positive findings. Rest of the findings were Possible jejunal polyp, migrated CBD stent in one patient each. Normal study was seen in 43 (53.75%) of patients.

Table 6:Endoscopic findings among the study population

Endoscopic Findings	Number (n)	Percentage (%)
Altered Blood	1	1.25
Obliterated Esophageal Varices	1	1.25
Pan Gastritis	1	1.25
Pyloric Channel Ulcer	1	1.25
D2 Scalloping	1	1.25
Duodenal Erosions	1	1.25
Duodenal Polyp	1	1.25
Duodenal Sub Mucosal Lesion	1	1.25
Jejunal Stricture	1	1.25
Normal	71	88.75
Total	80	100

Endoscopy showed predominantly normal study in 71 (88.75%) of patients. Other findings seen were altered blood, obliterated esophageal varices, pan gastritis, pyloric channel ulcer, D2 scalloping, duodenal erosions, duodenal polyps, duodenal sub mucosal lesions and jejunal stricture in one patient each.

Table 7:Colonoscopy findings in the study population

ColonoscopyFindings		Number (n)	Percentage (%)
Ileal ulcers / erosions/nodularity		6	7.5
IC valve	Inflammation	1	1.25
	Ulcers	1	1.25
Caecum	Angiodysplasia	1	1.25
	Diverticuli	1	1.25
Fresh blood or clots		4	5
Rectum	Erosions	1	1.25
	Varix	1	1.25
Internal hemorrhoids		1	1.25
Normal		59	73.75
Not done		4	5
Total		80	100

Colonoscopy showed Ileal findings such as ulcers or erosions or nodularity in 6 (7.5%), IC valve inflammation or ulcers in 2 (2.5%), Caecalangiodysplasia and diverticuli in 2 (2.5%), full of clots and fresh blood in 4 (5%) and predominantly normal study seen in 59 (73.75%).

Table 8:Enteroscopy findings in the study population

EnteroscopyFindings	Number (n)	Percentage (%)
Ileal lesions	21	26.25
Jejunal lesions	19	23.75
GIST	3	3.75
Dieulafoy's lesion	2	2.5
Atrophic jejunal mucosa	1	1.25
Bleeding hemangioma	1	1.25
Caecalangiodysplasia	1	1.25
Portal hypertensive enteropathy	1	1.25
Pseudo polyps (Duodenum)	1	1.25
Ulceroproliferative growth	1	1.25
Stent retrieval failed	1	1.25
Normal	26	32.5
Total	80	100

Enteroscopy findings were predominantly found in Jejunum in 19 (23.75%) and Ileim in 21 (26.25%) of patients. Findings like GIST were seen in 3 (3.75%), Dieulafoy's lesion in 2 (2.5%) and normal enyteroscopy found in 26 (32.5%). Rest of the findings are summarized in the table below.

Table 9: Histopathological findings observed in the study population

HPE Findings	Number (n)	Percentage (%)
Crohn's disease	23	50
GIST	3	6.52
Adenocarcinoma	2	4.34
Koch's	1	2.17
Non-specific inflammation	17	36.95
Total	46	100

The Jejunal findings were Strictures in 9 (47.36%), Jejunal ulcers in 4 (21.05%), erosions in 1 (5.2%), ulcer bleed in 1 (5.2%) and growth in 1 (5.2%). Combimed Jujunal &ileal findings like ulcers were seen in 2 (10.5%) and erosions in 1 (5.2%).

Table 10:Diagnostic yield of the study

Symptom/Finding	Number of Patients(n)	Positive Diagnosis (Diagnostic Yield)
Pain abdomen	68	42 (61.76%)
Loose stools	27	17 (62.69%)
Recurrent bloodtransfusions	11	9 (81.81%)
Melena	9	9 (100%)
Vomiting	9	7 (77.77%)
Weight loss	15	13 (86.66%)
Suspected Crohn's	63	43 (68.25%)
Abnormal CT findings	32	23 (71.87%)

Medical therapy was given in 64 (80%) and surgery was performed in 5 (6.25%). The total diagnostic yield was seen in 52 (65%) of patients. Diagnostic yield for pain abdomen was 61.76% (42/68), loose stools was 62.9% (17/27), recurrent blood transfusions was 81.81% (9/11), melena was 100% (9/9), vomiting 77.77% (7/9), weight loss was 86.66% (13/15), suspected chrohn's was 68.25% (43/63) and abnormal CT findings was 71.87% (23/32).

Discussion

Diagnosis, interventions and non-surgical management of small bowel disorders is difficult and challenging. This is due to lack of availability of proper investigational modalities to venture into long redundant small bowel loops. BAE is an emerging technique to carry out enteroscopies with therapeutic potentials.Since Tsujikawa et al[13] reported the preliminary experience of SBE, it has emerged as a novel diagnostic and therapeutic tool for small bowel diseases and may serve as an alternative for DBE or CE.Our study showed an overall diagnostic yield of 64%. Various studies have shown the overall diagnostic yield as 50% by Ramchandani et al[14] Our study's diagnostic yield is consistent with most of the enteroscopy studies found in the literature. However, the significant difference in the diagnostic yield depends upon multiple factors, including non-uniform inclusion criteria, quality and completeness of pre SBE endoscopic investigations and the timing of SBE, as well as a lack of clarity over what constitutes a clinically significant finding.The total number of persons that were included in the study were 80. Out of which the majority were male 56 (70%) and females were 24 (30%). The mean age of the study population was 40.5 and standard deviation of 15.03.The route of performing enteroscopy was selected after analyzing the reports. Considering the site of lesion the procedure was performed per orally or per rectally. In certain cases where the diagnosis was not confirmed through one route, the other route was also opted. Enteroscopy was performed per orally in 33 (41.25%), per rectally in 22 (27.5%) and both per orally – per rectally in 25 (31.25%) of patients.Pain abdomen was the predominant symptom with which the patients presented and was found in 68 (75%). The diagnostic yield achieved in this group was 61.76%. In a study conducted by Mauro Mannoet al[15], pain abdomen was seen in 32.07% and the diagnostic yield was 65%. Of note unexplained chronic abdominal pain in our cohort was much higher than those in other studies and the diagnostic yield was far superior.Loose stools were the second most predominant symptom found in 27 (33%) and diagnostic yield was achieved in 17 (62.9%). Enteroscopy study done by May A et al[16] showed chronic diarrhea in 18.86 % and diagnostic yield was achieved in 55%. In this aspect, too our study showed superior diagnostic yield.GI bleed in the form of recurrent blood transfusions or melena was seen in 20 (25%) of population and diagnosis was attained in 18 with diagnostic yield being 90%. In the study conducted by Ramchandani et al[14], obscure GI bleed was seen in 37% and diagnostic yield was achieved in 60%. In a study conducted by Wei Gong et al[17], obscure GI bleed was seen in 40.29% and diagnostic yield was 74.1%. Compared to most of the available literature, our study showed highest diagnostic yield in view of diagnosing the cause for GI bleed. Vomiting was found in 9 (11.25%), decreased appetite in 5 (6.25%), wheat intolerance in 2 (2.5%) and hematemesis in 1 (1.25%). The diagnostic yield was 77.77% for vomiting and 86.66% for unexplained weight loss. These findings were superior when compared to study conducted by Wei gong et al[17] which showed a diagnostic yield of 66.7% for vomiting.

Blood investigation showed abnormalities like decreased haemoglobin of <12 gm/dl in 10 (12.5%), elevated ESR in 47 (58.75%) and elevated CRP in 38 (47.5%). Elevated ESR and CRP are indicative of mucosal disease. Elevated ESR was calculated in Males as >22 mm/hr and was found to be elevated in 33 (41.25%) whereas females it was considered as >30 mm/hr and found in 14 (17.5%). The diagnostic yield was 68% (32/47). Elevated CRP was calculated as > 0.8 mg/dl and was found elevated in 26 (32.5%) male patients and 12 (15%) female patients. The diagnostic yield was 78.9% (30/38).CT Abdomen showed positive findings in 40% (32/80) of the study population and the maximum lesions were found to be in Ileum in 20% (16/32) and later Jejunum 16.25% (13/32). Rest of the findings were Possible jejunal polyp, migrated CBD stent in one patient each. Normal study was seen in 43 (53.75%) of patients. We went ahead for enteroscopy in patients with normal CT abdomen study if the inclusion criteria were strongly suspicious of small bowel disease.Endoscopy showed predominantly normal study in 71 (88.75%) of patients. Other findings seen were altered blood, obliterated esophageal varices, pan gastritis, pyloric channel ulcer, D2 scalloping, duodenal erosions, duodenal polyps, duodenal sub mucosal lesions and jejunal stricture in one patient each. Endoscopy being predominantly normal or in conclusive was the main reason for taking up the patient for further investigations when small bowel disease was suspected.Similarly, colonoscopy being predominantly normal or in conclusive made us to go ahead with further investigations and Enteroscopy. Colonoscopy showed Ileal findings such as ulcers or erosions or nodularity in 7.5% (6/80), IC valve inflammation or ulcers in 2.5% (2/80), Caecalangiodysplasia and diverticuli in 2.5% (2/80), full of clots and fresh blood in 5% (4/80) and predominantly normal study seen in 73.75% (59/80).On Enteroscopy, Jejununal lesions were seen in 23.75% (19/80) and Ileal lesions were seen in 26.25% (21/80) of patients. Findings like GIST were seen in 3.75% (3/80) and Dieulafoy's lesion in 2.5% (2/80). Findings like Atrophic jejunal mucosa, Bleeding hemangioma, Caecalangiodysplasia, Portal hypertensive enteropathy, Duodenal pseudopolyps, Ulcero proliferative growth were seen in one patient each. Migrated CBD stent removal was attempted but was not successful in one patient. Normal enyteroscopy was found in 32.5% (26/80).Looking further into the details of Jejunal lesions, stricture was seen in 47.36% (9/19). HPE showed Chron's disease in 77.77% (7/9) and non-specific inflammation in 22.22% (2/9). Interventional procedure CRE dilatation was done in 33.33% (3/9). Ulcers were seen in 36.84% (7/19). Among them one ulcer showed bleed and was treated using APC. Rest of the ulcers showed Crohn's disease in 57.14% (4/7) and non-specific inflammation in 42.85% (3/7). Jejunal erosions were seen in 5.26% (2/19) and HPE showed non-specific inflammation. Growth was seen in one case and it turned out to be Adenocarcinoma. Compiling all data from Jejunal lesions, Crohn's disease was identified in 57.86% (11/19).

Looking further into the details of the Ileal lesions, predominant finding was ulcers in 66.66% (14/21). Ulcers were associated with nodularity in 28.57% (2/14) and ulcers associated with strictures were seen in 35.71% (5/14). HPE showed Crohn's in 57.14% (8/14) and non-specific inflammation in 42.85% (6/14). Only finding of strictures were seen in 9.52% (2/21) and strictures with nodularity was seen in 9.52% (2/21) where all were diagnosed as Crohn's on HPE. Thickened mucosa and only erosions in one patient each which showed non-specific inflammation on HPE. Inflamed IC valve with ulcers was seen in one patient each which was diagnosed as Koch's on HPE. Compiling all data from Ileal lesions, Crohn's disease was identified in 57.14% (12/21).Endoscopic interventions were performed in 13.75% (11/80) of patients. CRE dilatation in 5% (4/80), among them 3 werejejunal strictures and one ileal stricture. APC was done in 3.75% (3/80) for Jejunal ulcer, jejuna angiodysplasia and cecalangiodysplasia. Haemoclips were applied in 3.75% (3/80) for Dieulafoy's lesion, Duodenal ulcer bleed and Bleeding hemangioma. EVL was done in 1.25% (1/80) for Gastric dieulafoy's lesion. In our study, the number of therapeutic interventions were less compared to other studies like Bennie R Upchurch et al[18] in 42% of patients.HPE was done in 57.5% (46/80) and positive results were seen in 63.04% (46/80). Crohn's disease was identified in 50% of biopsies (23/46), GIST in 6.52% (3/46), Adenocarcinoma in 4.34% (2/46), Koch's in 2.17% (1/46) and non-specific inflammation in 36.95% of biopsies (17/46). Targeted medical therapy was given in 64 (80%) and surgery was performed in 5 (6.25%). The only limitation of the study was absence of long term follow up data. Apart from there were no procedure or anesthesia related complications in our study.

Conclusion

Based on the findings of this study it may be concluded that, SBE appears to be safe and effective method for diagnosis and treatment of small bowel diseases. It demonstrates a high diagnostic yield. It avoids cumbersome surgeries and provides easy way of performing therapeutic interventions even in the deeper loops of the small bowel.

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