

Diagnostic and Therapeutic Role of Single Balloon Enteroscopy (SBE) in Small Bowel Disease

Kanni PY, Mathew P*, Gowda M, Uppalapati S, Garg A and Ansari J

Department of Medical Gastroenterology, Vydehi Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India

***Corresponding author:** Praveen Mathew, Associate Professor, Department of Medical Gastroenterology, Vydehi Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India, Tel: 9620880555; Email: drpraveenmathew@yahoo.com

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Abstract

Introduction: The small Intestine has long been considered a Pandora's Box by gastroenterologists because of its long length and the presence of multiple complex loops. With developments of device assisted enteroscopy there is significant improvement in the assessment and diagnostic yield of small bowel diseases.

Aim: To assess the diagnostic and therapeutic role of single balloon enteroscopy (SBE) in patients with small bowel disease.

Materials and methods: A retrospective, single-centre study, where we analyzed records of patients over 5 year duration between March 2014 & February 2019. Consecutive patients who fulfilled the necessary criteria were included in the study. SBE system used was SIF-Q180 enteroscope, an overtube balloon control unit (OBCU Olympus Balloon Control Unit).

Results: Total patients evaluated were 114, Male - 73 (64%), Female - 41(36%), Enteroscopy was performed in 61(53.50%) patients with suspected small intestinal inflammatory bowel disease (IBD)/Intestinal tuberculosis, and in 43(37.72%) with obscure gastro-intestinal (G.I) bleed. Approach was by per oral route in 33(28.94%), per rectal route in 59(51.76%), and both oral and rectal route in 22(19.30%).

Enteroscopy findings: Ulcers and erosions in small intestine 58(50.88%), strictures in 28(24.56%), nodularity in 15(13.15%), Angioectasia in 7(6.1%), polyps in 6(5.2%), polypoidal lesions in 6(5.2%), Dieulafoy lesion in 2(1.8%) and normal enteroscopy findings in 15(13.15%) patients.

Interventions were performed in 22 patients- SBE assisted through the scope (TTS) dilatation was done in 10 patients, SBE assisted hemostasis was achieved in 9 patients and SBE assisted ERCP was done in 3 patients. The commonest histopathological diagnosis was Crohn's disease 39(34.21%), followed by Tuberculosis in 6(5.26%), adenomatous polyp in 3(2.6%), intestinal lymphoma in 3 (2.6%), non specific changes in 28(24.56%), GIST in 4(3.5%) patients.

Conclusion: SBE demonstrated a high diagnostic yield and provided an effective mode of therapeutic intervention in carefully selected patients. Therapeutic interventions with good success rate can be achieved with SBE avoiding the need for surgical interventions.

Keywords: IBD-Inflammatory Bowel Disease; Obscure G.I (Gastro-Intestinal) Bleed; Strictureplasty; SBE-Small Bowel Disease

Introduction

The small bowel has long been considered as an area of difficult reach for endoscopists, because of its long length and the presence of multiple complex loops. Endoscopy using standard gastroscopes it is difficult to reach deep intubation into the small bowel and same goes with the colonoscopy. Thus, the development of capsule endoscopy (CE) and balloon-assisted enteroscopy has permitted the observation of the entire small bowel. The diagnostic yield of the balloon-enteroscopy for relevant pathologic findings can be of 70%-80%; in addition, it allows histological sampling and endoscopic therapy that it can be performed in more than 50% of patients [1].

In the studies on enteroscopy, the main indication was mid-gastrointestinal bleeding [2,3]. It also proved useful for endoscopic diagnosis and histological confirmation of lesions detected by other modalities like radiological imaging [4-6]. Small bowel enteroscopy can be considered the first diagnostic step in patients with suspected small-bowel stenosis [4]. Flexible enteroscopy is indicated for achieving hemostasis, polyp resections [7], balloon dilation of stenosis [5-7], preoperative marking of pathological findings and removal of foreign bodies [8]. Balloon Enteroscopy (BE) provides safe endoscopic access to the post-surgical gastrointestinal tract, for example ERCP after Billroth II or Roux-en-Y operation [9] and access to the biliary tree or gastric remnant following bariatric surgery.

Three modalities of Enteroscopy are commonly used in the present clinical settings and they are Single balloon enteroscopy (SBE), double balloon enteroscopy (DBE) and Spiral Enteroscopy (SPE).

Diagnostic and Therapeutic Role of Balloon Assisted Enteroscopy in Small Bowel Diseases

Small bowel bleeding- defined as bleedings with an origin located between the papilla and the ileo-caecal valve [14]. Flexible enteroscopy should be done for

targeted endoscopic treatment or for obtaining a biopsy. In cases of a negative capsule endoscopy with overt ongoing bleeding, balloon-assisted enteroscopy should be considered.

Crohn's disease -No single modality can be regarded as the gold standard for diagnosing or excluding small-bowel Crohn's disease. The small bowel is affected in more than 50% of patients with Crohn's disease [15]. Moreover, up to 30% of cases of Crohn's disease are limited to the small bowel, beyond the reach of ileo-colonoscopy, creating a particular challenge in establishing the correct diagnosis [16]. Direct visualization and biopsy of the stenosis allows discrimination of patients with active inflammation within the stenotic bowel segment [18-20] who may benefit from medical treatment, and some patients with fibrotic strictures can be treated by enteroscopic TTS balloon dilation Small bowel tumors- Small-bowel tumors are rare and include benign pathology (eg: hemangiomas, hamartomas, and adenomatous polyps) and malignant pathology (eg: carcinoids, GISTs, lymphomas, primary adenocarcinomas, and metastasis). In patients with suspected small-bowel tumors, balloon-assisted enteroscopy should be the first choice because of the ability to take biopsies of suspicious areas for histopathological diagnosis. The frequency of intestinal tumors in patients with obscure bleeding is reported to range between 5% and 10% [20,21]. Up to 60% of the tumors are malignant [22,23].

Polyposis syndromes- Capsule enteroscopy is indicated for surveillance in patients with hereditary polyposis syndrome like Peutz-Jeghers Syndrome. Push enteroscopy is reserved for polyps located in the very proximal jejunum. In patients with polyposis syndrome, who are having obscured gastrointestinal bleeding, balloon-assisted enteroscopy should be considered as the first diagnostic modality because SBE also provides an option of therapeutic intervention.

Materials and Methods

This is a retrospective analysis conducted in Vydehi Institute of Medical Sciences and Research Centre, a Tertiary care centre in Bangalore. In this study we analysed the records of consecutive patients who presented with suspected small bowel disease over period of five years from March 2014 till February 2019. In this study we evaluated one hundred and fourteen patients who satisfied the Inclusion criteria required for the study.

SBE system used was SIF-Q180 enteroscope, an overtube balloon control unit (OBCU Olympus Balloon Control Unit). SBE was done via either per oral, per rectal or by both per oral and per rectal depending upon the lesions identified by imaging technique. Indigo carmine dye was used for submucosal tattooing for identification of extent of study, in patients where no lesions were identified by single way of enteroscopy.

In this study, stricture was defined by 1 or more of the following criteria: (1) SBE showed the internal diameter of the bowel lumen to be 10 mm or the SBE could not pass through the lesion; (2) the patient complained of obstructive symptoms; (3) stricture was suggested or identified by imaging. Site of small bowel stricture was determined based on the results of previous investigations like computed tomography (CT) scan, magnetic resonance imaging (MRI)] and clinical findings, and diagnosis was established by SBE.

Obscure G.I bleeding is defined as bleeding from the gastrointestinal tract that persists or recurs after a negative initial evaluation using bidirectional endoscopy and radiologic imaging with small-bowel imaging. Overt G.I bleeding was defined as G.I bleeding visible in the form of hematemesis/malena/hematochezia.

Biopsies were taken from margins of ulcer, strictures, nodularity, unhealthy looking mucosa and random biopsies were taken from normal mucosa in patients with suspicion of small bowel disease.

Endoscopic Attempts at Hemostasis were Carried out in Accordance with Institutional Protocol

1. Vascular ectasia: argon plasma coagulation using ERBE VIO APC™ machine (Erbe Elektromedizin GmbH, Tübingen, Germany) and argon gas flow 1 L/min at a 30 W power setting
2. Ulcer with active bleed or non-bleeding visible vessel/Dieulafoy lesion: endoscopic injection of

adrenaline (1:10000 dilution) in 4 quadrants of ulcer along with endoscopic application of Instinct™ Endoscopic Hemoclip (Cook Medical, Bloomington, IN, USA)

3. Ulcer with adherent clot: endoscopic injection of adrenaline (1:10000 dilutions) in 4 quadrants of ulcer.
4. Ulcers with no stigmata of bleeding were treated conservatively (pharmacological therapy)
5. Enteroscopy assisted Stricture dilatation technique-Balloon dilatation was done trans-endoscopically with a controlled radial expansion (CRE) wire-guided balloon dilatation catheter (Boston Scientific, Natick, Mass.). The balloon was inflated with diluted Diatrizoate/Urografin solution to the pressure prescribed by the manufacturer per size of the balloon. This pressure was maintained for 30 or 60 seconds, once or twice per session. The endpoint of dilatation was the ability to pass the endoscope through the lesion.

Inclusion Criteria

1. Patients suspected to have small bowel disease by clinical evaluation and confirmed by imaging after inconclusive upper G.I Endoscopy and ileo-colonoscopy.
2. Age > 16 years

Exclusion Criteria

1. Incomplete data available in the records.
2. Patients who were discharged against medical advice.

Results

Total patients evaluated were 114, out of which 73 (64%) were males and 41(36%) were females and mean age of presentation was 41.58+ 15.64. Most common presenting symptom was pain abdomen which was present in 75(65.8%) patients, followed by loose stools in 41 (36%) patients. Among the 43 obscure G.I bleed patients, 15 patients had overt G.I bleed and 28 patients had occult G.I bleed. Among the 114 patients, 14(12.28%) patients had Diabetes mellitus, 13(11.40%) had Hypertension, 12(10.52%) patients had Ischemic heart disease, 1(0.9%) patient had chronic kidney disease and 1(0.9%) had chronic liver disease and 28(24.56%) patients were on Antiplatelet medication (12 patients were on dual antiplatelets, 12 patients were on Aspirin and 4 patients were on clopidogrel). Enteroscopy was performed by per oral route in 33 (28.94%), Per Rectal route in 59 (51.76%), and both oral and rectal route in – 22 (19.30%) (Table 1).

Age	→ 41.58+ 15.64
Gender	
Male	→ 73(64%)
Female	→ 41(36%)
Symptoms	
1. Pain abdomen	→ 75(65.8%)
2. Loose stools	→ 41(36%)
3. Weight loss	→ 33(28.9%)
4. Hematochezia	→ 12(10.52%)
5. Malena	→ 3(2.6%)
Co-morbid illness	
1. Type II Diabetes Mellitus	→ 14(12.28%)
2. Hypertension	→ 13(11.40%)
3. Ischemic Heart Disease	→ 12(10.52%)
4. Chronic Kidney disease	→ 1(0.9%)
5. Chronic Liver disease	→ 1(0.9%)

Table 1: Profile of patients included in the study.

Most common indication for Enteroscopy in our study 61(53.50%) was suspicion of IBD/Intestinal tuberculosis, out of which 39 patients had features of Crohn's disease, 6 patients had features favoring the diagnosis of tuberculosis, 12 patients had features of acute on chronic enteritis/ nonspecific changes on histopathological evaluation and 4 patients had normal enteroscopy findings. In the 43 patients who had obscure G.I bleed, 18 patients had overt G.I bleed, and lesions could be identified in 15 patients and no lesions could be identified in 3 patients. SBE assisted therapeutic intervention were

done in 9 patients, and 6 patients were referred to interventional radiologist/surgery for management of G.I bleed.

Enteroscopy findings: Ulcers and erosions in small intestine 58(50.88%), strictures in 28(24.56%), nodularity in 15(13.15%), Angioectasia in 7(6.1%), polyps in 6(5.2%), polypoidal lesions in 6(5.2%), Dieulafoy lesion in 2(1.8%) and normal enteroscopy findings in 15(13.15%) patients (Table 2).

Indication for Enteroscopy	Number of patients (percentage)
1. Suspicion of IBD/Intestinal tuberculosis	Ø61(53.50%)
2. Overt G.I bleed	Ø 18(15.78%)
3. Occult G.I bleed	Ø25(21.92%)
4. Suspected small bowel polyp/malignancy	Ø7(6.1%)
5. Post Gastro-Jejunostomy with obstructive jaundice	Ø 3(2.6%)
Enteroscopic(SBE) findings	Number of patients (percentage)
1. Small bowel erosions and ulcers	Ø 58(50.88%)
2. Small bowel strictures	Ø 28(24.56%)
3. Small bowel nodularity	Ø 15(13.15%)
4. Small bowel Angioectasia	Ø 7(6.1%)
5. Small bowel polyps	Ø 6(5.2%)
6. Small bowel polypoidal lesions	Ø 6(5.2%)

7. Dieulafoy lesion	Ø 2(1.8%)
8. Normal Enteroscopy	Ø 15(13.15%)
Route of Enteroscopy performed	Number of patients (percentage)
1. Per oral	Ø 33(28.94%)
2. Per Rectal	Ø 59(51.76%)
3. Per oral + Per rectal	Ø 22(19.30%)

Table 2: Enteroscopy details.

On histopathology evaluation, 39(34.21%) patients had features suggestive of Crohn's disease, 6(5.26%) patients had features suggestive of tuberculosis, small intestinal lymphoma was diagnosed in 3(2.6%), GIST in 4(3.5%), Adenocarcinoma in 1(0.9%), NET in 1(0.9%),

inflammatory stricture in 3 (2.6%), Eosinophilic enteritis in 3(2.6%), non-specific changes in 28(24.56%), and normal small intestinal mucosal architecture in 12(10.52%) patients (Table 3).

Diagnosis	Number of patients(percentage)
1. Crohn's disease	➤ 39(34.21%)
2. Intestinal tuberculosis	➤ 6(5.26%)
3. Small intestinal lymphoma	➤ 3(2.6%)
4. Small intestinal adenomatous polyp	➤ 3(2.6%)
5. Small intestinal adenocarcinoma	➤ 1(0.9%)
6. GIST	➤ 4(3.5%)
7. NET	➤ 1(0.9%)
8. Eosinophilic enteritis	➤ 2(1.8%)
9. Inflammatory strictures	➤ 3(2.6%)
10. Non specific changes	➤ 28(24.56%)
11. Normal intestinal architecture	➤ 12(10.52%)

Table 3: Histopathological diagnosis.

SBE assisted Interventions were performed in 22 (19.29%) patients; SBE assisted stricture dilatation was done in 10 patients, Hemoclip and adrenaline sclerotherapy was done in 3 patients, adrenaline sclerotherapy alone was done in 3 patients, in 3 patients argon plasma coagulation was done. In 3 patients with post gastro-jejunostomy and biliary tree calculi, ERCP was attempted with the help of SBE, all three patients had stricture at anastomotic site, out of which balloon

stricturoplasty was done in 2 patients and calculi were extracted successfully in 1 patient, in 1 patient even after stricturoplasty calculi could not be extracted and referred for surgical extraction of calculi, in 1 patient the stricture was very narrow and guide-wire could not be passed, hence stricturoplasty could not be done and patient was referred to surgical unit for further management (Table 4).

Therapeutic intervention performed	Number of patients
1. Through the scope stricture dilatation	➤ 10
2. Sclerotherapy using Adrenaline	➤ 3
3. Adrenaline Sclerotherapy+Hemoclip application	➤ 3
4. Argon plasma coagulation	➤ 3
5. ERCP	➤ 3
Successful	1
Unsuccessful	2

Table 4: Enteroscopy assisted therapeutic intervention.

Discussion

In our study, we analyzed data of 114 patients who underwent Enteroscopy (SBE) for the above mentioned indications; mean age of patients who underwent SBE was 41+ 15, with most common histological diagnosis being Crohn's disease which is common between 2nd and 4th decade of life, the youngest patient who underwent SBE was 4 years and the oldest patient was 74 years of age. Lesions were identified in 96 out of 114 patients (84.21%), which is similar to the study by Fukumoto A, et al. [17] where among the 179 patients lesions were identified in 156(87.15%) patients.

In our study the most common indication for enteroscopy was suspicion of IBD/ intestinal tuberculosis (53.50%), then followed by obscure G.I bleed (37.72%), which is in contrary to the study by Lin S, et al. [2] & Chak A, et al. [3] where the main indication for enteroscopy was mid gastrointestinal bleeding. Though India is a highly endemic area of tuberculosis, histopathological features of small intestinal lesions suggestive of tuberculosis was seen only in 5.26% patients.

Small bowel strictures were identified in 28 patients (Ileal strictures-22, Jejunal stricture-6), among whom only 12 patients had features feasible for through the scope (TTS) dilatation, out of the 12 patients, 10 patients consented for TTS dilatation, TTS dilatation was successful in 9 patients and 1 patient did not improve symptomatically post dilatation, and required surgical intervention within a week of dilatation. In the 9 patients who had successful TTS dilatation, 4 patients required more than one session, 8 patients are asymptomatic and are on continued follow up (minimum follow up- 1 year post first dilatation) and only one patient developed features of sub-acute intestinal obstruction and required surgical intervention. Though the number of patients underwent SBE assisted stricture dilatation were small, the successful dilatation rate (8 out of 10) was similar to the multicentre study by Fukumoto A et al where the long term successful dilatation was seen in 22 out of 30 patients [17].

In the 18 patients who had overt G.I bleed SBE, lesions could be identified in 15 patients and enteroscopy assisted therapeutic intervention were done in 9 patients, no lesions could be identified in 3 patients and 6 patients were referred to interventional radiologist/surgery for management of G.I bleed.

Conclusion

SBE similar to DBE is very useful in identifying the lesion, obtaining the adequate tissue sampling for establishing the diagnosis, achieving hemostasis in patients with overt G.I bleed and also very useful in non-surgical stricture dilatation with good success rate in carefully selected patients, thereby reducing the need for surgical interventions.

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