

Diagnostic yield, therapeutic impact, and complications of double-balloon enteroscopy in patients with small-bowel pathology

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Abstract

Background and aims Until recently the study of small bowel was limited to the radiographic approach. This paper describes experience with the first 86 procedures evaluated and treated with the new technique of double-balloon enteroscopy (DBE).

Patients and Methods Between August 2005 and September 2006, DBE was conducted in consecutive patients. The characteristics of the patients, indications for the procedures, procedural parameters, and diagnostic yield are described here. All conventional treatment options were available. All the patients had previously undergone esophagogastroduodenoscopy and colonoscopy.

Results Eighty-six procedures in sixty-eight patients were carried out (41 women, 27 men; mean age 48.5 years, range 20–82). The most common indications were gastrointestinal bleeding ($n = 40$) and iron deficiency anemia ($n = 7$). The mean duration of the procedure was 63 (range 20–194) mins and 80 (range 20–150) minutes for the oral and anal routes, respectively. The mean depth of small-bowel insertion was 250 and 200 cm for the oral and anal routes, respectively. Impact in diagnosis and/or treatment was obtained in 50 patients (73.5%). The commonest findings in the 68 patients were angiodysplasia ($n = 11$), polyps ($n =$

8), nodular lymphoid hyperplasia ($n = 5$) and normal ($n = 20$). No major complications were observed.

Conclusion DBE is a useful tool for the diagnosis and treatment of patients with small-bowel pathology in whom traditional methods have not been effective. In almost two-thirds of patients DBE was clinically useful for diagnosis and treatment. The complication rate with the procedure was very low.

Keywords Double balloon enteroscopy · Small-bowel pathology

Small-bowel pathology is difficult to evaluate with traditional methods (radiography or endoscopy) [1–2]. The diagnostic accuracy of these techniques (e.g., barium enema studies, endoscopic intubation, nuclear medicine scans, angiography) is limited by the small-intestine length, vigorous contractility, and its overlying loops. Moreover, bleeding in the small intestine is sometimes slow or intermittent, thus further limiting the usefulness of any diagnostic tool. Recently, wireless capsule endoscopy has shown to be superior to other conventional diagnostic modalities, including push enteroscopy and small-bowel radiography for the evaluation of small-intestinal diseases [3–4]. The currently available capsule, however, has only a diagnostic function, without the ability to sample tissues or perform therapeutic interventions. There are also considerable difficulties in the interpretation of nonspecific images [4].

In 2001, Yamamoto et al. [5–7] developed the double-balloon enteroscopy (DBE) system, based on a new insertion method that makes it possible to advance the endoscope into the distal portion of the small intestine. The double-balloon endoscope can be introduced either by the

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oral or anal route and can reach an average of half to two-thirds of the entire small intestine. The aim of the present study was to evaluate the diagnostic yield, therapeutic impact, and complications of DBE in patients with small-bowel pathology.

Patients and methods

Patients

We performed a retrospective analysis of consecutive patients evaluated for small-bowel pathology at a single center, the Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán in Mexico City from August 2005 to September 2006. Patients with obscure gastrointestinal (GI) bleeding, chronic diarrhea and suspicion of inflammatory bowel disease, small-bowel tumors or polyps were included in the study. Obscure GI bleeding was defined as positive fecal occult blood and iron deficiency anemia without visible blood loss in patients with negative upper endoscopy and colonoscopy; we also included in this group patients with visible blood loss with negative upper endoscopy and colonoscopy. All patients had prior negative endoscopy and colonoscopy before DBE. Anterograde (oral) and retrograde (anal) approaches were used depending on the clinical picture of each patient, patients with melena, upper abdominal symptoms or hematemesis were started with the anterograde route, and, if negative, the retrograde approach was performed. Patients with hematochezia were initially evaluated by the retrograde route. Total procedure time, endoscopic findings and complications were evaluated. All patients provided written informed consent to undergo the procedure.

Data for analysis included demographics, clinical features, laboratory values, indication for endoscopy, previous chronic diseases, prior endoscopic examinations, therapeutic interventions during DBE, complications related to the procedure, changes in management based on findings, and clinical follow-up. All procedures were performed with the patient under conscious sedation in the left lateral position without fluoroscopic control using the double-balloon enteroscope (Fujinon EN-450-T5, Fuji Photo Optical Co. Ltd., Omiya, Japan; diameter of biopsy channel 2.8 mm, length 200 cm). The instrument was used together with a soft overtube (Fujinon TS-12140, Fuji Photo Optical Co. Ltd., Omiya Japan; outer diameter 12.2 mm, length 145 cm). The procedure was performed according to the technique described by Yamamoto et al. [7].

Anterograde DBE examinations were conducted after an overnight fast and retrograde DBE was performed after standard bowel cleansing with 4 liters of Nulytely on the previous day. All patients received monitored conscious

sedation by an anesthetist using midazolam, fentanyl, and propofol during the procedures.

Failure to advance was defined as incapacity to advance the endoscope for more than 30 cm after three exchanges using the standard technique. The point of deepest insertion was marked with a tattoo using India ink.

Descriptive statistics were used to describe the patient's demographic and clinical characteristics, and the data are presented using means, SD, medians and ranges.

Results

General aspects

Eighty six procedures were carried out in 68 patients. The demographics and clinical characteristics are presented in Table 1. The technical aspects of DBE, findings and outcome are presented in Tables 2 and 3 and Fig. 1. Seven patients were evaluated with DBE after previous small-bowel follow-through examination, eight after computed tomography (CT), three after angiography, and five after gammagram with Tc99m. Eight patients (35%) with previous endoscopic study had a presumptive diagnosis. The indications for DBE are presented in Table 1.

Technical aspects

All procedures except four were carried out by the same gastroenterologist. All patients received midazolam, fentanyl, and/or propofol according to the anesthesiologist's decision. The average duration of the procedure was 63.5 min (range 20–194, SD 49) for anterograde examination and 80 min (range 20–150, SD 51) for retrograde DBE enteroscopy. The median depth for the oral route was 250 cm (range 30–450, SD 75) and 200 cm after the ileocecal

Table 1 Characteristics of patients and indications for the procedure

Number of patients	68
Age (median, range) yr	48.5 (20–82)
Sex, female <i>n</i> (%)	41 (60.2)
Blood hemoglobin (g/dl), mean (DE)	10.5 (3.4)
Duration of symptoms (months) median, range	12 (0.25–120)
Indications for the procedure	<i>n</i> (%)
Gastrointestinal bleeding of obscure origin	40 (59)
Iron deficiency anemia	7 (10.2)
Chronic diarrhea	6 (8.8)
Polyposis syndromes (evaluation)	6 (8.8)
Inflammatory bowel disease (suspected)	2 (2.9)
Neoplasia (evaluation)	7 (10.2)

Fig. 1 a. Diverticula in jejunum, b. jejunal tumor, c. nodular lymphoid hyperplasia in ileum, d. lymphangioma in jejunum

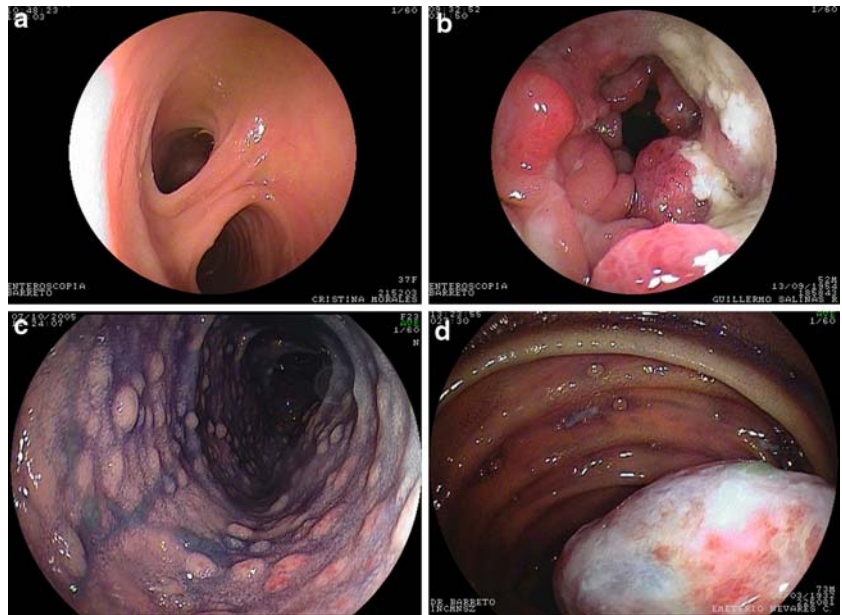


Table 2 Characteristics of the DBE technique

	Examination route		<i>p</i>
	Oral (<i>n</i> = 49, 72%)	Anal (<i>n</i> = 27, 40%)	
Depth of examination, cm, median (range)	250 (30–450)	200 (30–350)	0.12
Duration min, median (range)	63.5 (20–194)	80 (20–150)	0.010

p value corresponds to the Mann–Whitney *U* test

valve (range 30–350, SD 86) for the anal route (Table 2). Failure to advance was recorded in seven procedures.

Endoscopic findings

It was possible to evaluate the entire intestine in nine patients (20.4%) in which a previous tattoo was identified in a second session. Procedures were terminated before seeing the tattoo in 30 patients (44%) in whom diagnosis and treatment could be established (Table 3). A diagnosis was made in 73.5% of patients. The most common diagnosis were angiodysplasia (*n* = 11) and polyp (*n* = 8).

Clinical outcomes and therapeutic impact

The mean follow up period was 6 months (range 1–11 months), and three patients presented re-bleeding (one death because of massive hemorrhage, two without diagnosis at the end of the study). Two of those patients had had enteroscopy by both routes, one of them only

Table 3 Results of double-balloon enteroscopy in 68 patients

Endoscopic diagnosis	<i>n</i> (%)
Angiodysplasia	11 (16.1)
Polyps	8 (11.7)
Nodular lymphoid hyperplasia	5 (7.3)
Diverticular disease	3 (4.4)
Ulcerations/erosions	3 (4.4)
Ileitis/jejunitis	3 (4.4)
Tumors	3 (4.4)
Others	14 (20.5)
Normal	20 (29.4)

One patient had angiodysplasia and ischemic colitis; another had polyps and angiodysplasia.

anterograde approach. DBE resulted in a therapeutic intervention (medical, surgical or endoscopic) in 34 patients (50%). In seven patients (20.5%) an endoscopic intervention was made (adrenaline, *n* = 2; argon plasma coagulation *n* = 5). Nine patients underwent surgery (26.4%), for gastric cancer (*n* = 1), ischemic colitis (*n* = 1), gastrointestinal stromal tumor (GIST) (*n* = 1), polyps (*n* = 2), diverticular hemorrhage (*n* = 2), and intestinal obstruction (*n* = 2).

Complications

There were no major complications. One patient presented severe abdominal pain after the procedure that was secondary to excess intestinal air but improved gradually.

Discussion

The present study reports our initial experience with this new technique in the diagnosis and treatment of patients with suspected small-bowel diseases in whom other classical methods had not been useful. The diagnostic yield value, therapeutic value, and its impact on clinical decision-making were favorable in more than half of the patients studied. According with these results, the DBE has a higher diagnostic yield than previous methods of small-bowel evaluation [8–9] in agreement with previous reports [10–11].

Studies of push enteroscopy have shown disadvantages particularly for the evaluation of the deep jejunum as well as the terminal ileum [12]. With the retrograde route, the DBE enables deep portions of the terminal ileum to be reached, making it a useful method for the evaluation of pathology of this portion of the small bowel.

Capsule endoscopy provides a circumferential view of the intestine, so the possibility of missing a lesion is present [14]. The main indication and usefulness for DBE in our study was patients with obscure gastrointestinal bleeding. Capsule endoscopy is not available at our institution, but we agree that it can be useful before DBE to identify and localize lesions, and to decide which route (antegrade or retrograde) should be adopted. Nevertheless, we consider that a previous capsule endoscopy examination is not mandatory for patients with obscure GI bleeding who are going to undergo a DBE and both procedures may not therefore be in direct competition; the two tests may be capable of complementing each other. This study supports the good diagnostic yield of DBE for patients with obscure GI bleeding that has been shown in previous reports [10–11].

The limitations of DBE are the following: it is time-consuming; the procedure may lead to complications, mainly if it is used as a treatment; the need for adequate training in the procedure; the inability to visualize the entire small bowel in many cases; and the possibility of causing patient discomfort.

Some of the potential limitations of this study should be mentioned. Firstly, the number of patients is relatively small and the follow-up period is short. Secondly, the patients in our hospital are not representative of patients seen in primary-care practice. Therefore, at this moment, DBE cannot be considered as a first-line tool for the evaluation of the disorders mentioned. In relation to the relatively small number of patients few occidental studies that establish the usefulness and applicability of this procedure are available.

Conclusions

DBE is a useful tool for the diagnosis and treatment of patients with small-bowel pathology in whom traditional methods have not been effective. DBE has a high diagnostic yield and therapeutic impact, especially in patients with obscure gastrointestinal bleeding. The complication rate associated with the procedure is very low. Further studies are needed from the developing countries.

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