Diagnostic yield of push-type enteroscopy in relation to indication

B Landi, M Tkoub, M Gaudric, R Guimbaud, J P Cervoni, S Chaussade, D Couturier, J P Barbier, C Cellier

Abstract

***Background*—Push-type enteroscopy, a recent method for investigating the small intestine, is currently undergoing assessment. Its diagnostic yield varies in the studies reported to date.**

***Aim*—To assess the diagnostic value of push-type enteroscopy according to indication.**

***Patients and methods*—From January 1994 to September 1995, 152 consecutive patients (mean age 34 years) underwent push-type enteroscopy (jejunoscopy, n=93; retrograde ileoscopy, n=17; and double way enteroscopy, n=42). The indications were: unexplained iron deficiency anaemia or macroscopic gastrointestinal bleeding (n=76), radiological abnormalities of the small intestine (n=23), chronic diarrhoea and/or malabsorption syndrome (n=18), abdominal pain (n=12), and miscellaneous (n=23). All patients had undergone previous negative aetiological investigations.**

***Results*—The jejunum and ileum were explored through 120 cm (30–160 cm) and 60 cm (20–120 cm). Digestive bleeding: lesions of the small bowel were found in 6% of the patients with isolated iron deficiency anaemia and 20% of patients with patent digestive haemorrhage. Radiological abnormalities of the small intestine: push-type enteroscopy provided a diagnosis or modified the interpretation of radiological findings in 18/23 cases (78%). Chronic diarrhoea and/or malabsorption: push-type enteroscopy yielded explanatory findings in four cases (22%). Abdominal pain: push-type enteroscopy provided no diagnosis.**

***Conclusion*—In this series, push-type enteroscopy was of particular value in investigating patients with radiological abnormalities of the small intestine. It was of some value in the exploration of patent digestive haemorrhage or chronic diarrhoea, but not of abdominal pain. Its value was limited in the exploration of iron deficiency anaemia.**

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Laennec Hospital, Paris, France
B Landi
C Cellier
M Tkoub
J P Cervoni
J P Barbier

Cochin Hospital, Paris, France
M Gaudric
R Guimbaud
S Chaussade
D Couturier

Correspondence to:
Dr B Landi,
Service d'Hépato-Gastroentérologie,
Hôpital Laennec,
42 Rue de Sèvres,
75007 Paris,
France.

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Enteroscopy is an important advance in the exploration of the small bowel. Relative to other methods it has the advantage of direct visualisation of the lumen of the small intestine, permitting biopsy and in some cases treatment.[1] The first prototypes were enteroscopic probes,[2–4] which advanced along the small intestine by peristalsis, but the numerous disadvantages of this technique limited its use. A more recent development, push-type enteroscopy, based on a principle similar to that of oesophagogastroduodenal fibroscopy, is now available, coupled to a video recording system. The use of a gastric overtube and the retrograde exploration of the ileum mean that a larger proportion of the small intestine can now be explored. Nevertheless, push-type enteroscopy rarely permits the entire small intestine to be visualised. So far, the main value of push-type enteroscopy has been in the exploration of unexplained digestive bleeding.[5–10] Its diagnostic yield in other settings, such as radiological abnormalities of the small intestine, chronic diarrhoea and abdominal pain, are less well documented. The aim of this study was to assess the diagnostic yield of push-type enteroscopy according to clinical indication.

Methods

From January 1994 to September 1995, 152 consecutive patients were examined by means of push-type enteroscopy in two endoscopic centres (Laennec Hospital and Cochin Hospital, Paris). The group of patients consisted of 71 men and 81 women, with an mean age of 34 years (18–93 years). All had already undergone endoscopic investigations, including oesophagogastroduodenal endoscopy and complete colonoscopy, which had failed to provide a diagnosis. Clinical records were reviewed, and the indications were classified into five groups: (*a*) iron deficiency anemia; (*b*) macroscopic digestive bleeding; (*c*) radiological abnormalities of the small intestine; (*d*) chronic diarrhoea and/or malabsorption; and (*e*) abdominal pain (table 1). In the iron deficiency anaemia group there was no evidence of inadequate iron intake, excessive gynaecological bleeding or malabsorption.

Table 1 Indications for push-type enteroscopy

Indication	*Number*	*%*
Unexplained digestive bleeding	76	50
Iron deficiency anaemia	35	
Patent bleeding	41	
Exploration of radiological abnormalities of the small intestine	23	15
Small bowel follow through	21	
Abdominal CT scan	2	
Unexplained chronic diarrhoea or malabsorption syndrome	18	12
Abdominal pain	12	8
Miscellaneous	23	15

CT, computed tomography.

TECHNIQUE

Push-type enteroscopy was performed with an Olympus SIF-100 videoenteroscope (Olympus, Hamburg, Germany). The upper route was used in 93 patients, the lower route in 17 patients, and both in 42 patients (starting with the upper route). Intravenous sedation (propofol) was used in all cases. After a new examination of the upper digestive tract, the jejunum was explored after introducing a gastric overtube (Olympus ST-S1). Progression along the small intestine was ensured by a push–pull motion, helped if necessary by manual compression of the abdomen and changing the patient's position. The length of jejunum explored was estimated by the length of the device introduced after the angle of Treitz. When exploration of the jejunum was followed by retrograde exploration of the ileum, the colon was prepared with PEG (4 litres by mouth). The insertion method was identical to that used during colonoscopy, trying to eliminate all sigmoid loops. The length of explored ileum was estimated by the length of device introduced after the ileocaecal valve.

Results

LENGTH OF INSERTION: COMPLICATIONS

The jejunum and ileum were examined through respective mean lengths of 120 cm (30–160 cm) and 60 cm (20–120 cm). Retrograde ileoscopy was not possible in 13/59 patients because of inadequate preparation of the colon in three cases, and failure to cross the ileocaecal valve in 10 cases. Examination of the jejunum was always possible, in good conditions, except in a patient whose angle of Treitz could not be crossed owing to jejunal invasion by peritoneal cancer. One serious complication occurred, consisting of perforation of the genu superius, probably by the gastric overtube, in a women aged 72 years. This patient underwent emergency surgical suture and had no further complications. Tolerance was good in the other cases, except for occasional transient pharyngeal or abdominal pain.

Table 2 Characteristics of the patients explored for unexplained iron deficiency anaemia (n = 35)

Characteristic	*Value*
Mean age	50 years (21–86)
Mean haemoglobin concentration	7.8 g/100 (5–11)
Duration of anaemia	4.6 years (0.2–20)
Number of patients taking NSAIDs	3 (9%)

NSAIDs, non-steroidal anti-inflammatory drugs.

Table 3 Characteristics of the patients explored for unexplained patent digestive bleeding (n = 41)

Characteristic	*Value*
Mean age (y)	55 (20–93)
Number of bleeding episodes	
1	22%
2	22%
3	56%
Number of patients taking NSAIDs	5 (13%)

NSAIDs, non-steroidal anti-inflammatory drugs.

Table 4 Results of push-type enteroscopy in the exploration of unexplained digestive bleeding: lesions detected in the small intestine

Lesions	*n*
Arteriovenous jejunal malformations	6
Jejunal metastases of epideroid carcinoma	1
Jejunal leiomyoma	1
Radiation enteritis	1
Ulcerative ileitis	1
Total	10

Table 5 Results of push-type enteroscopy in the exploration of unexplained digestive bleeding: previously undiagnosed oesophogastroduodenal and colonic lesions

Lesions	*Number*
Hiatal hernia ulcer	3
Ulcerative oesophagitis	1
Subcardial varices	1
Ulcerative gastritis	1
Dieulafoy's disease of the fundus	1
Ulcer of the genu superius	1
Ulcerated caecal diverticulus	1
Caecal angiodysplasia	1
Total	10

DIAGNOSTIC YIELD ACCORDING TO THE INDICATION

Unexplained digestive bleeding

Seventy six patients were examined for unexplained iron deficiency anaemia (n=35) or patent digestive bleeding (n=41) (tables 2 and 3). Lesions potentially responsible of the bleeding were found in 20 patients (26%). They were located in the small intestine in only 10 cases (13%), in the jejunum in nine cases (upper approach), and in the ileum in one case (lower approach) (table 4).

Lesions were found in 6% of patients (n=2) with unexplained iron deficiency anaemia and 20% of patients (n=8) with patent digestive bleeding. In another 10 cases the lesions were oesophagogastroduodenal (n=8) or colonic (n=2), and had been missed during initial endoscopic examination (table 5).

Radiological abnormalities of the small intestine

Push-type enteroscopy was carried out in 23 cases for suspected abnormalities of small bowel follow through (n=21), or suspected thickening of the wall of the small intestine on CT scan (n=2) (table 6). Push-type enteroscopy was valuable in 18/23 cases (78%), either for confirming a lesion and providing a histological diagnosis in seven cases, or showing the normality of the small intestine in 11 cases. It was not useful in six cases, either because of non specific macroscopic or histologic lesions (four cases), or because the radiologically suspect area could not be reached (two cases).

Chronic diarrhoea—malabsorption syndrome

Eighteen patients were explored for chronic diarrhoea or malabsorption (table 7). Eight patients had chronic diarrhoea, although the cause had not been identified despite extensive investigations, including duodenal biopsies. Push-type enteroscopy provided a histological diagnosis in three cases (37%), consisting of intestinal lymphoma, a sprue related to anguillulosis, and microsporidiosis in a patient who

Table 6 Results of push-type enteroscopy in the exploration of small bowel follow through (n = 21) or computed tomography scan (n = 2) abnormalities of the small intestine

Suspected abnormality	*Result of push-type enteroscopy*
Localised stenosis or lacuna (n=8)	Normal (n=3) Crohn's disease (n=2) Adenocarcinoma of the small intestine (n=1) Lymphoma of the small intestine (n=1) Inaccessible (n=1)
Dilatation without stenosis	
Localised (n=3)	Normal (n=3)
Diffuse (n=2)	Dilatation of the small intestine without stenosis (n=2)
Inflammatory appearance of the small intestine (n=8)	Normal (n=3) Undiagnosed non-specific abnormalities (n=2) Crohn's disease (n=1) Radiation enteritis (n=1) Failure of retrograde ileoscopy (n=1)
Wall thickening (n=2)	Normal (n=1) Leishmaniosis (n=1)

Table 7 Results of push-type enteroscopy in the exploration of unexplained chronic diarrhoea or symptomatic coeliac disease

Indication	*Results*
Unexplained chronic diarrhoea (n=8)	Normal (n=5) Digestive lymphoma (n=1) Anguillulosis (n=1) Microsporidiosis (n=1)*
Coeliac disease	Total or partial villous atrophy (n=9)†
Resistant to gluten-free diet (n=9)	Ulcerative jejunitis (n=1)
Poor compliance to a gluten-free diet (n=1)	

*Previously undiagnosed AIDS.
†Identical findings on duodenal biopsy.

was subsequently found to be HIV seropositive. In five cases the macroscopic and histological aspect of the small intestine was normal.

Ten patients had symptomatic coeliac disease, despite good compliance to a gluten-free diet in nine cases. The other patient had abdominal pain and persistent diarrhoea, but had lapses in his diet. Push-type enteroscopy contributed in only one case, in which ulcerated jejunitis was diagnosed. The disease improved on administeration of steroid therapy. In the other cases, push-type enteroscopy only revealed persistent total or partial villous atrophy, which had previously been diagnosed by means of duodenal biopsy. Finally, push-type enteroscopy yielded explanatory findings in four of these 18 patients (22%).

Unexplained abdominal pain

Twelve patients were explored for unexplained abdominal pain. Push-type enteroscopy could not be used in one patient in whom it was impossible to advance beyond the angle of Treitz. Surgery subsequently revealed peritoneal cancer with invasion of the proximal jejunum. Findings were normal in all the other cases.

Other indications

Twenty three patients underwent push-type enteroscopy for miscellaneous reasons (known Crohn's disease, undetermined colitis, search for a primary neuroendocrine tumour, assessment of the extension of a digestive lymphoma, search for polyps of the small intestine in patients with familial rectocolonic polyposis). The diagnostic yield could not be determined given the small number of patients in each group.

Discussion

Non-surgical push-type enteroscopy is a recent technique for exploring the small intestine. Several studies have shown its value in the diagnosis of unexplained digestive bleeding, although the diagnostic efficiency varies according to the series.[6–12] Its value in the exploration of other manifestations possibly linked to abnormalities of the small intestine is less well documented.[11 12] The aim of our work was to study the diagnostic yield of push-type enteroscopy according to the indication.

Digestive bleeding often remains unexplained after oesophagogastroduodenal endoscopy and colonoscopy. Barium transit of the small intestine, intestinal arteriography and scintigraphy are often disappointing in this indication. Push-type enteroscopy can identify lesions potentially responsible for bleeding in the small intestine in 18 to 50% of cases.[5–12] A higher yield (83%) has been reported by some workers.[13] Arteriovenous malformations are the most frequent lesions.[5–8] In our series, the overall diagnostic yield in cases of unexplained digestive bleeding was 26%. However, as in most other series, we frequently identified previously undetected lesions of the upper and lower digestive tract (13% of cases). Lesions of the small intestine were only found in 13% of cases. The yield of push-type enteroscopy for lesions of the small intestine was greater in cases of patent bleeding than isolated iron deficiency anaemia (20% versus 6%). The discovery of ileal lesions by means of retrograde push-type enteroscopy was rare in this indication (one case).

Several factors may explain the differences in the diagnostic yield of push-type enteroscopy in the exploration of unexplained digestive bleeding in reported series.[6–13] (1) The length of small intestine examined differs according to whether a paediatric coloscope or an enteroscope is used, the latter sometimes being used by the upper route or both the upper and lower routes. (2) The study populations are not always comparable (iron deficiency anaemia or patent digestive bleeding, or, most often, both). In our series, the low diagnostic yield in the investigation of iron deficiency anaemia may be related to the relatively low numbers of non-steroidal anti-inflammatory drug takers, who may be more likely to have jejunal or ileal lesions. (3) Arteriovenous malformations can be confused with traumatic lesions. (4) The potential responsibility of certain abnormalities is judged differently according to the author—for example, diverticulitis in the small intestine. (5) The study populations can differ from one centre to another, especially with regard to the patients' ages and whether or not the centre specialises in the exploration of the small intestine.

The main application of push-type enteroscopy in our series was the exploration of radiological abnormalities of the small intestine. Push-type enteroscopy provided a firm positive or negative diagnosis in 78% of cases, confirming its particular value in this indication.[11 12 14] Nevertheless, enteroscopy can detect some abnormalities for which no

accurate diagnosis can be made despite histological analysis. This was the case of three out of nine patients in Davies' series,[11] and 2/21 cases in our series. In addition, the mid-section of the small intestine cannot currently be explored in most cases, owing to anatomical considerations and the characteristics of the enteroscope. Indeed, the adult small intestine measures an average of 3 m, but can stretch by a factor of two or three during enteroscopy[11]; moreover, loop formation increases gradually as the investigation progresses. Finally, one can rarely be sure of having reached the zone considered radiologically suspect when it is situated elsewhere than in the terminal or initial part of the small intestine. There are no anatomical milestones. Some authors recommend fluoroscopic verification of the position of the enteroscope during the examination,[15] but the mobility of the small intestine is such that the tip of the enteroscope cannot be superimposed with certainty on anterior radiological images.[16 17]

It has been suggested that enteroscopy can occasionally be useful in the aetiological diagnosis of unexplained chronic diarrhoea and malabsorption syndromes.[11 12] In most cases of diffuse abnormalities of the small intestine, the results of duodenal biopsies are similar to those of jejunal biopsies. However, the lesions can sometimes be heterogeneous and predominate in the proximal jejunum.[11 12] Indeed, jejunal biopsies allowed a diagnosis to be made in six out of 32 patients in two reported series, whereas duodenal biopsies were of little value.[11 12] This was also the case of three out of eight patients in our series.

Current data are insufficient to assess the value of push-type enteroscopy in coeliac disease. Rare cases have been reported in which jejunal biopsies provided the diagnosis whereas duodenal biopsies did not.[18] One prime indication might be the diagnosis of an intestinal lymphoma in patients with refractory sprue, but this situation is rare. In our series push-type enteroscopy identified no lymphomas in nine such patients. On the other hand, enteroscopy was useful for the diagnosis of ulcerative jejunitis in a case report,[19] and in one patient in this study.

Push-type enteroscopy has rarely been assessed in the aetiological diagnosis of abdominal pain. In our series, it was not useful, but we examined relatively few patients. A barium meal is probably a more suitable first-line examination when a patient has clinical or radiological signs of partial obstruction of the small intestine.[11]

Push-type enteroscopy is performed by most groups under light benzodiazepine sedation.[11 12] In this series, intravenous sedation by propofol was used in all cases as is our regular clinical practice for colonoscopy. The need for anaesthesia is uncertain, but its use seems to present some advantages. In our previous experience without sedation, we noted the poor tolerance of the overtube introduction and of the examination when the small bowel was deeply intubated or when the double way was used. The mean depth of insertion beyond the ligament of Treitz in our series is higher than reported with light sedation.[11 12] As a result, push-type enteroscopy is generally performed under sedation with propofol in France.[13 14]

A serious complication (duodenal perforation) occurred in our series. This perforation was associated with the use of the overtube.[20] Initial published experience with jejunoscopy suggested that the morbidity of this examination was similar to that of oesophagogastroduodenal endoscopy.[1] In reality, the use of a longer device, and especially recourse to a gastric overtube, are likely to increase the risk of complications, whose precise incidence remains to be determined.[1] Other serious complications reported in the literature include acute pancreatitis as a result of damage to the papilla and gastric laceration.[21 22]

In summary, push-type enteroscopy was of particular value for the exploration of radiological abnormalities of the small intestine, providing a diagnosis in 78% of cases. It revealed potentially explanatory lesions in 26% of patients with unexplained digestive bleeding, but these were located in the small intestine in only half the cases. Thus, it seems logical to prescribe repeat standard endoscopy (especially by the upper route) before envisaging a more invasive procedure such as enteroscopy in this type of indication. The diagnostic yield for lesions of the small intestine was higher in the case of patent bleeding than isolated iron deficiency anaemia (20% versus 6%). Push-type enteroscopy was of some value in the investigation of unexplained chronic diarrhoea and malabsorption syndromes but not in unexplained abdominal pain. The diagnostic yield of push-type enteroscopy should now be assessed in larger series of patients, taking into account the influence of endoscopic findings on patient management.

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