

Diagnostic yield of push enteroscopy in the investigation of small bowel disease

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SUMMARY

Aim: To assess the diagnostic value of push-type videoenteroscopy in the investigation of small bowel disease.

Patients and methods: From January 1994 to November 2000, 235 consecutive patients underwent push-type enteroscopy, using the Pentax, VSB 2900 video enteroscope. Indications for enteroscopy were: unexplained iron deficiency anaemia (n=59); macroscopic gastrointestinal bleeding (n=49); abnormal small bowel radiology (n=12); chronic diarrhoea and/or malabsorption (n=81); abdominal pain (n=22); suspected neoplasia (n=7) and polyposis syndromes (n=5).

Results: The median depth of small intestine intubated was 80 cm past the ligament of Treitz, (range 20-160cm). Procedure time varied from 15-45 minutes. Tolerance of the examination was good for all patients and there were no complications. In patients with anaemia and/or gastrointestinal bleeding, underlying pathology was detected in 64/108 patients (59%), while 19/108 patients (17.5%) had diagnostic findings located in the upper gastrointestinal tract. In those with abnormal small bowel radiology, abnormal findings were diagnosed or excluded as artifacts in 11/12 patients (91%). In those with diarrhea and/or malabsorption a definite diagnosis was made in 28/81 patients (34.5%). In patients with abdominal pain, abnormalities were detected in 3/22 patients (13.5%). Finally, in patients with Peutz-Jeghers syndrome push enteroscopy proved very sensitive

in detecting jejunal polyps.

Conclusion: Push-type enteroscopy is a quick and safe examination. Even though endoscopic exploration is restricted to the jejunum, it is efficacious in clinical practice and provides valuable diagnostic information in the investigation of patients with small bowel disease.

INTRODUCTION

The small intestine is the part of the gastrointestinal tract least accessible to endoscopic examination. This is due to several reasons related to its anatomy: 1) it is long, around 3 meters in living people with a great capacity to elongate to an extreme of 6 meters when measured at necropsy, 2) it is extremely mobile, since it's attached to the mesentery only, 3) it is very tortuous and 4) it is in the middle part of the gastrointestinal tract, a long way from either the mouth or the anus. Diagnostic investigation of small bowel disease consists of conventional radiology (follow-through, enteroclysis), radioisotope scans and angiography but the efficacy of these tests for the detection of a wide variety of specific lesions is low. Enteroscopy is an important advance in the exploration of the small intestine, as it has the advantage of direct visual inspection of the lumen and the mucosa, permitting biopsy and, in some cases, endoscopic treatment. Push enteroscopy is the standard examination as the use of sonde enteroscopy has been practically abandoned because of its numerous disadvantages. Push enteroscopy entails advancing an enteroscope beyond the ligament of Treitz into the jejunum. It was initially done using orally inserted adult or pediatric colonoscopes, but adult colonoscopes are too cumbersome and rigid for this purpose and pediatric colonoscopes are too flexible and short. Over the last decade, the "push-type" technique underwent further expansion when longer, purpose-de-

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signed instruments were developed. These instruments have a standard biopsy and accessory channel.

We report our six year's experience of the use of a dedicated video push-type enteroscope in patients suspected of having small bowel disease.

PATIENTS AND METHODS

Patients

A total of 235 patients (132 men and 103 women), aged 12 - 89 years (median 54) were examined over a 6 year period. Clinical indications for push enteroscopy were as follows: iron deficiency anaemia/occult gastrointestinal bleeding (n=59), overt gastrointestinal bleeding (n=49), chronic diarrhoea and/or malabsorption (n=81), radiological abnormalities of the small intestine (n=12), abdominal pain (n=22), evidence of primary or secondary neoplasia (n=7), polyposis syndromes (n=5).

All patients had already undergone endoscopic investigations, including gastroscopy and colonoscopy, which had failed to provide a diagnosis. Some of them had also been submitted to a small bowel radiological study, a radionuclide bleeding scan and/or angiography.

Endoscopic technique

The Pentax VSB 2900 was used for all examinations. This instrument is a video push-type enteroscope, with a total length of 2820cm and a working length of 2500cm. The tip outside diameter is 9,8mm and the biopsy channel is 2,8mm.

Enteroscopy was performed during the routine endoscopy list, under standard conscious intravenous sedation with midazolam and pethidine. The enteroscope was introduced through the mouth, with the patient in the semiprone position, as adopted for endoscopic retrograde cholangiopancreatography examinations. Then, following the same technique as in gastroscopy, the enteroscope was passed into the distal duodenum. Further insertion into the small intestine was made possible by advancing the scope under direct luminal view and after the traverse of each bend, withdrawal of the scope to straighten it out, as in colonoscopy. Advancing the endoscope was assisted by changing the patient's position and external pressure of the abdomen. Small bowel intubation length was estimated by straightening the instrument to remove the gastric loop, and subtracting 80cm from the depth inserted (80cm being the average distance from incisors to the ligament of Treitz).

RESULTS

Insertion beyond the ligament of Treitz ranged from 20 to 160cm (median 80cm). The duration of the procedure varied from 15 to 45 minutes (median 20 minutes). The majority of patients tolerated the examination very well, while around 30% of patients expressed transient discomfort during deep intubation which was relieved after withdrawal of the enteroscope.

Anaemia/occult gastrointestinal blood loss

Abnormalities were found in 31/59 (52,5%) patients. In 7/59 (12%) of them findings were located proximal to the 2nd part of duodenum and in 24/59 (40,5%) patients findings were located distal to this level. Proximal lesions were Cameron ulcers (n=2), angiodysplasias (n=2), Watermelon stomach (n=1), coeliac disease (n=2). (Table 1) Lesions beyond the 2nd part of the duodenum were angiodysplasias (n=11), teleangiectasias (n=3), hemangioma Caverosum (n=1), polyps (n=3), ulcers (n=2), lipoma (n=1), leiomyoma (n=2) and lead poisoning (n=1) (Table 2). In 28/59 (47,5%) patients no source of bleeding was detected.

Overt gastrointestinal bleeding

Diagnostic findings were detected in 33/49 (67%) patients. In 12/49 (24%) of them lesions were located proximal to the 2nd part of the duodenum, while in 21/49 (43%) of patients the lesions were found beyond the 2nd part of the duodenum. Proximal findings included duodenal bulb ulcers (n=2), gastric ulcers (n=2), Mallory – Weiss tear (n=1), angiodysplasias (n=3), Watermelon stomach (n=1), Cameron ulcers (n=2), antral erosions (n=1) (Table 1), Lesions found distal to the 2nd part of

Table 1. Results of push enteroscopy in patients with bleeding of obscure origin. Lesions detected in the small intestine

Findings	N (45)
Angiodysplasias	18
Telangiectasias	5
Hemangioma Caverosum	1
Blue Nevus Bleb syndrome	1
Polyps	4
Lipoma	1
Leiomyoma	4
Neurofibroma	3
Adenocarcinoma	2
Lead poisoning	1
Jejunal ulcers	4

Table 2. Results of push enteroscopy in patients with bleeding of obscure origin. Lesions detected proximally the 2nd part of the duodenum

Findings	N (19)
Angiodysplasias	5
Cameron ulcers	4
Watermelon stomach	2
Coeliac disease	2
Gastric ulcers	2
Duodenal ulcers	2
Mallory Weiss tear	1
Antral erosions	1

the duodenum were angiodysplasias (n=7), telangiectasias (n=2), adenocarcinoma (n=2), ulcers (n=2), Blue Rubber Bleb syndrome (n=1), neurofibromas (n=3), leiomyomas (n=2), polyps (n=1) and carcinoid in the ileum in a patient with previous gastrectomy (n=1) (Table 2).

Diarrhoea

Of the 81 patients with chronic diarrhoea or malabsorption, 23 (28,3%) had abnormal findings on enteroscopy (Table 3). Histological examination of the biopsies from jejunal mucosa in these patients, was also abnormal, detecting Whipple disease, (n=1), angiitis (n=1), tropical sprue (n=3), eosinophilic gastroenteritis (n=1), coeliac disease (n=4), lymphangiectasias (n=1), Crohn's disease (n=9), ulcerative jejunitis (n=2). Of these patients, 7/23 had normal endoscopic appearance of the duodenum, but abnormal jejunal findings (eosinophilic gastroenteritis 1/7, ulcerative jejunitis 2/7, Crohn's disease 4/7).

Abnormal histology, while endoscopy showed no ab-

Table 3. Results of push enteroscopy in patients with diarrhoea/malabsorption. Abnormal endoscopy+ abnormal histology

Findings	N (23)
Whipple disease	1
Angiitis	2
Tropical sprue	3
Eosinophilic gastroenteritis	1
Coeliac disease	4
Ulcerative jejunitis	2
Lymphangiectasia	1
Crohn's disease	9

normalities, was found in 5/81 (6,1%) patients. More specifically, histology revealed cryptosporidiasis in 1/5, microsporidiasis in 1/5, eosinophilic gastroenteritis in 2/5 and lymphangiectasia in 1/5 patients (Table 4).

Finally 13/81 (16%) patients had non-specific endoscopic findings such as edema, erythema, microgranulation and non diagnostic findings on histology, such as chronic inflammation.

Abdominal pain

Twenty two patients were studied because of abdominal pain or vomiting or both. One patient had an adenocarcinoma of the jejunum, 2 patients had eosinophilic gastroenteritis, and 2 patients had angiitis. In both patients with angiitis, lesions were visible in the duodenum, and could, therefore, be reached by the gastroscope. In the remaining 17/22 patients enteroscopy was non-diagnostic.

Radiological abnormalities of the small intestine

Push-type enteroscopy was carried out in 12 patients for suspected jejunal stricture on enteroclysis (n=9), or suspected thickening of the wall of the small intestine on CT scan (n=3). In 3/9 patients enteroscopy provided a definitive macroscopic and histological diagnosis of adenocarcinoma. In 1/9 patients histology revealed a benign stricture that was followed up regularly after treatment. In 1/9 patients jejunal intussusception was seen, and in 1/9 patients with small-cell lung cancer and a jejunal stricture on enteroclysis macroscopic and histologic examinations were inconclusive. In 3/9 patients with suspected small bowel stricture on enteroclysis, enteroscopy revealed no abnormality. In all 3 patients with an abnormal small bowel picture on CT scan, enteroscopy was normal.

Suspected neoplasia

In two patients with neoplastic lymphadenopathy, and in two patients with malignant ascites enteroscopy did not reveal a primary neoplasia into the small intestine. Two patients with a past history of malignant melanoma

Table 4. Results of push enteroscopy in patients with diarrhoea/malabsorption. Normal endoscopy-abnormal histology

Findings	N (5)
Eosinophilic gastroenteritis	2
Lymphangiectasia	1
Cryptosporidiasis	1
Microsporidiasis	1

and one patient with sarcoma Kaposi were referred for enteroscopy for possible small bowel metastatic lesions. None had abnormalities detected and all three patients had normal subsequent enteroclysis.

Polyposis syndromes

Five patients with Peutz-Jeghers syndrome underwent push enteroscopy. Polyps in the jejunum were found in all of them and biopsied. Intraoperative enteroscopy with the push enteroscope was also performed for total small bowel examination and polypectomy during which, on average, 12 polyps per patient were removed (range 10-21 polyps; mean diameter 10mm, range 0,5-40mm). Two patients underwent periodic push enteroscopy 3 years after surgery at which 6 polyps per patient were found (range 4-10; mean diameter 7mm, range 0,5-10 mm).

DISCUSSION

Push enteroscopy is a quick and fairly comfortable procedure with only a few patients reporting transient abdominal pain. All procedures were performed during the routine endoscopy list and none required hospitalization due to the examination. The overall visualization and the deflection of the distal tip were excellent. The enteroscope was inserted beyond the ligament of Treitz to a median depth of 80 cm, which was similar to that reached by others^{4,7}. If someone considers that in life, the length of the small bowel is about 2-3 meters, we may safely conclude that push enteroscopy allows, in most cases, examination of the entire jejunum. The depth of insertion after the ligament of Treitz was calculated by subtracting 80 cm from the total depth inserted. It must be noted that this is a rough method of estimating the depth of insertion, due to the different telescopic deployment of the bowel around the endoscope. An alternative method of measuring the length of the small bowel examined is to measure the length of the scope inserted after the ligament of Treitz on an X ray picture, but this method is not accurate and needs fluoroscopy.

In the group of patients with unexplained gastrointestinal bleeding we established a diagnosis in 59% (64/108) of the cases. It should be noted, however, that in 19/108 (17,5%) patients, the lesions detected could have been identified by standard gastroscopy. Most of the series on push enteroscopy report a similar incidence of lesions missed by gastroscopy^{5,6,8,9}. A possible explanation for that might be that the endoscopist either overlooked the lesion, or didn't consider the lesion responsible for the blood loss. Therefore it seems reasonable to perform a repeat gastroscopy in patients with obscure gastrointes-

tinal bleeding before referring them for enteroscopy.

In this study, the true diagnostic yield of push enteroscopy in suspected small intestinal bleeding was 41,5%. Other centers have reported a similar frequency of detected lesions^{4,9}. In patients with blood loss, vascular lesions were the most common finding beyond the ligament of Treitz, with angiodysplasias representing the vast majority of these lesions. All patients with angiodysplasias were over 60 years of age (median age 69 years). The diagnostic value of other small bowel examinations, such as enteroclysis or angiography, in detecting angiodysplasias is very low. Consequently, push enteroscopy is considered an examination of great value in the investigation of the patients with gastrointestinal bleeding of obscure origin. Furthermore, push enteroscopy provides the ability to apply endoscopic therapy for bleeding angiodysplasias by coagulation, which has already been reported with encouraging results^{6,9,10}.

The importance of investigating the small bowel in patients with gastrointestinal blood loss is underlined by the fact that 1 in 10 patients with obscure bleeding had either benign or malignant small bowel tumors. Two of these patients had false negative enteroclysis.

In conclusion, for the evaluation of patients with repeated episodes of gastrointestinal bleeding after a negative gastroscopy and colonoscopy, push enteroscopy should be the next step since there is a high likelihood of its revealing the cause of blood loss, most probably angiodysplasias. Should these investigations fail to establish a diagnosis, small bowel radiology may, potentially, be of value, especially in young patients, in order to exclude gross sources of bleeding, such as small bowel tumors.

The investigation of patients with abnormal small bowel barium studies was an excellent indication for push enteroscopy, provided that the abnormality is located within the reach of the enteroscope. In this study push enteroscopy provided a firm positive or negative diagnosis in 11/12 patients (91%). Barium studies are known to have false negative results for suspected malignant lesions¹¹. In our series there were also false positive reports. However what seems to be a great problem in this situation is that since there are no anatomical landmarks in the small bowel and there is a different degree of bowel stretching during enteroscopy, it is very difficult to be certain of having reached the area radiologically abnormal unless it is located in the proximal part of the jejunum.

Push enteroscopy was very helpful in the investigation of some cases of unexplained diarrhoea, with or without malabsorption, since it allowed endoscopic inspection of the intestinal mucosa at a much greater depth than with gastroscopy and with the advantage of multiple biopsies taken from different parts of the jejunum^{4,7,12-14}. In this study enteroscopy helped in the final diagnosis in 1/3 of the cases. Most of these cases could have been diagnosed with gastroscopy and multiple biopsies from the duodenum, since they were diseases either with diffuse mucosal damage such as Whipple disease and coeliac disease or with simultaneous duodenal and jejunal lesions such as eosinophilic enteritis, Crohn's disease or lymphagiectasia. Furthermore, there were a few cases with endoscopically normal mucosa, where histology provided the diagnosis, and therefore multiple "blind" duodenal and jejunal biopsies must be taken when diarrhoea is the indication for enteroscopy.

In the investigation of patients with abdominal pain, enteroscopy was beneficial in only 3/22 patients. Two patients were diagnosed histologically as suffering from eosinophilic gastroenteritis and in one an adenocarcinoma was found. In the case of patients with abdominal pain and symptoms suggesting small bowel obstruction, enteroclysis had an almost 100% positive prediction value and should therefore, probably precede enteroscopy.

Finally, push enteroscopy was found very reliable in detecting jejunal polyps in patients with polyposis syndromes. Specifically, in patients with Peutz-Jeghers syndrome the endoscopically found polyps corresponded in number and size with the operative findings. Furthermore, the use of the push enteroscope during intraoperative enteroscopy has facilitated the exploration of the small bowel and provided a supplementary modality for removing polyps, without the need of operative enterotomy. It has been reported that periodic screening with push enteroscopy of patients with polyposis syndromes with subsequent polypectomy of the detected polyps is feasible with push enteroscopy and would most probably reduce the need for emergency surgery in patients with Peutz-Jeghers syndrome¹⁵.

In conclusion, push enteroscopy is a quick, safe and straightforward procedure that can be carried out during the routine outpatient work of an endoscopy unit. Even though endoscopic exploration is restricted to the jejunum, push enteroscopy is efficacious in clinical practice and provides valuable diagnostic information in the investigation of patients with small bowel disease. More-

over, it offers the potential to apply endoscopic therapy such as cauterization of vascular ectasies and polypectomy. The impact of diagnostic and therapeutic enteroscopy on the actual long-term clinical outcome for the patient remains to be determined.

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