

Standard upper gastrointestinal (GI) endoscopes can be passed into the *distal duodenum*. The major application (apart from ERCP) is to diagnose or rule out mucosal abnormality (e.g. coeliac disease) in the context of malabsorption; details of endoscopic 'jejunal' biopsy are given in Chapter 4. The *terminal ileum* can be examined by passing a colonoscope through the ileocaecal valve (see Chapter 9). The remainder of the small intestine has proved rather resistant to endoscopy. Fortunately, small intestinal diseases are relatively rare. However, there has recently been greater interest in enteroscopy, particularly in the context of obscure GI bleeding and symptoms suggestive of inflammatory bowel disease.

There are three methods for endoscopic examination of the small bowel—push, sonde and intraoperative enteroscopy.

Push enteroscopy

This examination is done with a dedicated video-endoscope 170–250 cm in length which incorporates enhanced tip flexibility to facilitate deep intubation of the proximal small intestine. A standard (properly disinfected) colonoscope can be used when the specialized enteroscope is not available. The enteroscopes have working channels which allow tissue sampling and therapeutic interventions in the proximal small intestine. The instrument can be passed approximately 30–150 cm into the jejunum, with careful manipulation, depending on the experience of the operator. The use of a stiffening overtube to reduce gastric looping (the main cause of patient discomfort and failure to advance the enteroscope) can facilitate deep intubation of the proximal small intestine (Fig. 11.1). However, these stiffening techniques have not proved universally popular due to patient intolerance. Complications of gastric mucosal stripping and pancreatitis have been reported. Keeping air insufflation to a minimum and avoiding drugs that reduce bowel motility until immediately before withdrawal (thereby making use of peristalsis), allows similar depths of insertion to be achieved without overtubes. If biopsy forceps are needed or haemostasis is anticipated, the instrument may be 'pre-loaded'; the passage of forceps and therapeutic probes at a later stage can be difficult when the instrument is looped acutely. Average procedure duration is 30–45 min, depending on whether therapeutic intervention is required, and mucosal views are excellent.

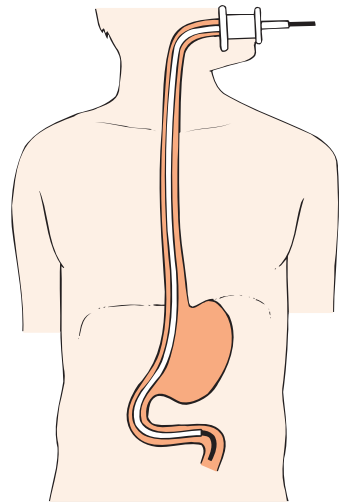


Fig. 11.1 A long overtube may facilitate jejunoscopy.



Fig. 11.2 A sonde-type small intestinal endoscope with a terminal weighted balloon.

Sonde enteroscopy

The sonde enteroscope is essentially a passive fiberoptic bundle 270 cm in length without tip deflection or a therapeutic channel (Fig. 11.2). A balloon on the distal tip of the instrument is inflated once the endoscope is in the duodenum. This method utilizes the passive propulsive effect of peristalsis to pull the instrument into the distal jejunum and ileum.

The sonde instrument is passed through the nose under light sedation, after applying topical anaesthesia to the nasal mucus membranes (cocaine 4–10% solution is particularly effective). The enteroscope can be allowed to pass spontaneously through the pylorus but this lengthens the procedure significantly. Most experts prefer to pass a standard upper GI endoscope *alongside* the enteroscope, and use grasping forceps to place the sonde tip into the duodenum. The patient is then kept comfortable and the progress of the instrument monitored by fluoroscopy. Prokinetic drugs have not proven beneficial in enhancing distal transit, but a single dose of metoclopramide (10 mg i.v.) may help initially in the distal duodenum. The patient may walk around once sedation has worn off (under nursing supervision); this may speed instrument advance. It usually takes 6–8 h for the enteroscope to reach the ileum.

Examination is performed on withdrawal. Water instillation and bimanual palpation, along with intermittent balloon inflation, can enhance the luminal views. Balloon inflation should be minimized to prevent a ‘concertina’ effect – rapid unfolding of compressed bowel loops during withdrawal. Unfortunately, due to the small bowel anatomy and inability to control tip deflection fully, only 40–70% of small bowel mucosa is viewed adequately by this technique. Few complications of sonde enteroscopy have been described; these include epistaxis and perforation of small bowel ulcers during the ‘blind’ intubation part of the examination.

Clinical indications

The duration of the procedure, and the need for continuous nursing care and fluoroscopy, make it unlikely that this technique will be attractive outside a few specialized centres. However, there is a significant role in selected patients.

Push and sonde enteroscopy should be seen as complementary in the investigation of patients with suspected small bowel disease. The commonest indication for enteroscopy is obscure GI bleeding which has not been explained by standard endoscopic and radiological investigations. These patients account for 5–15% of all patients presenting with GI bleeding. The yield is substantial, and enteroscopy should replace barium radiology

and isotope studies in this context. Since it is possible to treat lesions (e.g. angiodysplasia) through the push enteroscope, and because the examination is much simpler for the patients, this technique is used first in patients with obscure GI bleeding. Sonde enteroscopy is used only when that examination is normal. Haemostasis can be carried out using either a heat probe or a BICAP probe passed via the push enteroscope. In general, lower energy settings are required in the small intestine compared to the upper GI tract. Typically, 1–2 s pulses of 15–30 J are utilized to minimize the risk of perforation in the thin wall of the small bowel. Enteroscopy has highlighted the problems of ulcers and enteropathy induced by non-steroidal anti-inflammatory drugs in the small bowel. The procedure has also been used to evaluate patients presenting with abnormal small bowel radiology. Enteroscopic examination and biopsy are justified to aid diagnosis in patients where Crohn's disease or tumours are suspected.

Intraoperative enteroscopy

The small intestine can be examined endoscopically during laparotomy; the surgeon guides the endoscope through the small bowel with the abdomen open (or at laparoscopy). The new push enteroscopes are ideal in this setting, but colonoscopes can be used. Intraoperative enteroscopy is indicated particularly in the context of obscure GI bleeding when push and sonde enteroscopy are unavailable or unrevealing.

There are three possible approaches for intraoperative enteroscopy:

- 1 *Via the mouth.* The endoscopist passes the endoscope as far as possible into the duodenum/jejunum. Intubation of the duodenum is easier if it is done before the abdomen is opened and the tamponade effect of the abdominal wall is lost.
- 2 *Via a surgical enterotomy.* Opening the bowel for intraoperative enteroscopy has historical precedent but should rarely be required; in general it should be avoided since it carries an infection risk.
- 3 *Via the anus.* The colonoscopy takes up about 70 cm of instrument, leaving less for examination of the small bowel.

The endoscope used for enteroscopy should be fully disinfected before the procedure, and the bowel is prepared by standard techniques. Intraoperative enteroscopy must be managed carefully and methodically, with special care taken to avoid overinsufflation and rough handling of the intestine. Counterpressure is applied by the surgeon to straighten out acute angles and to prevent loops from forming in the stomach and duodenum (Fig. 11.3) – or in the colon during a transanal approach.

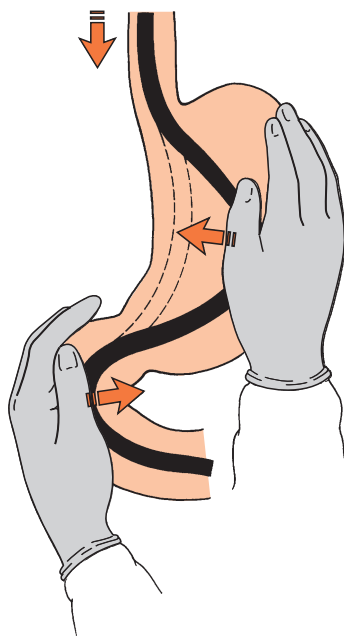


Fig. 11.3 Peroperative straightening of the stomach and duodenum.

The instrument tip is advanced by the surgeon, slowly feeding the bowel over the tip of the enteroscope whilst the endoscopist inspects the mucosa, keeping air insufflation to a minimum. It is particularly important that the surgeon and endoscopist should be aware of the risk of torsion or tear in the mesentery during the procedure. Utilizing this technique, the entire small intestine can be fed over the enteroscope with little difficulty. Surgical mobilization of the duodenum (the Kocher manoeuvre) is usually not necessary.

If enteroscopy is being performed for occult bleeding, it is important to view the bowel during advancement, so as not to be confused by haematomas caused by instrument trauma and suction. Angiomas can be seen by transillumination, performed simply by switching off the operating room lights. Sometimes, reverse transillumination is also helpful; the bowel is viewed endoscopically, using only the operating room lights for illumination. Lesions are marked by the surgeon with a suture. The decision whether to over-sew or resect is taken only after the examination is completed.

Intraoperative endoscopy appears to be a remarkably safe procedure when performed by an expert. It is preferable to 'blind' segmental resections such as empirical right hemicolectomy due to the frequency of recurrent bleeding in such situations.

The following points are the most important things for the beginner to appreciate and to perform:

- 1 Review the technique with the surgeon preoperatively. Agree that a complete examination should be carried out before the decision on the surgical approach is made.
- 2 Always advance under direct vision, but keep air insufflation to a minimum. This requires constant dialogue with the surgeon.
- 3 Examine the mesentery frequently. Do not allow tension on it to become excessive.
- 4 All but the distal 10–20 cm of small bowel is usually easily examined from above. The distal ileum can be intubated after passage of the endoscope through the colon.
- 5 Decompress the bowel completely before withdrawal with the enteroscope.

Complications

Complications of intraoperative enteroscopy are rare. Prolonged postoperative ileus and both mucosal and serosal tears have been described. This is a procedure which requires excellent co-operation between endoscopists and surgeons. Published results have been encouraging with a site-specific source of bleeding identified in up to 70% of patients. Unfortunately, many patients re-bleed following surgery, since lesions such as angiodysplasia may recur in previously unaffected areas of the bowel.

Future developments

There have been a number of innovative approaches to endoscopy of the small bowel recently. These include laparoscopy-assisted panenteroscopy, intraoperative sonde enteroscopy and the development of sonde instruments with tip deflection and biopsy facilities. It remains to be proven whether these innovations will prove useful in the clinical arena.

Further reading

- Berner JS, Mauer K, Lewis BS. Push and sonde enteroscopy for the diagnosis of obscure gastrointestinal bleeding. *Am J Gastroenterol* 1994;**89**:2139–42.
- Lewis BS, Waye JD. Chronic gastrointestinal bleeding of obscure origin: role of small bowel enteroscopy. *Gastroenterology* 1988;**94**:1117–20.
- Morris AJ, Wasson LA, McKenzie JF. Small bowel enteroscopy in undiagnosed gastrointestinal blood loss. *Gut* 1992;**33**:887–9.
- Ress AM, Benacci JC, Sarr MG. Efficacy of intra-operative enteroscopy in diagnosis and prevention of recurrent, acute gastrointestinal bleeding. *Am J Surg* 1992;**163**:94–9.