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ERCP is the standard technique for dealing with pathology of the common bile duct, such as bile duct stones or strictures due to malignant or benign processes. However, ERCP in patients with surgically altered anatomy, such as Roux-en-Y gastric bypass (RYGBP), total gastrectomy, Billroth II procedure or Whipple procedure (Fig. 10.1), is challenging. Several more or less invasive methods have been described for endoscopic biliary interventions in these patients.

10.1 ERCP Using Balloon Enteroscopy

Balloon enteroscopy can be performed to reach through the Roux limb, via the entero-entero anastomosis, and further on through the biliary limb into the duodenum to find the papilla.

Balloon enteroscopy has been available since the beginning of 2000, first described by Yamamoto [1]. There are two current technical solutions: the double-balloon technique from Fujinon and the single-balloon technique from Olympus. Both require specialised equipment and expertise that are not widely available. A long Roux limb can be technically challenging as well as the different anatomic constructions of the entero-entero anastomosis, both varying with type of reconstruction (Fig. 10.2). One major problem with balloon enteroscopy ERCP is the lack of efficient accessories. The enteroscope is long, 2 m, and the working channel is only 2.8 mm, making it impossible to use standard ERCP accessories. There are only a few specialised accessories for these procedures on the market, and some are not possible to use over a guidewire. Another drawback is the lack of elevator at the tip of the endoscope and the fact that the papilla is reached and visualised from below. All these factors make both cannulation and therapy challenging. A cap on

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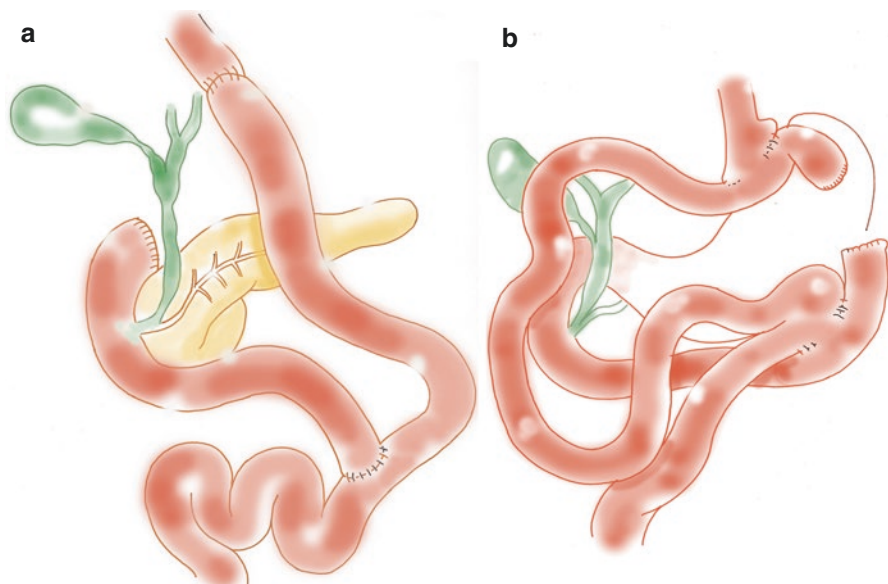


Fig. 10.1 Roux-en-Y reconstructions: (a) as performed after gastrectomy, resembling the situation after a BII resection or a Whipple procedure. (b) As performed during a gastric bypass procedure

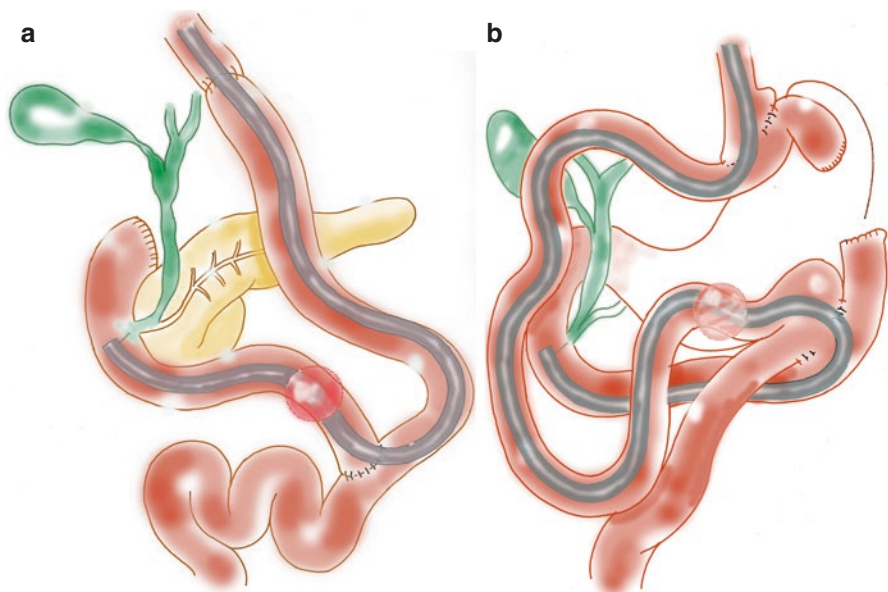


Fig. 10.2 Access to the duodenum using balloon enteroscopy. (a) In Roux-en-Y reconstruction after gastrectomy. (b) After Roux-en-Y gastric bypass surgery

the tip of the endoscope has been proposed to fixate the papilla during cannulation, making the procedure easier.

In a recent review article by Inamdar, the success rates for reaching the papilla in patients with altered anatomy differed between 55 and 100% [2]. The pooled enteroscopy success rate for all kinds of altered anatomy was 81% (CI 75–86%). The major reason for failure was difficulty to identify the biliary limb at the entero-entero anastomosis or trouble with intubating this limb with its marked angulation. The pooled diagnostic success rate for all attempted enteroscopies was 69% (CI 61–78%), and the pooled success rate for completed interventions was 62% (CI 53–71%). In patients with a successful enteroscopy, reaching the duodenum, the rate for interventional success was 79%. Schreiner et al. suggest that a successful balloon enteroscopy-aided ERCP is less likely in RYGBP patients with an alimentary limb of more than 150 cm [3].

10.2 Percutaneous Transhepatic Techniques

The percutaneous transhepatic cholangiography (PTC) technique has been used for many years for diagnostic and interventional purposes in the biliary tree. Direct transhepatic cholangioscopy, utilising the PTC access for endoscopy, was first described in 1974 by Takada. Today the PTC technique is often used as an alternative to ERCP for internal or external drainage of the biliary tree in situations with difficult cannulation. This access route can be used for interventions similar to those carried out using standard ERCP techniques. In patients with altered anatomy, the PTC technique offers an access route into the biliary system possible to use for primary interventions, for direct cholangioscopy and for aiding in enteral endoscopic interventions with rendezvous technique.

We have used this technique for rendezvous procedures aiming at ERCP in patients with altered anatomy. A guidewire was introduced through the PTC catheter through the papilla and advanced down to the entero-entero anastomosis to meet a balloon enteroscope. The guidewire was grasped by a snare from the endoscope which then could be manipulated up to the papilla (Fig. 10.3). Biliary interventions were then performed over the existing guidewire. Different endoscopes can be used for these rendezvous interventions, depending on the length of the Roux limb (in gastric bypass – enteroscope, after Whipple procedure or total gastrectomy – therapeutic gastroscope).

10.3 Percutaneous Transgastric Access

In gastric bypass patients, a gastrostomy placed in the remnant stomach can be used as an access port for ERCP (Fig. 10.4). The gastrostomy can be achieved using various techniques:

- (a) Radiologic ultrasound-guided puncture of the remnant stomach

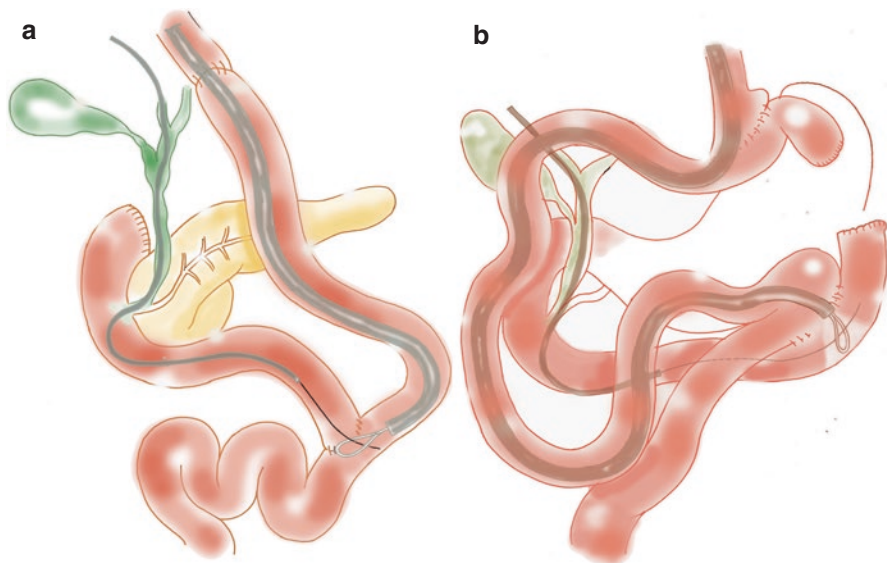


Fig. 10.3 Access to the duodenum and bile ducts using rendezvous techniques with a preplaced PTC access. The endoscope meets the transhepatic guidewire at the entero-entero anastomosis. **(a)** In Roux-en-Y reconstruction after gastrectomy. **(b)** After Roux-en-Y gastric bypass surgery

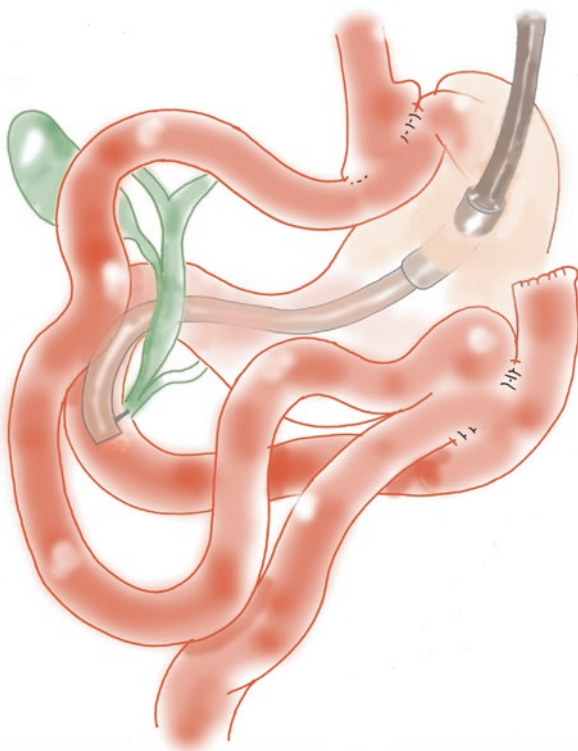


Fig. 10.4 Percutaneous access to the remnant stomach in Roux-en-Y gastric bypass. This access can be achieved using different techniques, as described in the text, but they all result in the possibility to insert the duodenoscope percutaneously

- (b) Balloon enteroscopy into the remnant stomach followed by PEG placement
- (c) Laparoscopic assisted gastrostomy

ERCP performed through a gastrostomy is technically similar to an ordinary per oral procedure as a standard duodenoscope is used together with standard accessories.

If the gastrostomy has been achieved using traditional endoscopic or radiologic PEG techniques, the stoma has to be established before it can be safely used for access. Achieving a secure gastrostomy takes about 4 weeks making this technique unsuitable in acute situations. To access the stomach with a duodenoscope, the stoma needs to be dilated to at least 15 mm. After the procedure a large diameter gastrostomy tube needs to be placed to secure the stoma. Tod Barron has described a technique, using balloon enteroscopy, creating an endoscopic gastrostomy for immediate access by placing a covered stent in the stoma [4]. The stent diameter allowed for passage of the duodenoscope and kept the stomach attached to the abdominal wall. Postoperatively a 26Fr gastrostomy tube was left in place for 4 weeks.

The technique for laparoscopic assisted access to the remnant stomach was first described by Pimentel in 2004 [5] and has since been repeated and described by several authors [6]. Using this technique, a laparoscopic port (15 mm) is placed through the skin into the stomach under direct laparoscopic vision. The abdominal cavity is then exsufflated and an ERCP can be performed through the port. After completion of the ERCP, the stomach incision can be surgically closed and no gastrostomy tube is needed. The entire procedure can be performed as day care surgery. The laparoscopic approach is well suited for acute situations but needs the assistance of a skilled minimal invasive surgeon.

If further ERCP interventions are required, the stoma can be preserved by leaving a gastrostomy tube in place, regardless of the type of initial stomach access.

10.4 EUS-Assisted Transgastric Techniques

New techniques using EUS for gaining access to the biliary tree are currently being developed. Recent reports describe both direct puncture of bile ducts in the left liver lobe and puncture of the remnant stomach from the pouch or the Roux limb in gastric bypass patients (Fig. 10.5).

The direct puncture technique can be used in all kinds of altered anatomy and is the same technique as in direct puncture of the common bile duct from the duodenal bulb [7]. It can only be used in cases with dilated bile ducts. When the access to the left bile duct has been established, direct drainage can be achieved by placement of a covered metal stent draining the bile into the pouch or Roux limb. Just as in PTC techniques, a guidewire can be introduced through this access into the common bile duct and out through the papilla for rendezvous attempts, brush cytology or stent placement [8].

In gastric bypass anatomy, EUS can be used to puncture the remnant stomach from the pouch or the Roux limb. This technique has recently been described by

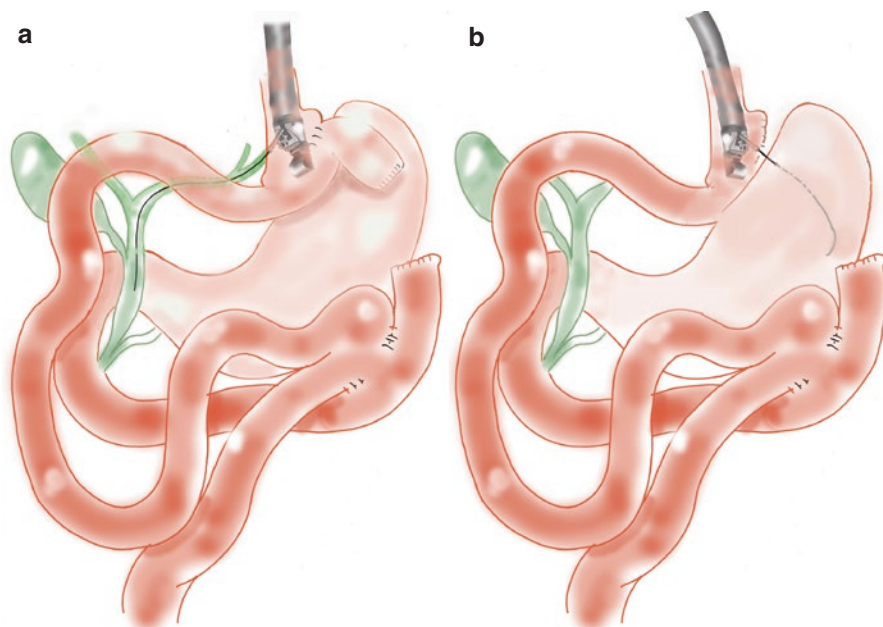


Fig. 10.5 EUS-guided techniques; (a) direct puncture of the left liver lobe. (b) Puncture of the remnant stomach through from the pouch

Kedia et al. Access was established by placement and dilatation of a lumen-apposing metal stent into the remnant stomach. A conventional ERCP was then performed via the stent. After the procedure the fistula was closed using endoscopic suturing with Overstitch [9]. The technique allows for acute interventions but requires advanced EUS competence.

10.5 Discussion

Performing ERCP in patients with altered anatomy is demanding and challenging and requires specialised equipment and expertise that are not widely available, why these procedures mostly will take place in tertiary or sometimes in secondary centres. The algorithm for solving the ERCP challenge in these patients depends on the available expertise and on which pathologic problem that needs to be solved. Very often a multidisciplinary approach is required. Regardless of which technique that is utilised, the procedure will be time-consuming and will involve advanced anaesthesia.

If the biliary tract pathology is a bile duct stone and the Roux limb is shorter than 150 cm, balloon enteroscopy might be the first choice, if available, despite a fairly low success rate.

However, if the pathology is a stricture or suspected malignancy, the success rate drops significantly and the “PEG” technique or a traditional PTC might be preferred

in gastric bypass-operated patients. In other altered anatomy situations, PTC with or without rendezvous will be the most available option. In gastric bypass patients, the combined laparoscopic gastrostomy and ERCP may be the best alternative as it can be performed in day care surgery as well as in acute situations. One drawback is that it has to be performed in the operating theatre with full anaesthesia and that the patient has to be fit for surgery. In patients who previously have undergone laparotomy, intra-abdominal adhesions might cause technical problems. One advantage with the “PEG” technique is that it allows for the ERCP to be performed using standard duodenoscopes and accessories. By leaving a gastrostomy-tube in place after the procedure, the papilla can easily be reached later on, as in a normal ERCP, for re-interventions at the endoscopic unit.

The EUS techniques still have to be developed and evaluated. However, these techniques require a highly skilled interventional EUS endoscopist which is not even available at every tertiary endoscopic centre.

In conclusion the balloon enteroscopy is the least invasive method but at the moment with lower success rate compared with the surgical “PEG” ERCP or PTC. The lack of sufficient accessories for balloon enteroscopy ERCP is presently a drawback that probably will be solved in the near future. For each institution, the primary choice of method for performing ERCP in patients with altered anatomy, will depend on locally available resources and expertise.

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