Duodenal Atresia Repair

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Aimee Gibson and Nada Sudhakaran

Abstract

Laparoscopic duodenal atresia repair (duodenoduodenostomy) was initially described at the beginning of the twenty-first century; some centres abandoned the laparoscopic approach due to high anastomotic leak rates [1]. One particular centre [1] reported an anastomotic leak rate of just under 30 %, in their initial early series before abandoning the procedure for some time. After modifying their technique from interrupted to continuous suturing, they revisited the procedure in a new cohort of patients and, with this, had no complications. As a result, they have been performing and teaching the procedure ever since. Others have also reported similar results [1]. They have themselves suggested that laparoscopic duodenoduodenostomy should be restricted to paediatric centres with extensive laparoscopic experience.

Keywords

Laparoscopic duodenal atresia repair • Duodenoduodenostomy

20.1 General Information

Laparoscopic duodenal atresia repair (duodenoduodenostomy) was initially described at the beginning of the twenty-first century; some centres abandoned the laparoscopic approach due to high anastomotic leak rates [1]. One particular centre [1] reported an anastomotic leak rate of just under 30 %, in their initial early series before abandoning the procedure for some time. After modifying their technique from interrupted to continuous suturing, they revisited the procedure in a new cohort of patients and, with this, had no complications. As a result, they have been performing and teaching the procedure ever since. Others have also reported similar results [1]. They have themselves suggested that laparoscopic duodenoduodenostomy should be restricted to paediatric centres with extensive laparoscopic experience.

Advantages of the laparoscopic approach include faster recovery and earlier resumption of oral feeding, leading ultimately to earlier discharge.

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20.2 Relevant Anatomy

There are three categorised types of duodenal atresia. Type 1 involves either a diaphragm or web that includes submucosa and mucosa. Type 1a is termed the "windsock" deformity, where the diaphragm has ballooned distally. 1b involves a membrane without ballooning, whereas 1c involves a web between the duodenal segments. Type 2 atresias have a dilated proximal segment, with collapsed distal segment connected by a fibrous cord. Type 3 atresias have no connection between proximal and distal segments. Most atresias occur at the level of D2 (Fig. 20.1).

More than 50% of duodenal atresias are associated with other congenital anomalies, and approximately 30% are associated with trisomy 21. Other associations include cardiac anomalies and other gastrointestinal abnormalities, the most important of which to recognise is malrotation.

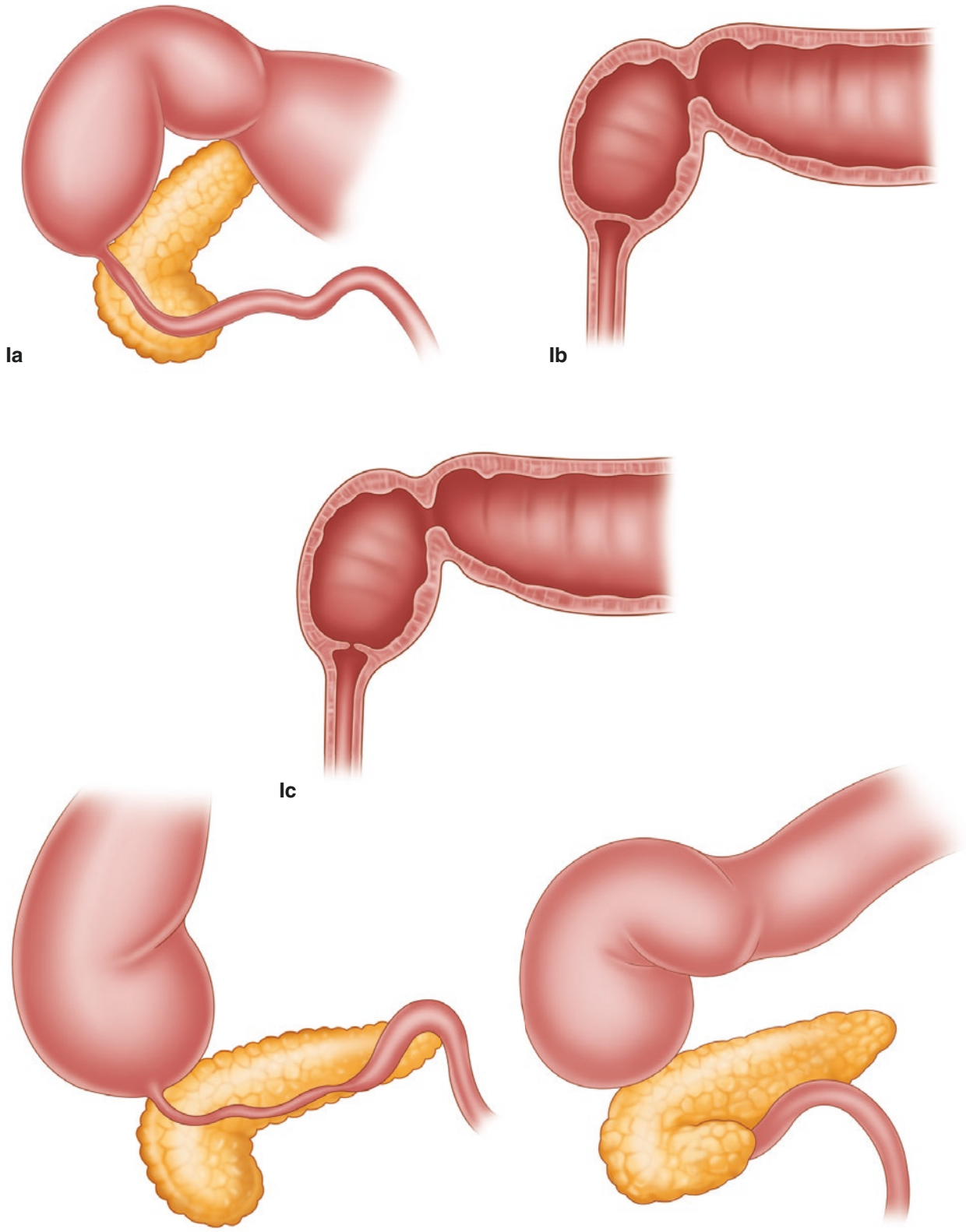
Diagnosis may be made antenatally, with findings of a double bubble sign. Most were detected within the seventh and eighth months of pregnancy.

Although the duodenum has numerous close anatomical relations, those most important in laparoscopic duodenoduodenostomy include:

1. The falciform ligament: containing the left umbilical vein, it should not be transected but carefully secured superiorly to retract the liver.
2. The right lobe of the liver: in infants, the liver is quite large with respect to the abdominal cavity size and hangs over the duodenum.
3. The transverse colon: also overlying the duodenum, it must be gently peeled away from the duodenum to get exposure.
4. The pancreas: locating the pancreas helps identify the proximal and distal parts of the duodenum in duodenal atresia as it generally separates the two. In some cases, an annular pancreas may be identified

20.3 Working Instruments

- 3 mm hasson port
- Either 30° or 0° laparoscope
- 3 mm needle holders
- 3 mm scissors
- 3 mm suture cutting scissors
- 3 mm Maryland forceps
- 2×3 mm soft bowel grasping forceps
- 3 mm monopolar hook
- 3 mm Reddick Olsen grasper
- 3 mm bipolar scissors/grasper (optional)



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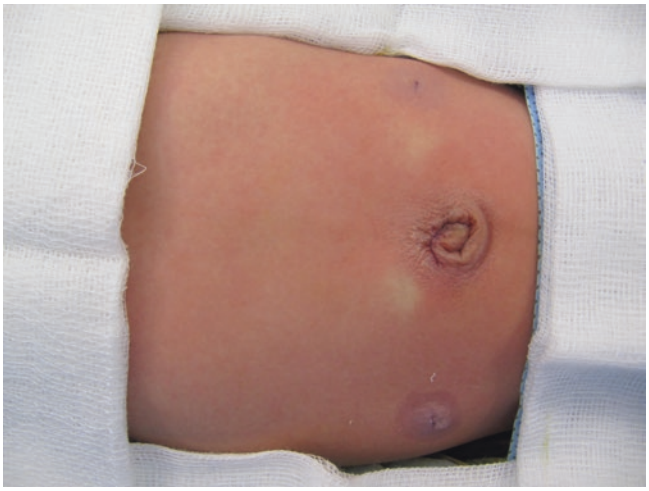
20.4 Positioning, Port Siting, and Ergonomic Considerations

The baby is positioned supine with the legs as close to the lower end of the operating table as possible. A 3 mm hasson port is placed at the umbilical fold and two stab incisions are placed at the level of the umbilicus on either flanks (Fig. 20.2). The portless approach is used to introduce the suture with its needle into the abdominal cavity.



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20.5 Surgical Technique

The anatomy is first assessed to confirm the diagnosis. We need to ascertain that the proximal duodenum is dilated and that there is no malrotation.

Figures 20.3, 20.4, 20.5, 20.6, 20.7, 20.8, 20.9, 20.10, 20.11, 20.12, 20.13, 20.14, 20.15, and 20.16 illustrate the steps involved in duodenal atresia repair.

Special note on technique: avoid handling the needle point during suturing, which can blunt the needle, making passing the needle into the tissue more traumatic. While performing continuous suturing, the suture should be grasped towards the needle end to avoid weakening it and risk breaking.

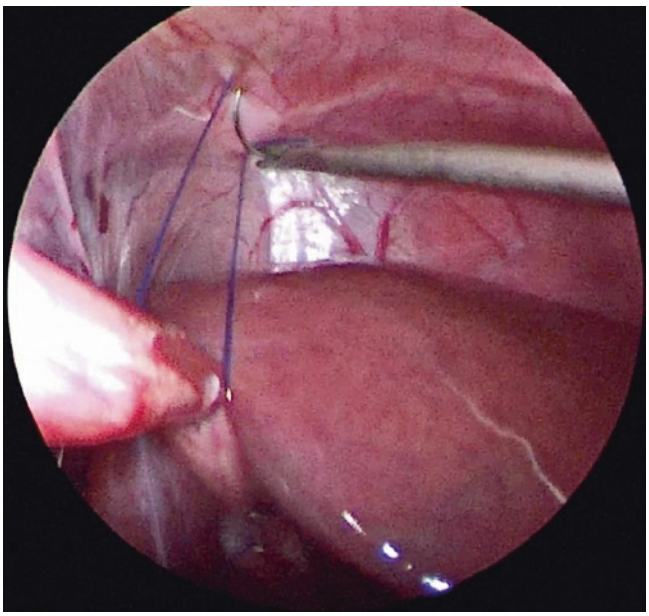

Fig. 20.3 Falciform ligament being retracted via sutures to the anterior abdominal wall. Once duodenal atresia is confirmed, the liver is retracted away from the field of interest by means of a "holding stitch" through the anterior abdominal wall and around the falciform ligament. The suture ends are pulled up and held together with an artery clip and a gauze swab protecting the skin from pressure injury

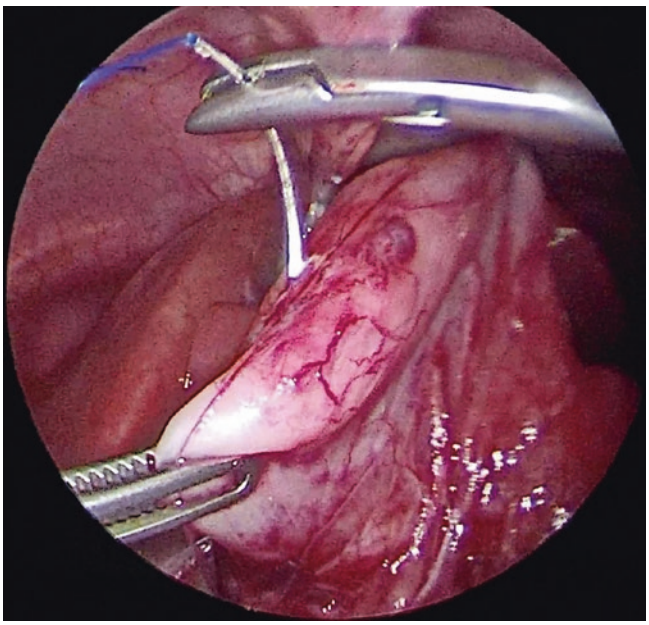

Fig. 20.4 Second suture being placed on the proximal duodenum. The distal part of the proximal dilated duodenum is suspended by means of two sutures suspended form the anterior abdominal wall. This helps to display the anatomy better and to stabilise the duodenum when it comes to suturing later

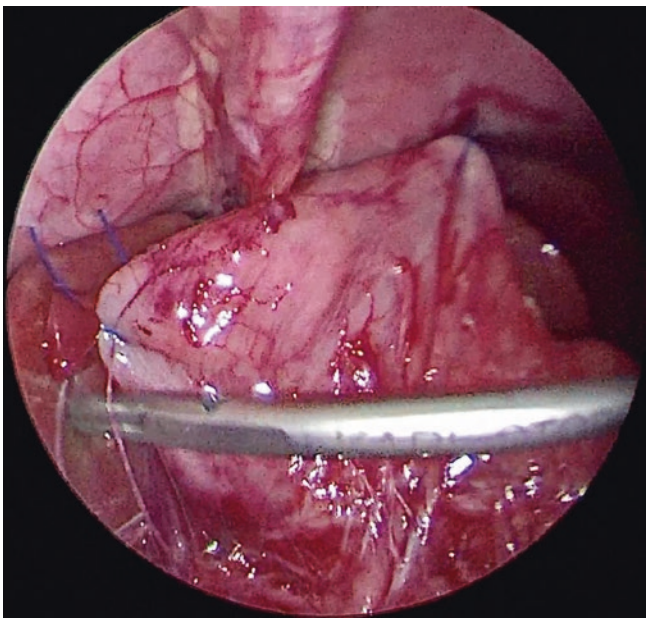

Fig. 20.5 Proximal duodenum suspended from the anterior abdominal wall

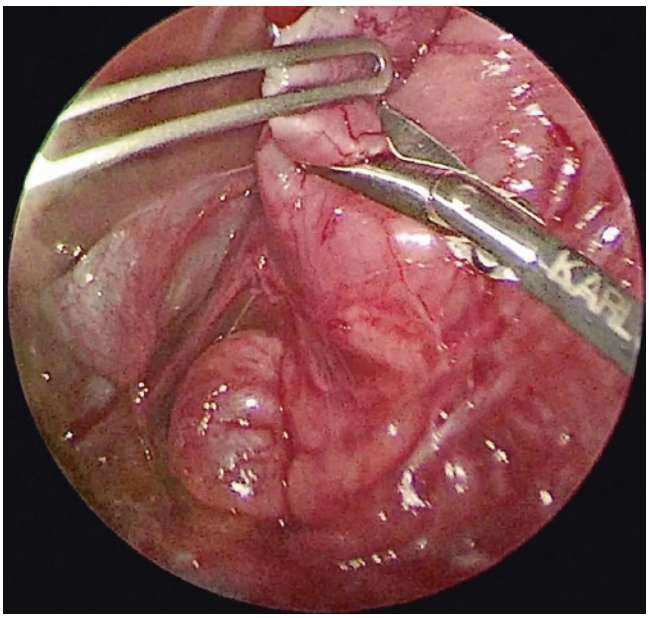

Fig. 20.7 Proximal duodenum enterotomy made transversely for the anastomosis. Scissors or monopolar diathermy can be used to make a transverse incision of the most distal (dependent) part of the proximal dilated duodenum

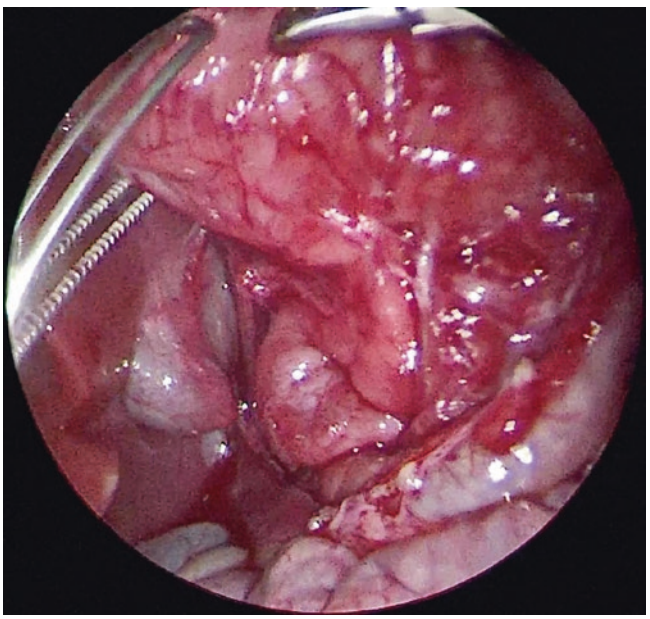

Fig. 20.6 Display of the essential anatomy—proximal duodenum held with soft forceps, distal to it is the pancreas and the distal duodenum

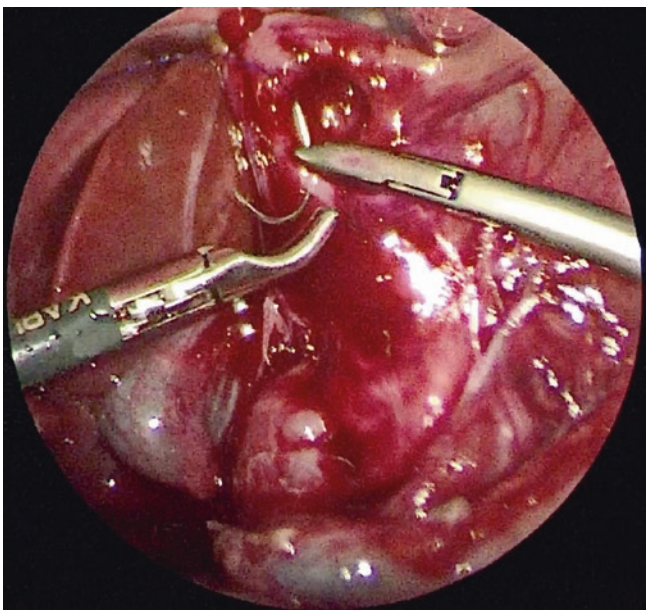

Fig. 20.8 An anchoring suture is placed between the midpoint of the enterotomy and the proximal part of the distal collapsed duodenum without much tension between the tissues

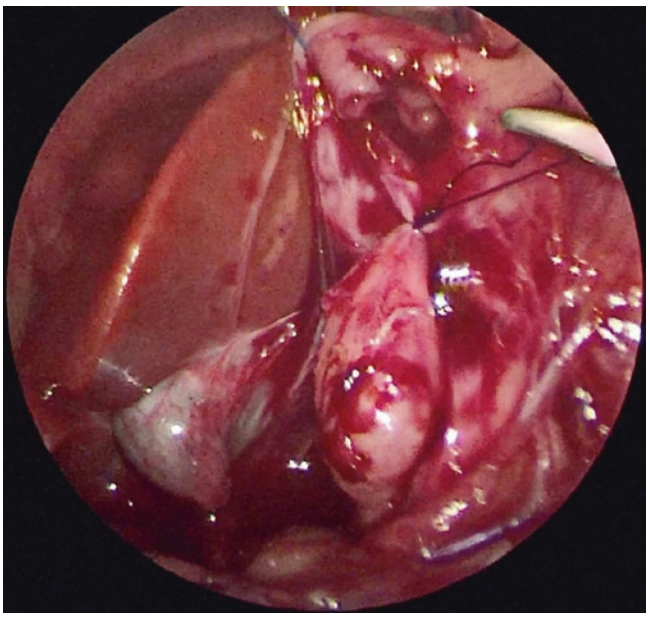

Fig. 20.9 The two ends to be anastomosed are brought together by means of one single serosal suture. This allows for the distal duodenum to be stabilised for an enterotomy and better estimation of the position of the cut. This stitch later becomes the midpoint of the "inner" suture line. It keeps the both edged of the posterior suture line from slipping away and risks anastomotic leaks

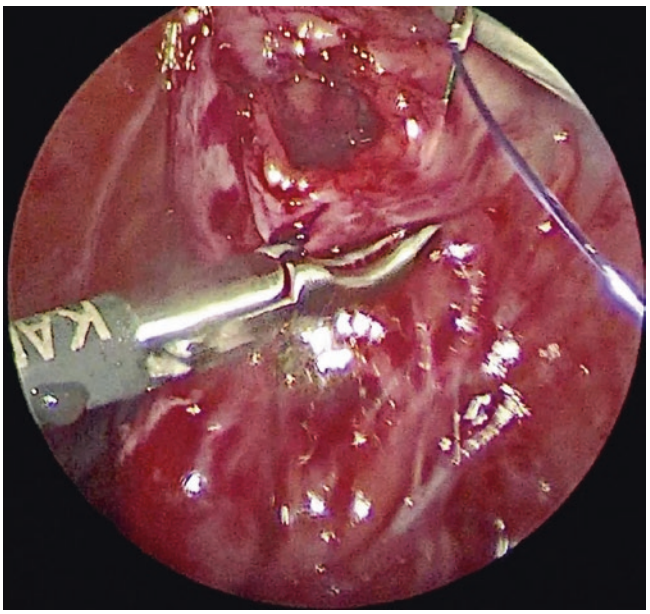

Fig. 20.11 A diamond shaped (Kimura type) anastomosis is prepared. Two further sutures are placed on the two corners of the proximal duodenal enterotomy. These are stitched to the midpoint of the longitudinal incision of the distal duodenum on either side. This image shows a "bite" taken at the proximal corner

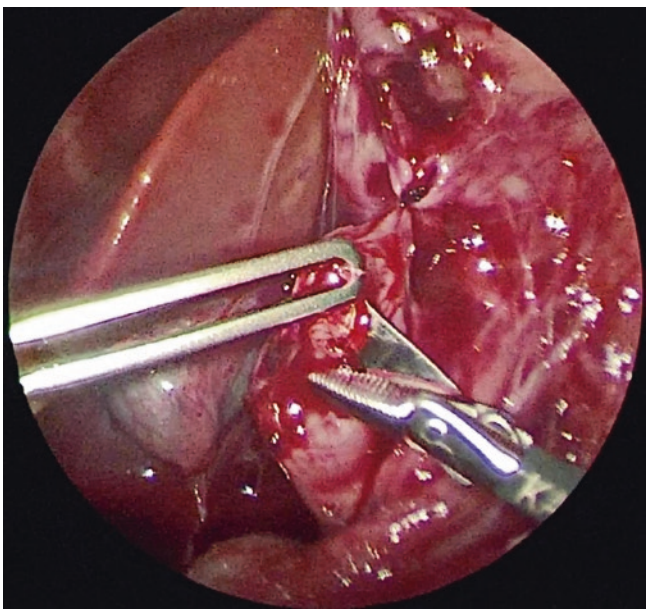

Fig. 20.10 Enterotomy of the distal duodenum, made longitudinally along its length

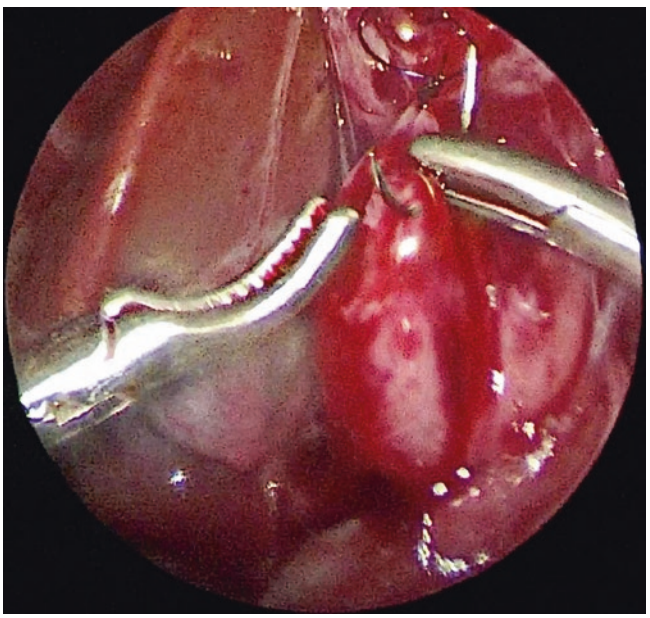

Fig. 20.12 Another "bite" of the same suture at the mid point of the longitudinal incision of the distal duodenum. The same is done on the other side

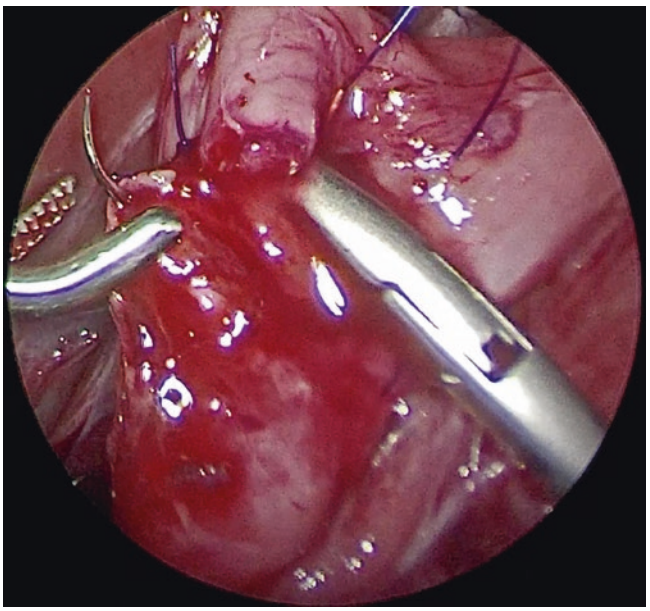

Fig. 20.13 The start of the continuous suture of the posterior wall anastomosis, intraluminally

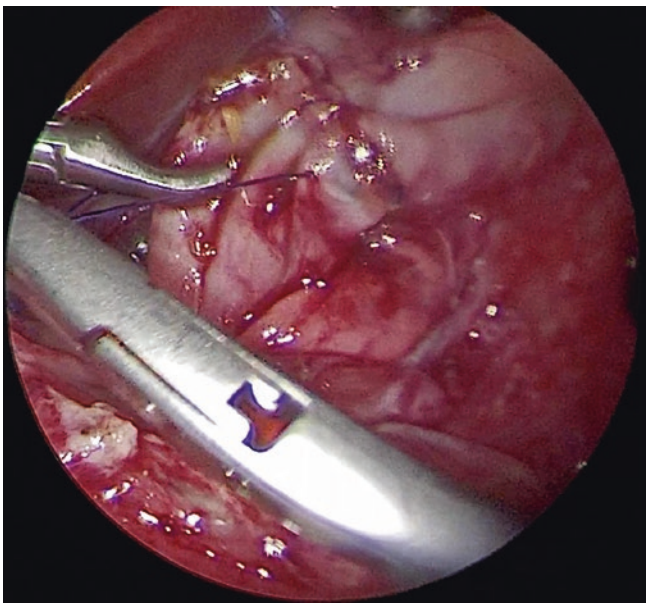

Fig. 20.15 Towards the end of the continuous suturing of the anterior wall of the anastomosis. The holding sutures are removed to complete the procedure. The wound is closed with skin glue. Gentle feeding can commence the next day and gradually increase

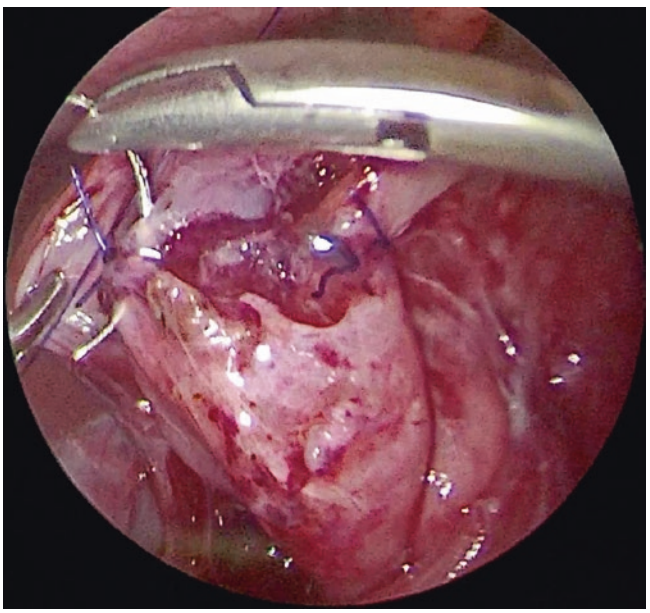

Fig. 20.14 The start of the anterior wall continuous suturing

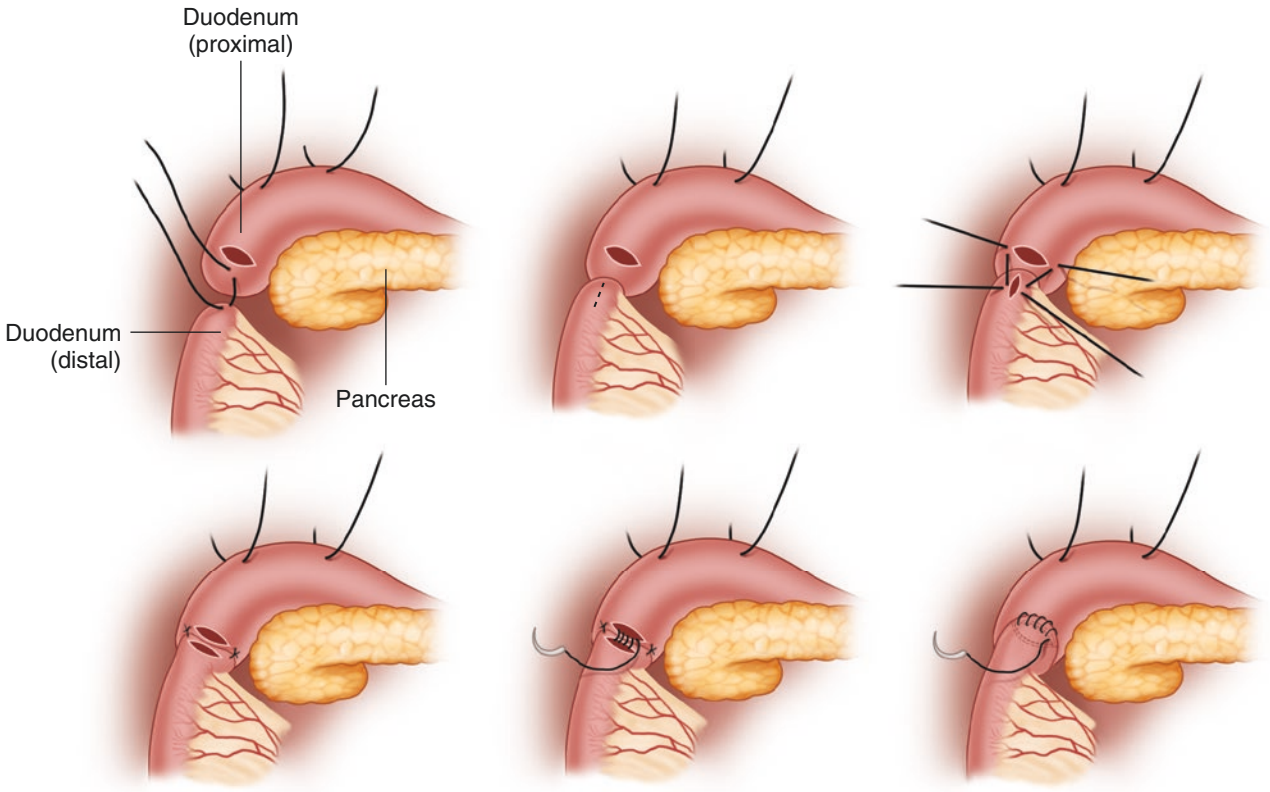

Fig. 20.16 Diagramatic representation of the procedure

Reference

1. Van der Zee DC. Laparoscopic repair of duodenal atresia: revisited. World J Surg. 2011;35:1781–4.

Suggested Reading

Bax NM, Ure BM, Van der Zee DC, van Tuijl I. Laparoscopic duodeno-duodenostomy for duodenal atresia. Surg Endosc. 2001;15(2):217.

Holcomb GW, Murphy JP. Ashcraft's paediatric surgery: duodenal and intestinal atresia and stenosis. 5th ed. Philadelphia: Saunders; 2010. p. 400–4.

McMinn RMH. Last's anatomy: regional and applied. 9th ed. Edinburgh: Churchill Livingstone; 1995. p. 335–6.

Rothenburg SS. Laparoscopic duodenoduodenostomy for duodenal obstruction in infants and children. J Pediatr Surg. 2002; 37(7):1088–9.