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Laparoscopic fundoplication is one of the most common elective laparoscopic procedures in childhood. The indications for laparoscopic fundoplication are similar to those for the open procedure and include failure of medical therapy in children with symptomatic gastroesophageal reflux disease (GERD). Children with GERD can present with digestive (recurrent vomiting, failure to thrive, oesophagitis, peptic stricture) or respiratory symptoms (apnea, aspiration pneumonia, apparent life threatening events – ALTE). In addition GERD often required surgical correction in neurologically impaired children or in children previously operated for oesophageal atresia, congenital diaphragmatic hernia or abdominal wall defects.

### Equipment

- 5-mm 30° telescope
- 7-mm Hasson Trocar
- 3-mm KOH needle holder
- Two pairs of 3-mm Kelly forceps
- Two pairs of 3-mm Reddick–Olsen forceps
- Nathanson retractor or 3-mm Manhes toothed grasper on ratcheted handle
- 5-mm bipolar scissors or other energy sources, such as an Harmonic scalpel., etc.

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### Pre-operative

A large nasogastric tube (10–12 Fr) must be inserted preoperatively. In neurologically impaired children it is important to ensure that they are not constipated, because a large distended transverse colon will make the operation considerably more challenging. It may be necessary to administer a bowel wash out in these patients preoperatively.

### Patient Positioning

The patient is positioned at the foot of the operating table, with the surgeon at the end of the table and the assistant surgeon on the right of the surgeon.

In older children the patients, legs should be parted as per French position, supine with legs apart, (Fig. 1) for laparoscopic fundoplication.

If the video monitor is pendant mounted, it should be placed directly in front of the patient for the best hand-to-eye coordination; otherwise it is better on the patient's right. The patient should be tilted 30°, head up, which allows the transverse colon to fall away from the stomach.

### Ports Position and Placement

- The Hasson cannula should be inserted in the umbilicus using the open laparoscopy method previously described.
- An additional three instrument ports are required, one for liver retraction, and one each from each hand instrument. In older children hand instruments can be sited higher in the upper quadrant, about 10 cm to each side of the midline. If the patient requires a gastrostomy, then site the left upper quadrant (LUQ) port at

the position which suits the gastrostomy placement best (Fig. 2).

## Operative Technique

### Liver Retraction

It is necessary to retract the left lobe of the liver off the hiatus to gain exposure to the hiatus, and this can be done either by attaching a toothed grasping forceps on the muscular diaphragm



Fig. 1

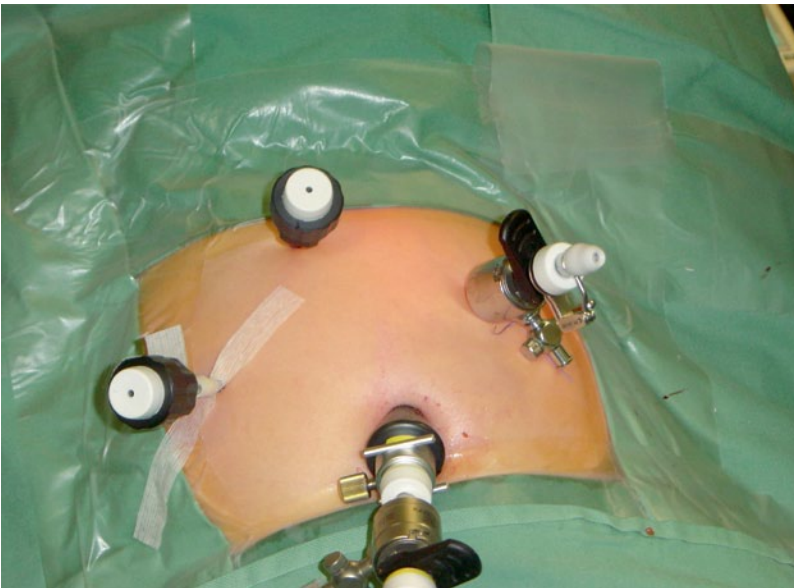


Fig. 2

1–2 cm above the hiatus or by inserting a Nathanson retractor.

### Hiatal Exposure

The hiatus is easily identified but the right crus will not be easily seen, as it will be deep to the phreno-oesophageal membrane covering the caudate lobe and the crus. This membrane has to be divided (Fig. 3).

The right crus can then be identified sitting snugly on the oesophagus, and can be separated from the loose adventitial attachments with ease. The peritoneum over the “white line” should be completely divided to expose the underlying oesophagus, this incision is followed over the crus (Fig. 4), the left crus is separated from the oesophagus by incising the overlying peritoneum until it meets the R crus as a V.

At this point you will be able to see the gastrophrenic ligament which attaches the fundus of the stomach (between the spleen and left crus); this must be divided (Fig. 5). These ligaments will prevent the fundus from being pulled through the posterior oesophageal window. Completely freeing this ligament will allow the fundus to be pulled without tension.

Once the gastrophrenic ligament is mobilised, a small posterior window is created behind the oesophagus in the peritoneum between the oesophagus, left gastric artery and the posterior vagus nerve, that should be easily identifiable (Fig. 6). The posterior wall of the fundus should then be visible and can be pulled through this hiatus after enlarging the window with blunt instruments. You should now see if the stomach is easily pulled through this window.

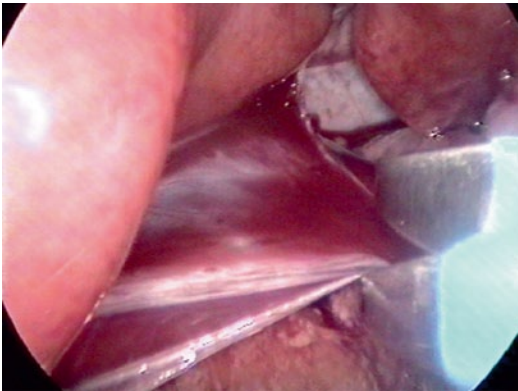


Fig. 3



Fig. 4



Fig. 5

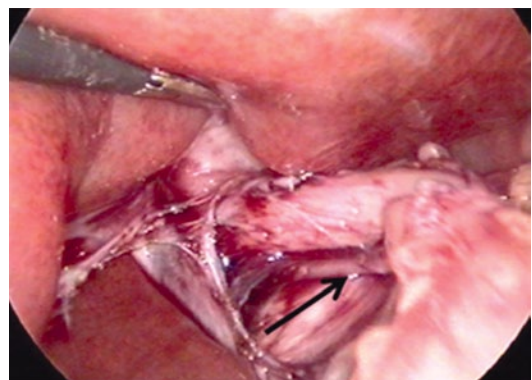


Fig. 6

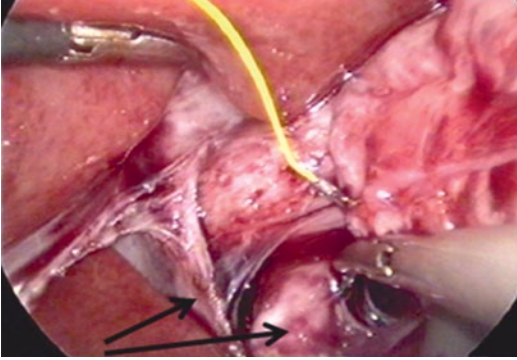


Fig. 7

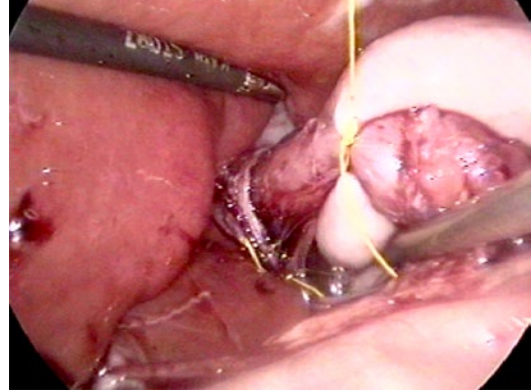


Fig. 8

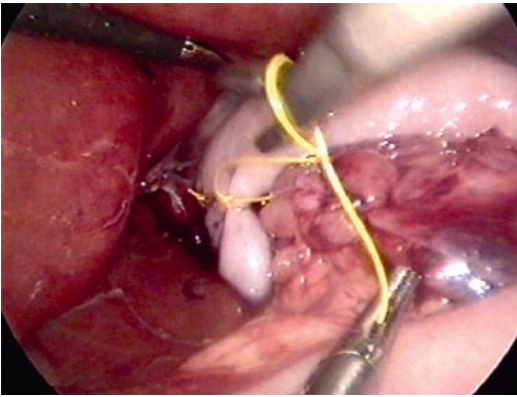


Fig. 9

The next step is to repair the crus to prevent the wrap from migrating into the chest; a single suture to approximate the crus is all that is usually required (Fig. 7).

The fundus is then pulled through again, and a loose, floppy wrap performed with a non-absorbable suture which should not be anchored to the underlying oesophagus (Fig. 8). This allows you to manoeuvre the wrap along the oesophagus to determine the optimum site for the second and third suture which are transfixed to the anterior oesophagus (Fig. 9).

The liver retractor can then be removed, the fascia of the instrument ports sites is closed with a single absorbable suture and topical skin adhesive for skin (2 Octyl-Cyanoacrylate). The nasogastric tube is left on free drainage, removed the next day and feeding commenced.