Hiatal Hernia

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Hiatal hernia (HH) is a common finding in the general population, and given the aging and the prevalence of obesity of the population in the United States, these numbers will increase in the future [1]. It is a condition in which the stomach, in some cases together with other structures, herniates through the esophageal hiatus into the mediastinum. HH is a frequent finding in patients with gastroesophageal reflux disease (GERD) eliminating a key component of the antireflux mechanism as it interrupts the synergistic action between the lower esophageal sphincter (LES) and the diaphragmatic crura [2]. HH has a distinct connection with obesity due to increased intra-abdominal pressure [3, 4], which also increases the risk of recurrence [5].

Classification

The HH are divided into four groups [6]:

- *Type I HH,* so called sliding HH, is the most common, and it is responsible for more than 95% of the cases. The gastroesophageal junction (GEJ) herniates upward into the posterior mediastinum through the esophageal hiatus [7] (Fig. 7.1).
- *Type II HH* is the pure paraesophageal hernia (PEH). There is no displacement of the GEJ, which is located below the diaphragm, but there is herniation of the gastric fundus above the GEJ and lateral to the esophagus. Type II is the least common among the PEH.

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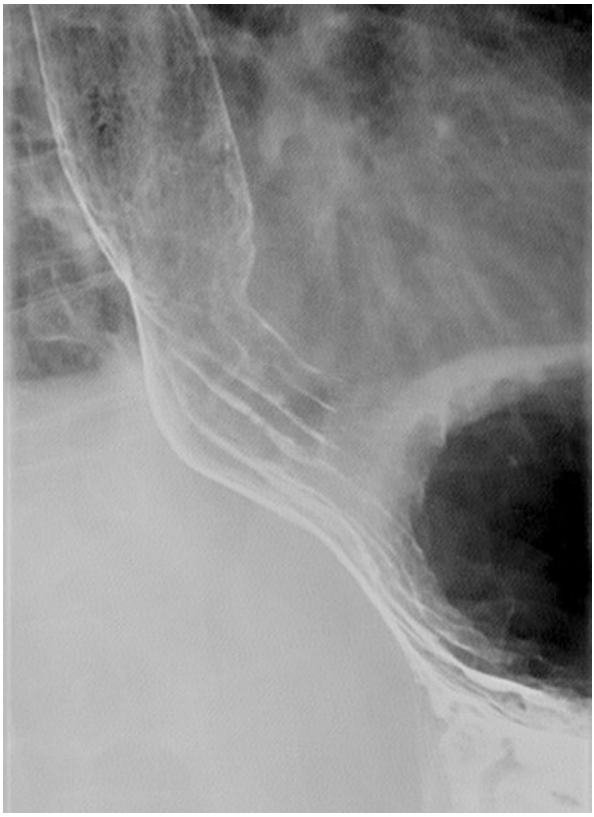

Fig. 7.1 Hiatal hernia type I

- *Type III PEH* is the combination of types I and II as the GEJ and fundus are both herniated into the mediastinum [6]. More than 90% of PEH are Type III (Fig. 7.2).
- *Type IV PEH* is characterized by the presence of other structures, such as the omentum, colon, small bowel, spleen, and/or pancreas within the hernia sac in mediastinum (Fig. 7.3).

Symptoms and Complications

Although many patients with HH are asymptomatic, each type of HH may present with different symptoms. Complaints related to GERD, such as heartburn, regurgitation, chronic cough, laryngitis, and asthma, are the consequence of the antireflux mechanism disruption and are typical for type I HH. This may lead to GERD complications such as esophagitis, Barrett esophagus, and strictures. Respiratory complications vary from chronic cough to asthma, aspiration pneumonia, and even pulmonary fibrosis. According to Schlottmann et al. patients with larger HH have more frequent episodes of coughing and wheezing, decreased pressure of the lower esophageal sphincter, weaker peristalsis, more acid reflux (as documented by pH

Fig. 7.2 Hiatal hernia type III

Fig. 7.3 Hiatal hernia type IV

monitoring), and more severe esophagitis [8]. While in type I HH dysphagia is usually secondary to abnormal peristalsis, in PEH it may be caused by compression of the distal esophagus by the hernia. Large PEH may lead to respiratory and cardiac impairment caused by direct compression of the thoracic organs [9]. Another complication is anemia secondary to bleeding from venous stasis of the gastric wall or

Cameron lesions [10]. Acute symptoms are more common for PEH. Volvulus, strangulation, obstruction, ischemia, necrosis, and perforation are potentially lethal complications [11].

Evaluation

Most patients require an esophagogastroduodenoscopy, barium swallow examination, high resolution manometry, and pH monitoring. A chest and abdomen CT is key for the diagnosis of a type IV hernia, which can be suspected in a chest X-ray.

Endoscopy

Endoscopy gives information about the presence of esophagitis or Barrett's esophagus and rules out other gastric or duodenal pathology.

Barium Swallow

It determines the size and type of HH. While this test is important to delineate the anatomy, it should not be considered diagnostic for GERD.

Esophageal Manometry

High-resolution manometry (HRM) determines the level of the crura, the respiratory inversion point, and the location of the lower esophageal sphincter (LES). It may also give information regarding the size of sliding HH, the pressure of the LES, and the quality of esophageal peristalsis. In addition, HRM enables a pH probe to be properly positioned 5 cm above the upper border of the LES. The manometry and pH monitoring are often omitted in elderly patients with type III HH.

pH Monitoring

Ambulatory pH monitoring is used to determine the presence of abnormal reflux, and the correlation between symptoms experienced by the patient and episodes of reflux. This is key before planning surgical treatment of GERD with a fundoplication.

Computed Tomography

CT scan is recommended when a type IV HH is suspected or in case of acute complications.

Surgical Treatment

Asymptomatic HH do not need surgery. However, patients with large PEH should have regular follow-up as the annual probability of developing acute symptoms is around 1% [12]. The surgical approach and the indications for surgery differ depending on the type of HH.

Type I Most patients with GERD are treated with acid reducing medications. The indications for surgery are intolerance to medical therapy or inadequate symptom control despite optimal medical management, patient preference for surgery despite successful medical management, complications of GERD, such as stricture while taking PPI, and/or persistence of extra-esophageal symptoms despite medical therapy. The technique will be described in the chapter that treats GERD.

Types II, III, and IV Surgery is indicated when the patient is symptomatic. It is usually elective surgery. When ischemia is present, urgent repair is needed [13]. Surgical techniques for HH evolved over time [14]. Previous studies have shown that laparoscopic HH repair, as compared to open, was associated with significantly better postoperative outcomes in terms of morbidity, mortality, length of hospital stay, and costs [15]. The following describes the technical steps of the repair of a type III hiatal hernia. In most cases, the type IV hiatal hernia can also be treated laparoscopically as it is possible to reduce all the organs. However, when severe adhesions are present, a left thoracotomy might be necessary.

Patient Positioning

Laparoscopic HH repair is performed under general anesthesia. During the procedure, patient lies in supine position. The beanbag mattress is useful especially when using the reverse Trendelenburg position. Patient's legs are positioned on stirrups with knees flexed at 30 degrees. After inducing anesthesia, the anesthesiologist inserts an oro-gastric tube to decompress the stomach. During the operation, the surgeon's position is between the patient's legs with assistants on both sides of the operating table (Fig. 7.4).

Trocar Placement

The operation is performed using 5 trocars. After abdominal cavity insufflation using a Verres needle, trocar 1 is placed 14 cm below the xiphoid process in the midline or slightly to the left. Trocar 2 is placed in the left midclavicular line at the level of trocar 1. Trocar 3 for the liver retractor is placed in the right midclavicular line at the level of trocar 1. Trocars 4 and 5 are placed under the costal margins on the left and right side, and are used for the dissecting and suturing instruments (Fig. 7.5).

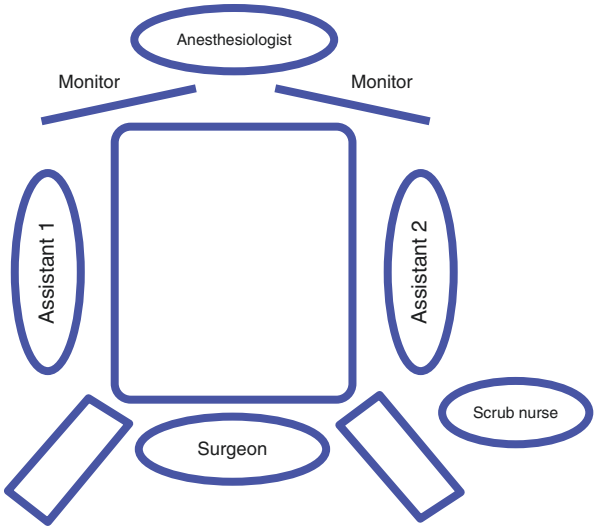

Fig. 7.4 Patient and personnel positions

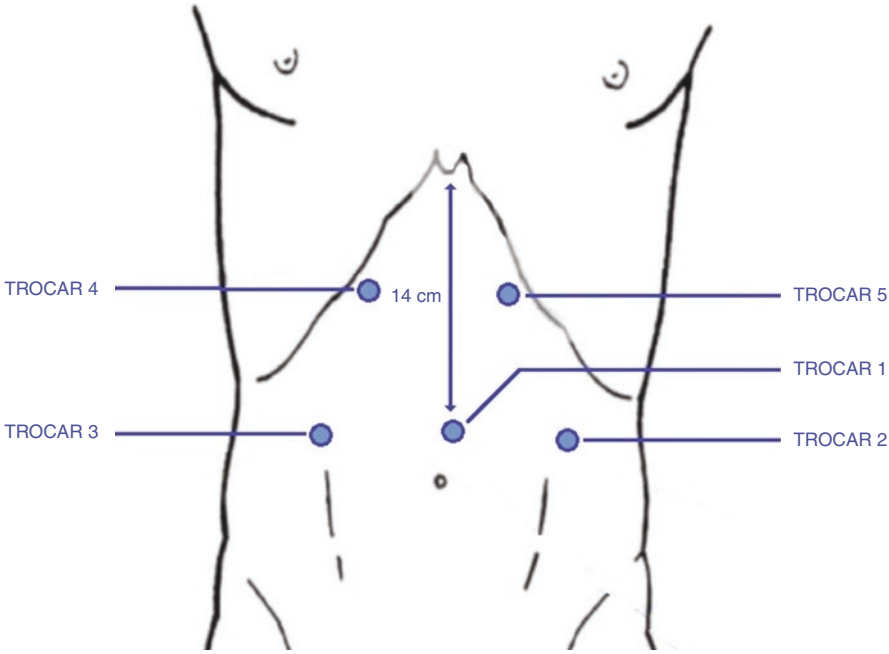

Fig. 7.5 Trocar positioning

Dissection of the Hernia Sac and Mobilization of the Esophagus

Traction is applied to the herniated stomach to reduce it below the diaphragm as much as possible (Fig. 7.6).

The short gastric vessels are divided and the left pillar of the crus is reached. The left crus approach reduces the risk of injury to an accessory left hepatic artery that can occur if the dissection is started over the gastrohepatic ligament, with resultant bleeding difficult to control (Fig. 7.7). The hernia sac is incised at the junction with the left crus and an anterior and lateral mobilization of the esophagus is performed (Fig. 7.8). Next the gastrohepatic ligament is divided at the pars flaccida above the caudate lobe of the liver toward the right pillar of the crus, and the esophagus is further dissected in the posterior mediastinum paying attention not to damage the parietal pleura and the vagus nerves. A posterior window behind the esophagus is then created, and a Penrose drain is placed around the esophagus, incorporating both the anterior and the posterior vagus nerves. This maneuver facilitates exposure to complete the dissection (Fig. 7.9). Dissection is continued in the posterior mediastinum circumferentially around the esophagus. During this part of the dissection, it is important to avoid injury to the pleura and the vagus nerves. If proper dissection

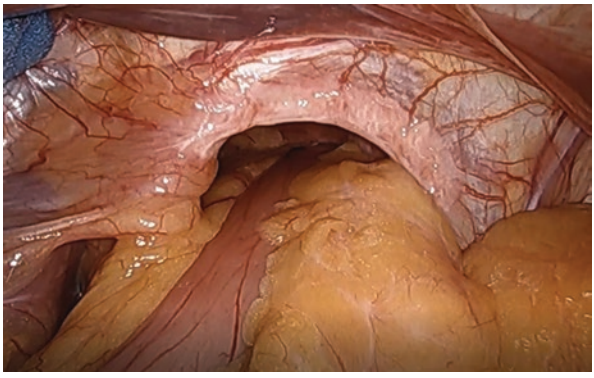

Fig. 7.6 Paraesophageal hernia

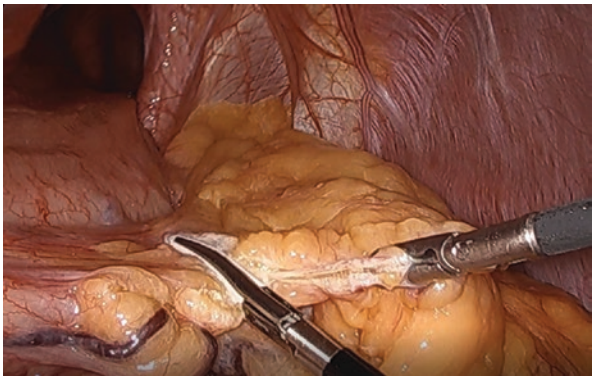

Fig. 7.7 Dividing short gastric vessels

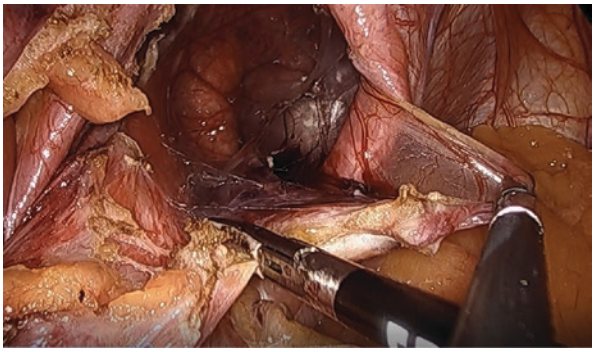

Fig. 7.8 Hernia sac dissection

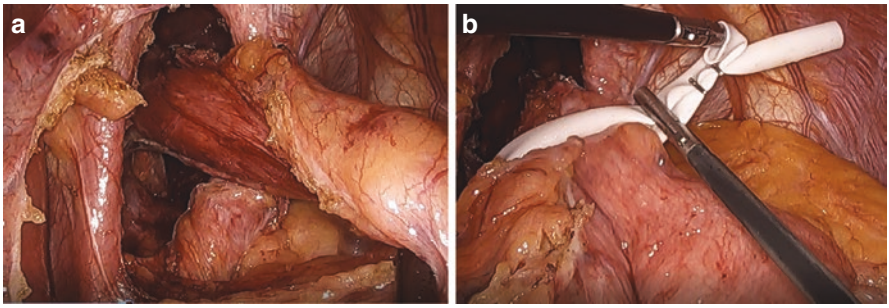

Fig. 7.9 Posterior window (**a**) and Penrose drain placement (**b**)

is performed, it is usually possible to have about 3 cm of esophagus below the diaphragm without tension. In our experience, a lengthening procedure is rarely necessary.

Closure of the Diaphragmatic Crura

The right and left pillar of the crus are approximated behind the esophagus using interrupted silk sutures. Suturing is performed by placing stitches at 1 cm intervals. In some cases, when the hiatal defect is large, some stitches can be placed anterior to the esophagus. The recurrence rate after laparoscopic PEH with cruroplasty is significant [16–22]; however, in the majority of cases the recurrent hernia is asymptomatic and small [22–24]. Some studies have demonstrated lower recurrence rates after nonabsorbable mesh PEH repair compared with cruroplasty [25, 26]. At the same time, the use of synthetic mesh has been associated with severe complications, such as erosions through the esophageal wall, esophageal stenosis, and infections [27, 28]. To avoid these complications, the use of biological materials has been investigated [24, 29–32]. While a significant lower early recurrence rate 6 months after the surgery was reported in the group of patients treated with mesh repair compared to the group of patients who underwent cruroplasty (9% vs. 23%) [24], at 5-year follow-up the recurrence rate was similar in the two groups of patients (54%

vs. 59%) [33]. Interestingly, both group of patients reported similar symptom improvement and a reoperation was necessary in only 3% of cases regardless of the technique used to close the hiatal defect. As literature shows that using mesh does not reduce the recurrence rate, it is associated with long-term complications, and implies high costs for the healthcare system, surgeons should not routinely use mesh at the hiatus and consider its use only for a very selected group of patients. Most likely patients with a giant PEH, redo operations, or cases where the tension-free cruroplasty cannot be achieved are mostly benefited by the use of mesh (Fig. 7.10).

Fundoplication

Fundoplication is the last step of the procedure. It both prevents gastroesophageal reflux and works as a gastropexy. If the quality of peristalsis has been assessed and found to be normal, a 360 degree fundoplication is performed over a 56–60 French bougie [34]. But in elderly patients and when the manometry has not been performed, a partial posterior fundoplication is the procedure of choice. Failure of the closure of the crura and an anatomically incorrect wrap are the main reasons for failure of antireflux surgery [35–37] (Fig. 7.11).

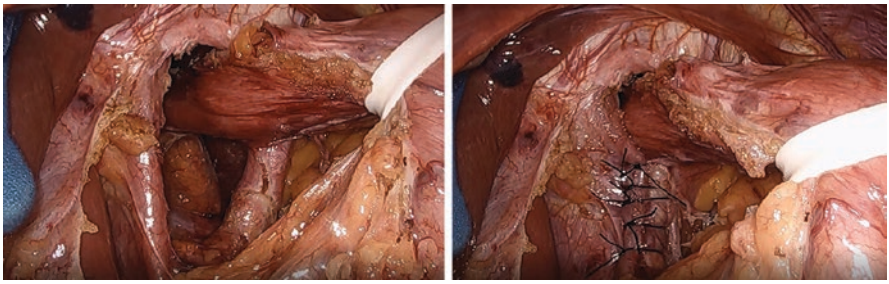

Fig. 7.10 Closure of the esophageal hiatus

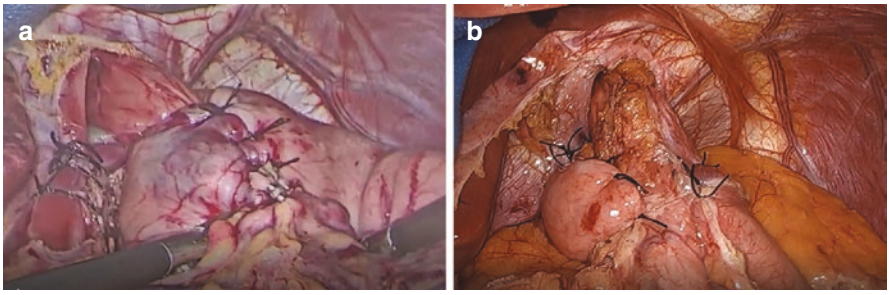

Fig. 7.11 Nissen fundoplication (**a**) and partial posterior fundoplication (**b**)

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