

Research Article

Nissen fundoplication in a series of 53 consecutive patients

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Summary

Hiatal hernia (HH) is often seen in surgery practice. The main feature of HH is the migration of abdominal viscera in the mediastinum via the esophageal hiatus. We performed - on 53 patients from November 2009 to June 2018 in the Department of General and Digestive Surgery of General Hospital of Villarobledo. Forty-one patients were diagnosed with hiatal hernia, 9 - with gastroesophageal reflux disease (GERD), and 3 - with Barrett's esophagus. The average operative time was 89 ± 33 minutes, and the average follow-up was four years. The following complications were recorded: perforation of the distal esophagus in 1 patient (1.9%), postoperative spleen hemorrhage requiring emergency laparotomy in 1 patient (1.9%), dysphagia in 6 patients (11.3%) in the early postoperative period (treated conservatively), one patient had small bowel obstruction in the fourth postoperative year, three patients (5.6%) had radiological signs of HH recurrence and GERD despite the fundoplication. One patient (1.9%) was reoperated for stenosis of the distal esophagus and recurrent paraesophageal hiatal hernia one year after the first intervention. Postoperative ventral hernia (POVH) was seen in 2 patients (3.8%). All recurrence rate was 7.5%, recorded in 4 patients.

Key words: Hiatal hernia, gastroesophageal reflux, laparoscopic Nissen fundoplication, esophageal hiatus, Recurrences



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Introduction

Bowditch was the first to publish and describe the HH as a clinical disorder (1853). Soresi made the first surgical reduction of a hiatal hernia and suture of the diaphragm crura in 1919 (Stylopoulos and Rattner 2005). It was not before the 1950ies that the connection between GERD and HH was broadly accepted. First, Nissen described fundoplication in 1956, and in 1957, Collis published a report on the transthoracic gastropasty and the esophageal lengthening procedure (Nissen 1956; Collis 1957).

The etiology of hiatal hernia is not completely certain, but two possible pathways lead to its development. Gastroesophageal reflux causes fibrosis and shortening of the esophagus, creating traction in the gastroesophageal junction and, eventually, hiatal hernia. On the other hand, the chronic positive pressure on the diaphragm hiatus leads to the transition of a part of the stomach to the thorax and the establishment of hiatal hernia or GERD (Mitiek and Andrade 2010).

Hiatal hernias are classified into the following types:

- Type I - Sliding HH
- Type II - Paraesophageal HH
- Type III - Mixed type HH
- Type IV - Herniation of one or more abdominal viscera may occur (omentum majus, small or large bowels, spleen, etc., besides herniation of the stomach. (Landreneau et al. 2005)

Giant hiatal hernia implies that not less than 30% of the stomach occupies the thoracic cavity, although a unified definition does not exist. Most cases of giant HH are type III (mixed type) with a paraesophageal component (Landreneau et al. 2005; Mitiek and Andrade 2010).

Laparoscopic Nissen fundoplication is now considered a golden standard in treating hiatal hernia and gastroesophageal reflux disease (Kohn et al. 2013; Rodriguez and Ponsky 2017). Despite good postoperative results in gastroesophageal reflux control and a low recurrence rate, because of the specific surgical skills required, postoperative life-threatening complications could be seen (Köhler et al. 2015; Baison and Aye 2021; Laxague et al. 2021).

Aims

We aimed to analyze the surgical approach, hiatal crura closure, and surgical complications in a series of 53 patients who underwent Nissen fundoplication for hiatal hernia, gastroesophageal reflux disease, or Barrett's Esophagus.

Patients and methods

Nissen fundoplication was performed on 53 patients in the Department of General and Digestive Surgery in the General Hospital of Villarobledo between November 2009 and June 2018. Forty-one patients were diagnosed with HH, 9 - with GERD, and 3 - with Barrett's esophagus. The patients operated on for Barrett's esophagus were in the first and second stages, without metaplasia of the distal esophagus (Table 1).

Table 1. Preoperative diagnosis.

Preoperative diagnosis	Hiatal Hernia	GERD	Barrett's esophagus	Total
Patients	41	9	3	53

Twenty-seven of the patients were males, and 26 - were females. The mean age of the group was 61 years, range 25–84. (Table 2). All patients with gastroesophageal reflux underwent preoperative esophageal manometry and a pH study. The DeMeester score over 14.72 was considered pathognomonic for gastroesophageal reflux. In the patients who underwent simultaneous cholecystectomy, the gallbladder stones were diagnosed preoperatively by abdominal ultrasound, and all of them presented with gallstone disease symptoms. All patients were operated under general anesthesia. The preoperative ASA risk ranged between 1 and 3, with a mean value of 2. The

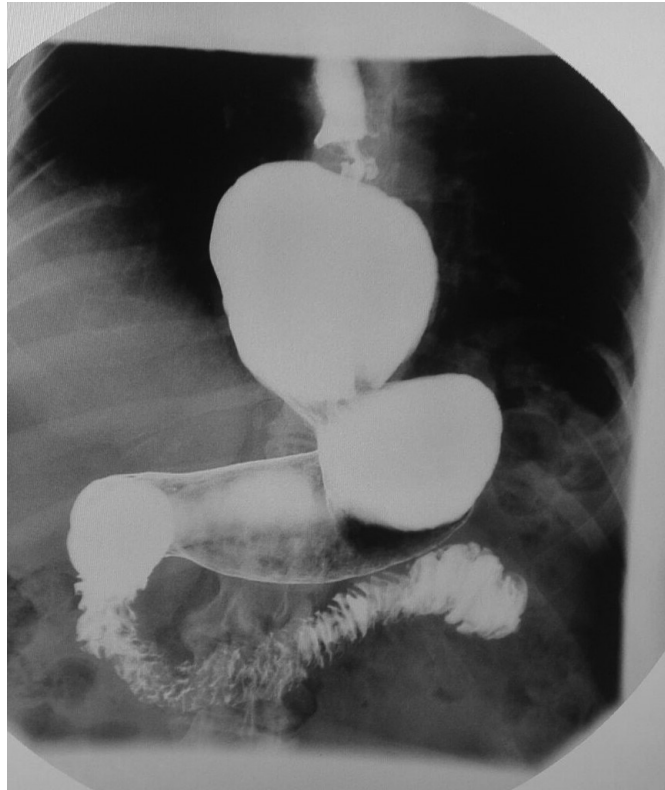


Figure 1. Barium swallow of huge sliding hiatal hernia.

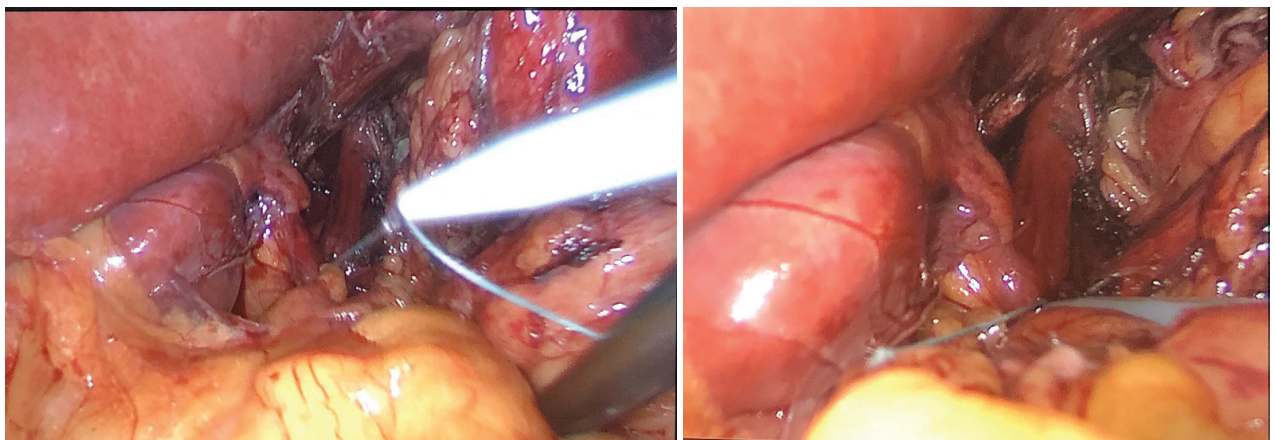


Figure 2. Diaphragmatic crura repair.

conventionally operated patients underwent middle supra-infra umbilical laparotomy. In laparoscopically operated patients, the pneumoperitoneum was created with a Veres needle, placed just below the umbilicus. The first trocar (camera's port) was placed on the left of the mid-line, 15–20 cm, always from the xiphoid process. Five trocars were routinely applied, and only in certain cases, due to technical problems during the operation, was an additional 6th and/or 7th port usually applied in the left upper lateral mesogastrum. The patients were placed in French Fowler position, and the surgeon stayed between the legs. The floppy Nissen technique was applied in all patients, and short gastric vessels were always divided. The tension-free crural repair was always performed with non-resorbable suture material, usually applying extracorporeal knots.

The floppy Nissen technique was used in all the patients, and short gastric vessels were always divided. In 21 patients, the fundoplication was anchored to the hiatus to prevent recurrence or migration of the valve to the mediastinum. In 2 patients with type 3 hernia, reinforcement of esophageal hiatus with titanium mesh was carried out because of the large hiatal defect. Postoperatively, gastroesophageal barium meal examination was performed in all patients, including asymptomatic individuals. The mean follow-up of patients was four years.

Abbreviations

Hiatal hernia - **HH**, Gastroesophageal Reflux Disease - **GERD**, Postoperative Ventral Hernia (**POVH**).

Results

Fifty-one patients were operated laparoscopically, and 2 patients underwent conventional surgery. Neither intraoperative nor postoperative anesthetic complications were seen. The average blood loss during the surgery was 100 ml (50–150 ml). The average operative time was 89 minutes and ranged from 56 to 122 minutes. The average hospital stay was 4.9 (1–43) days. (Table 2).

Table 2.

Variables	N of patients	Mean	Range
Age	53	61 years	25–84 years
Operative time	53	89 min	56–122 min
Hospital stay	53	4.9 days	1–43 days
Blood loss	53	100 ml	50–150 ml

Intraoperatively, type I HH was found in 33 patients: in 1 patient, type II HH – in one patient, and type III HH – in 7 patients. On two of the laparoscopically operated patients, a conversion was made: in one, because of the patient’s obesity with excessive abdominal fat; in the other - because of a giant hiatal hernia. In 5 patients, cholecystectomy was done simultaneously because of cholelithiasis. In one of the conventionally operated patients, a right colectomy was performed because of an appendicular mucinous tumor. The tumor had not been diagnosed preoperatively, and this additional finding was encountered during the surgery (Table 3).

Table 3.

Variables	Type I HH	Type II HH	Type III HH	Simultaneous cholecystectomy	Simultaneous right colectomy
Patients	33	1	7	5	1

The following complications and follow-up events were recorded (Table 4):

- Perforation of the distal esophagus occurred in one patient (1.9%) who was reoperated on the fifth postoperative day. Gastroesophageal disconnection with esophagostomy and permanent feeding jejunostomy were made.

The patient was evaluated for gastrointestinal tract reconstruction in the second and third postoperative years. However, due to the advanced patient's age and high perioperative risk, the reconstruction was dismissed.

- Bleeding of the spleen in 1 patient (1.9%) required emergent reoperation on the second postoperative day, and splenectomy was performed. The same patient was operated on in the second postoperative year for a giant ventral hernia.
- Dysphagia in the early postoperative period was diagnosed in 6 patients (11.3%) and was treated conservatively in all of them. One patient was readmitted for dysphagia. The symptoms in that case were worse with liquid rather than solid food.
- One patient (1.9%) was reoperated for stenosis of the distal esophagus and recurrent paraoesophageal hiatal hernia one year after the first intervention.
- One patient (1.9%) was operated on for small bowel obstruction in the 4th postoperative year. Seven months later, the patient underwent surgery for a postoperative ventral hernia, and 8 months after that, the patient underwent a right hemicolectomy for *volvulus of the caecum*.
- One patient (1.9%) was diagnosed with right colon carcinoma one year after the operation, and a right hemicolectomy was done.
- In 3 patients (5.6%), hiatal hernias recurrence and radiological signs of gastroesophageal reflux were recorded despite the fundoplication. Two out of these 3 patients had clinical symptoms of reflux.
- Early postoperative mortality was 0%. One patient (2.2%) died in the 4th postoperative year due to comorbidity not unrelated to the operation.
- No complications were recorded in the group of patients who underwent simultaneous surgery.

Table 4.

Postop. Complications and Follow-up events	Perforation of distal esophagus	Stenosis of distal esophagus	Abdominal bleeding Splenic lesion	Small bowel obstruction	POVH	Right colon cancer	Caecum volvulus	Recurrences	Dysphagia
N patients	1	1	1	1	2	1	1	4	6
Surgery	Gastroesophageal disconnection. Esophagostomy. Feeding jejunostomy	Redo surgery	Splenectomy	Explorative laparotomy	Mesh Eventroplasty	Right colectomy	Right colectomy	1 patient redo surgery 3 patients Follow-up	Medical treatment

Discussion

Nowadays, laparoscopic Nissen fundoplication has become a gold standard for treating HH and GERD. Approaching, dissection, and freeing of mediastinum adhesions with subsequent retrieving of the hernial sac are incomparably easier laparoscopically than conventionally, which makes it applicable even in circumstances of HH recurrence and failure of antireflux surgery (Schlottmann et al. 2021).

One of the challenges to surgeons dealing with this type of pathology is repairing the hiatal crura in giant hiatal hernias. The dilemma is whether a synthetic mesh should be applied or the diaphragmatic crura should be closed without a mesh. Despite publications supporting the use of synthetic mesh due to the low hernia recurrence rate, the risk of esophageal erosion led to the general aban-

donment of synthetic materials in the closure of the esophageal hiatus. Most surgeons consider hernia recurrence a lesser problem than esophageal erosion, which can result in esophagectomy. However, because of the advantages of the mesh in the reinforcement of diaphragmatic crura and simultaneously diminishing the risk of esophageal erosion, there is presently increased interest in the use of biologic and/or absorbable meshes for giant hiatal hernia repair (Diwan et al. 2008; Oelschlager et al. 2011). In a recent systematic review, Petric J. et al. concluded that reinforcing esophageal hiatus with mesh offers no advantage over suturing the diaphragmatic crura with non-resorbable suture material (Petric et al. 2022). Both techniques give excellent outcomes and similar recurrence rates, but diaphragmatic crura closure with a nonabsorbable suture is still the more suitable choice (Watson et al. 2020; Petric et al. 2021). An alternative technique to crura closure without mesh in large hiatal hernias is the hepatic shoulder technique, as described by Quilici P. J. et al. The technique involves mobilizing and placing the left liver lobe immediately below the gastroesophageal junction. The recurrence rate in Quilici's series of 49 patients with 10-year follow-up was 12.3% (Quilici et al. 2020). In our series, reinforcement of esophageal hiatus with titanium mesh was carried out only in 2 patients with type 3 hernia. In the rest of the patients, hiatal cruras were closed with non-resorbable suture material.

Another challenge to surgeons is the recurrence of the hiatal hernia, whether they require surgical treatment, and when to apply it. Many authors believe that recurrent asymptomatic hiatal hernia does not require surgical treatment and that the physiopathology of a small recurrent hiatal hernia is very different from that of the intrathoracic stomach before the operation (Zehetner et al. 2011; De-meester 2015). Petric J. et al. reported 735 patients who underwent surgery for HH. Of these, 388 patients had mesh reinforcement of the esophageal hiatus, and 347 had simple closure of the diaphragmatic crura. The recurrence rate in the first postoperative year was 10.1% in the mesh reinforcement technique vs. 15.5% for simple crura suture ($p = 0.22$). In the 3–5 year period, it was 30.7% for the mesh vs. 31.3% for the diaphragmatic crura suture ($p = 0.69$) (Petric et al. 2022). In our group, 3 patients (5.6%) had radiological signs of HH recurrence and GERD despite the fundoplication. Two of them had clinical symptoms of GERD. One patient (1.9%) was reoperated for stenosis of the distal esophagus and recurrent paraoesophageal hiatal hernia one year after the first intervention. The overall recurrence rate was 7.5%. The low recurrence rate in our series of patients is probably attributable to the relatively small group of operated individuals. No patient underwent additional surgery for symptomatic GERD recurrence.

As for Barrett's esophagus, there is a good response to the disorder's evolution after introducing the laparoscopic Nissen fundoplication (Wetscher 2004; Castelijns 2018). Barrett's esophagus should be treated with an antireflux procedure only if there is no data on distal esophageal metaplasia because that would make the subsequent endoscopic follow-up difficult (Oelschlager et al. 2003). In our group of three patients with Barrett's esophagus who underwent surgery, there was no preoperative data of distal esophageal metaplasia.

Conclusions

1. The laparoscopic approach for treating hiatal hernias and gastroesophageal reflux has become a gold standard in surgical practice.

2. According to the literature, reinforcement of the esophageal hiatus with mesh versus closure with nonabsorbable suture material yields good and comparable clinical results. Diaphragmatic crura suture alone is still a more appropriate method.
3. Despite the good postoperative results in the control of GERD and the low rate of recurrence of hiatal hernia, postoperative life-threatening complications can be seen.
4. In our series of 53 operated patients, the recurrence rate was 7.5%, with a mean follow-up of 4 years and good control of GERD. The discrepancy between the lower recurrence rate reported in our study and the rate reported in the literature is probably due to the relatively small group of patients in our study.

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