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Post-operative giant hiatal hernia

A single center experience

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Abstract

To verify the results of the treatment of post-operative giant hiatal hernia (POGH).

The POGH becomes each time more frequent after surgical treatment of the gastroesophageal reflux.

Fifteen patients (6 females and 9 males; 43.66 ± 5.05 years old; BMI 22.13 ± 1.92) were referred to our Service, for surgical treatment of a type III POGH 30.4 ± 1.76 months after treatment of gastroesophageal reflux disease. The need for a reoperation was determined mainly by dysphagia.

Reoperation was completed laparoscopically in all patients and the mean postoperative hospital stay was 3.2 ± 1.2 days (range, 1–6 days). Mortality was 0% and there were not postoperative complications. They became asymptomatic along follow-up of 2.86 ± 1.40 years. Around 1 year from the procedure, patients were submitted to control exams and barium esophagogram revealed well positioned esophago-gastric junction and signs of intact fundoplicature, the same observation having been done at esophageal endoscopy. Esophageal manometry showed preserved peristaltism, increase of resting pressure and extension of the intra-abdominal LES and significant raise of amplitude of deglutition waves at distal third of the esophagus. No reflux was observed at post-operative 24-hour pH testing.

The corrective surgery of POGH can often be completed laparoscopically in experienced hands. Successful results can be obtained performing reduction of the hernia, sac excision, crural repair, anti-reflux procedure and long anterior gastropexy.

Abbreviations: BMI = body mass index, EGD = Esophagogastroduodenoscopy, GERD = gastroesophageal reflux disease, LES = lower esophageal sphincter, POGH = post-operative giant hiatal hernia, PPI = proton pump inhibitor, QoL = quality of life.

Keywords: complications, giant hiatal hernia, postoperative hiatal hernia, surgical treatment of GERD

1. Introduction

Hiatal hernia is a common disorder.[1] It is characterized by a protrusion of any abdominal structure other than the esophagus into the thoracic cavity through a widening of the hiatus of the diaphragm.

Recurrent hiatal hernias are known problem in clinical practice. Any hernia seen on postoperative radiological contrast imaging or on endoscopy is classified as a recurrence and when greater than 2 cm in length is often clinically significant.[2]

An entity becomes each time more frequent, the postoperative giant herniation (POGH), after surgical treatment of the gastroesophageal reflux. Giant hiatal hernias are generally defined as those hernias with greater than 50% of the stomach above the diaphragm.[1] Of them, more than 90% are Type III hernias, a combination of Types I and II, with both the gastroesophageal junction and the stomach herniating through the hiatus.

In the early postoperative period, sudden increases in intra-abdominal pressure are thought to predispose to this anatomical failure. Thus, early postoperative gagging, belching, and vomiting have been suggested to be predisposing factors.[3] Gastric distension should be recognized early as it can be potentially dangerous in the immediate postoperative phase, and can be treated successfully by the placement of a nasogastric tube.

Body weight gain, a significant independent risk factor for development of a hiatal hernia, also increases the rate of post-operative hernia.[4] The larger the size of the hiatal hernia, as measured by the hiatal surface area, the more likely the possibility of a recurrence.[5] Certainly, other factors as pregnancy, intestinal constipation, prostatism, copious meals and excessive athletic activities also can cause late rupture of the new anatomical configuration of the esophago-gastric junction.[6]

Characterization and treatment of giant herniation after fundoplication are the aim of this study.

2. Methods

Fifteen patients (6 females and 9 males; 43.66 ± 5.05 years old; BMI 22.13 ± 1.92) were referred to our Service, for surgical

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All authors have contributed to and agreed on the content of the manuscript.

Ethics Committee approved this research with acceptable international standards (Declaration of Helsinki). All persons gave their informed consent prior to their inclusion in the study.

The authors have no conflicts of interest to disclose.

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Table 1

Clinical data. Possible determinant factors of POGH.

Remarkable events	Number of patients	%
Gagging, belching, or nausea in early post-operative period	4	26
Intestinal constipation	6	40
Free athletic activities	9	60
Body weight gain after surgery	14	93
Non-restricted volume of meals	15	100

treatment of a type III POGH, from 2010 to 2013. All patients underwent a prior laparoscopy 30.4 ± 1.76 months ago for the treatment of gastroesophageal reflux disease (GERD). The need for a reoperation was determined by dysphagia, weight loss (5.43 ± 1.12 Kg), chest pain, early satiety and regurgitation; five patients referred associated heartburn despite PPI use (omeprazole 20 mg twice a day). The duration of these symptoms was 22 ± 2.82 months. The patients were inquired about potential determinant factors of emergence of POGH after the previous surgical procedure (Table 1) and remarkable events of late post-operative period were prevalent. The interval between the initial surgery and reoperation was 33.86 ± 1.92 months. The study has been performed in accordance with the ethical standards laid down in *Declaration of Helsinki* and was approved by Ethical Committee; all patients signed informed consent.

A barium esophagogram was performed primarily and was most useful in developing a working diagnosis. The presence of a giant type III hiatal herniawas common to allpatients (Fig. 1).

Endoscopy was used to define the esophago-gastric anatomy and to identify esophagitis or another foregut disease. Giant type III hiatal hernia was confirmed in all, as well as distal esophagitis, Los Angeles (LA) Grade A in ten patients (67%) and LA Grade B, in 5 (33%). Fundoplicature was partially (6/15 – 40%) or totally (9/15 – 60%) dehiscent in all cases.

Esophageal manometry was performed using an 8-channel water-perfused catheter (Medtronics/Synectics, Stockholm, Sweden). Resting pressure and extension of the intrathoracic lower esophageal sphincter (LES) were analyzed (7.33 ± 1.01 mmHg and 1.53 ± 0.39 cm, respectively); esophageal body motility (preserved peristalsis in all) and amplitude of deglutition waves at distal third of the esophagus (13.8 ± 2.11 mmHg) were evaluated along 10 wet swallows (Table 2). Manometry was also used in all patients to guarantee precise pH probe positioning 5 cm above LES.

Twenty-four-hour pH testing was done in all and the DeMeester score was calculated using the standard software program (Medtronics/Synectics, Stockholm, Sweden). It was abnormal (41.35 ± 3.15) in 13 out the 15 patients tested.

New exams were programmed to post-operative follow-up.

2.1. Surgical procedure

The abdomen is entered using the Veress needle technique in the left upper quadrant. Carbon dioxide gas is insufflated, a 10-mm port is placed, and a camera is inserted. Blunt dissection is used to separate adhesions. The camera is switched to a second port after its placement 5 to 6 cm above the umbilicus in the midline. The remainders of the ports are placed in the usual manner for a laparoscopic Nissen fundoplication.

Defining the diaphragmatic crura is the first step of the procedure. This allows for anatomic dissection at the hiatus.

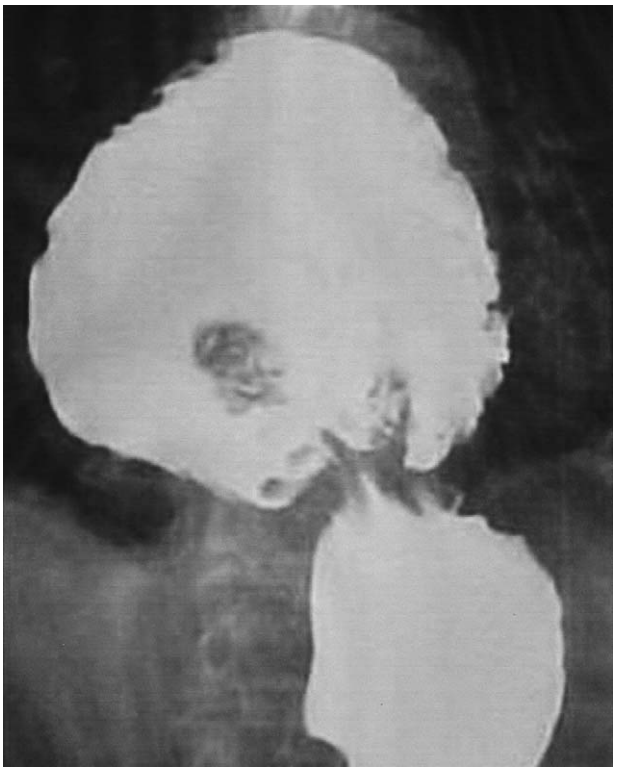

Figure 1. Esophagogram. Post-operative giant hiatal hernia without any signal of previous fundoplicature.

There were always signals of previous tentative of hiatoplasty (remnants of suture threads and fibrotic tissue). One retracted local mesh was found and resected. The right crus of the diaphragm is defined by retracting the liver and sharply dissecting the stomach off the liver bed. This plane is followed in the direction of the diaphragm until the vertical muscle fibers of the right crus are identified. The right crus is separated from the esophagus, followed up to the anterior portion of the right crus, and finally, to the left crus. The gastroesophageal junction is located by repositioning the stomach into the abdomen and retracting the esophagus.

Surgical technique includes routinely reduction of hiatal hernia, complete excision of the mediastinal sac, complete takedown of the previous fundoplication (when partially dehiscent – 4 patients) and extended mediastinal dissection to obtain at least 2.5 cm of intra-abdominal esophagus without tension. Primary crural closure is performed in simple 2.0 cotton sutures in posterior face of the hiatus, joining right and left arms of the crura, with separate stitches; sutures in anterior and left faces are applied to complete loose esophageal adjusting to the

Table 2

Manometric data.

Esophageal manometry	Pre-operative	Post-operative	*P*
LES extension (cm)	1.53 ± 0.39	3.23 ± 0.41	<.01*
LES rest pressure (mmHg)	7.33 ± 1.01	13.13 ± 1.40	<.01*
Deglutition wave amplitude (mmHg)	13.8 ± 2.11	36.86 ± 3.22	<.01*

* Statistical significance.

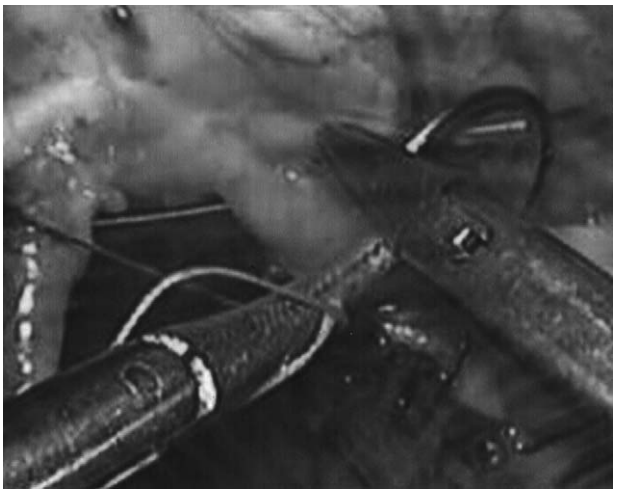

Figure 2. Suturing the anterior face of the hiatus.

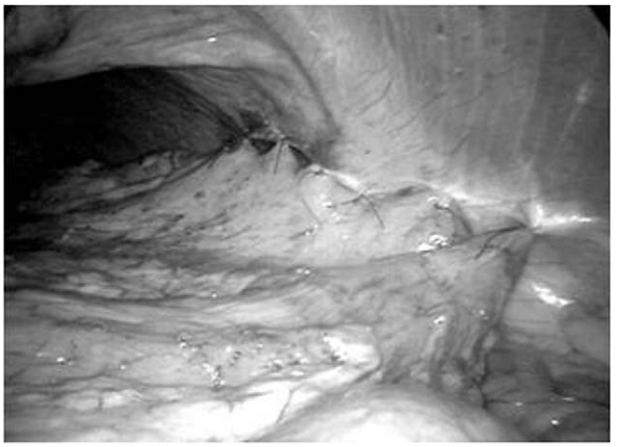

Figure 4. Long anterior gastropexy.

crura (Fig. 2). Any type of mesh overlay is never used. A 360° Nissen fundoplication (Fig. 3) and long anterior gastropexy (Fig. 4), also using 2.0 cotton sutures, are performed to complete procedure.

Patients are followed by a graduated diet from liquids at the outcome to soft solids in the first 30 post-operative days. Then all receive free diet being advertised to avoid copious meals, body overweight and excessive physical efforts along their lives. They must control rigorously their intestinal habit.

2.2. Statistical analysis

Statistical analysis of the quantitative data was performed using the Student *t* test.

3. Results

Reoperation was completed laparoscopically in all patients and the duration of the procedure in this series was 2.5 ± 0.37 hours. The mean postoperative hospital stay was 3.2 ± 1.2 days (range, 1–6 days). Mortality was 0% and there were not postoperative complications. They became asymptomatic along follow-up of 2.86 ± 1.40 years (range 1–5 years; median 3 years). PPI was discontinued in all.

Around 1 year from the procedure, patients were submitted to control exams and barium esophagogram revealed well positioned esophago-gastric junction, without hiatal hernia, in all, with signs of fundoplicature (Fig. 5), the same observation having been done at esophageal endoscopy; no endoscopic inflammation

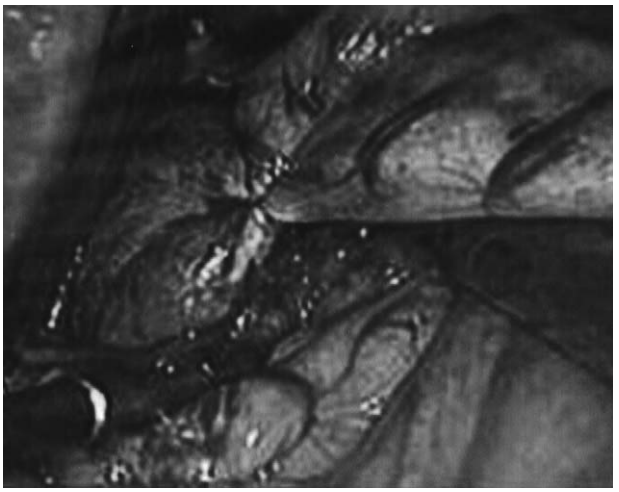

Figure 3. Nissen fundoplication.

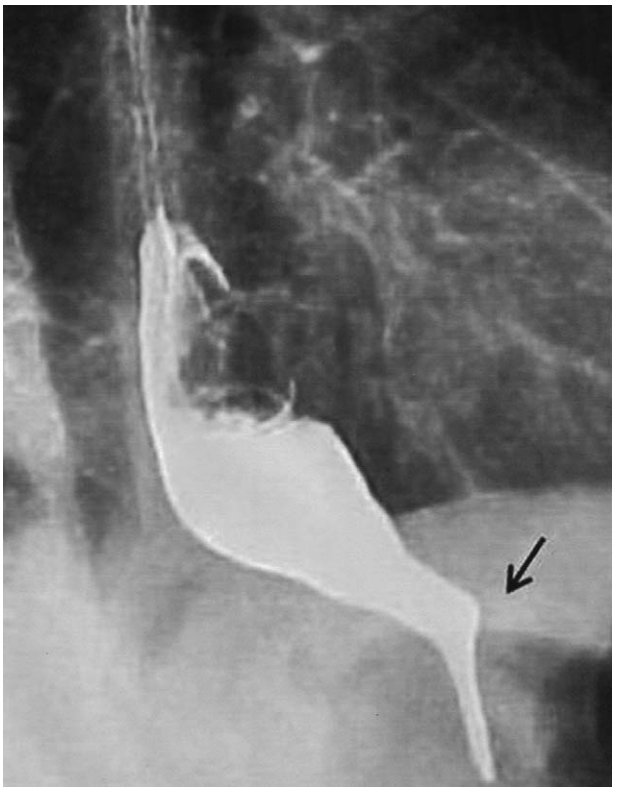

Figure 5. Post-operative esophagogram. Intra-abdominal esophago-gastric junction and radiologic sign of fundoplicature (arrow).

was recognized, except 1 patient, showing an edematous distal esophagitis.

Esophageal manometry demonstrated preserved peristaltism, increase of resting pressure and extension of the intra-abdominal LES (13.13 ± 1.40 mmHg and 3.23 ± 0.41 cm, respectively; $P < .01$ to both), and significant raise of amplitude of deglutition waves at distal third of the esophagus (36.86 ± 3.22 mmHg; $P < .01$) (Table 2). No reflux was observed at post-operative 24-hour pH testing.

4. Discussion

Giant hiatal hernias are generally defined as those hernias with greater than 50% of the stomach above the diaphragm.[1] Thoughtfulness must be reserved to rising index of its occurrence after surgical treatment of GERD, a current practice in the video laparoscopic era. Many factors contribute to its emergence, including disrespected limits in late post-operative period as we demonstrated inquiring our patients about potential determinant causes of type III POGH. Volume of meals was never restricted, body weight gain was common to almost all patients and 60% out them (9/15) had practiced free athletic activities; on the other hand, only 26% of patients (4/15) referred remarkable events in early post-operative period.

Not only early post-operative gastric distension, gagging, belching, and vomiting are predisposing factors,[3] but pre-existing or supervening body weight gain, pregnancy, intestinal constipation, prostatism, copious meals and excessive athletic activities can also cause late rupture of the new anatomical configuration of the esophago-gastric junction[6]. Alert to all these factors are basic steps if we want a desirable definitive solution to our operated patients.

A series of 15 patients is presented, all exhibiting giant hiatal hernia as post-operative event after surgical treatment of GERD, showing clinical presentation of the POGH and the results of surgical repair. Contrast studies are helpful to gauge the size and reducibility of the hiatal hernia, and to localize precisely the gastroesophageal junction and the stomach in relation to the esophageal hiatus. Esophagogastroduodenoscopy (EGD) allows visual assessment of the mucosa of the esophagus, stomach and duodenum. Further, the size and type of hernia can be confirmed.

Esophageal manometry can demonstrate the level of the diaphragmatic crura, the respiratory inversion point and the location of the LES. An esophageal motility study is critical to discard anassociatedmotor disease, mainly in dysphagic patients, and to enable a pH probe to be properly positioned 5 cm above the LES. The pH testing has limited relevance in the diagnosis of a hiatal hernia, but is critical to identify the presence of increased esophageal acid exposure and to confirm surgical results in scientific protocols.

All these concepts were reinforced in this series of post-operative giant hiatal hernias (POGH). Contrast studies and esophagogastroduodenoscopies documented disease as well as adequately positioned esophagogastric junction after surgical procedure and esophageal motility study showed significant differences from pre-operative to post-operative measures of resting pressure and extension of LES and amplitude of deglutition waves at distal third of the esophagus. Intrathoracic LES became intra-abdominal high-pressure zone. Proved pre-operative gastroesophageal reflux disappeared at 24-hour pH testing in 13 patients after operation.

Only hernias where the gastric fundus has migrated above the diaphragm, that is, paraesophageal hernias, are at risk of obstruction.[7] Obstructive symptoms range from mild nausea, bloating, or postprandial fullness to severe distress with dysphagia and retching. Pain, often described as a full or heavy feeling in the upper abdomen or as severe postprandial pain is often relieved by vomiting. Dysphagia and postprandial fullness occur secondary to compression of the adjacent esophagus by a progressively expanding herniated stomach and by angulation of the gastroesophageal junction that occurs as the stomach becomes progressively displaced in the chest.[8] In this series, mainly dysphagia justified reoperation. The laparoscopic approach was used in all our cases, but conversion to open should be considered for complex problems or when appropriate for the safety of the patient.[9]

Giant hiatal hernias can be repaired either transabdominally (open or laparoscopic), as we prefer, or via thoracotomy, usually through the left chest. There are no randomized trials directly comparing open transthoracic vs open transabdominal hiatal hernia repair, and there are no data assessing minimally-invasive thoracic approaches. There are superior QoL scores with laparoscopic repair compared to open transthoracic repair.[10] While the transthoracic approach offers excellent visualization of the hiatus and the ability to maximally mobilize the esophagus, the morbidity and prolonged recovery associated with this approach have rendered it obsolete except in rare circumstances. The standard for repair today is a laparoscopic approach.

Laparoscopic hiatal hernia repair results in less postoperative pain compared with the open approach. The smaller incisions of minimally-invasive surgery are less likely to be complicated by incisional hernias and wound infection. Postoperative respiratory complications are reduced, with shorter hospital stay and less morbidity resulting from the minimally invasive approach. Recurrence rates are similar.[11]

Open conversion is occasionally necessary for reasons such as bleeding, splenic injury or dense adhesions, and it is important that surgeons taking these on as laparoscopic procedures are comfortable with an open repair should conversion become necessary. We did not have intraoperative intercurrences, post-operative relevant undesirable events or mortality.

Sac dissection during hernia repair is thought to release the tethering of the esophagus, to facilitate intraoperative reduction of the hernia and to decrease early recurrence, as well as protecting the esophagus from iatrogenic damage.[12] Hiatal hernia recurrence can be reduced by extensive mediastinal esophageal mobilization to bring the gastro-esophageal junction at least 2 to 3 cm into the abdomen without tension.[13]

Primary sutured crural repair has been the mainstay of practice and some authors advocate that the crural repair must be reinforced, but the ideal mesh and technique are unknown at this point. Most commonly the mesh is applied in an on-lay fashion after primary crural closure. In some cases, mesh has been used as an interposition or bridge when crural approximation is not possible.[14] In the rare occasion when the crus cannot be primarily approximated, various techniques using native or prosthetic material have been described, as have techniques for crural relaxing incisions to allow primary crural closure in patients with large defects.[15] In our cases, complementary sutures in anterior and left faces of hiatus promoted convincing adjustment of esophagus to crura.

Additional evidence is required to better establish the safety and long-term outcomes of mesh use at the hiatus. Long-term safety related to the type of mesh used and placement technique is important, with many similarities being drawn in the literature to the Angelchik prosthesis used as an antireflux barrier in past decades which was found to cause frequent erosions into the esophageal lumen.[16]

A limitation of the available data is the lack of long-term follow-up mesh implantation. Although mesh erosion is the most feared complication, other complications also can occur, such as esophageal stenosis, pericardial tamponade and effusion.[17,18] Synthetic mesh when placed as a bridge is more likely to have direct contact with the oesophagus and as a result is probably associated with erosion. We avoided any type of mesh in this series.

Most of reports of paraesophageal hiatal hernia repair in the recent literature describe the performance of a fundoplication as a step of the repair, and we agree. This is thought to aid in prevention of postoperative gastroesophageal reflux and to buttress the repair to prevent recurrence.[19] Moreover, extensive hiatal dissection might also potentiate reflux. There is however no high-level evidence to support this practice of routine fundoplication.

The placement of a gastrostomy tube is often used to both provide fixation of the anterior stomach to the abdominal wall and to aid in post-operative venting of the stomach in cases of delayed gastric emptying. Study promoting an anterior gastropexy to reduce the recurrence rate after laparoscopic hiatal hernia repair described in a prospective series of 28 patients a repair with reduction of the hernia, sac excision, crural repair, anti-reflux procedure and routine anterior gastropexy.[20] No recurrences were reported in up to 2 years of follow-up evaluation. Applying the same technique in a series of 14 patients published in 1994[21] we observed comparable results. This finding has been supported by others; a recent study of 89 patients with large hiatal hernias undergoing laparoscopic repair concluded that the addition of a anterior gastropexy significantly reduced recurrent hernias.[22] Other reports concluded the opposite. Medium-term outcome in 116 patients having laparoscopic paraesophageal hernia repair,[23] with and without gastropexy, found no significant difference in recurrence rate. In this series gastropexy was routinely performed seeming important to guarantee good late results.

The results of the series showed that the corrective surgery of POGH emerged after surgical treatment of GERD can often be completed laparoscopically in experienced hands. Successful results can be obtained performing reduction of the hernia, sac excision, crural repair, anti-reflux procedure and long anterior gastropexy.

Author contributions

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