

Minimally Invasive Surgery for Achalasia: Laparoscopic Heller Myotomy with Accidental Esophageal Perforation

Jara Hernandez Gutierrez* and Aurelio F Aranzana Gómez

General Surgery, Complejo Hospitalario Universitario de Toledo, Spain

*Corresponding Author: Jara Hernandez Gutierrez, General Surgery, Complejo Hospitalario Universitario de Toledo, Spain.

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Abstract

Achalasia is a relatively rare disease included within the group of motor disorders of the esophagus, characterized by impaired lower esophageal sphincter relaxations and the absence of esophageal peristalsis.

Laparoscopic Heller myotomy has become the procedure of choice for treating primary achalasia, due to the fact that the procedure is the one that has shown the best results in terms of morbidity, mortality and recurrences.

We present a 60-year-old woman diagnosed with Achalasia. We describe the procedure and show figures of the surgery. The patient underwent an extended Heller's extramucosal myotomy with intraoperative esophageal perforation at the esophagogastric junction, associating Dor type anterior antireflux technique, the surgical procedure was completed laparoscopically. There was no postoperative morbidity or mortality. At 4 years follow-up the patient was asymptomatic and with correct radiological control.

The Minimally Invasive Surgery is the treatment of choice for Achalasia, it consists of an extended Heller myotomy associated with an antireflux technique. Intraoperative perforation of the esophageal mucosa always makes the procedure more difficult, and it is necessary to insist on completing the myotomy to avoid recurrence of the disease.

Keywords: Achalasia; Lower Esophageal Sphincter; Extended Heller's Extramucosal Myotomy; Esophageal Perforation; Minimally Invasive Surgery; Laparoscopic Surgery;

Abbreviations

LES: Lower Esophageal Sphincter; CT: Computed Tomography; EGD: Esophageal Transit; PO: Postoperative;

EGJ: Esophagogastric Junction

Introduction

Achalasia is a relatively rare disease included within the group of motor disorders of the esophagus, characterized by impaired lower esophageal sphincter relaxations and the absence of esophageal peristalsis.

The treatment of this pathology has evolved, going through pharmacological medical treatment, endoscopic dilation, conventional surgical treatment with a thoracic or abdominal approach and lately with a thoracoscopic or laparoscopic approach associ-

ated with an antireflux procedure. The Minimally Invasive Surgery is the treatment of choice for Achalasia, because is the one that has shown the best results in terms of morbidity and mortality and recurrences, being today the most indicated treatment.

One of the most serious complications associated with this procedure is perforation of the esophageal mucosa. If promptly and carefully repaired at the time it is discovered, it is rarely followed by an esophageal fistula. The most common site of the perforation is at the level of the esophagogastric junction, and it occurs when the myotomy is extended onto the gastric wall.

Materials and Methods

We present a clinical case, it is a 60-year-old female patient diagnosed with achalasia, who presented a marked esophageal dilation in the preoperative esophageal transit.

The complementary explorations and iconography of interest are exposed:

- **Endoscopy:** Gastroscopy. Esophagus somewhat dilated with tertiary contractions. At the level of the distal esophagus, punctate stenosis with normal-appearing mucosa flanking without difficulty passing into the stomach. Findings suggestive of primary achalasia. Stomach with pale mucosa that reveals the submucosal vascular network, with decreased gastric folds. Negative antrum and body biopsies.
- **Manometry:** Not performed due to the refusal of the patient.
- **Thoracic-abdominal CT:** Esophageal dilation to the esophagogastric junction where stenosis is observed (bird's beak). Findings in relation to Achalasia.
- **Esophageal transit while standing (EGD):** Increase in the caliber of the esophagus due to lack of relaxation at the LES level. Suggestive of Achalasic disorder.

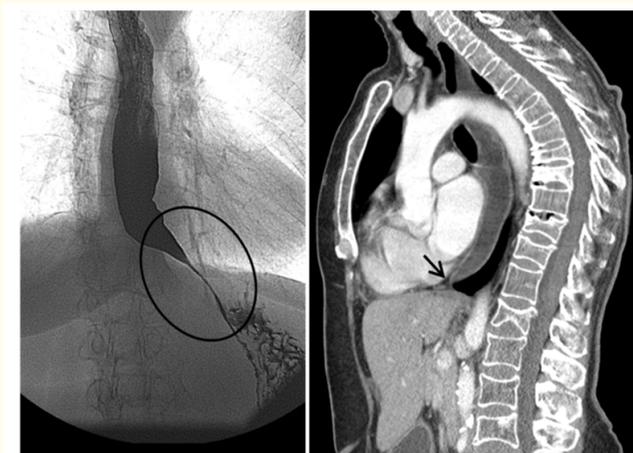


Figure 1: EGD and CT. Esophageal transit in the standing position, an increase in the caliber of the esophagus was observed due to lack of relaxation at the level of the lower esophageal sphincter (circle), suggestive of achalasia. On CT, esophageal dilation was observed until the esophagus-gastric junction where a stenosis was observed "in the beak of a bird" (arrow), findings related to achalasia.

We describe the procedure and show figures of the surgical intervention, the objective is to show the performance of an extended Heller myotomy by laparoscopy, even when an intraoperative esophageal perforation occurs.

Results and Discussion

Patient underwent minimally invasive surgery using a laparoscopic approach with 5 trocars. Basically, the surgery proceeded in accordance with our standardized procedure for laparoscopic extended Heller extramucosal myotomy, measuring more than 10 cm, including 3 cm distal to the esophagogastric junction.

During the surgical procedure, mucosal perforation was observed at the esophagogastric junction, which made it difficult to perform the myotomy due to fibrosis, dissection of fibers proximal and distal to the perforation was necessary. The perforation is sutured with alternate stitches of resorbable material, checking the tightness of the esophageal mucosa suture with methylene blue. Associating a Dor type anterior antireflux technique fixed to the abutments and both edges of the myotomy with drainage placement.

Good postoperative course of the patient. Ingestion on the 4th postoperative day after radiological control with water-soluble contrast.

We describe the procedure and show figures of the surgical intervention

Figure a

At the beginning of the surgical procedure the hepatic retractor is inserted. The left lateral segment of the liver is retracted, exposing the hiatus. We began the intervention by opening the gastrohepatic ligament with LigaSure™ Blunt Tip.

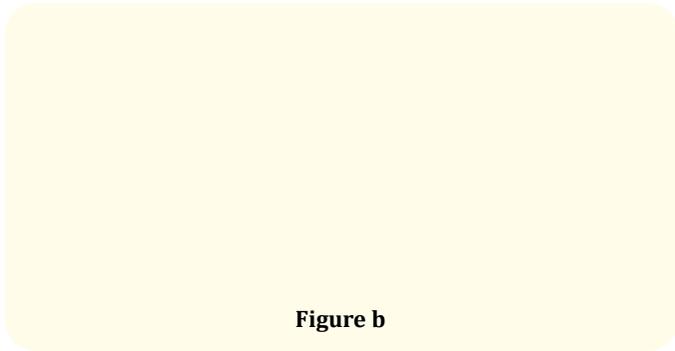


Figure b

Section of the phrenoesophageal membrane at the level of the left diaphragmatic crus, continuing the dissection on the lateral and anterior sides of the esophagus.

The dissection of the esophageal hiatus is completed, achieving complete exposure of the UEG and both diaphragmatic crura. The posterior fixations of the esophagus are preserved intact. It is not necessary to perform a retroesophageal window for the realization of a Dor-type anterior fundoplication.

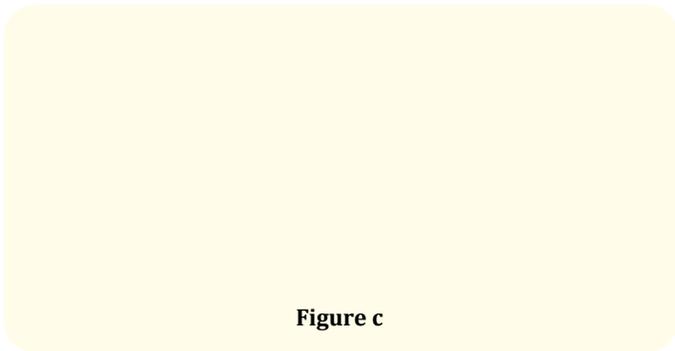


Figure c

Dissection is started by dividing the gastrosplenic ligament beginning just lateral to the midportion of the greater curvature of the stomach using ligasure dissection. The short gastric vessels are divided along with the posterior attachments to the fundus.

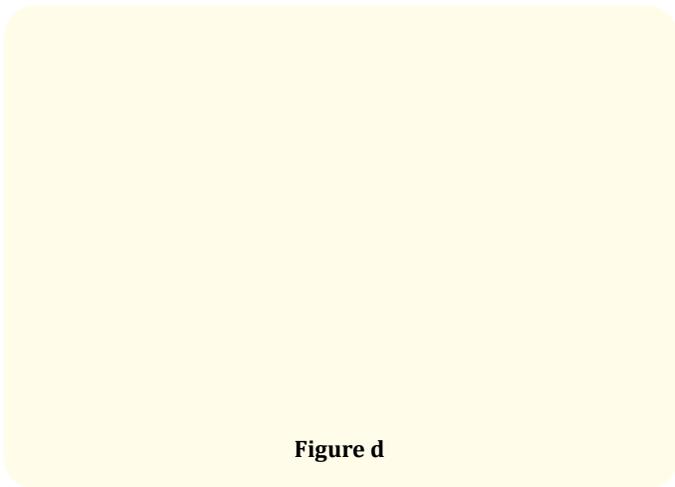


Figure d

Identification of the His angle.

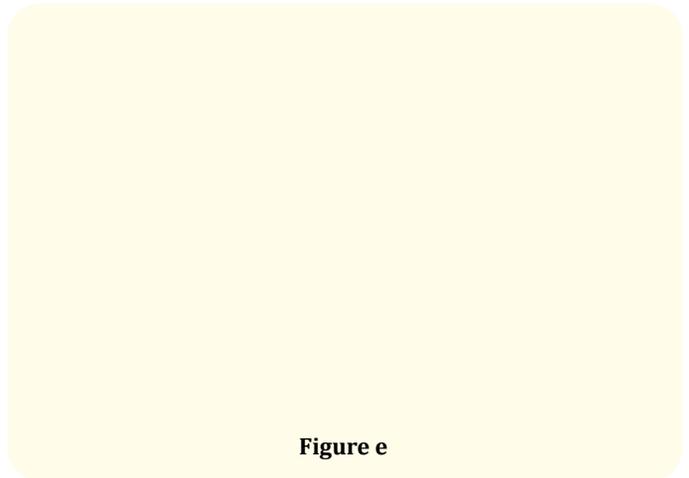


Figure e

Identification of the left diaphragmatic cru.

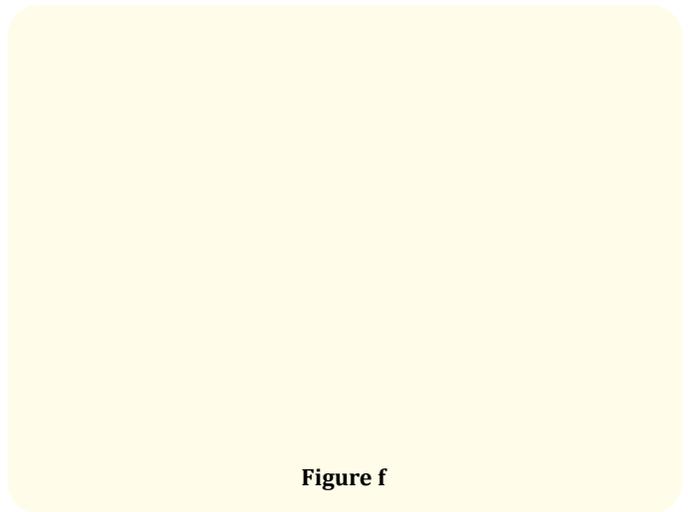


Figure f

Once the greater curvature is completely mobilized, the gastrohepatic ligament is divided and the right cru of the diaphragm is exposed. Dissection is continued to expose the esophagogastric junction.

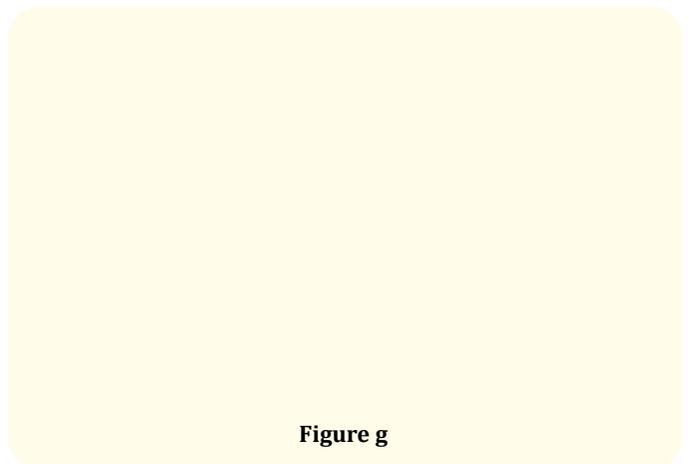


Figure g

Dissection is continued to expose the distal portion of the esophagus. Identify and spare the anterior vagus nerve. In some patients with extensive adhesions of the hernia sac, a bougie may

facilitate identification of the esophageal wall and vagal nerves. A 36F Foucher esophageal bougie is placed into the stomach.

Figure h

Extended mediastinal esophageal dissection: a circumferential dissection of the esophagus is made in the mediastinum to get

enough abdominal esophagus (> 5 cm) to properly perform myotomy.

Figure i

It is important to rule out the presence of a short esophagus.

Identification and mobilization of the anterior vagus nerve, preserving it.

Figure j

A wide myotomy is started on the anterior face of the esophagus, about 2 cm distal from the cardia.

Dissolution of the longitudinal muscular layer until visualizing the circumferential muscle fibers.

Always keep in mind to preserve the anterior vagus nerve.

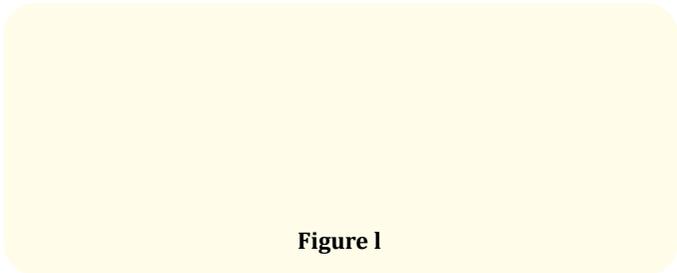


Figure l

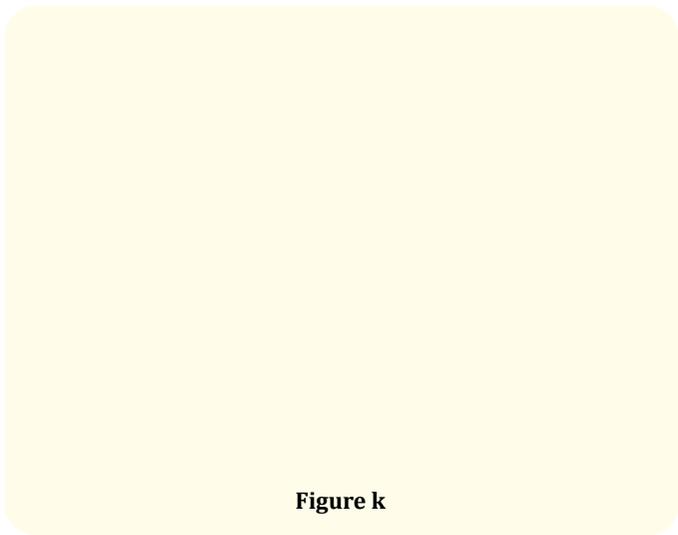


Figure k

Section of the circular fibers until the submucosal plane is easily discovered. The myotomy is continued in the cranial direction

until reaching a length of 6-7cm. Thus we complete the proximal myotomy.

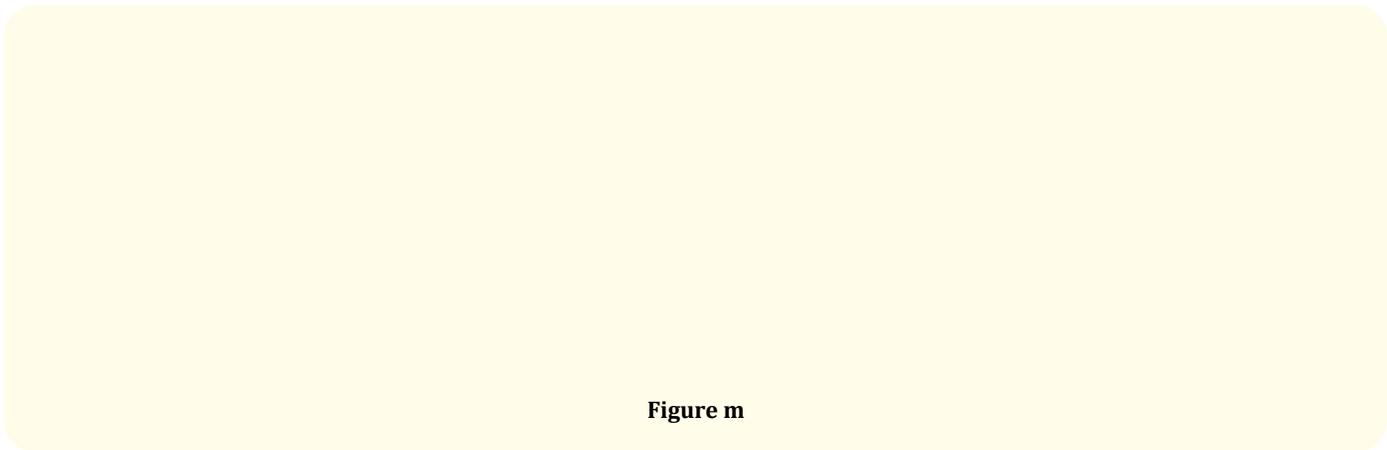


Figure m

We start the distal myotomy. Myotomy at the level of the gastric anterior plane and in line with the esophageal myotomy, we do it with coagulation with the hook to be able to do it selectively. The section of the gastric muscle fibers begins about 2 cm distal to the cardia, identifying characteristic oblique fibers. The dissection progresses in a cranial direction to the confluence with the esophageal myotomy.

Mucosal esophageal Perforation During Laparoscopic Heller Myotomy.

Completion of the distal myotomy.

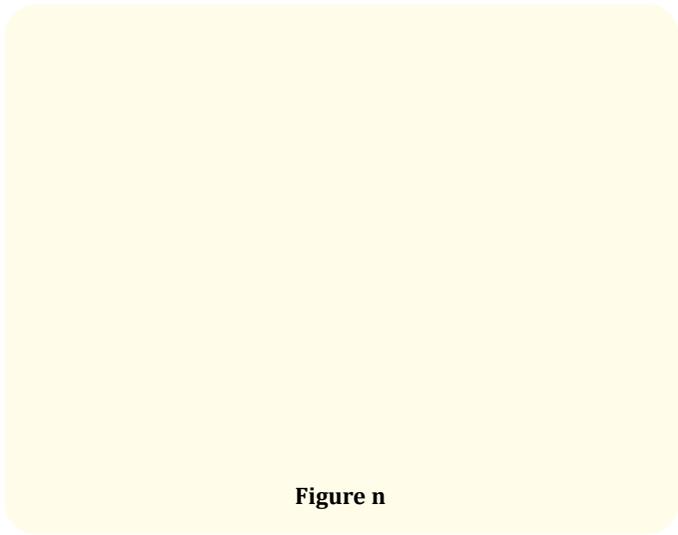


Figure n

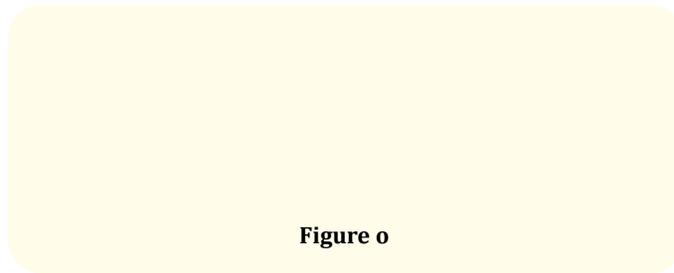


Figure o

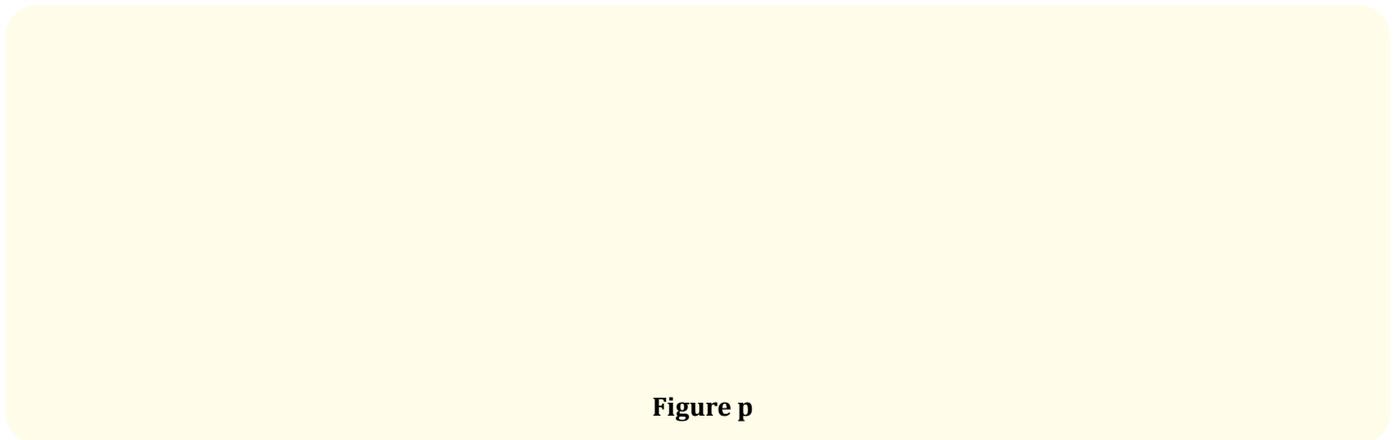


Figure p

Myotomy proximal to the mucosal esophageal perforation.

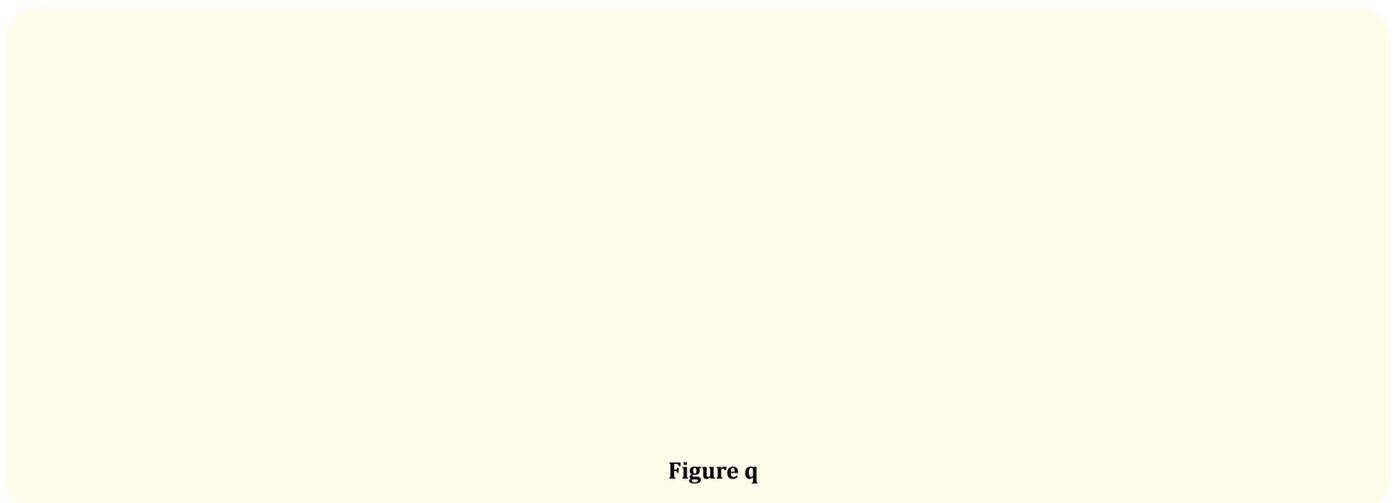


Figure q

Myotomy distal to the mucosal esophageal perforation.

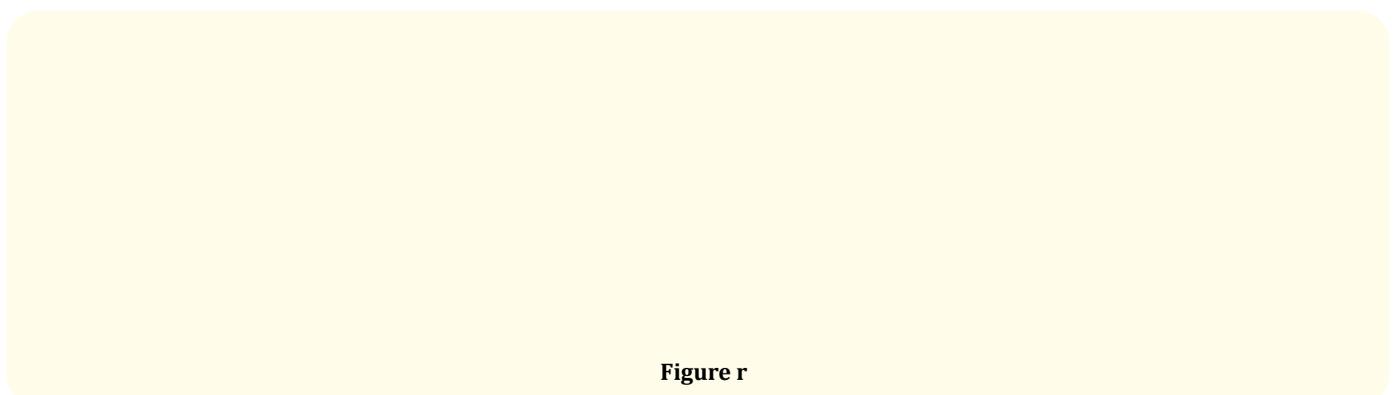


Figure r

Myotomy measurement > 10 cm. Heller extramucosal myotomy extending more than 10 cm including 3 cm distal to the esophago-gastric junction. We perform a calibration bougie with a 33F Faucher tube.

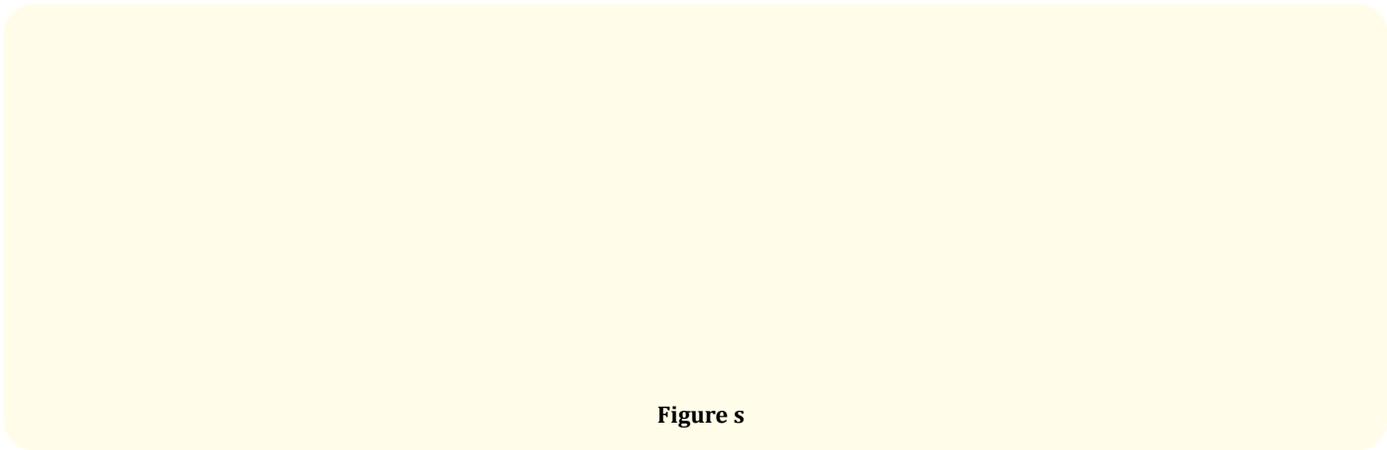


Figure s

A 3/0 absorbable suture was performed with 1-3 separate stitches to suture the mucosal perforation.

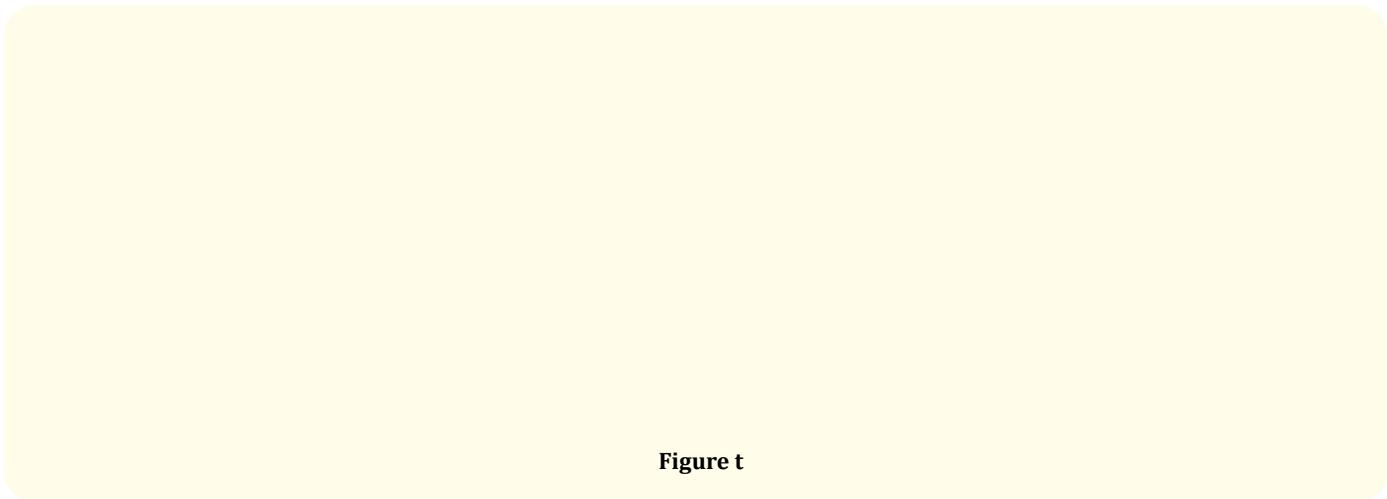


Figure t

Instillation of methylene blue through the nasogastric tube to test for integrity of the esophageal and gastric wall.

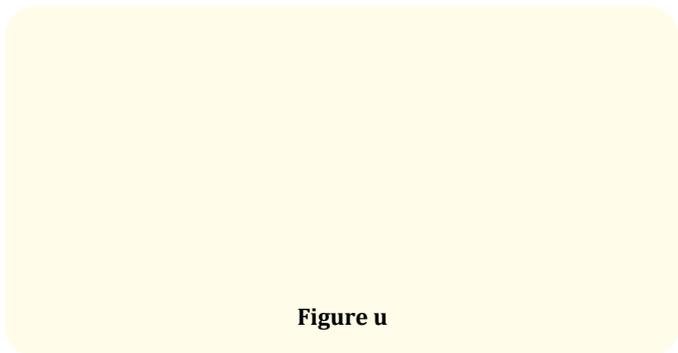
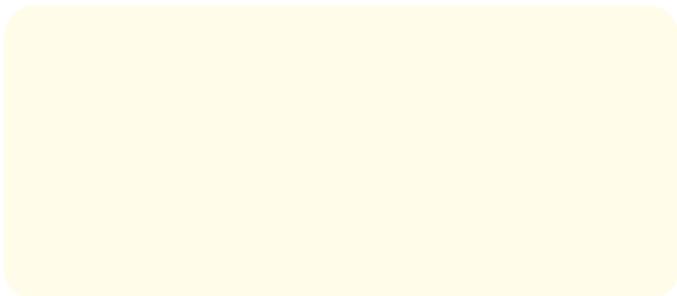


Figure u

Associating an antireflux technique Dor Anterior fundoplication. It is important to do a mobilization of the gastric fundus, for a correct fundoplication.

Fixing 4 stitches on each side of the myotomy and 1 stitch taking the edge of the myotomy and fixed to each diaphragmatic crus.

Figure 2: EGD 4th day PO: a transit through the esophagus is observed within normal limits.

Patient is discharged from hospital on the 6th postoperative day. Being asymptomatic and with correct radiological control 4 years after surgery.

Achalasia is a relatively rare disease included within the group of motor disorders of the esophagus, characterized by impaired lower esophageal sphincter relaxations and the absence of esophageal peristalsis. The onset of symptoms is insidious and progresses gradually. The most frequent symptom is dysphagia for solids (91%) and for liquids (85%), another symptom that can accompany it is retrosternal chest pain, regurgitation of the esophageal content (76-91%), weight loss [10].

For this a wide diagnostic arsenal is available: the upper gastrointestinal transit shows characteristic signs such as the dilation of the esophageal body or the sharpening of the esophagogastric junction.

Upper endoscopy may reveal a dilated esophagus that contains residual material, sometimes in large quantities. The LES typically does not open spontaneously to allow effortless passage of the endoscope into the stomach but, unlike obstruction caused by neoplasms or fibrotic strictures, the contracted LES can usually be

traversed easily with gentle pressure on the endoscope. The esophageal mucosa usually appears normal. Endoscopy is very important since it allows to rule out other diseases.

Manometry allows to confirm the diagnosis when objectifying an aperistalsis of the esophageal body. Both conventional and high-resolution manometry can diagnose achalasia, but high-resolution manometry is preferred due to a higher sensitivity, as it provides enhanced detail in the characterization of achalasia and the morphology of the esophagogastric junction. HRM can also be used to accurately categorize achalasia into one of three distinctive subtypes - Type I (classic achalasia), II or III (spastic achalasia), which can guide prognosis and management.

pHmetry is indicated whenever the patient reports symptoms compatible with GERD [9].

The treatment of this pathology has evolved, going through the medical pharmacological treatment of little efficacy, endoscopic dilation or conventional surgery with a thoracic or abdominal approach and lately with a thoracoscopic or laparoscopic approach associated with an antireflux procedure. The Minimally Invasive Surgery is the treatment of choice for Achalasia, because is the one that has shown the best results in terms of morbidity and mortality and recurrences, being today the most indicated treatment. Furthermore, in recent years, with the development of more advanced endoscopic techniques, a new endoscopic technique has been developed for the treatment of this pathology; the POEM technique (Per Oral Endoscopic Myotomy). It is a less invasive selective myotomy than surgical treatment. This technique is safe and effective, although the clinical guidelines consider that more experience is necessary before recommending it [9].

Achalasia has an indication for surgical treatment with a success rate greater than 90%. It is indicated in patients without surgical contraindication as the first therapeutic option or in those patients in whom other treatments have failed.

The laparoscopic approach using 5 trocars, with the patient in a supine position and with the lower extremities open and in a slight anti-Trendelenburg position. A pneumoperitoneum was established through a Veress needle, and maintained at 10 mmHg. Four working trocars were placed: a 5-10mm trocar in the xiphoid midline, a 10 mm trocar in the supraumbilical midline, a 5mm subcostal trocar in the right upper quadrant, a 5-10 mm subcostal trocar in the left upper quadrant, and lastly, a lower 5mm trocar, in the left upper quadrant.

Figure 3: Diagram showing the insertion points of the trocars [12].

Regarding the surgical technique, it consists of performing a myotomy by means of a single and total section of the esophageal musculature longitudinally on the anterior face of the esophagus, about 2 cm from the cardia. This technique is called Heller extramucosal myotomy.

There is controversy regarding the association or not of an antireflux procedure and also regarding the length of the myotomy.

We usually perform a Heller extended extramucosal myotomy, it consists of an extended myotomy of more than 10 cm in length including 3 cm distal to the esophagogastric junction. Associating an antireflux technique Dor anterior fundoplication (90°), fixing the first point to the apex of the hiatal orifice and the rest, 2 or 3 more, to the right edge of the myotomy and the right pillar. Another alternative is the Toupet-type fundoplication (posterior 270°), there is no consensus on which of the two techniques has better results. The Dor-type anterior fundoplication avoids the mobilization of the stomach during the initial dissection, produces less alteration of the anatomy, allows covering the esophageal mucosa in the event of a perforation and is easier and faster to perform [12]. The advantages of the Toupet's technique are that it supposes a more effective antireflux mechanism and keeps the edges of the myotomy separated, thus avoiding possible recurrence.

The complications of the surgical treatment of achalasia are esophageal perforation with an incidence of 1-7% [12], pleural in-

jury, injury of a vagal trunk conditioning gastroparesis that could favor gastroesophageal reflux.

Esophageal perforation does not usually go unnoticed, since during the surgical procedure the surgeon observes the exit of air, saliva, etc. which allows its early diagnosis and therefore its treatment. If a perforation is appreciated intraoperatively, a Dor-type fundoplication is recommended.

Long-term complications may also occur, such as persistent dysphagia, which may be related to insufficient myotomy or gastroesophageal reflux, being more frequent when an antireflux technique is not associated during the procedure [2].

Conclusion

The laparoscopic approach is of choice in the surgical treatment of achalasia, with the extended Heller myotomy associated with an antireflux technique being the technique that has shown the best results. The length of the myotomy, especially below the esophagogastric junction, is one of the most important aspects of the surgery, most authors recommend that the myotomy extends 1-2 cm into the stomach, we, like Pellegrini, propose to expand the myotomy up to 3 cm below the EGJ to achieve effective LES disruption. Intraoperative perforation of the esophageal mucosa always makes the procedure difficult, and it is necessary to insist on completing the myotomy to avoid recurrence of the disease.

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Conflict of Interest

The authors have no conflicts of interest to declare.

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