

# Laparoscopic treatment of a gastric diverticulum

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**Abstract.** – Gastric diverticula are rare disorders which present usually with vague upper abdominal symptoms. The diagnosis is based on endoscopic and radiologic findings, but it may remain uncertain until the operation. Herein we report the case of a 46-year-old woman with a diverticulum of the posterior aspect of the upper part of the gastric fundus, referred to our attention for epigastric pain. The preoperative work out evidenced a pouch of the gastric fundus which was misinterpreted as a paraesophageal or a diaphragmatic hernia. The operation was performed by laparoscopy with a 4-port technique and the diverticulum was resected by an endoscopic stapler. The patient is well and symptom-free more than two months after the operation.

*Key Words:*

Gastric diverticulum, Laparoscopic resection, Laparoscopic gastric surgery.

## Introduction

Gastric diverticula are rare disorders. They may be found in the upper portion of the stomach, where they are true diverticula as their wall is composed of all the layers of the gastric wall. They may also be located in the distal stomach, and in that case they are false diverticula as they form as a result of the herniation of the mucosa and submucosa through the muscular wall. The patients often present with atypical gastroesophageal symptoms. Diagnosis may be difficult as they can mimic other pathologies, such as paraesophageal hernias, gastric ulcers or neoplasms, renal or adrenal cysts, fundic varices. The treatment of choice is the surgical excision of the diverticulum. The advance of laparoscopic surgery permits to treat such diverticula by mini-

mally invasive techniques. Herein we present the case of a patient with a gastric fundus diverticulum simulating a paraesophageal hernia, excised by laparoscopy.

## Case Report

A 46 year-old woman was referred to our endoscopic service for epigastric pain and fullness. Endoscopy revealed a circular opening in the gastric fundus upper-posterior wall, which simulated a left diaphragmatic or paraesophageal hernia (Figure 1). Subsequently, the patient underwent a barium study, which confirmed the presence of a little well-defined pear-shaped pouch in the posterior aspect of the upper gastric fundus (Figure 2). Also the radiologist misinterpreted this finding as a diaphragmatic or a paraesophageal hernia.

The surgical treatment was decided and a laparoscopic approach was planned with the informed consent of the patient.

After antibiotic short-term intravenous prophylaxis, general anaesthesia was induced and maintained as usual. The trocars were placed according to our technique of laparoscopic fundoplication. The first 10-12 mm trocar was placed with the “open” technique about 10 cm cranially with respect to the umbilicus and about 6 cm at the left of the midline. The second 10-12 mm trocar was inserted along the midclavicular line in the left upper quadrant. The third 10 mm trocar was inserted slightly at the right of the midline in the right upper quadrant. The last 10 mm trocar for the liver retractor was placed in the right upper quadrant just anteriorly to the anterior axillary line.

To obtain a good exposure of the proximal gastric portion, the left lobe of the liver was retracted by an atraumatic retractor.

All manoeuvres were performed by the ultrasonic dissector.



**Figure 1.** Endoscopic picture showing a sharply defined opening in the gastric fundus wall.

The gastric fundus was completely mobilized by the section of the upper short vessels, the upper gastrosplenic ligament and the gastrophrenic ligament. The phrenoesophageal membrane was incised and the anterior and right aspects of the hiatus were exposed. No paraesophageal hernia was found. On the contrary, a diverticulum of the posterior aspect of the gastric fundus was found at about 4 cm from the cardia and dissected free from the surrounding tissues. In particular, extensive adhesions were found between the diverticulum, the diaphragm and the upper pole of the spleen.

Once completely mobilized, the diverticulum was resected 1 cm distally to its neck with an en-



**Figure 2.** The barium upper intestinal study shows a pouch in the posterior aspect of the gastric fundus, some centimeters from the cardia.

doscopic stapler (Figure 3). The specimen was then removed in a retrieval bag.

The stump of the gastric fundus was anchored to the left crus by two single stitches.

Histology showed a gastric true diverticulum, with all the layers normally represented.

The procedure was completed with the insertion of a drainage tube near the hiatus and a nasogastric tube.

The postoperative period was completely uneventful. The nasogastric tube was removed on postoperative day 1. On postoperative day 3 a gastrographin swallow was performed, which confirmed the absence of any leak, and fluid oral intake was allowed. On postoperative day 4 normal food was allowed and the patient was discharged.

The patient is well and symptom-free more than 2 months after the operation.

## Discussion

Gastric diverticula are rare disorders, whose incidence ranges from 0,01% to 0,11%<sup>1</sup>, first described by Moebius in 1661<sup>2</sup>. The first – and maybe still valid – classification dates back to 1923<sup>3</sup>. It divides “true” diverticula and “false” ones. True gastric diverticula may be congenital, due to malformation, or acquired, due to the traction of the gastric wall by inflammatory adhesions (traction diverticula). All five layers of gastric wall are represented. In false gastric diverticula the inner layers herniate through a weak mus-



**Figure 3.** Intraoperative picture showing the completely mobilized diverticulum being resected with an endoscopic stapler.

cularis (pulsion diverticula). Nothing new with respect to the classical pathogenesis of digestive tube diverticula. True diverticula are typically located at the posterior wall near the gastroesophageal junction, probably due to an anatomical weakness related to the splitting of the longitudinal muscular fibers leaving only the circular and oblique fibers to cover the mucosal layer<sup>4</sup>. The false diverticula are mostly located in the distal part of the stomach, and in particular in the prepyloric region, resembling a “double pylorus” aspect at endoscopy<sup>5</sup>.

Most gastric diverticula are thought to be asymptomatic or to cause vague symptoms. Often, the patient may complain of dyspepsia, epigastric pain and/or sensation of fullness. Rarely, the diverticulum can cause vomiting or rare complications such as bleeding or perforation<sup>1,6-9</sup>. Moreover, the diverticulum itself may contain ectopic pancreatic tissue or gastric glands which may cause erosions and ulcerations. Our patient was referred to us by her family physician to investigate her epigastric pain and discomfort. For this reason she underwent an upper endoscopy and a barium study, which revealed a “pouch” of the gastric fundus, with normal gastric mucosal pattern. Both exams did not succeed to demonstrate that the pouch was on one side or the other of the diaphragm. The endoscopist and the radiologist thought it might be a paraesophageal or a diaphragmatic hernia. Endoscopic diagnosis is based on the finding of a circular opening in the gastric wall with a defined margin and a normal mucosa surrounding the hole<sup>10</sup>, whereas the radiologic findings are those of a pouch with a narrow neck, usually in the posterior aspect of the gastric fundus, with absence of spasm in the surrounding gastric wall<sup>11</sup>. Computed tomography may be useful in selected cases<sup>12,13</sup>. Even with the most accurate technique in the most expert hands, a margin of diagnostic uncertainty remains, as about 5% of gastric diverticula may be missed at upper gastrointestinal series<sup>10</sup>. Moreover, a gastric diverticulum may often mimic a paraesophageal or diaphragmatic hernia, as in our case, an adrenal mass<sup>14,15</sup>, a gastric, pancreatic or renal tumor or fundic varices<sup>4,13</sup>. Finally, a gastric diverticulum may be often associated with other disorders, such as reflux disease with/without hiatal hernia<sup>4,13,17</sup>, gastric volvulus<sup>2</sup> or cholelithiasis<sup>16</sup>. Sometimes, only the association of endoscopy, conventional radiology, computed tomography and endoscopic ultrasound may define the diagnosis before the operation<sup>12,13,18</sup>.

Laparoscopic resection of a gastric diverticulum was first described in 1998 by Fine<sup>12</sup>. Since then, the laparoscopic approach has demonstrated to be safe and effective<sup>4,16,17,19,20</sup> also in children<sup>8</sup>. The position of the trocars may be the same as laparoscopic fundoplication. Likewise to the laparoscopic operations for reflux disease, we place the trocars in a reverse W-shaped pattern. The first trocar, for the 30° scope, is inserted about 10 cm cranially with respect to the umbilicus and about 6 cm at the left of the midline, just in front of the hiatus, which is slightly at the left of the midline. The second and third trocars are placed respectively in the upper left quadrant along the midclavicular line and in the upper right quadrant slightly at the right of the midline. The fourth trocar, for the liver retraction, is placed in the upper right quadrant, just anteriorly to the anterior axillary line, instead of the more commonly used epigastric site. In laparoscopic fundoplication we often use a fifth trocar, placed in the upper left quadrant along the anterior axillary line, to exert a caudal traction on the gastric body, but in this case this fifth trocar was not necessary.

As we suspected a diaphragmatic hernia at the left of the hiatus or a left paraesophageal hernia, the dissection started with the access in the upper lesser sac with the division of the upper short vessels and the gastrophrenic and upper gastrosplenic ligaments, to completely mobilize the gastric fundus. To explore the hiatus in order to rule out the presence of a paraesophageal hernia, the phrenoesophageal membrane was taken down and the left crus was exposed. As in other reports, to mobilize the fundus some adhesions needed to be dissected<sup>4,8,16</sup> and the posterior gastric wall was reflected ventrally<sup>20</sup>. No diaphragmatic or paraesophageal hernia was found, but a gastric fundus diverticulum was immediately evident and could be dissected free. However, the identification of the diverticulum is not always so easy. Some Authors suggest the use of intraoperative endoscopy<sup>4,12</sup>, some others advocate the gastric filling with air<sup>20</sup> or saline<sup>21</sup>, or even an anterior gastrotomy<sup>22</sup>. The immediate availability of an endoscopist is mandatory during this kind of surgery, as with every other esophagogastric surgical procedure. Other techniques, and in particular the performance of an explorative gastrotomy, might be considered obsolete. The complete dissection of the left aspect of the hiatus is useful to rule out other disorders, such as a left paraesophageal hernia or a hiatal hernia. During the

dissection of the fundus, which can be performed by harmonic dissector or electrified scissors and clips, attention must be paid to avoid injuries of the upper pole of the spleen.

The resection of the diverticulum can be performed by means of a linear endoscopic stapler, following a line slightly proximal to the neck of the diverticulum. In some case the pneumatic control of the stapled line may be useful<sup>4</sup>.

The short and long term follow-up reveals the complete resolution of the symptoms in most of these patients after the operation<sup>4,8,12,16,17,19,20</sup>.

As the operation is minimally invasive and highly effective, it may be considered the first choice treatment in all symptomatic gastric diverticula.

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