



Contents lists available at ScienceDirect

## International Journal of Surgery Case Reports

journal homepage: [www.casereports.com](http://www.casereports.com)

## Asymptomatic gastric diverticulum as incidental radiographic finding after surgery for strangulated inguinal hernia: Report of a case

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## ARTICLE INFO

## Article history:

Received 7 January 2018  
 Received in revised form 16 March 2018  
 Accepted 20 March 2018  
 Available online 22 March 2018

## Keywords:

Gastric diverticulum  
 Asymptomatic  
 Strangulated hernia  
 Radiographic  
 Laparoscopic resection

## ABSTRACT

**INTRODUCTION:** Gastric diverticula consist a rare form of diverticula of the gastrointestinal tract. They can be described as an “out-pouching” protrusion from the gastric wall. They are usually found in patients aged between 20 and 60 years old.

**PRESENTATION OF CASE:** We present herein a case of an 82 year- old male patient who was admitted to our hospital with a strangulated inguinal hernia and a gastric diverticulum was incidentally found, as a post- operative radiographic finding.

**DISCUSSION:** For symptomatic gastric diverticula, a conservative treatment is usually preferred as first approach with PPIs and soft diet to alleviate the symptoms. Surgical treatment as first approach should be preserved for cases where a connection has been established between the patients’ symptoms and the clinical presentation.

**CONCLUSION:** Resection via laparoscopic surgery is nowadays the method of choice for the treatment of gastric diverticula. Open surgery is still performed through a median laparotomy or a subcostal incision.

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## 1. Introduction

Gastric diverticula consist a rare form of diverticula of the gastrointestinal tract. They can be described as an “out-pouching” protrusion from the gastric wall. They are usually found in patients aged between 20 and 60 years old. Cases have also been reported in children. They vary in size and shape and most often there is a single diverticulum. They are commonly 1–6 cm in diameter. Multiple and larger diverticula have also been reported [1]. The majority of them can be found in the posterior wall of the cardia region and along the lesser curvature. The greater curvature and the pyloric region can be affected as well [2]. Most patients are asymptomatic.

We present herein a case of an 82 year- old male patient who was admitted to our hospital with a strangulated inguinal hernia and a gastric diverticulum was incidentally found.

## 2. Case report

An 82-year-old male was admitted to the emergency department of our hospital complaining of colicky abdominal pain,

nausea, episodes of vomiting and inability to defecate for the last five days.

Clinical examination of the patient revealed a distended abdomen, with diffuse tenderness in the palpation of the lower abdomen, absent bowel sounds on auscultation, high fever up to 38,3 °C and a firmly fixed mass in the right lower quadrant of the abdomen, suggesting a strangulated, incarcerated inguinal hernia. Laboratory findings were significant for marked leukocytosis and hypokalemia, while the plain abdominal x-ray films revealed dilated small bowel loops with air- fluid levels.

The patient was then admitted to our department and was provided with oral gastrographin [Gastrographin gastroenteral solution®, sodium amidotrizoate (sodium diatrizoate) and meglumine amidotrizoate (meglumine diatrizoate)] and intravenous contrast agent in order to perform an emergency CT for diagnostic reasons. However, due to the presence of the acute abdomen and the rapid deterioration of the patient’s clinical situation, he underwent an emergency exploratory laparotomy. We did not consider the possibility of conservative treatment because the patient had emerging signs of acute abdomen. Through a midline incision, a thorough inspection of the abdominal cavity revealed purulent peritonitis with strangulated part of the omentum in the right inguinal region. The dead omental tissue was removed and the whole peritoneal cavity was surgically cleaned with large amounts of warm normal saline. The patient then moved to the intensive care unit (ICU) of our hospital.

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**Fig. 1.** Postoperative chest and abdominal x-rays showing a steady, round-shaped, radiopaque, radiographic finding in the left upper abdomen.

The patient remained in the ICU for 10 days and was discharged to our department for further management. During his presence in the ICU, postoperative chest and abdominal x-rays were performed and showed a steady, round-shaped, radiopaque, radiographic finding in the left upper abdomen (Fig. 1). At the same time, the patient presented high fever (up to 38.6 °C), with significant leukocytosis (WBC: 18 K/ $\mu$ l) and deterioration of the values of the liver enzymes, especially  $\gamma$ -GT. An abdominal ultrasound (U/S) revealed signs of acute acalculous cholecystitis but failed to explain the postoperative radiopaque finding, causing problems in the differential diagnosis (mass, foreign object).

An abdominal CT was performed, which confirmed the acute acalculous cholecystitis and also described a radiopaque formation in the left upper quadrant of the abdomen, with dimensions 3.6  $\times$  3.3 cm (Fig. 2).

Finally, an endoscopy of the upper gastrointestinal (GI) tract revealed the presence of a true diverticulum in the greater curvature of the stomach, in the gastric fundus, filled with chronic accumulation of calcified gastric contents “painted” with the oral gastrographin provided at the initial emergency CT (Fig. 3).

The patient underwent an emergency surgical operation, where access to the peritoneum was granted through the middle incision from the previous surgery. An open cholecystectomy was performed. Then, the stomach was carefully inspected and a large protrusion of the gastric wall was found at the fundus of the stom-

ach, consistent with the findings from the preoperative image studies. The diverticulum was excised at its base, removed and sent for histopathologic examination (Fig. 4). The gastric diverticulum was not seen during the first emergency exploratory laparotomy as it was located in the posterior wall of the stomach, it was asymptomatic and we had no previous knowledge or implication of its existence.

The development of signs compatible with acute acalculous cholecystitis during the presence of the patient in the ICU, along with the steady postoperative radiographic finding (the gastric diverticulum), lead us to the decision of a second operation, an open cholecystectomy and diverticulectomy at the same time.

Histopathology confirmed a gastric diverticulum comprising of all layers of the stomach wall, without presence of *H. pylori* or signs of malignancy.

### 3. Discussion

To our knowledge, gastric diverticula have been observed in 0.03–0.1% of upper gastrointestinal contrast studies, 0.03–0.3% of autopsies and 0.01–0.11% of oesophagogastroduodenal endoscopies [1]. The age of presentation is between 20- and 60-year old with a 1:1 ratio between male and female [2]. Cases of gastric diverticula in adolescents have also been reported [3–5], although 4% of gastric diverticula occur in patients under 20 years of age [2].



**Fig. 2.** Abdominal CT shows the gastric diverticulum withholding gastrografin.

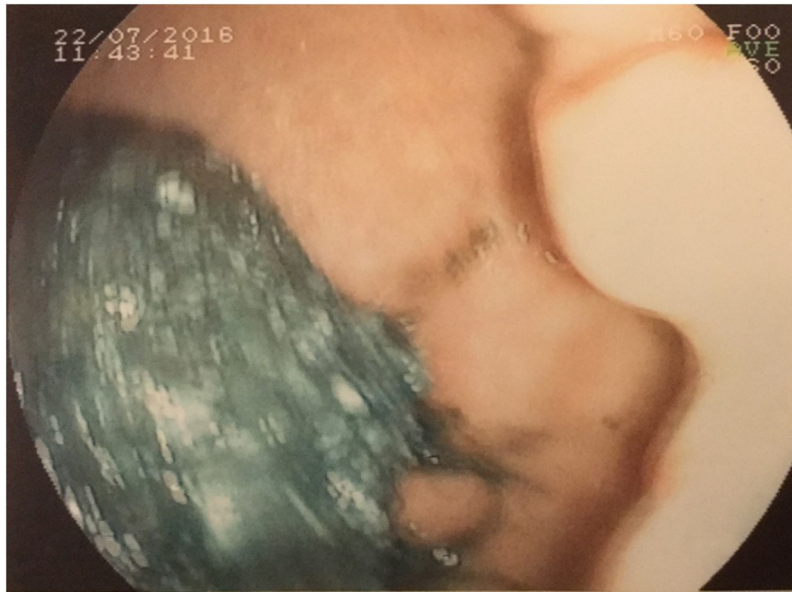
Gastric diverticula can be divided into two types depending on the cause of formation: congenital and acquired, and into two types depending on the histologic formation of their wall: true diverticula, consisting of all the layers of the stomach, and false or pseudodiverticula, which are lacking muscular layers. The congenital type tend to be true diverticulum and comprises 70–75% of all gastric diverticula [6]. This type is usually formed on the posterior wall of the stomach in the cardia region, approximately 2 cm bellow the oesophagogastric junction and 3 cm from the lesser curvature of the stomach [6]. This may be a result of the anatomy of this region of the stomach, because the longitudinal muscle fibres split and only the circular muscle layer remains to cover the mucosa [3]. In pediatric patients, pancreatic tissue can be found inside these diverticula. The pathophysiology of these juxtacardiac diverticula is a result of a division between the longitudinal smooth muscle

fibres in the cardia region of the stomach, which in turn causes weakness of the gastric wall [7].

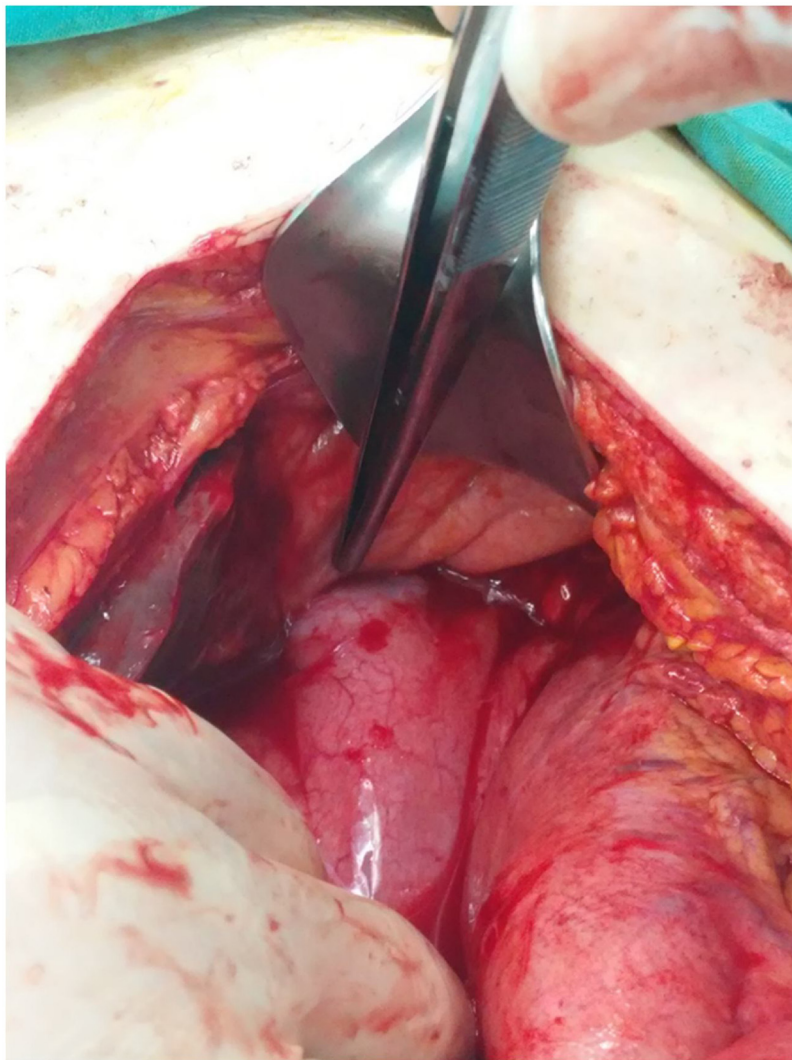
The acquired gastric diverticula are basically pseudodiverticula. They are associated with other conditions like gastric malignancy, peptic ulcer disease, pancreatitis and previous surgery. They are primarily found in adults usually near the gastric antrum. Recent trauma to the stomach wall during surgery of the stomach, for example Roux-en-Y gastric bypass [8], where areas of the stomach wall may be weakened due to surgery, is likely to form a false diverticula.

Most gastric diverticula are asymptomatic. Symptomatic patients may present with upper abdominal pain, dysphagia, nausea, vomit, early satiety and weight loss. There have been cases of dramatic presentation such as acute hemorrhage, perforation, diverticulitis and malignancy [8,9].





**Fig. 3.** The endoscopy of the upper gastrointestinal (GI) tract revealed the presence of a true diverticulum in the greater curvature of the stomach, in the gastric fundus, filled with chronic accumulation of calcified gastric contents “painted” with the oral gastrograhin provided for the initial emergency CT.



**Fig. 4.** The gastric diverticulum, located at the gastric fundus.

Imagine studies with orally administered barium: characteristic appearance of a mucosa-lined contrast-filled outpouching with air fluid level in the upright position [6]. On CT scans they are depicted as an abnormal rounded soft tissue shadow in the left paravertebral region. An upper gastrointestinal endoscopy is also useful to diagnose a gastric diverticula and can also be used to induce symptoms by enlarging the diverticuli with air or normal saline. More often, a combination of the above methods must be used to successfully diagnose a gastric diverticula.

For symptomatic gastric diverticula, a conservative treatment is usually preferred as first approach with PPIs and soft diet to alleviate the symptoms [2]. Surgical treatment as first approach should be preserved for cases where a connection has been established between the patients' symptoms and the clinical presentation. Resection via laparoscopic surgery is nowadays the method of choice [10]. Open surgery is still performed through a median laparotomy or a subcostal incision.

### Conflicts of interest

The authors state that they do not have any conflict of interest.

### Funding

The authors state that they do not have any source of funding for their research.

### Ethical approval

Our military hospital does not have an ethics committee and case reports are exempt from ethical approval in our institution.

### Consent

Written informed consent was obtained from the patient's relatives for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

The patient's relatives have provided informed consent and this case report has been written according to the SCARE guidelines [11].

### Author contribution

Ioannis Passos: General Surgery Resident, Medical Doctor in the Greek Army, Phd Candidate, Corresponding Author, Writer of the Manuscript.

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Michael Polyzonis: Consultant General Surgeon, Medical Doctor in the Greek Army, Second Operator, Data Collector.

George Chatzoulis: Consultant General Surgeon, Medical Doctor in the Greek Army, Data Collector, Conductor of the Case Report.

Konstantinos Miliias: Consultant General Surgeon, Medical Doctor in the Greek Army, Data Collector, Writer, Doctor of the Patient, First Operator, Conductor of the Case Report.

Panagiotis Spyridopoulos: Director of the Department of Surgery, Consultant General Surgeon, Medical Doctor in the Greek Army, Head of the Department of Surgery.

### Guarantor

Ioannis D. Passos.

### References

- [1] N.L. Simstein, Congenital gastric anomalies, *Am. Surg.* 52 (1986) 264–268.
- [2] E.D. Palmer, Gastric diverticulum, *Surg. Obstet. Gynecol.* 92 (1951) 417–428.
- [3] Rainer Kubiak, James Hamill, Laparoscopic gastric diverticulectomy in a 13-year-old girl, *Surg. Laparosc. Endosc. Percutan. Tech.* 16 (1) (2006) 29–31.
- [4] Steven Elliott, Anthony D. Sandler, John J. Meehan, John P. Lawrence, Surgical treatment of a gastric diverticulum in an adolescent, *J. Pediatr. Surg.* 41 (2006) 1467–1469.
- [5] Arbay O. Ciftci, F. Cahit Tanyel, et al., Gastric diverticulum: an uncommon cause of abdominal pain in a 12 year old, *Pediatr. Surg.* 33 (3) (1998) 529–531.
- [6] T. Tsitsias, J.G. Finch, Gastric diverticulum of the prepyloric region: a rare presentation of gastric diverticulum, *Case Rep. Gastroenterol.* 6 (2012) 150–154.
- [7] M.E. Lopez, C. Whyte, S. Kleinhaus, Y. Rivas, B.H. Harris, Laparoscopic excision of a gastric diverticulum in a child, *J. Laparoendosc. Adv. Surg. Tech. A* 17 (April) (2007) 246–248.
- [8] E.H. Cheng, R.R. Pavelock, Multiple gastrointestinal tract diverticula, *Gastrointest. Radiol.* 15 (1990) 282–284.
- [9] E. Chasse, A. Buggenhout, M. Zalcman, et al., Gastric diverticulum simulating a left adrenal tumor, *Surgery* 133 (2003) 447–448.
- [10] Andrea Zelisko, John Rodriguez, Kevin El-Hayek, Matthew Kroh, Laparoscopic resection of symptomatic gastric diverticula, *JSLs* 18 (2014) 120–124.
- [11] R.A. Agha, A.J. Fowler, A. Saetta, I. Barai, S. Rajmohan, D.P. Orgill, for the SCARE group, the SCARE statement: consensus-based surgical case report guidelines, *Int. J. Surg.* 34 (Oct) (2016) 180–186.

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