Stomach volvulus: Why should we remember it?  
Case review

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Abstract: Stomach volvulus is a medical entity which has different implications in terms of clinical presentation, diagnosis, imaging support, and pathological behavior and evaluation. Analysis of features of these implications is essential when deciding a course of action, which can vary from simple observation to aggressive and urgent resolutions in order to save the patient's life. Gastric volvulus represents an unusual rotation of the organ on its own axis, thus entailing risk of ischemia and necrosis. There are two major types of gastric volvulus, i.e., organoaxial and mesenteroaxial. It can occur in any stage of life, preferably in adulthood, with clinical signs of acute abdomen in most of the cases. Due to the risk of ischemia, necrosis, and vital compromise, an urgent response involves surgical resolution which can lead to the removal of the organ, with a high risk of mortality in the intra- and post-operative periods. We report the case of a patient presenting with the aforementioned clinical processes.  
Keywords: Borchardt’s triad, Gastrectomy, Stomach, Volvulus.

Resumen: El vólvulo gástrico es una entidad médica de diversas implicancias en cuanto a la presentación clínica, diagnóstico, apoyo imaginológico, conducta y evaluación patológica. Por tanto, es fundamental la revisión de las características de cada una de ellas, con el objeto de orientar una conducta que posee caracteres tan amplios como lo es la simple observación hasta una conducta agresiva y urgente que implique salvar la vida del paciente. El vólvulo gástrico consiste en una rotación del órgano sobre su propio eje, de baja ocurrencia, presentándose dos tipos: organoaxial y mesenteroaxial, en los cuales existe riesgo de isquemia y necrosis. Se manifiesta en cualquier etapa de la vida, de preferencia en etapa adulta y con clínica de abdomen agudo en gran parte de los casos. Debido al riesgo de isquemia, necrosis y compromiso vital, la conducta urgente implica resolución quirúrgica, que puede concluir en extirpación del órgano, con un alto riesgo de mortalidad en el intra y postoperatorio. Presentamos el caso de una paciente característica en cuanto a la presentación de los procesos clínicos antes mencionados. Palabras clave: Estómago, Gastrectomía, Triada de Borchardt, Vólvulo.

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Introduction

Gastric volvulus is a clinical entity caused by rotation of the stomach on its axis. This event of rare occurrence, less frequent than in other parts of the gastrointestinal tract, such as sigmoid, cecal or midgut volvulus, may be transient, with non-specific symptoms, or may lead to an obstruction with ischemia and necrosis.  

An estimated 75-80% of cases correspond to adult patients, with clinical presentation usually associated with predisposing congenital and acquired factors together.  

Gastric volvulus should be carefully considered as the cause of epigastric pain and vomiting, since misdiagnosis can lead to patient’s death.
Radiology procedures provide the most significant tool for diagnosis and subsequent therapeutic approach to this pathology, primarily through basic and x-ray contrast imaging, followed by CT scanning, which represents an excellent tool for anatomic orientation for treatment.

This work reports a case of gastric volvulus in adult patient without known associated comorbidity correlation with subsequent imaging, surgical, and anatomopathological findings.

**Case report**

Female patient aged 81 years old, with Tako-Ttsubo cardiomyopathy (transient apical dyskinesia) with surgical history of cholecystectomy and right total hip arthroplasty; she was brought to the emergency room complaining of epigastric abdominal pain, nausea, vomiting and fever within last 24 hours of evolution.

Clinical examination detected a markedly distended abdomen, highly sensitive, and febricula.

Abdominal and pelvic CT scan is requested due to suspected stuck umbilical hernia; it revealed a severe gastric dilatation with organ folding extending up to the pelvic excavation, compatible with organo-axial gastric volvulus associated to gastric pneumatosis and abundant portal venous gas, with displacement and compression of intestinal loops to posterior and inferior planes (Figures 1, 2, 3a, 3b). Laboratory tests revealed significant leukocytosis and increased PCR.

**Figure 1.** Scout view showing severe dilated tubular structure which extends from the left hypochondrium till the pelvic excavation, along with signs suggestive of intrahepatic air.

**Figure 2.** Coronal reconstruction of CT scan showing same findings described above, along with displacement and compression of small-bowel loops into the pelvis.

**Figure 3a.** Axial computed tomography showing large dilated stomach with signs suggestive of gastric pneumatosis and displacement of small-bowel loops towards right flank.

**Figure 3b.** Coronal reconstruction also depicting left kidney displacement.
Patient undergoes an extensive exploratory laparotomy evidencing an organo-axial volvulated stomach with transmural ischemic compromise of gastric body and fundus, in addition to a macroscopic perforation.

Total gastrectomy and subsequent anastomosis were performed (Figures 4, 5).

Anatomopathologic testing of surgical specimen evidenced complete gastric piece with necrotic gastric body and fundus along with macroscopic perforation in the same area (Figure 6).

Patient evolved satisfactorily from a medical perspective and anastomosis was programmed.

Discussion

Gastric volvulus is a rare entity. By 2009 a publication documented that 350 cases had been reported worldwide\(^\text{(1)}\). Its first description was made in 1866 by Berti, as a postmortem finding. Later, it was repeatedly described during autopsies and surgeries. In 1921, Rosselet reported the first case of chronic gastric volvulus radiologically seen\(^\text{(2)}\).

The peak incidence of gastric volvulus occurs in the fifth decade of life, although some authors speculate that it is higher in children\(^\text{(3)}\). No significant differences in prevalence by gender or race have been found, although some authors have reported a higher prevalence in females\(^\text{(4)}\).

Gastric volvulus is defined as an abnormal rotation of the stomach of more than 180 degrees, which can lead to obstruction of the gastric light, associated or not to blood flow alteration. It may result in complications such as gastric ischemia, necrosis and perforation, thus requiring rapid diagnosis.

Predisposing risk factors have been identified, which can be divided into idiopathic and secondary factors. Among idiopathic causes, elongation or absence of ligaments that attach the stomach to the peritoneum stand out: gastrohepatic, gastrophrenic, gastrocolic, and gastroplenic ligaments. Furthermore, abnormally distended stomachs are more prone to rotate. Other associated anomalies are diaphragmatic hernias, evagination of the diaphragm, wandering spleen, and malrotation with asplenia\(^\text{(5)}\). In a study of 500 autopsies of patients with hiatus hernia, incomplete gastric volvulus was found in 12 cases\(^\text{(6)}\).

Figure 4. Image of overdistended stomach in supra- and infra-umbilical open laparotomy.

Figure 5. Intraoperative view of stomach with mucosal signs of ischemia and necrosis at gastric fundus and body levels.

Figure 6. Total gastrectomy specimen with signs of severe vascular compromise at the level of gastric body and fundus.
Bariatric surgery, such as Nissen fundoplication, gastric ligament ruptures post liver transplantation, or trauma and gastric tumors are mentioned among secondary risk factors.

According to the direction of rotation, two types of volvulus may be found: organoaxial volvulus (58% of cases) and mesenteroaxial volvulus (29% of cases). An estimated 2% of cases corresponds to mixed volvulus, remaining unclassified about 10%. In up to 70% of cases, gastric volvulus is associated with diaphragmatic defects or pathology of the esophagogastric junction (Figure 7).

Organo-axial volvulus is most commonly seen in adults, associated to strangulation in 5-28% of cases. It occurs when the stomach rotates on its own axis, or the line resulting from joining pylorus with the gastroesophageal junction; greater curvature is found cephalad whilst less curvature stays caudal to its normal position, which constitutes a surgical emergency. It is most commonly encountered associated to trauma or paraesophageal hernias that alter the normal gastric position, manifested as complete or partial volvulus. When volvulus is complete, i.e., rotated greater than or equal to 180 degrees, obstruction occurs and stomach dilates secondarily. Conversely, if the volvulus is partial, i.e., rotated less than 180, there may absence of obstruction, vascular compromise or associated symptoms. In this case we can say that stomach has an organoaxial position rather than constituting an organoaxial volvulus as such. This position of stomach predisposes to future organoaxial volvulus; therefore, patient follow-up must be indicated.

In turn, organo-axial volvulus can be classified into type 1 (primary) and type 2 (secondary). Type 2 is the most common presentation (2/3 of cases), with supradiaphragmatic location; it is usually seen in cases of paraesophageal hiatal hernia, diaphragmatic eventration, trauma, diaphragmatic paralysis (phrenic nerve injury), among others.

Mesenteroaxial volvulus is rare. It occurs when stomach rotates on its minor axis, resulting in the displacement of the antrum above the gastroesophageal junction. This rotation is usually partial (less than 180 degrees) and not associated to diaphragmatic defects.

There are also complex or mixed volvulus, with organoaxial as well as mesenteroaxial components, exhibiting low frequency, as reported in the literature.

The clinical presentation of gastric volvulus can be acute or chronic. Acute volvulus may present clinically with the triad of Borchardt: vomiting, epigastric pain and an inability to pass an NGT, due to distortion of anatomy at the gastroesophageal junction. Gastric necrosis with fatal outcome may occur within hours if not promptly resolved by surgery. Chronic presentation may be asymptomatic, its diagnosis being usually incidental. It presents with upper abdominal pain that may radiate to the back or shoulders, pain during feeding or early post prandial discomfort, early satiety and vomiting. In this case, symptomatology of frequently associated diseases such as diaphragmatic hernia and eventration of diaphragm may be found.

An accurate and timely diagnosis is of vital importance, since patient’s prognosis will depend on it.

Side-up position of the stomach with pylorus cephalad to cardia, and a double air-fluid level are radiological findings in mesenteroaxial volvulus. Furthermore, diaphragmatic hernias containing antrum and pylorus within may be found, which constitutes the so called “hook sign”. Concerning organoaxial volvulus, diagnosis is more difficult: stomach may be observed horizontally located with lesser curvature placed caudal to the greater curvature and presence of a single air-fluid level (Figures 8, 9). The oral barium fluoroscopic study confirms diagnosis and degree of obstruction, besides allowing observation of contrast agent passage through partial volvulus as well as accumulation of it in volvulus surrounding areas in the complete entities. Computed Tomography ultimately provides a detailed anatomical view of the case, in addition to describing the phenomenon complications among which gastric pneumatosis, portal venous gas and pneumoperitoneum are included (Figures 10, 11).

There are isolated descriptions in literature about the appearance of organoaxial volvulus on ultrasound sequences, visualized as a double dilation with central stricture, the so called “peanut sign”.

Management of gastric volvulus will depend mainly on its origin and presentation, whether acute or chronic. There are three pillars in its treatment: reduction of the volvulus, gastric fixation and correction of predisposing factors.

Three surgical techniques have been described: laparotomy, laparoscopy and endoscopy.
GASTROINTESTINAL

Figure 8. Coronal reconstruction of CT scan demonstrating severely distended stomach, vertical distribution, with an air-fluid level in addition to gastric pneumatosis and portal venous air.

Figure 9. Sagittal reconstruction confirming same previous findings.

Figure 10. Computerized tomography section showing severe gastric dilation, compression of liver parenchyma with portal air, and displacement of retroperitoneal structures to right.

Figure 11. Computed tomography cut showing gastric pneumatosis in pelvic excavation.

In 1968 Tanner describes various surgical methods for repairing gastric volvulus involving repair of diaphragmatic hernias, gastropexy, partial gastrectomy for gastric necrosis, fundoantral gastro-gastrostomy (Opolzer’s Operation), gastropexy with gastrocolic ligament fixation (Tanner’s Operation), gastrojejunostomy, and repair of diaphragmatic hernias[11,12].

In preoperative high-risk patients, endoscopic approach, i.e., performance of devolvulation via endoscopic percutaneous gastrostomy, has shown good surgical outcomes[13]. Two techniques have been described for devolvulation: Alpha-loop maneuver described by Tsang et al in 1995, which encompasses 6 steps: the initial aim is to create an alpha shaped loop in the proximal end of the
volvulated stomach. Next, the tip of the endoscope is advanced through the location of the stenosis produced by the volvulus. The following three steps aim to take the end of the endoscope to the duodenum. Once there, clockwise torque is endoscopically applied to complete the devolvulation\(^{(14)}\), J-maneuver, or retroversion, has also been used to perform gastropexy.

Laparoscopic treatment has indications such as reducing the volvulus, anchoring the gastric fundus to the diaphragm, connecting the greater curvature of the stomach to the abdominal wall, in addition to some diaphragmatic repair. Laparoscopic technique is indicated in patients with chronic volvulus where neither necrosis nor gastric ischemia is observed. Total gastrectomy is performed only in cases of gastric necrosis.

Pathologic anatomy has a large surgical specimen in acute cases in which gastric necrosis is detected intraoperatively, in which case a commonly total gastrectomy is performed. This necrosis is secondary to ischemia generated by two mechanisms: vascular obstruction as such, and intramural irrigation injury due to acute dilation\(^{(15)}\).

Findings comprise necrosis of wall thickness in the gastric area closest to the greatest site of vascular obstruction, mucosal and submucosal necrosis half-way to the same site, and inflammatory infiltrate in more peripheral areas. Transmural microperforation and signs of inflammation and necrosis of vascular structures may also be found (Figures 12, 13).

Mortality rates for this disease vary in different publications depending on statistical consideration of chronic gastric volvulus and the type of surgery performed, ranging from 12 to 50%\(^{(16)}\), rising to more than 80 % in cases where portal venous gas is present.

**Figure 13.** Pathological specimen demonstrating macroscopic parietal perforation.

**Conclusion**

Gastric volvulus is a clinical entity with low frequency rates as well as discrete expression in world literature, mainly appearing in case reports. There is a wide spectrum of this pathology, ranging from chronic presentation (underdiagnosed, with non-specific symptoms) to acute entity with abrupt clinical presentation, ominous prognosis, with eventual outcome of death.

The fundamental role of diagnostic radiologic techniques is to provide guidance in detecting the presence, mechanism of occurrence, and entity-related complications in order to promote early diagnosis, adequate planning of therapeutic approach, as well as reduction in morbi-mortality rates.

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