JBR–BTR, 2014, 97: 279-282.

MULTIDETECTOR COMPUTED TOMOGRAPHY DIAGNOSIS OF GASTRIC VOLVULUS THROUGH THE FORAMEN OF MORGAGNI

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Morgagni hernia is considered to be the rarest form of all diaphragmatic hernias. It develops through a congenital defect in the retrosternal area. Usually asymptomatic, this entity can lead to life-threatening complications such as incarceration, strangulation or volvulus of the herniated viscus. We hereby report a rare case of organoaxial gastric volvulus producing through the foramen of Morgagni in a 78-year-old woman. The full diagnosis was made by upper gastro-intestinal series and multidetector computed tomography (MDCT). The basic anatomy, physiopathology, diagnostic methods, complications and surgical treatment of Morgagni hernia are briefly reviewed.

Key-words: Hernia, diaphragmatic – Stomach, volvulus.

Morgagni hernia (MH), an uncommon anteromedial subcostosternal diaphragmatic hernia, represents 3% of all surgically repaired diaphragmatic hernia. More frequently observed among women, MHs occur in most cases on the right side (90%). Most MHs are discovered incidentally. Despite a non obvious symptomatology or an asymptomatic character, MHs need an appropriate care and a prompt treatment to avoid life-threatening complications such as gastric volvulus.

Case report

A 78-year-old woman presented with complains of abdominal pain, pyrosis and post-prandial dyspepsia associated with symptoms of gastro-oesophageal reflux.

Since 2005, the patient had had a medical history of esophagitis associated with a hiatal hernia and was treated by proton pump inhibitor.

Based on the history and current symptoms, gastroscopy was performed and confirmed a grade C esophagitis. At the same time, a massive amount of fluid was found in the stomach and one litre was sucked up. The endoscope could not progressd beyond the pylori. The procedure was repeated with a longer endoscope but remained unsuccessful.

Upper gastro-intestinal series were performed to investigate chronic gastric emptying disorders, to estimate the size and reducibility of the alleged hiatal hernia, to localize the gastro-oesophageal junction and to exclude a duodenal obstruction (Fig. 1A). The morphology of the oesophagus and the position of the cardia appeared normal but the largest part of the stomach comprising the distal fundus and the antrum were found within the thorax suggesting a clockwise intrathoracic gastric volvulus through an anteromedial retrosternal orifice.

Contrast-enhanced Multidetector Computed Tomography (MDCT) of the thoraco abdominal junction (Fig. 1B

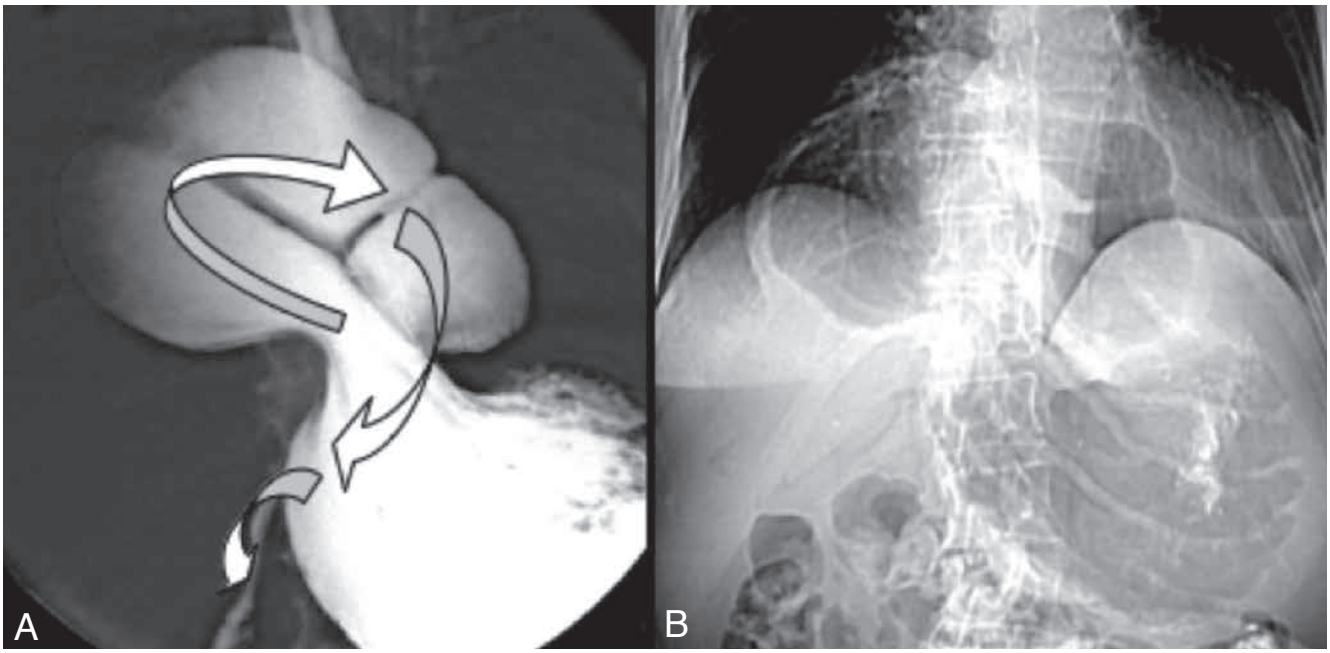

Fig. 1. — Global anteroposterior plain film (A) obtained during upper gastrointestinal series illustrates the intrathoracic clockwise gastric volvulus (curved arrow) producing through an anterior defect of the diaphragm. The same situation is spontaneously found on the CT topogram (B).

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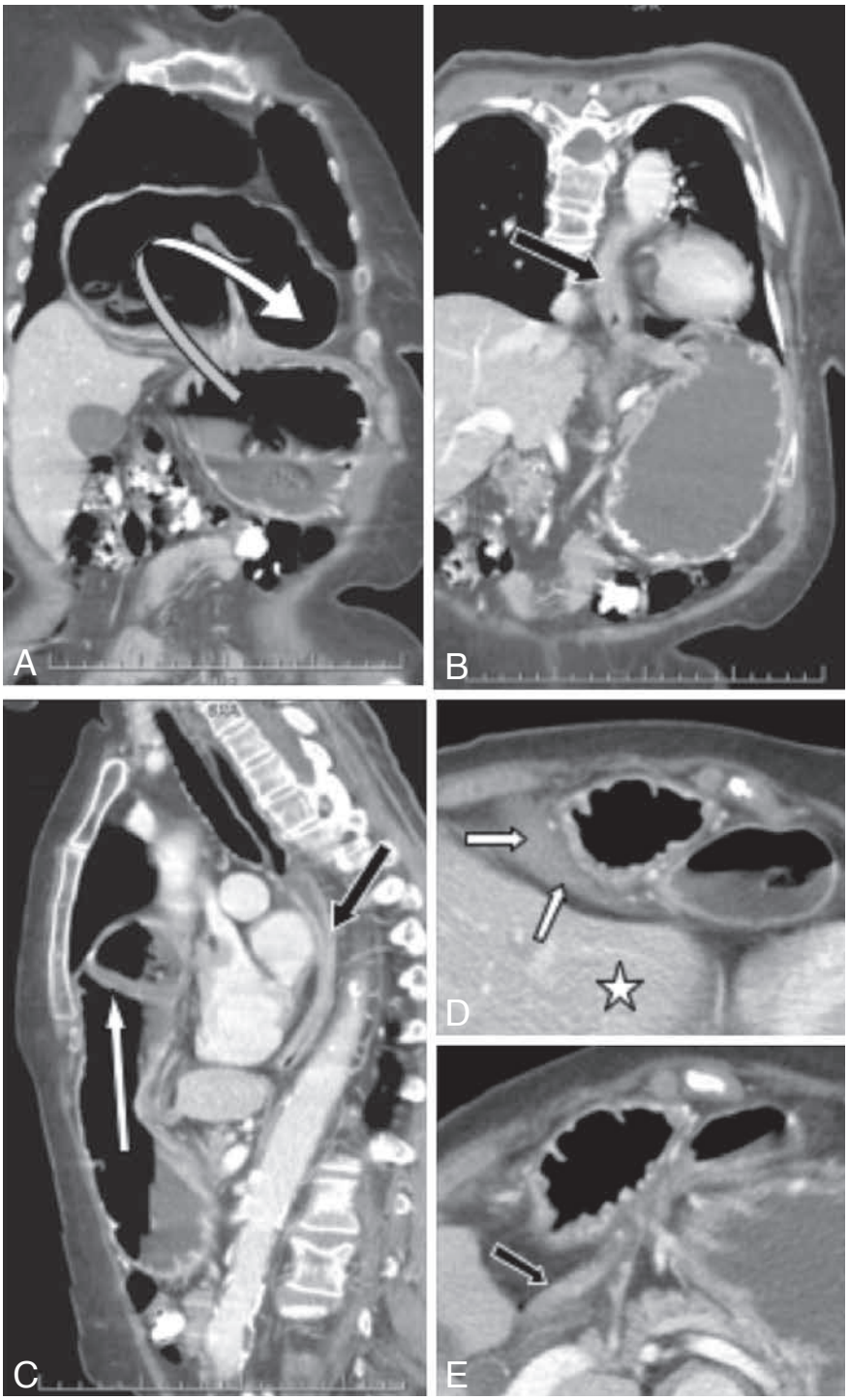

Fig. 2. — A series of selected MPR views obtained in the anterior coronal (A), posterior coronal (B), nearly medial sagittal (C), axial (D) and axial oblique planes (E) illustrates the complex anatomy of herniating process. The esophagus and the cardia are in place (black arrows on B & C). The greater tuberosity appears distended by fluid and but remains in the left upper quadrant. A large portion of the gastric body and gastric antrum clockwise protrude within the thorax (white curved arrow on A) through a retrosternal orifice (straight white arrow on C). The diaphragmatic landmark of the orifice is clearly delineated (small white arrows on D) and finally the stretched distal antrum is seen reintegrating the epigastric area (short black arrow on E).

and 2) confirmed a typical Morgagni hernia (MH) complicated by an organoaxial gastric volvulus.

During laparotomy, the stomach was first carefully decompressed allowing the complete reduction of the volvulus. There was no sign of necrosis or perforation and gastric resection can be avoided. The distended foramen of Morgagni (6 cm of diameter) was firmly sutured (Fig. 3). The post-operative period was uneventful.

Discussion

In 1769, thanks to his studies of autopsy specimens, Morgagni, an Italian anatomist and pathologist, was the first to describe the Morgagni orifice as a triangular anterior diaphragmatic defect (the foramen of Morgagni) between the muscle fibres of the xiphisternum and the costal margin (1-2). The defect also is referred to as the space of Larrey who described it as a foramen through which pericardial tamponade could be treated (3-4). This space is the result of a failure of fusion between the musculo-fibrotendinous elements of the diaphragm that come from the xiphisternum and the costal margin and insert on the central tendon of the diaphragm (5-6).

Usually the defect has a greater transverse diameter than the anteroposterior one (3, 6). The internal mammary artery and its vein and lymphatics are the only anatomic structures that cross over this space to become the epigastric artery (5- 6).

The physiopathology of the Morgagni hernia (MH) is currently explained as an acquired herniation of abdominal contents through this congenital defect in the anteromedial diaphragm.

Although this defect is congenital, MH is extremely rare in children. The congenital weakness of the diaphragm resulting in a small defect tends to enlarge with age as a result of raised intra-abdominal pressure, explaining a more common presentation in adulthood (1, 4, 7). The main factors that increase abdominal pressure are pregnancy, multiparity, obesity, chronic constipation and chronic cough (3-5, 8).

MHs can also be acquired secondary to a traumatic injury (9). Accounting for 3% of all surgically repaired diaphragmatic hernias, it is the rarest diaphragmatic hernia (5, 10). It occurs far more common on the right side of the diaphragm (90%) despite protection of the liver (3, 5-6, 8).

Only 8% of MHs occur on the left side. One hypothesis to explain it is that the extensive pericardial attachments on the left provide additional supports for that side of the diaphragm (3, 5, 11). So the left diaphragmatic defects are covered by the heart and pericardium, constituting an obstacle to the herniating process (1). However, a MH acquired secondary to a traumatic injury is

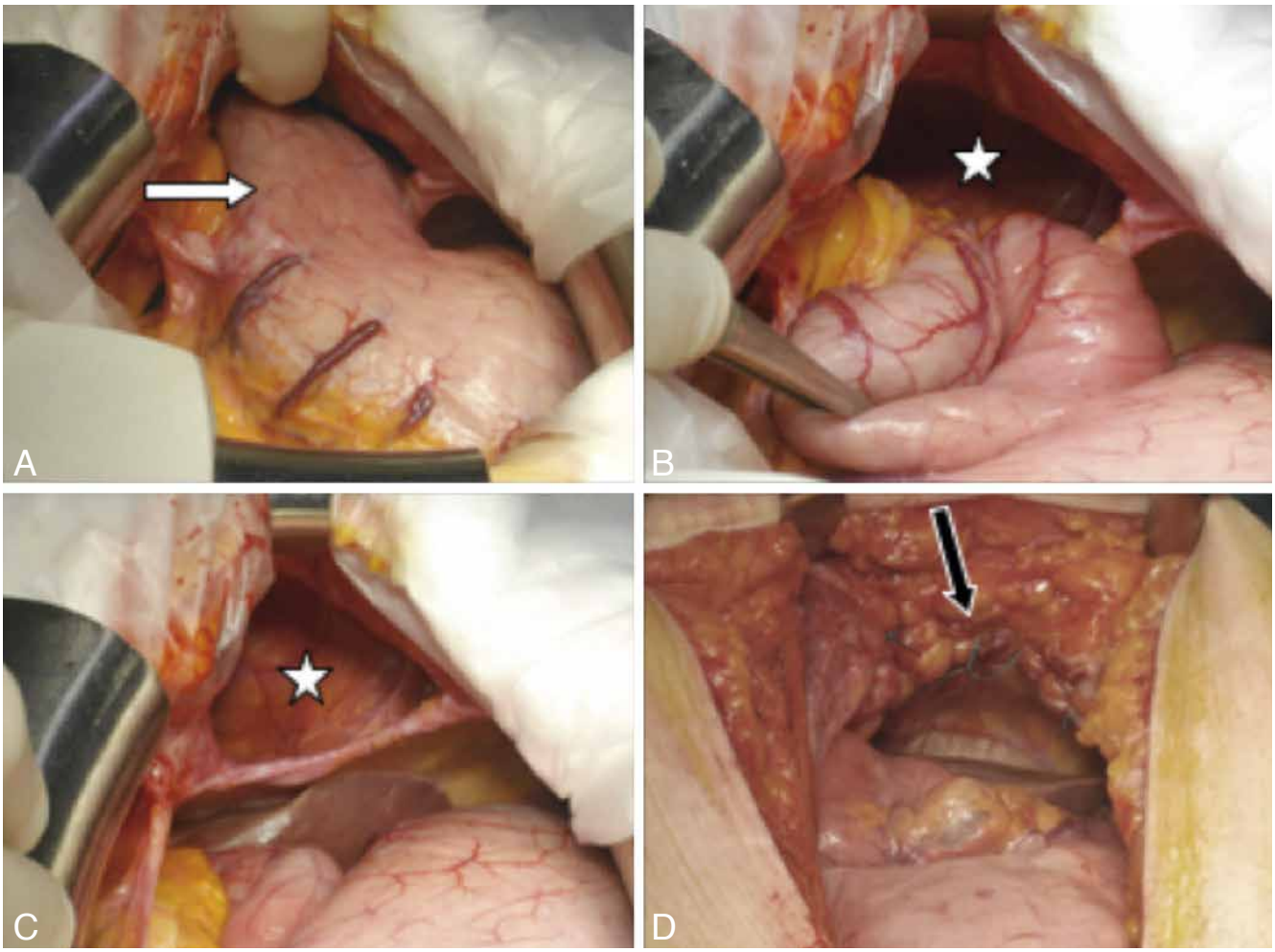

Fig. 3. — Surgical views. During laparotomy a large anterior retroxyphoidian orifice is found (A). The deflated gastric body clockwise protrudes within the thorax through this orifice (white arrow). The volvulus is reduced and the 6 cm wide open foramen of Morgagni clearly appears (white star on B & C) and is firmly sutured (black arrow on D).

more frequently seen at the left side because of the protection of the right diaphragmatic cupola by the liver (9). Bilateral presentations are exceptional (2%) (1, 5, 7). 70% of the patients presenting with MH are women (3, 5-6, 8). The average age of presentation is 58 years in female and 50 years in males (4).

Most patients with MH do not have any symptom and the hernias are usually discovered incidentally (4, 6-8). Symptoms occur mainly in patients who have a hollow viscus included in the herniation (6, 10-11). Symptoms are nonspecific, frequently digestive or pulmonary such as abdominal discomfort, fullness, bloating, nausea, vomiting, cramps, cough, dyspnea, pain in the chest (4-5, 12).

The diagnosis of MH may be suggested on plain chest or abdominal X-rays which may show a mass at the cardiophrenic angle with the density of the heart or a bowel gas pattern within the chest when the stomach or the intestines are herniated (1, 3, 5, 13).

Barium investigations can help to the diagnosis but their contribution may be limited when the herniating sac doesn't contain any hollow viscera, for example when it only contains the greater omentum (8, 14).

In our situation, contrast studies were first performed to investigate and evaluate the alleged and symptomatic hiatal hernia and the gastric emptying disorders (SAGES guidelines) (15). Furthermore, barium investigations are frequently carried out before surgery for better delineation of the anatomy, especially to localize the gastro-oesophageal junction (15).

However, in acute situations with suspected complications, contrast-enhanced MDCT is the diagnostic method of choice, making the correct diagnosis in 100% of cases (5, 7). It is essential for a complete preoperative anatomic diagnosis, able to determine the site, the level and the cause of many digestive obstructions including the MH. It can identify the specific herniated organs and the potential accompanying complications (1-2, 5).

Furthermore, when the hernia is purely omental, this exam can make the distinction between herniated fat of the greater omentum and epicardial fat pad or lipoma thanks to the identification of the rich vascular network of the greater omentum (3-6). In fact, the presence of fine curvilinear or linear densities within the fat represents omental vessels and confirms without doubt a hernia of the greater omentum with intrathoracic topography (1, 14).

After a MDCT showing an anterior mediastinal mass with partially fat density, MRI can be interesting to distinguish between a chest- and an abdominal process, especially when the differential diagnosis includes mediastinal tumours (3, 5).

Apart from mediastinal tumours, the main differential diagnosis in-

cludes atelectasis, pneumonia, mesothelioma, pulmonary sequestrum (3, 11).

Endoscopy is not helpful to make the diagnosis but the inability to pass the endoscope beyond the duodenal bulb suggests some gastric anomaly (7).

The most common contents of the hernia sac are omentum exclusively (31%) or colon and omentum (29%). More rarely, the stomach (15%) (generally secondary to the incarceration of the transverse colon), the small bowel (11%) and the liver (4%) can also herniate (3, 5-6).

The main but infrequent complications of a Morgagni hernia are incarceration, strangulation, bowel obstruction and volvulus of the herniated organ (7). These life-threatening complications need a prompt diagnosis.

The incidence of an acute strangulation complicating a MH is about 10-15% and among these strangulations, gastric volvulus (GV) is particularly uncommon (5).

The main aetiologies of GV include diaphragmatic anomalies (hernias, eventrations, etc), splenic anomalies (wandering spleen, asplenia), liver anomalies (aplasia of the left liver lobe) and gastric lesions (gastric ulcus or neoplasm, pyloric hypertrophy) (5, 16). Ligament laxity is an essential and constant factor to arise a GV (13, 16). Some others predisposing factors are mentioned such as gastric repletion, repeated vomiting and factors that increase the abdominal pressure.

GV may be organoaxial (59%), mesentericoaxial (29%), combined (2%) or not classified (10%) (5, 16). The classical symptoms of GV are known as the Borchardt's triad including severe epigastric or thoracic pain, abdominal distension with unproductive vomiting and difficulties or impossibility to put a nasogastric tube (5, 16).

Given the potentially severe and life-threatening complications of MHs, surgery is indicated in all cases, symptomatic or not (1, 3-4, 6, 11). Several surgical approaches have been used to repair MHs: laparotomy, thoracotomy and minimal invasive surgery (laparoscopic and thorascopic). The optimal surgical treatment is still controversial (4).

For acute surgical presentation, laparotomy is the most common surgical approach (4).

Thoracotomy remains the best approach to allow the dissection of the hernial sac (3-4).

Laparoscopy provides the benefit of an excellent view of the defect and abdominal contents, minimal tissue trauma, superior cosmetics, rapid recovery of the patient and earlier return at home (2, 4).

Laparoscopic is actually considered as a safe and effective alternative to laparotomy or thoracotomy (1, 11-12).

There is no consensus related to the management of the hernial sac (4, 8). Some surgeons don't recommend the resection of the hernial sac to avoid some fatal complications secondarily to the dissection of intrathoracic adhesions, such as pneumopericardium, injury to the lung, pericardium and mediastinal structures (3, 8).

Other surgeons recommend removing the sac when it is small, without intrathoracic adhesions and when there are few risks of injuring thoracic structures (3).

The necessity to close or not the defect with prosthetic mesh is also a matter of debate. The use of prosthetic mesh is recommended if the defect is larger than 3 cm. The smallest defects can be repaired with a simple suture (4).

Conclusion

Morgagni hernia (MH), a rare and usually asymptomatic diaphragmatic hernia needs an appropriate and prompt diagnosis because a late diagnosis or misdiagnosis can be fatal. In fact, the entity can lead to life-threatening complications. For patients with suspected complications, contrast-enhanced MDCT is currently the diagnostic method of choice, providing two- or three-dimensional reformatted images of high quality and allowing correct diagnosis in 100% of cases.

Modern surgical techniques as laparoscopy allow an effective, minimally invasive and safe repair of MHs but laparotomy remains the most common surgical approach for acute surgical presentation.

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