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, stranguation 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 progressed 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)
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 antero-posterior 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...
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 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).

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).

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 viscer, 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).

Further, 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, me-
thesioma, pulmonary sequestrum (3, 11).
Endoscopy is not helpful to make the
diagnosis but the inability to pass
the endoscope beyond the duodenal bulbl
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%) (gen-
erally 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 compli-
cations of a Morgagni hernia are in-
carceration, strangulation, bowel ob-
struction and volvulus of the herniated
organ (7). These life-
threatening complications need a
prompt diagnosis.

The incidence of an acute strang-
ulation complicating a MH is about
10-15% (5) and among these strangula-
tions, gastric volvulus (GV) is par-
ticularly uncommon (5).

The main aetiologies of GV in-
clude diaphragmatic anomalies (her-
nias, eventrations, etc), splenic
anomalies (wandering spleen, asple-
nia, eventrations, etc), splenic
fallopian tube (5, 16).

Ligament laxity is an essential and constant factor to
arise a GV (13, 16). Some others pre-
disposing factors are mentioned
such as gastric repletion, repeated
vomiting and factors that increase the
abdominal pressure.

GV may be organoaxial (59%), me-
sentericaxial (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 unpro-
ductive 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 cas-
es, symptomatic or not (1, 3-4, 6, 11).
Several surgical approaches have
been used to repair MHs: laparo-
scopy, thoracotomy and minimal in-
vasive surgery (laparoscopic and thoracoscopic). The optimal surgical
treatment is still controversial (4).

For acute surgical presentation,
laparotomy is the most common sur-
gical 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 consid-
ered as a safe and effective alter-
native 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 rec-
ommend the resection of the hernial
sac to avoid some fatal complica-
tions secondarily to the dissection of intrathoracic adhesions, such as
pneumopericardium, injury to the
lung, pericardium and mediastinal
structures (3, 8).

Other surgeons recommend re-
moving 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 pros-
thetic mesh is recommended if the
defect is larger than 3 cm. The small-
est defects can be repaired with a
simple suture (4).

Conclusion

Morgagni hernia (MH), a rare and
usually asymptomatic diaphragmat-
ic 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 complica-
tions, 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, mini-
mally invasive and safe repair of
MHs but laparotomy remains the
most common surgical approach for
acute surgical presentation.

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