

Internal hernias

Grigoris Chatzimavroudis, Georgia Kotoreni, Ioannis Kontsidis, Basilios Papaziogas, Ioannis Koutelidakis, Theodoros Kaltsikis, Michael Penlidis, Emmanouil C. Christoforidis

2nd Surgical Department, School of Medicine, Aristotle University of Thessaloniki, G.Gennimatas General Hospital, Thessaloniki, Greece

Abstract

Internal hernias consist a surgical condition that can cause intestinal obstruction. They can be congenital or acquired. The incidence of internal hernias becomes more and more common due to the increasing number of surgical procedures that cause defects in the abdominal cavity such as the bariatric surgical procedures. Their complications can lead to ischemia and necrosis of the intestine, so the early diagnosis is of significant importance. A high index of clinical suspicion is needed to detect internal hernias. Computed tomography is the most helpful imaging tool, to lead the differential diagnosis to internal hernias. Each type of internal hernias has its own characteristics but the treatment is common for all; surgical repair.

Key words: *hernia; internal; congenital; acquired; surgery*

Introduction

Hernia is the protrusion of viscera from their normal anatomical position in another area. Hernias are divided into internal and external. In external hernias the protrusion of the viscus is through a defect of the abdominal wall. Regarding the internal hernias the protrusion is through a defect that is located inside the abdominal cavity. This defect can be congenital or acquired. Congenital defects are created due to some embryological mistake that is made between the 5th and 7th week of embryonic development, during which the rotation of the abdominal organs and the merge of the visceral peritoneum with the parietal in specific locations occur. The acquired defects are created after surgical procedures, injury or inflammation (1). Nowadays acquired internal hernias have increased due to the growing number of surgical procedures that could create defects, such as the bariatric ones. The internal hernias could lead to severe complications like obstruction, twisting, incarceration and necrosis of the herniated contents, so the early diagnosis and treatment play a very important role. Internal hernias are the fourth cause of intestinal obstruction after adhesions, tumors and external hernias (2) and they are considered responsible for 0,2-5,8% of all intestinal obstructions (3) (4).

Clinical features and diagnosis

The clinical features of internal hernias are not as clear as in external, in which the hernia is seen or palpated. The symptoms of internal herniation usually point to acute intestinal obstruction. In other cases the patient may refer chronic mild digestive complaints or remain asymptomatic. In case of acute obstruction the patient may complain for abdominal pain, bloating, vomiting, absence of gases and feces. Very rarely a mass of viscera can be palpated. So, there must be a high index of clinical suspicion of internal hernia

to every patient presenting to the emergency department with symptoms and signs of bowel obstruction. Incarceration is less common. A detailed patient's anamnesis is very important, because a previous surgery that could cause an acquired internal hernia like Roux-en-Y, can easily add internal hernia into the differential diagnosis. Furthermore, patients with congenital internal hernias often report a history of chronic, mild, digestive complains and chronic pain or a previous visit to the emergency department because of abdominal pain that was improved with spasmolytics (5).

Concerning the imaging, first of all, the plain radiograph may show dilated small bowel loops or air-fluid levels (obstruction imaging). In addition, shaded radiograph can be used either with gastrografin or barium and either with oral ingestion or enema, in which a cluster of dilated small bowel loops or displacement of some part of the colon can be seen. Fluid in the abdominal cavity can be identified on the ultrasound.

The diagnostic tool of choice for internal hernias is the computed tomography (CT). CT is fast, non invasive, widely available and has a high sensitivity (94%) and specificity (96%) in the diagnosis of obstruction (5). CT will probably depict signs of obstruction; dilated bowel loops with air-fluid levels, a cluster of bowel loops, the transition point where the obstruction occurs and some times more specific signs like the swirl sign that is created by swirled vessels and fat. (6)

If a CT cannot be conducted, for example in case of pregnancy, magnetic resonance imaging (MRI) can be used instead. (7)

However, sometimes there are no clinical or imaging findings that can lead to diagnosis. Initial diagnostic imaging with CT is diagnostic in 64% of the patients. (8) As a result the diagnosis in these cases is set in the operating room.

Types of internal hernias

Internal hernias are divided into congenital and acquired. Acquired internal hernias are divided into paraduodenal (left and right) (53%), pericaecal (13%), foramen of Winslow hernias (8%), transmesenteric and transmesocolic (8%), sigmoid mesocolic (6%), pelvic and supravesicular (6%), transomentum (1-4%) (1). Acquired internal hernias are generated after surgical procedures that can create defects in the abdominal cavity, such as Roux-en-Y gastric bypass.

Congenital internal hernias

Paraduodenal hernias

Paraduodenal are retroperitoneal hernias and are divided into left and right. The left paraduodenal hernias are more common with a 3:1 ratio compared to the right ones (1). Paraduodenal hernias are more common in men with a 3:1 ratio and they appear usually between the age of 40 and 60 (2).

Left paraduodenal hernias

Left paraduodenal hernias herniated to the Landzert’s fossa, which is located posterior to the inferior mesenteric vein and middle colic artery and lateral to the fourth portion of the duodenum (Fig. 1). The content of the hernia is located between the stomach and the pancreas. The hernia content is usually small intestine or omentum and less commonly colon or stomach (9). The dominant theory suggests that the left paraduodenal hernias are formed during embryonic life, because the small intestine is trapped between the mesocolon and the posterior abdominal wall (9) (10). This type of hernia can be asymptomatic, cause chronic pain or be present as acute obstruction or ischemia. The image of the CT could be an encapsulated cluster of small bowel loops between stomach and pancreas that displaces the stomach and strained mesentery vessels (10). The inferior mesenteric vein and the median colic artery are located anterior and medial to the hernia (11).

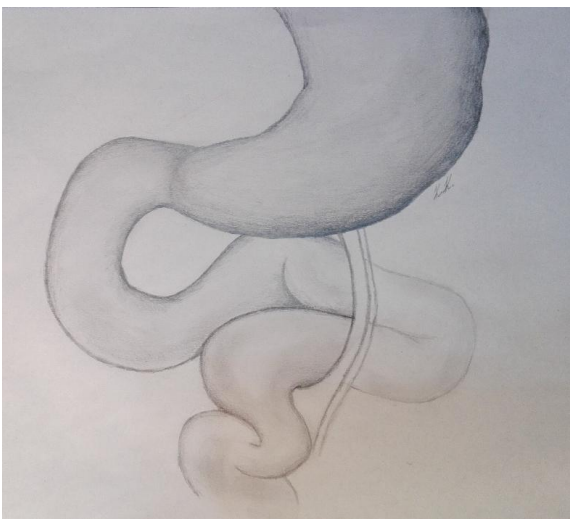


Figure 1. Left paraduodenal hernia

Right paraduodenal hernias

Right paraduodenal hernias herniate to the Waldeyer’s fossa, posterior to the superior mesenteric artery and inferior to the third portion of the duodenum (Fig. 2). On CT the

cluster of small bowel loops will be lateral and superior of the second portion of the duodenum and posterior and lateral of superior mesenteric artery (11).

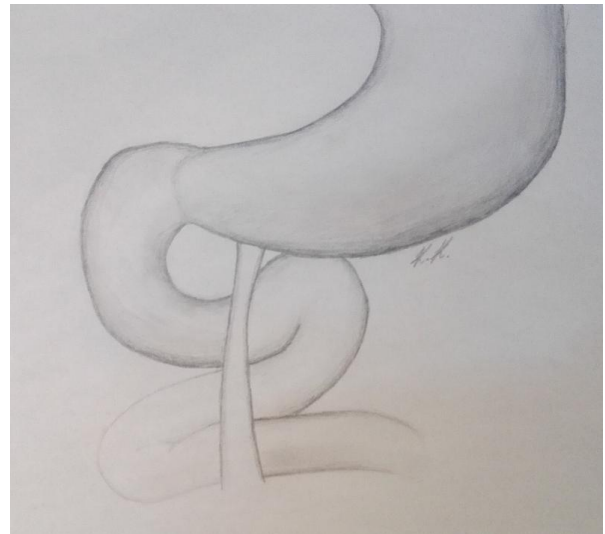


Figure 2. Right paraduodenal hernia

Pericaecal hernias

Pericaecal hernias can herniate to the paracaecal, superior ileocaecal, inferior ileocaecal, retrocaecal or caecal recess (12) (3) (11) (Fig. 3). They are formed during the embryonic development. The hernia content can rarely be the appendix or even the ovary or the fallopian tube (12). The clinical findings may indicate acute appendicitis. On CT imaging the cluster of small bowel loops are usually found lateral of the caecum and posterior of the ascending colon (11). The diagnosis of these hernias is usually made in the operating theatre (12). The pericaecal hernias can lead to incarceration with high rates of mortality (1).

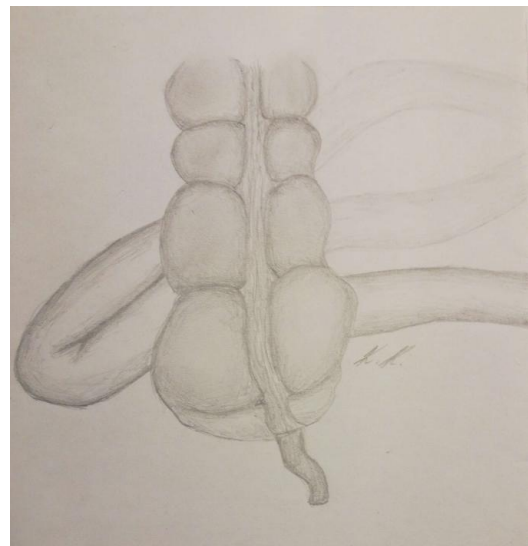


Figure 3. Pericaecal hernia

Foramen of Winslow hernias

This type of hernia herniates through the foramen of Winslow or omental foramen (Fig. 4). The foramen of Winslow is an orifice which connects the peritoneal cavity with the minor omental pouch and is located posterior to the hepatoduodenal ligament, superior to the second portion of the

duodenum, inferior to the liver and anterior to the inferior vena cava.

The foramen of Winslow hernias are divided according to their content into: Type I with content small bowel and a frequency of 53-70%, type II with content terminal ileum, caecum, or/and ascending colon and frequency 25-30%, type III with content the transverse colon and frequency 7% and type IV with content the gallbladder, that occurs very rarely (13).

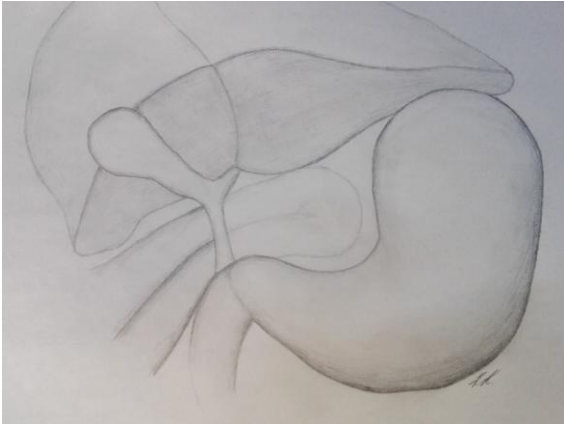


Figure 4. Foramen of Winslow hernia

Clinical findings could be, except for the obstruction symptoms, vomiting because of stomach pressure and less commonly jaundice because of bile duct pressure (1). On plain radiograph, dilated small intestine bowel loops can be depicted on the epigastric area. If the hernia content is the caecum, then there will be an absence of air imaging in the right iliac fossa. Furthermore, there can be obstruction imaging findings such as air-fluid levels. On CT imaging the content of the hernia is depicted between the stomach and the liver in the minor omental pouch as a cluster of small bowel loops sometimes with air-fluid levels (13). In contrast to the left paraduodenal hernias that are encapsulated, the foramen of Winslow hernias are not surrounded by a membrane (11). The left paraduodenal hernias are slightly inferior and to the left of the spine while the foramen of Winslow hernias are superior and to the right (11).

Transmesenteric, transmesocolic, sigmoid mesocolic, supramesenteric and transomentum hernias

Transmesenteric and transmesocolic hernias herniate through defects of the mesentery or the mesocolon respectively and their content is usually small intestine and less commonly omentum. It is possible that these hernias are complicated with twisting, incarceration or ischemia (5). On CT imaging the cluster of small bowel loops will be near the posterior abdominal wall.

Sigmoid mesocolic hernias are created by the herniation of bowel loops in the intersigmoid pouch, which is the pouch that is formed between the sigmoid colon and the sigmoid mesocolon (2) (Fig. 5). The sigmoid mesocolic hernias are divided into intersigmoid, transmesosigmoid and intramesosigmoid (14).

Supramesenteric hernias herniate through defects that are located around the bladder. The clinical findings include symptoms of frequent urination because of the bladder

pressure and bowel obstruction symptoms like every other internal hernia.

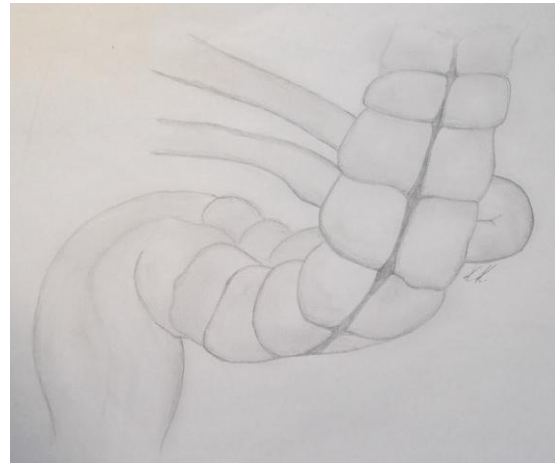


Figure 5. Sigmoid mesocolic hernia

Transomentum hernias herniate through a defect in the greater omentum (Fig. 6).



Figure 6. Transomentum hernia

Acquired internal hernias

Acquired internal hernias are generated after surgical procedures that contain creation of defects in the abdominal cavity due to cutting of the mesentery or the mesocolon, such as Roux-en-Y gastric bypass and others like gastrectomies, colectomies etc. Usually, the cause is the poor closure of the defects that are created but there are also other factors that contribute to the acquired internal hernias formation, like the sudden weight loss in bariatric procedures that weaken the tissues on which the sutures have been put.

Hernias after Roux-en-Y gastric bypass

Bariatric surgical procedures such as Roux-en-Y gastric bypass are conducted in patients with morbid obesity aimed at weight loss and they are a very widely used technique for the treatment of morbidly obese patients. These procedures create defects that did not previously exist. During this kind of operations the defects that are created should be very carefully closed with sutures to reduce the incidence of in-

ternal hernias (15) (16). However, even if the surgical technique is excellent, the following weight loss leads to loss of fat in the mesenteries so the defects can open again (7). During the laparoscopic Roux-en-Y gastric bypass the odds of occurrence of internal hernia are more compared to the laparotomy (0,8-5%) (17). This happens because more adhesions are created due to laparotomy, so the viscera are "immobilized" and the chance of escaping from their normal anatomical position is reduced (7) and because during laparoscopy the recognition and closure of the defects is more difficult (18). However, it should be kept in mind that laparoscopy leads to lower wound infection rates, shorter hospital stay, and fewer external hernias (15). Internal hernias are the most common cause of intestinal obstruction in patients that have undergone laparoscopic Roux-en-Y gastric bypass (17).

Increased intra-abdominal pressure, such as in a pregnancy, can increase the incidence of internal hernia, so it is recommended to avoid pregnancy at least for one year after the operation (7).

The hernias after Roux-en-Y gastric bypass are divided into transmesocolic hernias that herniate through the transverse mesocolon in cases of retrocolic Roux-en-Y, Petersen's hernias that herniate between the mesocolon and the mesentery of the Roux limb, mesojejunal hernias that herniate through the mesentery defect of the jejunojejunal anastomosis and jejunojejunal hernias that herniate through the suture location of the two jejunal loops (17). It is referred that after a Roux en Y gastric bypass operation, the biliopancreatic limb was the most commonly involved (51,9%), Petersen's hernia the most frequent (59,3%) and the left-to-right direction the most common (19).

The antecolic anastomosis leads to fewer internal hernias in comparison with the retrocolic (18) (20) When a retrocolic technique is used, transverse mesocolic hernias are more common than the other types of hernia. (8) So it is recommended to conduct antecolic Roux-en-Y in order to prevent transverse mesocolic hernias. However the Petersen's defect becomes bigger, so there are less transmesocolic but more Petersen's hernias (18). The shorter the biliopancreatic limb is, the lower are the odds of a Petersen's hernia (15).

On CT imaging the cluster of small bowel loops is usually located on the left upper quadrant between stomach and spleen (17) because most of these hernias come from right to left (4) . In transmesenteric hernias the point of transition of dilated to collapsed bowel loops is located where the mesocolic defect is expected to be (17).

Hernias through the falciform ligament after laparoscopy

Internal hernias that herniate through the falciform ligament can occur due to congenital, iatrogenic or traumatic causes (21). They represent only 0,2% of internal hernias (22).

Within the last years there are reported cases of internal hernias after laparoscopic procedures such as cholecystectomy or fundoplication, caused by injury of the falciform ligament during the port entrance (22).

The content of the hernia can be small intestine, omentum or colon (21).

The diagnosis is difficult to be put preoperatively.

It is very important to be extremely careful when entering the peritoneal cavity during a laparoscopic procedure, so that the injury of the falciform ligament can be avoided.

Treatment

The treatment of the internal hernias is surgery. The internal hernia is located; reduction of the hernia is made; if the content cannot be reduced, then opening of the hernia neck is conducted; if there is incarceration and necrosis, the affected piece of bowel is removed; and finally the defect is closed with sutures taking care not to injure any vessels, for example the mesentery vessels in left paraduodenal hernias. If more defects are found in the peritoneal cavity, they are also closed. Restoring the internal hernia can be either with laparotomy or with laparoscopy. The laparoscopic approach is favored from many authors (15). The advantages of the laparoscopic treatment are the reduction of postoperative pain, reduction of morbidity, faster feeding after surgery and shorter hospital stay (9). However, when incarceration is suspected then the laparotomy is preferred because an enterectomy may be needed (14). Late surgical treatment is connected to higher rates of morbidity (5) (13) (3). That's the reason why early diagnosis is of great importance. Surgical treatment of internal hernias should be conducted to asymptomatic patients, too. That could help prevent the complications of internal hernias because the chances of happening are high and last for a lifetime (9).

Conclusion

In conclusion, internal hernias are a relatively rare condition, whose causes may be congenital or acquired in origin. The second category is highly associated to Roux en Y bariatric procedures. The clinical signs and symptoms are very similar to the ones of a bowel obstruction. It is of great importance to have a high index of clinical suspicion, especially concerning the clinical signs and the surgical anamneses, because the early diagnosis is vital to prevent complications. The gold standard test is the CT. The therapy is surgical.

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Corresponding author

Grigoris Chatzimavroudis, MD, MSc, PhD
Assistant Professor of Surgery
2nd Surgical Department, School of Medicine
Aristotle University of Thessaloniki
G.Gennimatas General Hospital
Ethnikis Aminis 41, 54635
Thessaloniki, Greece
Tel: 0030-2310-992518
E-mail: gchatzim@auth.gr