

Internal hernias: anatomical basis and clinical relevance

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Abstract The aim of this study was to present and discuss the anatomical basis of internal hernias thanks to our clinical experience of 14 cases. Internal hernias are uncommon cases of acute intestinal obstruction when a viscera protrudes through an intraperitoneal orifice, remaining inside the peritoneal cavity. It excludes iatrogenic post surgical hernias. From an anatomical point of view, three kinds of orifices may be interested. The orifice may be normal: epiploic or omental (Winslow's) foramen, or abnormal through a pathologic transomental hole realizing an internal prolapsus or procidentia, without sac. Or this orifice may be a paranormal peritoneal fossa (para duodenal or retrocaecal) acting as a trap for the bowel: these hernias possess a sac and are considered as true hernias. The clinical diagnosis is always difficult. CT scan can be useful confirming the obstruction and leads to an urgent operation. This retrospective study evaluates diagnosis, management and follow-up according to the type of anatomical orifice and delay of surgery.

Keywords Internal hernia · Peritoneal fossa · Epiploic foramen · Small bowel obstruction · Paraduodenal fossa · Retrocaecal fossa

Introduction

Internal hernias are rare, often revealed by intestinal obstruction, and in the literature only some case reports are described but very rarely series.

Two conditions must be combined: no previous surgery (excluding iatrogenic hernias) and a herniation inside the abdominal cavity through an orifice, which can be normal, paranormal or abnormal. The aim of our study is to describe the three different kinds of protrusion with anatomical basis, their pathogeneses and consequences thanks to a series of 14 cases.

Materials and methods

During a period of 26 years, retrospective study from 1979 to 2005, we had the opportunity to observe fourteen patients in our department presenting internal hernias.

The mean age was 71 (51–84) and the sex ratio 11 M/3 F. Thirteen were symptomatic: nine bowel obstructions, three peritonitis, and one acute abdominal pain. Only one patient was asymptomatic, his internal hernia was discovered during surgical exploration for gastric cancer. The diagnosis was “suspected” only three times over thirteen, thanks to clinical and radiological criteria, but in all cases surgery confirmed, even when there was a suspicion. According to the type of orifice we found different kinds of internal hernias: two through the normal epiploic foramen, eleven in a peritoneal fossa with

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five different locations and one case through a pathological orifice.

These different types, clinical aspects, surgical procedures and consequences were analyzed.

Results

Except for the asymptomatic case, all underwent emergency treatment. A laparotomy was performed for nine bowel obstructions, three peritonitis and one acute abdominal pain. An entire exploration of the abdominal cavity permitted to distinguish from an anatomical point of view three different types of internal hernias according to the orifice: (1) normal epiploic foramen: two cases (where the right colon was strangulated), (2) unusual peritoneal fossa: eleven cases with four retrocaecal hernias, four paraduodenal (2 right and 2 left), one ileocaecal, one retroduodenal fossa, and one in a paravascular fossa due to the right iliac artery (3) abnormal orifice: one through a pathological hole in the greater omentum. In three cases the small bowel was involved.

Surgery noticed three peritonitis due to intestine necrosis: two through the epiploic foramen (patients were over 70 years old and needed a right colectomy and a small bowel resection), the other was a retrocaecal hernia (a 66-year-old man in whom a 45 cm small bowel resection was performed). These three cases of peritonitis died: one during the urgent operation complicated by faecal peritonitis, one by cardiac post surgery failure, and the third after three early post operative bowel obstructions. In another case, there was a necrosis of the small bowel incarcerated in a left paraduodenal fossa.

All the eleven others underwent well after reduction of the herniated viscera and closure of the peritoneal fossa or the hole with no recurrence.

Discussion

We want to consider both anatomical background and their clinical consequences.

The definition of internal hernia excludes post surgical iatrogenic hernias, and of course one or more viscera can be protruded through an orifice, which remains inside the peritoneal abdominal cavity. Three main types of orifices may be involved:

1. The orifice can be normal: epiploic or omental foramen (Fig. 1). This type of hernia supposes two predisposing factors: the foramen is larger than usual and a high mobility of the right colon or a long mesentery is required. The limits of this hernia are: the posterior peritoneum recovering the inferior vena cava on the dorsal side, the

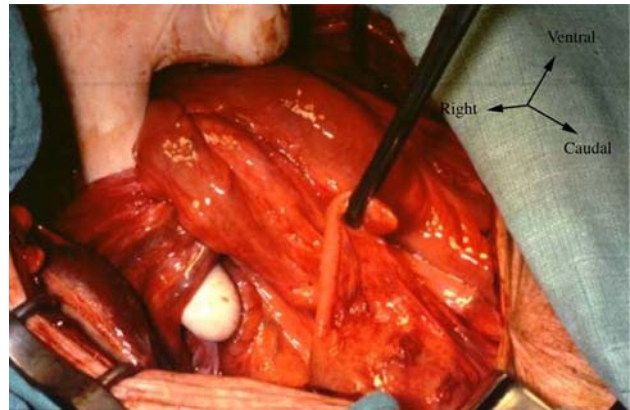


Fig. 1 Peroperative view. Internal hernia through a normal orifice: the epiploic foramen (hiatus of Winslow). The ascending colon with the appendix in a forceps is strangulated behind the hepatic pedicle, which clearly appears in the middle of the slide (with a dilated vessel)

portal vein on the ventral side and the upper part of the retro mesoduodenal (Treitz's fascia) which can be abnormal or thinner below.

Known as Blandin's hernia (described in 1823), it realizes a prolapsus of the right colon, small bowel or gallbladder through this orifice. The viscera are often strangulated due to the fulfilled space in which they protrude [15–24]. This strangulation explains the obstructive jaundice in one case report [2].

In this case there is no specific sac but it is formed by the peritoneum of the foramen bursae omentalis.

2. The orifice can be abnormal realizing a congenital hole in a mesentery, or in a ligament such as the falciform ligament of the liver [29] (Fig. 2). It can also be a pathological orifice formed in a mesentery or omentum: transmesenteric, transmesocolic or transomental: greater [27] or lesser [8, 24, 27].

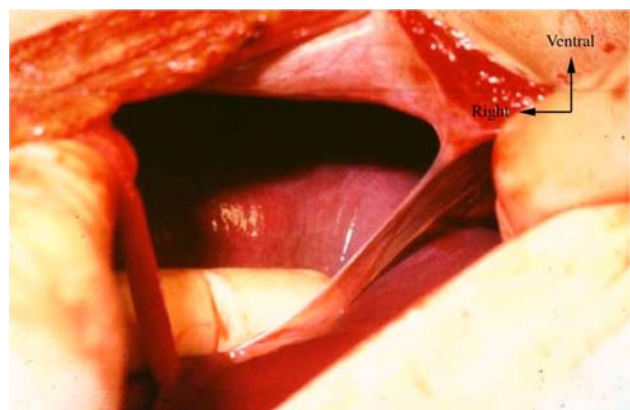


Fig. 2 Abnormal orifice. This per operative view shows a defect in the falciform ligament of the liver. The ascending colon with abnormal mobility, or small bowel, may go through and can be strangulated realizing an internal hernia

Such as in the first case this type realizes an internal procidentia without peritoneal sac and its description depends on the location of the hole.

3. The orifice can also be paranormal and it is the most frequent type: eleven cases in our series. Two main places: retrocaecal or para and retroduodenal [13, 14, 16, 17, 21, 26] (Fig. 3).

In these two last hernias the mechanism is well described by Peltier in SRA [21] but two main theories remain controversial. Either it is acquired or related to anomalous rotation of the midgut (physiological herniation during the 6th–11th week of gestation). Problems during reintegration of midgut can explain malrotation of duodenojejunal flexure and so right or retroduodenal hernia (Fig. 4). Such malformation may be associated with diaphragm abnormality or agenesis [1]. In case of left paraduodenal hernia [20, 23, 25] it can be an enlargement of peritoneal fossa realizing a volvulus of the bowel, or more bellow due to the inferior mesenteric vein, which raises the posterior parietal peritoneum [21]. It is often the same mechanism of protrusion of vessels [5], a kind of hole so created entraps the bowel, explaining the large variety of types: paracolic [12], inter and mesosigmoidal, supramesic, broad ligament of the uterus [21].

When it is retrocaecal it realizes a hernia of Rieux described in 1853, and it is due to a partial defect of fixation of the right ascending mesocolon (Toldt's fascia) (Fig. 5), the viscera is trapped between the abdominal posterior peritoneum on the dorsal side, the caecum ventrally and the right ascending mesocolon for the upper limit.

In these hernias there is a real peritoneal sac or fossa and we can consider them as "true" internal hernias.

Since our paper published in 1997 in Hernia [4] only three series of 14 cases each are reported, included this one [10, 22] and we only kept in references recent papers.

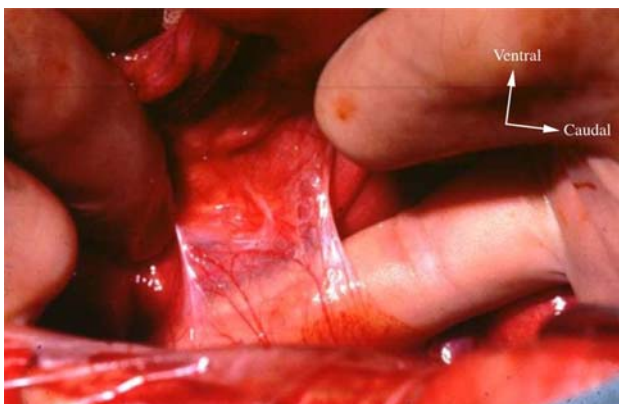


Fig. 3 Internal hernia through a paranormal orifice: paraduodenal fossa (surgical view). The index is in the fossa (there is a real sac, it is a true hernia) after the small bowel has been reduced from this orifice

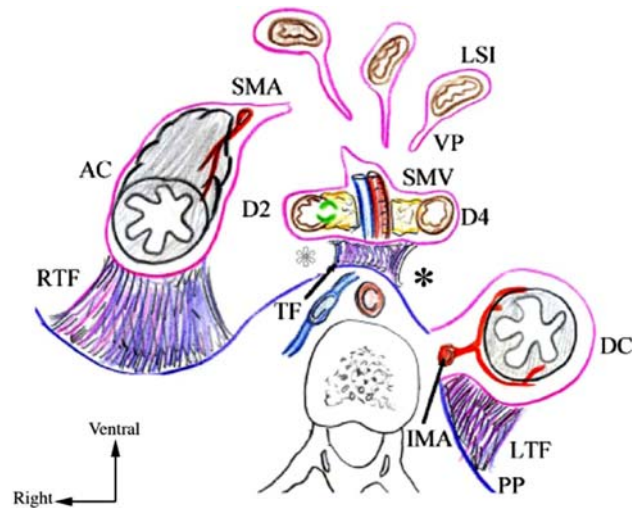


Fig. 4 Courtesy of Peltier [21] Horizontal section at L2. RTF right retroduodenal fossa (Toldt's fascia), AC ascending colon, SMA superior mesenteric artery, D2 second portion of the duodenum, D4 fourth portion of the duodenum, SMV superior mesenteric vessels, LSI loop of small intestine, TF retro mesoduodenum (Treitz's fascia), IMA inferior mesenteric artery, LTF left retroduodenal fossa (Toldt's fascia), DC descending colon, PP parietal peritoneum, VP visceral peritoneum, right retroduodenal fossa (*), left retroduodenal fossa (*)

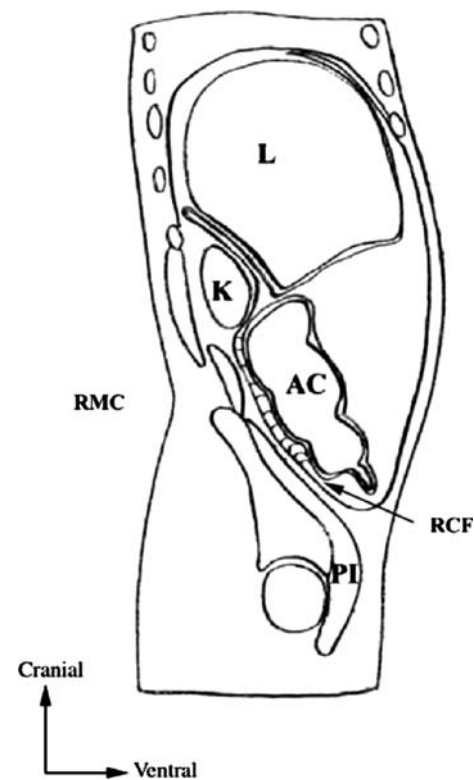


Fig. 5 Parasagittal section through AC ascending colon, RMC right ascending mesocolon (right Toldt's fascia), RCF retrocaecal fossa (←), PI ilio-psoas muscle, K right kidney, L liver

It represents approximately 0.2–0.9% of dissections in cadavers and 0.2–2% of all parietal hernias [21].

According to the literature the repartition between the different types is as follows. Through a pararnormal orifice: 55.3% [11] paraduodenal hernias are the most frequent, then retrocaecal and only 5% of intra mesosigmoidal or pararectal hernias [4], 11 over 14 in our series.

Through an abnormal orifice: 36.1%. We observed only one case of this type through the great omentum, but it can be everywhere through an omentum or a ligament. In one case it was reported a double omental hernia: through gastrocolic and gastrohepatic ligament [27].

Through a normal orifice: epiploic foramen: 8–8.5%, two patients in our series.

All ages can be affected, the mean age was between 38 and 45 years [10, 21], while in our 14 cases the mean age was older (71). The male prevalence has also been reported by others [21, 22], as shown in our study (11 males, 3 females).

Patients were admitted on emergency for two main diagnosis: bowel obstruction in nine cases or abdominal pain for four patients with three cases of peritonitis. In some cases in childhood it was revealed by uncommon symptoms: obstructive jaundice due to the compression of hepatic pedicle [2] or protein-losing enteropathy [26]. Only one case was discovered during another surgery and was asymptomatic which is rarely reported [6].

Pre operative diagnosis is practically impossible. One may think if there is no previous surgery and external parietal hernia. Symptomatology is confirmed by laparotomy discovery.

CT scan can be useful showing a bowel obstruction (Fig. 6), leading to an urgent surgery [7, 9], but most of the time the pictures are correctly interpreted only after the surgical procedure.

The treatment requires urgent surgery. The consequences of delayed diagnosis can be dramatic for mortality [18, 19, 21]. Laparotomy was the most performed procedure (12 midline, 1 transverse incision for a suspicion of appendicitis). Some authors have reported cases treated by laparoscopy [3, 27, 28]; none of ours were treated by this procedure. Reduction of the protruded viscera was easy except through the epiploic foramen where it can be quite difficult due to the strangulation. Soft procedure using the two hands (through the pars flaccida) is then required and it must be atraumatic [10, 24]. The management of the bowel depends on intestinal necrosis, four resections in our series: three with peritonitis (strangulation in two epiploic foramen and one retrocaecal hernia) and one for a necrosis of the small bowel in a left paraduodenal hernia. The intestinal continuity was re-established in the same time (right colectomy or small bowel resection). The closure of the sac is easy when it exists such as for retrocaecal or paraduodenal

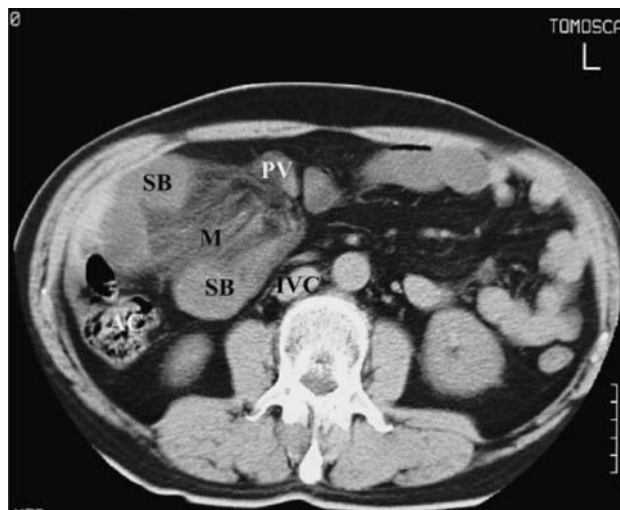


Fig. 6 CT-scan, L1 level. Internal SB, small bowel, hernia through a normal orifice: the epiploic foramen (hiatus of Winslow). M mesentery, IVC inferior vena cava, AC ascending colon, PV portal vein

hernias and paravascular ones and the closure of a defect such as a hole in a mesentery or omentum is not a problem as well. But what about normal orifice such as epiploic foramen? If there is no resection of the right colon, which is not fixed, it is easy to fix it in the right colo parietal space. In the other cases, to prevent recurrence, it is a real problem especially when there is a long mesentery. Some authors have described a closure of this orifice but there is a real risk of portal vein thrombosis, even in case of using the greater omentum, that is the reason why it is not recommended to close it [4, 11, 24].

Three patients died, one during the procedure with faecal peritonitis, another due to cardiac postoperative failure, the last one who presented three small bowel postoperative obstructions. Mortality was the consequence of peritonitis in elderly patients, and the location could be considered as a risk, the two patients with hernias through the epiploic foramen died.

Morbidity was independent of hernia but related to the classification of the American Society of Anesthesiology (ASA) and there was no recurrence in our series.

Conclusion

Internal hernias are rare and preoperative diagnosis is very difficult, some clues may help to suggest it.

Anatomical knowledge is essential to understand the three different types of hernias and their clinical consequences. An urgent surgery must be performed to reduce delay and complications, especially in case of bowel obstruction or peritonitis. An entire exploration of the abdominal cavity is compulsory.

Treatment is often easy except for hernia through the epiploic foramen. Results are excellent according to ASA classification peritonitis and bowel obstruction with no recurrence.

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