

# Interest of Computed Tomography in the Diagnosis of Intestinal Obstruction Due to an Internal Hernia of Unusual Location: The Falciform Ligament

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## Abstract

Pathological implications of the falciform ligament are rare and internal hernias are exceptional. The origin of the falciform ligament defect can be congenital or inflammatory (a satellite of acute cholecystitis) or even post-surgical. The internal hernias of the falciform ligament are most often revealed by an acute intestinal obstruction syndrome with an ischemic component. The scanner provides the benchmarking examination allowing us to conduct a positive diagnosis and see also the inherent complications, which drives us to take the appropriate and fast surgical procedures. It is an entity that must be known.

## Keywords

Internal Hernia, Falciform Ligament, Scanner

## 1. Introduction

Internal hernias are protrusions of hollow abdominal viscera in an intraperitoneal orifice but which remains inside the abdominal cavity [1] [2]. They can be revealed through an acute picture of intestinal obstruction, most often with ischemic component by strangulation. The hernia with the falciform ligament is exceptional and often diagnosed intraoperatively [3] [4]. An emergency abdominal CT scan is the benchmarking examination [5]. It can help in preoperative diagnosis and guide surgical procedures. Thus, we report a case of internal

hernia of the falciform ligament revealed on an abdominal CT scan, the purpose of which is to show the interest of CT in the diagnosis and the inherent complications of this pathology.

## 2. Observation

We report the case of a 78-year-old patient with no particular history who was admitted to the emergency room for abdominal pain with vomiting and without fever, lasting for a few hours. There was no stopping of materials and gases.

On examination, he presented a tusk in the epigastric region with a cry from the umbilicus. The biological examinations did not find any hydro-electrolyte disorder and the blood count was normal.

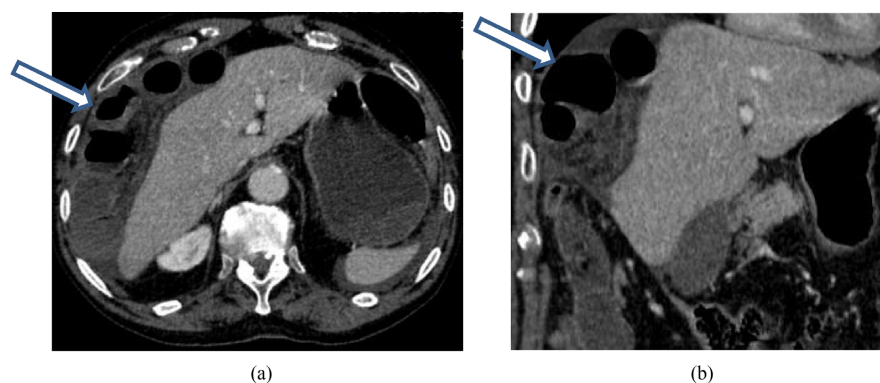
An abdominal and pelvic CT scan was performed urgently in front of the peritoneal irritation syndrome with helical acquisition in thin sections without and with injection of contrast product in the portal phase, covering the abdominal and pelvic region. There was only a protrusion of dilated small loops between the abdominal wall and the liver, accompanied by peritoneal fat, with a transitional zone in the shape of a bird's beak (**Figure 1** and **Figure 2**). A mechanical occlusion on internal hernia of the falciform ligament was then mentioned. We also noted pain in the small loops along with a lack of parietal enhancement associated with infiltration of peritoneal fat.

The surgical intervention had objectified a hernia of the falciform ligament through a large defect and necrotic loops (**Figure 3** and **Figure 4**). It had been performed during a median sub-umbilical laparotomy, a disinsertion with collapse of the falciform ligament, an ileal resection with terminal ileo-ileal anastomosis.

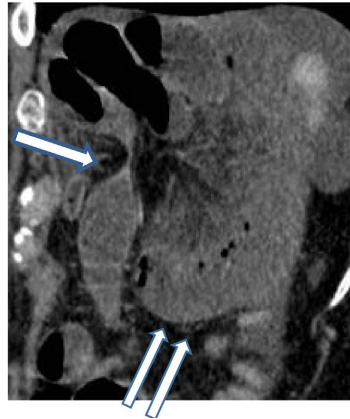
The postoperative course was simple. Histological examination revealed hemorrhagic necrosis of the intestinal wall without signs of malignancy.

## 3. Comments

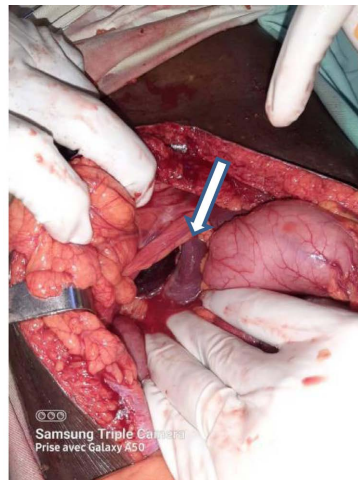
The falciform ligament is a remnant of the ventral midgut. It is stretched sagittally



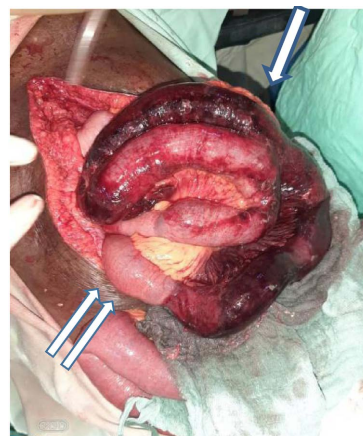
**Figure 1.** Axial (a) and coronal (b) section of an abdominal CT scan with injection of contrast product in the portal phase: interposition of dilated small loops between the liver and the abdominal wall, accompanied by peritoneal fat (arrow).



**Figure 2.** Sagittal reconstruction of an abdominal CT scan with injection of contrast product: Transitional level reflecting the area of stricture (single arrow). Infiltration of peritoneal fat and lack of enhancement of the wall of the dilated small bowel loops (double arrow) suggesting ischemia.



**Figure 3.** Intraoperative view showing a large falciform ligament defect (arrow) containing necrotic loops.



**Figure 4.** Intraoperative view after extrication showing viable loops (double arrow) and necrotic loops (single arrow).

from the superior surface of the liver to the inferior surface of the diaphragm and to the posterior surface of the abdominal wall. The two sheets which constitute it and which follow the upper sheet of the coronary ligament are formed by the reflection of the hepatic visceral peritoneum on the diaphragmatic peritoneum. It contains the round ligament, the para-umbilical veins and a variable degree of fat [6] [7].

Pathological implications of the falciform ligament are rare. Apart from hernias, gangrene, most often related to acute necrotizing pancreatitis, benign or non-benign tumors (lipomas and myxoid sarcomas in particular) and torsion of fatty fringes have been described [8] [9].

The internal abdominal hernias fall into two categories: the hernias developed in a normal or paranormal orifice of the peritoneum and the internal hernias developed through an abnormal orifice of the peritoneum [1].

The hernias of the first category most often develop quietly, under the action of peristalsis of the digestive loops trapped in a normal (omental foramen) or paranormal orifice, corresponding to a progressive detachment of normally joined peritoneal fascia during embryological development (anterior paraduodenal, pericaecal and intersigmoid hernias) [1] [2].

On clinical grounds, they are characterized by a more or less long latency period, with a more or less complete occlusive symptomatology, during which they can be diagnosed by imaging. Their revealing symptomatology can be very variable: vague sensations of epigastric heaviness, periumbilical pain, spontaneously resolving subocclusive episodes. They can obviously be revealed by an acute picture of “flat belly” occlusion as well in the event of inaugural incarceration with vascular strangulation. In imaging, it shows the existence of a hernial sac that gives the loops trapped in the cavity their overall circular appearance, corresponding to the globally spherical or ovoid volume in which they evolve [1].

Concerning the second category of internal hernias (developed through an abnormal orifice of the peritoneum), the orifice is small, with fibrous contours, inextensible, of dysembryoplastic or acquired origin (post traumatic, post inflammatory, etc.) in which a generally fairly short segment of intestine will incarcerate in a manner analogous to what may occur in certain strangulated parietal hernias. The upstream loops have a propensity to volvulate due to their fluid distension and strangulation can involve both the incarcerated intestinal segment and the upstream involuted loops [1].

The falciform ligament hernia falls into this category with transmesenteric, transomental hernias, the hernias of the gastrocolic ligament or transverse mesocolon, the hernias of the hepato-gastric ligament, the trans-meso-sigmoid and intersigmoid hernias, the hernias of the broad ligament and the perirectal hernias.

These types of internal hernia can only be diagnosed during an acute and indicative hyperalgesic episode since there is no positional abnormality of the intestinal structures before the digestive incarceration in the peritoneal “trap”. This was the case of our patient under study who presented an acute sympto-

matology evolving for a few hours.

The revelation of these types of hernia is often early, in the case of young subjects, on average 38 years old and without prior surgery [1]. However, some late revelations despite the congenital nature of the abnormalities responsible have been noted. In the series by Zissin *et al.*, involving 11 cases, four patients aged 76 and 96 when their internal hernia was revealed by an acute picture [1]. This is the case of our patient under study who is 78 years old.

The internal hernias of the falciform ligament are exceptional and represent approximately 0.1 to 0.3% of all internal hernias. The average age is 43 years and they generally concern the small intestine. The origin of the falciform ligament defect can be congenital or inflammatory (a satellite of acute cholecystitis) or even post-surgical [1]. In the case of our patient, in the absence of particular medical and surgical history, it is probably a congenital defect.

The imaging examinations theoretically useful for the diagnosis of occlusive syndromes are the abdomen without preparation (ASP), ultrasound, Computed Tomography (CT) and magnetic resonance imaging (MRI) [10].

The ASP has long been an important examination in suspected occlusion. However, it encounters a certain number of false negatives, in particular in the case of severe occlusions when the digestive loops have an exclusively liquid content and do not allow room for the diagnosis of cause and complication. Already since 2009, the High Authority of health of France [11] had clearly concluded that ASP no longer provide any indication for mechanical occlusion and recommended performing a CT as first intention. Thus, an ASP X-ray was not performed in our patient under study.

Ultrasound has no first-line indication when faced with the suspicion of intestinal obstruction in adults. It can possibly be performed secondarily after the CT to clarify certain images [10].

MRI has no place in clinical strategies even though it has the advantage of not inducing exposure to X-rays [10].

The abdominal CT is the reference imaging examination for occlusive syndrome in adults [12]. In the context of internal hernias, it is a powerful examination, allowing an accurate diagnosis to be made in 77% of cases, with a sensitivity of 63% and a specificity of 76% [13].

The examination must be carried out with helical acquisitions in thin millimetric or sub-millimetric sections covering the volume of the abdomen and the pelvis are necessary allowing multiplanar reconstructions.

An intravenous injection of iodinated contrast product is generally recommended. If it is contraindicated (kidney failure, allergy), this must obviously be specified in the request for examination and the scanner will be less effective in the search for strangulation, even if the spontaneous hyperdensity of the digestive wall is a powerful sign in these conditions.

In the internal hernia of the falciform ligament, the scanner allows the identification of the distended loops with hydro-aeric level, whose diameter is greater than 2.5 cm. These distended loops are located in the peri-hepatic region. The

scanner also finds the convergence of the mesenteric folds and the vessels in the area of stricture formed by the falciform ligament in the left lobe-lobe junction.

The scanner also makes it possible to make the diagnosis of complication by showing signs of digestive ischemia associating modifications of the digestive wall associated with modifications of the fat and the mesenteric vessels [10]. The modifications of the digestive wall are in the form either of a circumferential thickening of the intestinal wall testifying to a submucosal edema in the case of a beginner ischemia, or by a defect of parietal enhancement with a virtual wall aspect indicating a transmural infarction. A œdematous infiltration of the mesentery and turgidity of the draining veins are often associated. In the case of established infarction, there may be a high-density sero-haematic effusion between the affected loops and/or parietal pneumatosis or mesenteric-portal venous pneumatosis [10].

In the case of our patient, the topography of the distended loops as well as the study of the parietal enhancement had made it possible to evoke the diagnosis of internal hernia of the falciform ligament complicated by intestinal ischemia, thus directing towards rapid surgical procedures.

Emergency surgery is required to achieve extrication with or without intestinal resection depending on its vitality. The defect of the falciform ligament can be treated by the collapse of this ligament along the entire length of its diaphragmatic insertion in order to prevent recurrences [5]. Our patient under study had benefited from this type of treatment with unfortunately an intestinal resection-anastomosis because there were necrotic loops.

#### 4. Conclusion

The internal hernias of the falciform ligament are exceptional, most often revealed in an array of acute intestinal obstruction. The helical CT scan is the benchmarking examination allowing us to describe the diagnosis and to detect the inherent complications. Treatment is usually surgical.

#### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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