Internal Hernias: Surgeons Dilemma-Unravelled by Imaging

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Abstract Internal hernias may present as intestinal obstruction and account for 0.5 to 4.1 % of all cases. Clinical diagnosis of internal hernias is often difficult and thus imaging studies plays an important role in the early diagnosis. It is vital for the radiologist to be familiar with the various types of internal hernias and their radiological features so that prompt diagnosis and early intervention can be made.

Keywords Internal hernias · Small bowel obstruction · Paraduodenal hernia · Foramen of Winslow · Pericecal hernia · Transmesenteric hernia

Internal Hernias—Surgeon’s Dilemma—Unravelled by Imaging

Internal hernias may present as intestinal obstruction and account for 0.5–4.1 % of all cases [1–3]. Clinical diagnosis of internal hernias is often difficult and thus imaging studies play an important role in the early diagnosis. It is vital for the radiologist to be familiar with the various types of internal hernias and their radiological features so that prompt diagnosis and early intervention can be made.

Internal hernias are defined as protrusion of a viscous through a defect in the mesentery/peritoneum into the abdominal cavity through normal/abnormal apertures [4, 5]. They can be congenital or acquired, which can be secondary due to surgery, trauma, and inflammation [1, 6].

The most common types of internal hernias according to the classification of Welch [2] in descending order of frequency are as follows:

- Paraduodenal hernias (left > right)—53 %
- Pericecal hernia—13 %
- Through the foramen of Winslow—8 %
- Transmesenteric—8 %
- Intersigmoid—6 %
- Supravesical and pelvic—6 %
- Transomental—1–4 %

Features of internal hernias are based on the following characteristic findings:

1. Bowel configuration
2. Changes in the mesentery
3. Cluster of dilated bowel loops
4. Engorged, stretched, and displaced vascular pedicle

In this article, we present the various types of internal hernias—right and left paraduodenal hernias, through the foramen of Winslow, pericecal hernia, transmesenteric hernia, and their imaging features.

Clinical Features

Patients can be asymptomatic or present with signs and symptoms of intestinal obstruction and chronic postprandial pain. Hernias can undergo spontaneous reduction and are best diagnosed when patients are symptomatic.

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Imaging Techniques

Contrast-enhanced gastrointestinal studies such as enteroclysis, enterography, and abdominal computed tomography (CT) help in the diagnosis of various types of internal hernias. Multidetector computed tomography (MDCT) plays an important role in the diagnosis of low or high-grade intestinal obstruction and strangulation.

All our patients underwent CT (64-slice multidetector, GE VCT, 140 kVp, 800 mA), where plain as well as contrast examination was done using 100 ml of nonionic iodinated contrast iohexol (omnipaque-350 mgI/ml, -GE) administered intravenously at the rate of 2–3 ml/s, followed by saline chase of 50 ml with a power injector (Optivantage DH Mallinckrodt). Oral contrast was not given as patients presented to the emergency department with acute abdominal pain. Arterial and venous phases were taken. The venous phase was taken at 70 s to look for intestinal mucosal enhancement. Images were acquired with section thickness of 7 mm.

MDCT with 3D reformations (MPR, VR, and MIP) was done, which helped us in identifying the various types of internal hernias. MDCT with 3D reformations has added advantages over conventional imaging in the identification of the site, level, and cause of small bowel obstruction.

Imaging Features

(A) **Paraduodenal hernias:** They are the most common internal hernias with left-sided paraduodenal hernias being most common compared to the right.

- (i) **Left paraduodenal hernia:** This is due to protrusion of the small bowel loops through the foramen of Landzert which is located behind the ascending or the fourth part of the duodenum.

CT features include encapsulated clustered bowel loops in the left upper quadrant to the left of fourth part of duodenum and into the transverse mesocolon/descending mesocolon on the left. The abnormal bowel loops are located between the stomach and the pancreas with displacement of the stomach anteriorly, duodenojejunal junction inferomedially (Figs. 1 and 2).

Associated features of small intestinal obstruction such as dilated loops with air fluid levels may be noted. Vascular abnormalities such as engorgement at the point of entry of the sac [7, 8]/stretching and displacement of the inferior mesenteric vein to the left may be seen. The IMV and ascending left colic artery is located at the anteromedial border of the left paraduodenal hernia sac.

Fig. 1 Contrast-enhanced CT shows encapsulated clustered bowel loops (c) between the pancreas (p) and the stomach (s) through the foramen of Landzert, which is situated behind the fourth part of duodenum. Engorged vessels are seen (arrow) at the point of entry of the sac—left paraduodenal hernia

Fig. 2 CECT coronal shows congested vessels at the entry point of the sac—left paraduodenal hernia

- (ii) **Right paraduodenal hernia:** This is a congenital disorder which occurs due to the partial or complete failure of rotation of the embryologic midgut. This is due to entrapment of small bowel loops within the abnormal peritoneal recess—foramen of Waldeyer.

On imaging the proximal portion of the small bowel loops are seen to lie to the right of the

superior mesenteric artery. CT is useful to distinguish between right and left paraduodenal hernias. Abnormal clustered and dilated small bowel loops are seen, positioned lateral and inferior to the second part of the duodenum and lie posterior to the superior mesenteric artery (Fig. 3). As these are related to abnormalities of embryologic midgut rotation, additional clues such as superior mesenteric vein (SMV) occupying ventral/left position in relation to superior mesenteric artery (SMA) may be seen. The SMA is located at the anteromedial border of the sac which is the landmark for right paraduodenal hernia [9]. The jejunal branches of SMA and SMV may be seen coursing posteriorly and to the right of the superior mesenteric vessels. Vessel engorgement may also be noted.

- (B) **Pericecal hernia:** There are four types of pericecal recess formed by the peritoneal folds: superior ileocecal recess, inferior ileocecal recess, retrocecal recess, and paracolic sulci.

The bowel loops may herniated through the defect to lie in the right paracolic gutter. The specific CT features of these hernias is not established. The cluster of fluid-filled bowel loops may be seen lateral to the cecum and posterior to the ascending colon (Fig. 4).

Fig. 3 CT (scout film) shows dilated centrally placed bowel loops. CECT reveals cluster of small bowel loops in the ascending mesocolon (*curved arrow*) through the foramen of Waldeyer. Bowing of the jejunal branches of superior mesenteric vessels (*arrowhead*) to the right and posteriorly is noted—right paraduodenal hernia

Fig. 4 CECT—small bowel loops (s) is seen lateral and posterior to the ascending colon (a) with stretched (*arrow*) and engorged vessels. Free fluid (ff) is also seen in the right paracolic gutter—pericecal hernia

Also tethering may be seen at the aperture of the peritoneal recess along with dilated small bowel loops

with transition zone. These features help to diagnose pericecal hernias with certainty [10].

Fig. 5 CT (scout) shows centrally placed dilated small bowel loops. CECT reveals dilated bowel loops (w) with stretched vessels through the foramen of Winslow located between the portal vein anteriorly and IVC posteriorly - foramen of Winslow hernia. C-Chiladiti syndrome-bowel loops are interposed between the diaphragm and the liver (l)

Fig. 6 CECT—clustered bowel loops (c) with converging and stretched (arrow) mesenteric vessels are seen at the hernial orifice—transmesenteric hernia

- (C) **Foramen of Winslow hernia:** Foramen of Winslow is a normal aperture that connects the greater and lesser peritoneal cavities. It is located beneath the free edge of the lesser omentum. The IVC forms the posterior boundary, the caudate lobe forms the superior boundary, and the duodenum forms the inferior boundary. The usual contents of these types of hernias are small bowel alone (two-thirds) and may also contain cecum and ascending colon (in one-third of cases).

On CT, dilated fluid-filled bowel loops are seen located in the lesser sac anterior to the IVC. The stomach may be displaced anteriorly and laterally (Fig. 5). The mesenteric vessels appear engorged and stretched out. They have similar radiographic findings to that of the left paraduodenal hernia. The paraduodenal hernias have an encapsulating membrane which is not seen with those involving the foramen of Winslow. The left paraduodenal hernia is located slightly inferior and to the left of the spine, whereas the foramen of Winslow hernia is seen slightly superior and to the right of the spine.

The CT features are (i) dilated nonencapsulated bowel loops located in the lesser sac anterior to the IVC, (ii) two or more bowel loops in the high subhepatic space,

- (iii) presence of sentry between the IVC and the portal vein, and (iv) absence of ascending colon in the right paracolic gutter.

- (D) **Transmesenteric hernia:** The small bowel mesentery is a double-layered peritoneal reflection that fixes the small bowel loops to the posterior abdominal wall. It extends at the level of ligament of Treitz on the left to the ileocecal valve on the right. Transmesenteric hernias can occur due to congenital defects or secondary due to surgery, trauma, or inflammation. About 35 % of these hernias occur in the pediatric population. CT features consist of engorged and crowded mesenteric vascular pedicle with mesenteric vessels located at the entrance of the hernial sac (Fig. 6).

Conclusion

MDCT is now recommended to aid in the diagnosis and causes of small bowel obstruction. Thus, knowledge of the anatomy of the peritoneal cavity and recognition of the characteristic CT findings may assist in the detection of internal hernias in most cases of small bowel obstruction.

References

1. Ghahremani GG (2000) Abdominal and pelvic hernias. In: Gore RM, Levine MS (eds) Textbook of gastrointestinal radiology, 2nd edn. Saunders, Philadelphia, pp 1993–2009
2. Welch CE (1958) Hernia: intestinal obstruction. Year Book Medical, Chicago, pp 239–268
3. Hanssmann GH, Morton SA (1939) Intraabdominal hernia. Arch Surg 39:973–986
4. Mayers MA (2000) Internal abdominal hernias. In: Mayers MA (ed) Dynamic radiology of the abdomen, 5th edn. Springer, New York, pp 711–748
5. Ghahremani GG (1984) Internal abdominal hernias. Surg Clin N Am 64:393–406
6. Newsom BD, Kukora JS (1986) Congenital and acquired internal hernias: unusual causes of small bowel obstruction. Am J Surg 152:279–285
7. Blachar A, Federle MP, Dodson SF (2001) Internal hernia: clinical and imaging findings in 17 patients with emphasis on CT criteria. Radiology 218:68–74
8. Blachar A, Federle MP, Brancatelli G, Peterson MS, Oliver JH III, Li W (2001) Radiologist performance in the diagnosis of internal hernia by using specific CT findings with emphasis on transmesenteric hernia. Radiology 221:422–428
9. Okino Y, Kiyosue H, Mori H et al (2001) Root of the small-bowel mesentery: correlative anatomy and CT features of pathologic conditions. Radio Graph 21:1475–1490
10. Lu HC, Wang J, Tsang YM, Tseng HS, Li YW (2002) Pericecal hernia: a report of two cases and survey of the literature. Clin Radiol 57:855–858