Section: Radiodiagnosis

Original Research Article

ROLE OF MULTI-DETECTOR COMPUTED TOMOGRAPHY IN INTRA-ABDOMINAL INTERNAL HERNIAS IN CORRELATION WITH INTRAOPERATIVE SURGICAL FINDINGS

Bharathi Priya. R[1], Ashwin Kumar. A[2], Gomathi. G[3], Raveendran. J[4]

[1]Assistant Professor, Department of Radiodiagnosis, Government Stanley Medical College and Hospital, Tamilnadu, India.
[2]Assitant Professor, Department of Radiodiagnosis Barnard Institute of Radiology, Madras Medical College, Tamilnadu, India.
[3]Assistant Professor, Department of Radiodiagnosis, Government Villupuram Medical College and Hospital, Tamilnadu, India.
[4]Assistant Professor, Department of Radiodiagnosis, Institute of Child Health and Hospital for Children, Madras Medical College, Tamilnadu, India.

Received : 09/01/2023
Received in revised form : 11/02/2023
Accepted : 23/02/2023

Keywords:
Computed tomography, Internal hernia, Small bowel obstruction.

Corresponding Author:
Dr. Raveendran. J
Email: raveendran.jayabalan@gmail.com

DOI: 10.47009/jamp.2023.5.2.96

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (2); 458-462

Abstract

Internal hernias continue to benefit from multi-detector computed tomography's (CT) status as a potent diagnostic tool for acute abdomen. Providing appropriate guidance to surgical colleagues by radiologists may be essential to avoid irreversible damage to the bowel wall and mesentery. Early surgical intervention is recommended in patients with internal hernia suspicions to lower the high morbidity and mortality rates. Understanding the anatomy of the peritoneal cavity, the anatomic location of each internal hernia, and recognition of the characteristic CT findings may assist in considering or identifying internal hernias in most cases of small bowel obstruction. Currently, multi-detector row CT is most often recommended to detect the cause of small bowel obstruction and to facilitate the diagnosis of various internal hernias. Therefore, appropriate guidance of surgical colleagues by radiologists may be essential to avoid irreversible damage to the bowel wall and mesentery.

INTRODUCTION

Internal abdominal hernias involve protrusion of the viscera through the peritoneum or mesentery and into a compartment in the abdominal cavity. The most typical presentation is a small bowel loop obstruction that develops through normal or abnormal apertures.[1] Preoperative diagnosis is challenging because clinical symptoms can range from mild, occasional digestive complaints to acute intestinal obstruction. Diagnosing an acute intestinal obstruction and formulating a surgical plan benefit greatly from computed tomography (CT). Despite being rare, internal hernias may be considered in the differential diagnosis when there is intestinal obstruction, particularly if there is no prior history of abdominal surgery or trauma. Small bowel obstruction can be seen on a CT scan in patients with internal hernias. The most common symptom of internal hernias is strangulating small bowel obstruction, which develops after closed-loop obstruction. Therefore, early surgical intervention may be recommended in patients with internal hernia suspicions to lower the high morbidity and mortality rates.

Congenital or acquired orifices of internal hernias are both possible. A normal foramen, an unusual peritoneal fossa, or recesses linked to peritoneal fusion failure are examples of congenital orifices, whereas acquired orifices are caused by trauma, inflammation, or prior surgery. The herniated viscera are typically small bowel loops. According to conventional wisdom, internal hernia accounts for 4% of acute small bowel obstruction cases. Most internal hernias commonly cause epigastric discomfort, periumbilical pain, and recurrent episodes of intestinal obstruction. But they can be silent if they are easily reducible. Delays in diagnosis increase the risk of serious complications such as strangulation and internal hernias, which are only clinically apparent when caused by small bowel obstruction.[2]

This case series includes the findings of Internal abdominal hernias in a multi-detector Computed tomography. Internal hernias continue to benefit from multi-detector computed tomography's (CT) status as a potent diagnostic tool for acute abdomen. Providing appropriate guidance to surgical colleagues by radiologists may be essential to avoid irreversible damage to the bowel wall and

ISSN (O): 2687-5365; ISSN (P): 2753-6556

mesentery. Early surgical intervention is recommended in patients with internal hernia suspicions to lower the high morbidity and mortality rates.

Meyers et al. have defined an internal hernia as a protrusion of abdominal viscera through an opening within the confines of the peritoneal cavity. However, not all internal hernias are strictly intraperitoneal.[3] Internal hernias account for approximately 0.5-5.8% of all cases of intestinal obstruction and are associated with a high mortality rate, exceeding 50% in some series. The classification for internal hernia devised by Ghahremani and Meyers is relatively well accepted. A retrospective review of medical records and radiologic images revealed 13 patients (eight male, five female) with surgically proved internal hernias. More than half of the patients were over the age of 50 years. The occurrence of abdominal, internal hernias is rare. They are reported in 0.2%– 0.9% of autopsies and in 0.5%– 4.1% cases of intestinal obstruction.[4]

CASE SERIES

Case 1

History A 50-year-old male patient was referred to our institution for two days with abdominal pain, vomiting, and constipation. On clinical examination, the patient had right iliac fossa tenderness. On laboratory investigations, he had minimally raised WBC counts. Surgeons had a clinical suspicion of acute small bowel obstruction, and the patient was referred to our department for CECT abdomen.

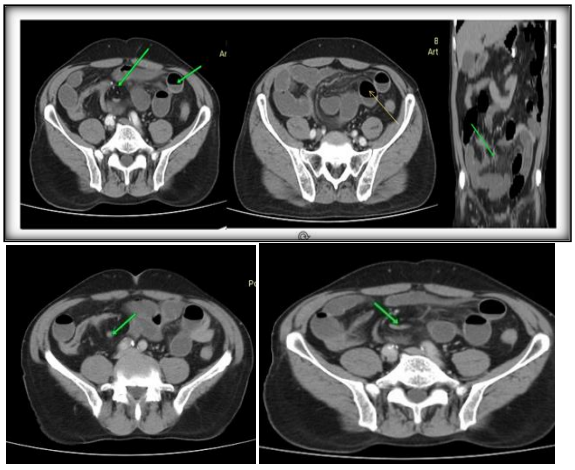

Figure 1A to C shows focal segmental dilatation of ileal loops with a maximum diameter measuring 2.7 cm (indicated by yellow arrow). Proximal jejunal loops appear dilated. The right iliac fossa noted the stretching, twisting, and crowding of the mesenteric vessels located centrally within the clumped bowel loops (indicated by green arrows in Figures 1A and 1C). [Figure 1D, E] indicates the two transition point that enters into the defect in the mesentery . Cecum and large bowel loops appear collapsed. Minimal free fluid was noted in the pelvis. We reported it as an internal hernia (mesentery hernia). The surgery was delayed due to the patient's unwillingness. The patient was operated on three days after admission.

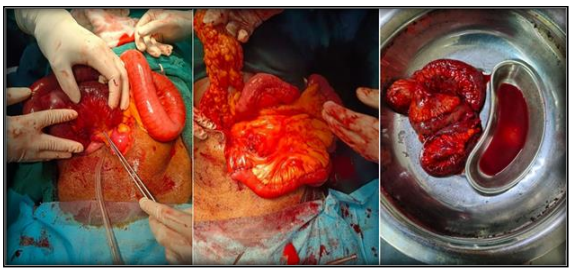

Figure 1: F-H shows the intraoperative images of the patients. A small defect was noted in the small bowel mesentery. 50 cm of small bowel loop (distal jejunum and ileum)got herniated through the defect and became gangrenous due to closed loop obstruction. The gangrenous bowel segment was resected, and end-to-end anastomosis was done

Case 2

History A 48-year-old female patient was referred to our institution for three days with abdominal pain, abdominal distention, and vomiting. The patient had constipation for two days. The patient was referred to our department for CECT abdomen.

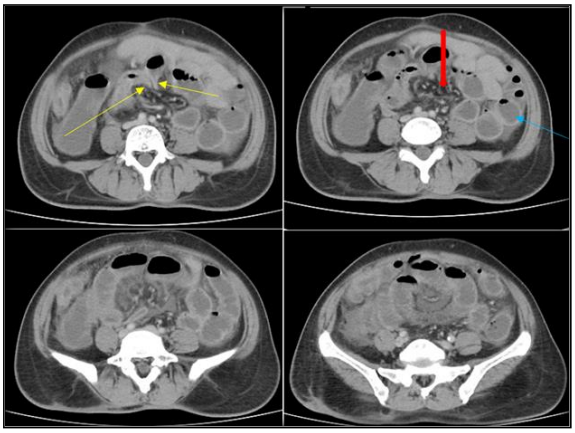

Figure 2A-D shows focal segmental dilatation of ileal loops (indicated by a blue arrow). Stretching, twisting, and crowding of the mesenteric vessels located centrally within the clumped bowel loops noted in the root of mesentery (indicated by red color arrows in figure 2B). In Figure 2A, two blue arrows indicate the two transition points that enter the defect noted in the mesentery. Cecum and large bowel loops appear collapsed. Free fluid was noted in the pelvis. Distal ileum, ileocecal junction, and proximal ascending colon appear edematous. The ileal loops showed hypo enhancement. On image-guided aspiration of free fluid in the pelvis, they seemed to be hemorrhagic, indicating venous congestion. We had reported it as an internal hernia (mesentery hernia).

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Figure 2 E shows the intraoperative image. The obstruction of the small bowel loops was relieved by carefully withdrawing the loops from the hernia sac. The bowel loops showed normal vascularity intraoperatively. Finally, the mesenteric defect was closed, and DT was kept.

Case 3

History A 40-year-old female patient complained of abdominal pain, distention, and vomiting for three days. She had a history of gastrectomy surgery with Roux-en-y-anastomosis done for carcinoma stomach four months back. And CECT abdomen taken.

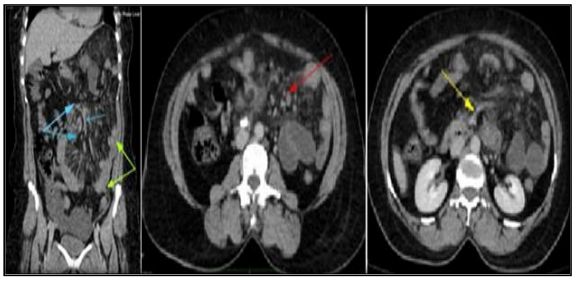

Figure 3A, B shows clustering of jejunal bowel loops seen in the left side of the abdomen with minimal dilatation (green arrow) and mild mesenteric edema noted. Stretching and twisting of mesenteric vessels were noted (indicated by the red and blue arrow). Figure 3C shows the focal thinning of SMA (indicated by the yellow arrow). Free fluid was noted in the pelvis. Features of closed loop obstruction that occurred possibly due to herniation of jejunal bowel loops into the trans mesocolon defect. The patient was operated on, and the defect was closed after reliving the obstruction. The bowel loops showed normal vascularity.

Case 4

History A 45-year-old year female patient had a history of abdominal pain for two days with severe vomiting and was referred to our institution.

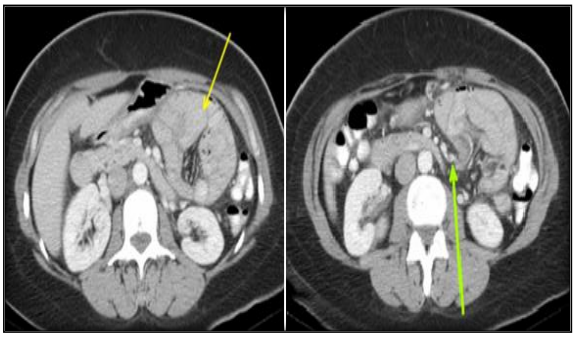

Figure 4 A: B shows an abnormal cluster of the proximal small bowel (yellow arrow), left of midline, converging towards a neck slightly posterior and lateral to the inferior mesenteric vein(green arrow). There was a mild mass effect on the left pararenal space/kidney and no evidence of obstruction. It was a case of a left paraduodenal hernia.

Intraoperatively, an approximately 30 cm section of the small bowel had herniated posterior to the inferior mesenteric vein. This was easily reducible, and all the bowel loops appeared viable. The defect was closed.

Case 5

History A 10-year-old male child had a history of abdominal pain for two days with severe vomiting and was referred to our institution.

Figure 5A, B shows an abnormal cluster of the proximal small bowel (red arrow), right of midline, converging towards a neck slightly posterior and lateral to the superior mesenteric artery. There was a mild mass effect on the right pararenal space/kidney and no evidence of obstruction. It was a case of a right paraduodenal hernia.

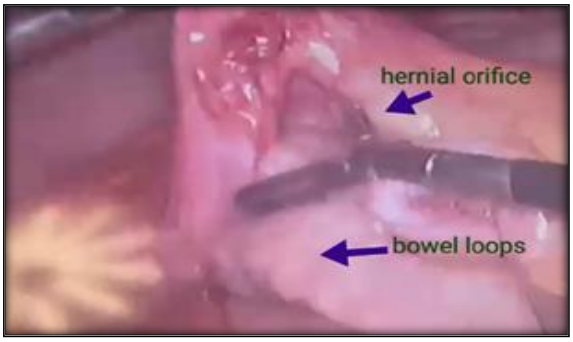

Figure 5C shows the intraoperative image. Intraoperatively, an approximately 35 cm section of

ISSN (O): 2687-5365; ISSN (P): 2753-6556

the small bowel had herniated posterior to the superior mesenteric artery. This was easily reducible, and all the bowel loops appeared viable. The defect was closed.

DISCUSSION

According to Ghahremani[4,5] and Meyers.[3] internal hernias are classified as follows: paraduodenal, foramen of Winslow, inter-sigmoid, pericecal, pelvic and supra vesical, transmesenteric, and transomental. However, this classification is neither fully systematic nor comprehensive. Internal hernias are also classified using potential orifices with relative frequency based on their topographic distribution in the peritoneal cavity according to the classification of Welch [Table 1]. Classification based on the type of hernia orifice is important for a systematic radiologic approach to diagnosis [Table 2].

Table 1: Classification of internal hernia- according to locations and relative frequencies

Types of hernia	Frequency
Paraduodenal hernia	53%;
Pericecal hernia	13%;
Foramen of Winslow hernia	8%;
Transmesenteric and transmesocolic hernia	8%;
Pelvic and supravesical hernia	6%;
Sigmoid mesocolon hernia	6%;
Transomental hernia	1%– 4%

Table 2: Classification of internal hernia- according to the type of Hernia Orifice

Type of Hernia Orifice	Types of internal hernia
Normal foramen:	Foramen of Winslow hernia (type of lesser sac hernia)
Unusual peritoneal fossa or recess into retroperitoneum:	Paraduodenal hernia, Pericecal hernia, Intersigmoid hernia (a subtype of sigmoid mesocolon–related hernia), and Most types of internal pelvic hernia (except for broad ligament hernia).
Abnormal opening in a mesentery or peritoneal ligament:	Small bowel mesentery–related hernia, Greater omentum–related hernia, Most types of lesser sac hernia (except for foramen of Winslow hernia), Transverse mesocolon–related hernia, Transmesosigmoid and Intramesosigmoid hernia (subtypes of sigmoid mesocolon–related hernia), Falciform ligament hernia, Broad ligament hernia (type of internal pelvic hernia), Roux-en-Y anastomosis–related hernia

Most mesenteries and peritoneal ligaments consist of two peritoneal layers. Abnormal openings can arise in only one peritoneal layer or through both layers. Internal hernias associated with an abnormal opening in a mesentery or peritoneal ligament are subcategorized according to the degree of the defect: (a) Transmesenteric or fenestra type if both peritoneal layers are involved; or (b) Intramesenteric or pouch type, if either peritoneal layer is involved. Classically, the Paraduodenal hernia has been reported as the most common type of internal hernia.[2] However, reports of postoperative internal hernias, particularly after Roux-en-Y anastomosis reconstruction, have been increasing recently.[5] Transmesenteric hernia is currently the most prevalent type, even if Roux-enY anastomosis–related hernia is excluded. Current incidences of the various hernia types are thus difficult to ascertain.

Gastrointestinal studies enhanced with intraluminal contrast material (barium-enhanced studies, enteroclysis) and abdominal CT enable accurate diagnosis of any internal hernia.[7] Thin-section axial images, and high-quality multiplanar reformations allow improved visualization of normal anatomic structures and pathologic conditions, leading to greater diagnostic accuracy. Furthermore, three-dimensional (3D) images, such as volume-rendered images, aid in understanding pathologic conditions and contribute to optimal surgical planning. Non-enhanced CT scans should detect hyperattenuating bowel walls reflecting hemorrhagic congestion and compare the enhancement degree after intravenous contrast material administration.[8] Portal venous phase scans are considered the most important, with the advantages of depicting mesenteric vessels and allowing better assessment of abnormalities of the bowel wall itself. However, acquiring arterial phase images and reformations of CT angiograms are also of great value in assessing mesenteric arteries.[9] The following factors may be helpful in preoperative diagnosis of internal hernias with CT: (a) knowledge of the normal anatomy of the peritoneal cavity and the characteristic anatomic location of each type of internal hernia; (b) observation of a saclike mass or cluster of dilated small bowel loops at an abnormal anatomic location in the presence of Small bowel obstruction; and (c) observation of an engorged, stretched and displaced mesenteric vascular pedicle and converging vessels at the hernial orifice.

The first step in surgical treatment is reduction. After reduction has been achieved, the hernia contents are carefully inspected for signs of ischemia, and nonviable structures are subsequently resected. The hernia orifice is usually closed to prevent a recurrence. Sometimes transection of a surrounding structure from the orifice to the free border is performed if no vital organ is inside. Closure of the foramen of Winslow is not routine because complications such as portal venous thrombosis may occur. Internal hernias have traditionally been managed with open laparotomy. Recently, laparoscopic surgery in selected patients with internal hernias has shown advantages, including a shorter hospital stay, better cosmetic appearance, and fewer postoperative complications than traditional open laparotomy.[10]

CONCLUSION

Understanding the anatomy of the peritoneal cavity, the anatomic location of each internal hernia, and recognition of the characteristic CT findings may

ISSN (O): 2687-5365; ISSN (P): 2753-6556

assist in considering or identifying internal hernias in most cases of small bowel obstruction. Currently, multi-detector row CT is most often recommended to detect the cause of small bowel obstruction and to facilitate the diagnosis of various internal hernias. Therefore, appropriate guidance of surgical colleagues by radiologists may be essential to avoid irreversible damage to the bowel wall and mesentery.

REFERENCES

1. Mayers MA. Internal abdominal hernias. In: Mayers MA, ed. Dynamic radiology of the abdomen. 5th ed. New York, NY: Springer-Verlag, 2000; 711–748.
2. Sufian S, Matsumoto T. Intestinal obstruction. Am J Surg 1975; 130:9–14.
3. Meyers MA, Charnsangavej C, Oliphant M. Internal abdominal hernias. In: Meyers MA, Charnsangavej C, Oliphant M, eds. Meyers' dynamic radiology of the abdomen. 6th ed. New York, NY: Springer, 2011; 381–409.
4. Ghahremani GG. Abdominal and pelvic hernias. In: Gore RM, Levine MS, eds. Textbook of gastrointestinal radiology. 2nd ed. Philadelphia, Pa: Saunders, 2000; 1993–2009.
5. Mathieu D, Luciani A; GERMAD Group. Internal abdominal herniations. AJR Am J Roentgenol 2004;183(2):397–404.
6. Martin LC, Merkle EM, Thompson WM. Review of internal hernias: radiographic and clinical findings. AJR Am J Roentgenol 2006; 186:703–717.
7. Blachar A, Federle MP, Dodson SF. Internal hernia: clinical and imaging findings in 17 patients emphasising CT criteria. Radiology 2001; 218:68 –74.
8. Hayakawa K, Tanikake M, Yoshida S, Yamamoto A, Yamamoto E, Morimoto T. CT findings of small bowel strangulation: the importance of contrast enhancement. Emerg Radiol 2013; 20:3–9.
9. Wiesner W, Khurana B, Ji H, Ros PR. CT of acute bowel ischemia. Radiology 2003; 226:635–650.
10. Jeong GA, Cho GS, Kim HC, Shin EJ, Song OP. Laparoscopic repair of paraduodenal hernia: comparison with conventional open repair. Surg Laparosc Endosc Percutan Tech 2008; 18:611–615.

ISSN (O): 2687-5365; ISSN (P): 2753-6556