Emergency MDCT in Internal Hernias: Short Reports Highlighting the Importance of Timely Surgical Intervention

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To the Editor,

Internal hernias (IHs) are rare clinical entities, with an overall incidence of <1%, defined as the protrusion of abdominal viscera through congenital or acquired defects in the peritoneum or mesentery [1,2]. They account for approximately 5.8% of all mechanical small-bowel obstructions (SBOs) [2,3]. Because the clinical presentation is nonspecific, diagnosis is often delayed; if left untreated, particularly when strangulation occurs, mortality exceeds 50% [2,3,4]. Consequently, multidetector computed tomography (MDCT) with multiplanar reconstructions (MPRs) is the primary diagnostic tool [2,3].

This short report includes three patients evaluated at Careggi University Hospital, a tertiary medical centre in Florence (2025–2026). Three cases with clinically and radiologically relevant features were selected from patients evaluated at our tertiary medical centre during 2025–2026. Initial CT scans were interpreted prospectively in the emergency setting by on-duty radiologists and subsequently re-evaluated retrospectively after surgical confirmation.

Short Report 1

A 91-year-old woman presented to the emergency department (ED) with a 12-hour history of diffuse abdominal pain, progressive asthenia over the preceding weeks, and acute melaena. Her history included a hysterectomy 47 years earlier and uninvestigated chronic anaemia due to patient refusal. Physical examination (PE) revealed diffuse abdominal tenderness without peritoneal irritation. Laboratory tests showed severe anaemia (haemoglobin: 6.3 g/dL) and moderate leucocytosis (12,600/µL), with a normal C-reactive protein level. Bedside ultrasound (US) demonstrated dilated small-bowel loops and free intraperitoneal fluid.

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Urgent contrast-enhanced CT (CECT) performed 3 hours after ED presentation showed fluid-filled ileal loops with spontaneously hyperdense walls and post-contrast hypoperfusion, suggesting acute bowel ischaemia (ABI). Two distinct transition points delineated the trapped segments, with severe upstream small-bowel dilatation, characteristic of a closed-loop obstruction. MPRs demonstrated the hernial orifice adjacent to the sigmoid colon, with mesenteric vessel convergence towards the defect and anteromedial displacement of the sigmoid colon, consistent with an ischaemic IH involving the sigmoid mesocolon. A synchronous gastric antropyloric mass was also identified (Fig. 1).

An emergency exploratory laparotomy performed 5 hours after arrival revealed haemoperitoneum and a complete defect of the sigmoid mesocolon, through which approximately 200 cm of ileum had herniated and developed transmural necrosis. A transmural antral malignancy was confirmed. The necrotic ileum was resected and the defect repaired. Given the patient's advanced age, critical condition, and synchronous malignancy, primary intestinal reconstruction was avoided in favour of a terminal ileostomy. After transfusions and tailored refeeding, she was discharged on postoperative day (POD) 10 with a functioning ileostomy and referred to palliative care.

Sigmoid mesocolon hernias (SMHs) are a rare subtype of IHs (6% of cases) [3]. Their radiological patterns depend on whether the defect involves one or both peritoneal layers:

- Intersigmoid and intramesosigmoid: involve protrusion into a congenital recess (intersigmoid fossa) or a defect confined to a single peritoneal leaf, resulting in a constrained, sac-like appearance [3,5].
- Transmesosigmoid: involve a full-thickness defect extending through both peritoneal layers (as confirmed intraoperatively in our patient); lacking an encapsulating peritoneal sac, they present as a sac-less pattern with unconstrained expansion towards the abdominal wall [3,5].

These defects may be congenital or acquired secondary to surgical trauma, inflammation, or adhesive traction: in this patient, the previous hysterectomy may have contributed

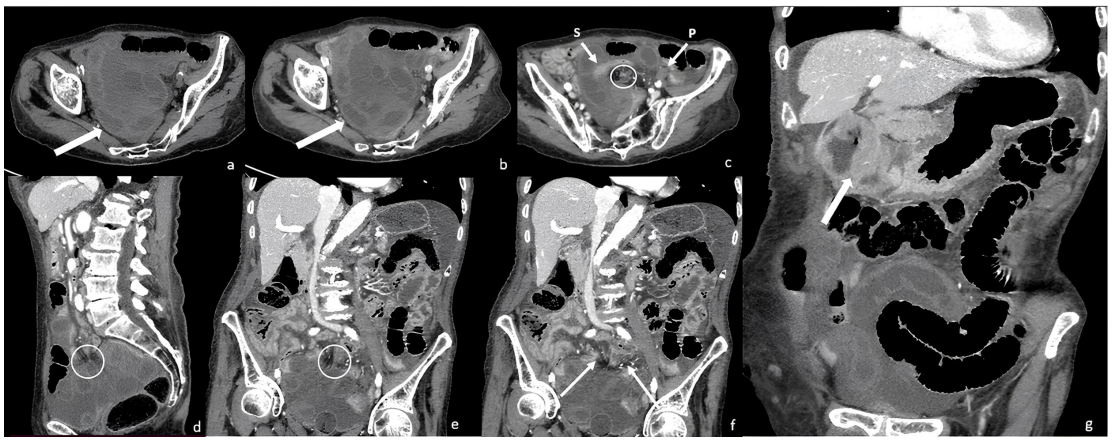


Fig. 1. Acute bowel ischemia secondary to a transmesosigmoid internal hernia with coexisting gastric antropyloric mass. (a) Axial unenhanced computed tomography (CT) scan demonstrating fluid-filled ileal loops with spontaneously hyperdense walls in the pelvic region (arrow). (b) Axial post-contrast CT scan showing persistent bowel wall hypoperfusion, suggesting acute bowel ischemia (ABI) (arrow). (c) Axial post-contrast CT scan demonstrating the location of the hernial orifice (circle) between the left psoas muscle (P, arrow) and the sigmoid colon (S, arrow). (d,e) Multiplanar reconstructions (MPRs) depicting the hernia defect between the left psoas muscle (P) and sigmoid colon (S). White circles in (d,e) indicate the location of the hernial orifice. (f) Coronal post-contrast CT scan displaying the convergence of mesenteric vessels toward the internal hernia defect (arrows). (g) Coronal post-contrast CT scan highlighting multiple dilated ileal loops and a gastric antropyloric mass (arrow).

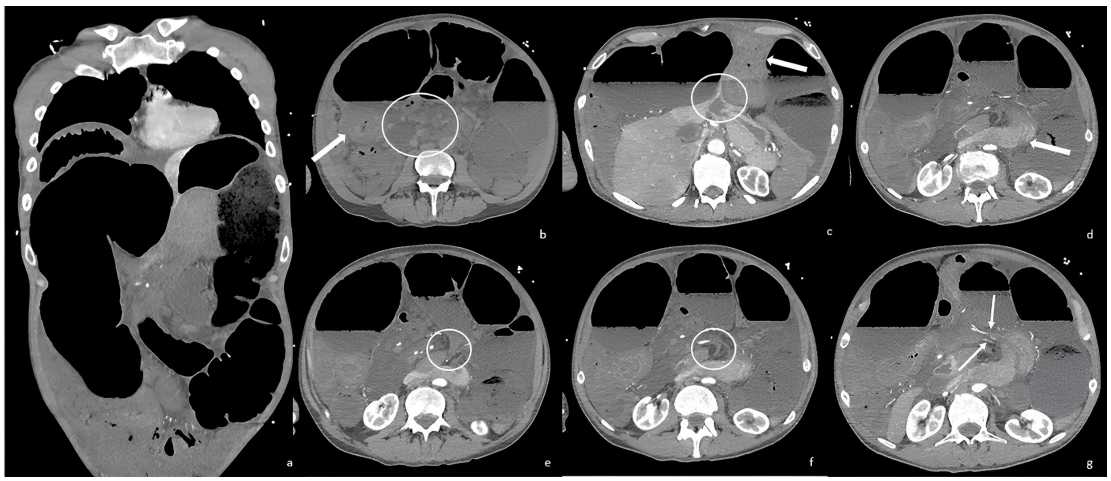


Fig. 2. Simultaneous double volvulus of the first jejunal loop and the distal transverse colon with acute bowel ischaemia. (a) Coronal CT scan showing marked dilatation of the stomach, small-bowel loops, and colon. (b) Unenhanced CT scan demonstrating spontaneous hyperdensity of the superior mesenteric vein branches, suggestive of thrombosis (circle), and hyperdense bowel walls (arrow). (c) Axial post-contrast CT scan showing an abnormal angulation of the pylorus, stretched leftwards and anterior to the duodenum (circle), with anterior displacement of the first jejunal loop (arrow). (d) Axial post-contrast CT scan showing stretched appearance of the ligament of Treitz (arrow). (e) Axial post-contrast CT scan demonstrating abrupt caliber reduction of a bowel loop at the level of the distal transverse colon (circle). (f) Axial post-contrast CT scan highlighting "whirl sign" of the mesenteric vascular pedicle (circle). (g) Axial post-contrast CT scan demonstrating non-opacification of several superior mesenteric artery (SMA) branches (arrows).

to the development of the defect. Although SMHs typically present as small-bowel loop clusters posterolateral to the sigmoid colon, this classic configuration was absent in our patient because massive herniation distorted the pelvic anatomy.

Short Report 2

A 61-year-old male with no surgical history presented to the ED with acute, worsening abdominal pain after a 25-kilometre bicycle ride, preceded by mild dyspepsia since the previous evening. PE revealed marked abdominal distension, diffuse tenderness, and asymmetric peripheral pulses. Laboratory tests showed leucocytosis (18,900/μL) and hyperfibrinogenaemia (500 mg/dL). CECT was performed within 30 minutes of arrival, demonstrating severe dilatation of the stomach, caecum, ascending colon, and proximal transverse colon, with several jejunal loops displaced into the right subdiaphragmatic space.

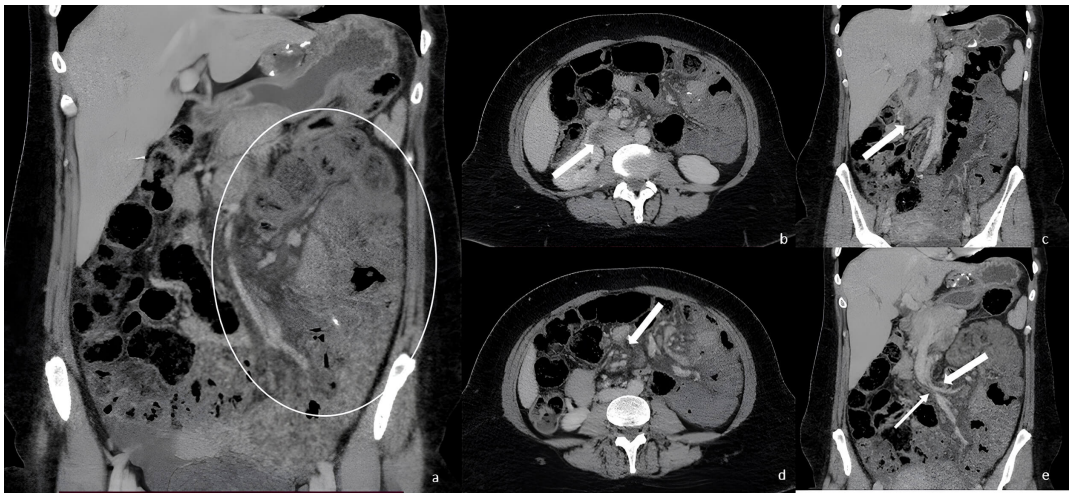


Fig. 3. Computed tomography (CT) findings of a Petersen's hernia. (a) Coronal post-contrast CT scan showing diffusely thickened and conglomerate bowel loops in the left flank and iliac fossa (circle). (b,c) Axial and coronal post-contrast CT scans demonstrating the ligament of Treitz anomalously located in the right paramedian region (arrow). (d) Axial post-contrast CT scan revealing the "whirl sign" of the mesenteric vessels (arrow). (e) Coronal post-contrast CT scan displaying vessel rotation with convergence toward the hernia defect (thick arrow) and focal narrowing of the superior mesenteric vein at the rotation site (thin arrow).

CECT revealed a simultaneous double volvulus involving the anteriorly displaced first jejunal loop and the distal transverse colon, with a prominent vascular "whirl sign". The stomach was markedly dilated, while the antrum appeared collapsed and atypically angulated in the pyloric region, stretched leftwards and anterior to the duodenum. Unenhanced scans revealed hyperdense mesenteric venous branches, indicating thrombosis, and thickened, hyperdense small-bowel walls, suggesting intramural haemorrhage, alongside free peritoneal fluid. Post-contrast scans showed non-opacification of some superior mesenteric artery (SMA) branches alongside superior mesenteric vein (SMV) occlusion (Fig. 2).

These findings suggested simultaneous double volvulus with signs of ischaemia associated with an IH, as suggested by abnormal antropyloric displacement. A trans-omental hernia could not be excluded, given the anterior displacement of the first jejunal loop and anterior antral traction, which simulated a posterior-to-anterior herniation trajectory. Although the vertically stretched gastro-omental vessels typical of trans-omental herniation were absent, mixed arterio-venous changes and anatomical displacement of the bowel loops complicated the assessment of these subtle vascular landmarks, preventing definitive exclusion.

An exploratory laparotomy performed within 40 minutes identified a herniation of the gastric antrum and first duodenal portion through a transverse mesocolon defect into the retroperitoneal space, with abundant haemorrhagic peritoneal fluid. During exploration, generalised laxity and abnormal elongation of the mesentery and mesocolon were noted. After derotations and hernia reduction, two areas of irreversible transmural ischaemia were identified: the first extended from the ligament of Treitz for approximately 300 cm, and the second involved the ascending and proximal transverse colon. The distal ileum (approximately 230 cm) and ileocaecal valve remained well perfused. Extensive jejunoileal resection and right hemicolectomy were performed. After a 48-hour open-abdomen VAC, a second-look laparotomy confirmed bowel viability and allowed isoperistaltic ileo-transverse and duodeno-ileal anastomoses. Recovery was uneventful, with full nutritional autonomy by POD 35.

Transmesocolic hernias (~8% of IHs) occur when bowel protrudes through an abnormal opening in the transverse mesocolon. They are predominantly iatrogenic, secondary to prior bariatric surgery, such as retrocolic Roux-en-Y gastric bypass (RYGB) [2,5]. Given the absence of surgical history, the observed mesenteric and mesocolonic laxity may have been associated with this rare non-iatrogenic presentation. Moreover, while these hernias usually involve small-bowel herniation into the lesser sac, this case featured an unusual retroperitoneal herniation of the gastric antrum.

Short Report 3

A 44-year-old woman presented to the ED with a 24-hour history of severe, opioid-resistant epigastric pain and intractable vomiting. Her surgical history was notable for a laparoscopic RYGB performed 5 years earlier. PE showed a soft, diffusely tender abdomen with hyperactive bowel sounds. Bedside US was non-diagnostic.

Urgent CECT within 2 hours of arrival demonstrated diffuse wall thickening and hyperenhancement of clustered jejuno-ileal loops in the left flank and iliac fossa, alongside anomalous rightward paramedian placement of the ligament of Treitz. A prominent mesenteric "whirl sign" was identified, associated with focal SMV narrowing at the rotational axis and moderate free intraperitoneal fluid (Fig. 3).

Table 1. Step-by-step reporting checklist for the emergency radiologist.

Reporting step	Key question to answer on CT	What to look for
Step 1: spatial arrangement and morphology	Are the bowel loops located in a physiological position?	Look for the Cluster Sign (conglomerate of loops in an anomalous location). Determine morphological pattern: • Sac-like: clustered loops encapsulated within a restrictive anatomical/peritoneal pouch or recess (e.g., paraduodenal, pericecal, or intersigmoid hernias). • Sac-less (disorganized): loops protrude through a full-thickness defect without a peritoneal membrane, expanding unconstrained toward the abdominal wall (e.g., transmesosigmoid in Short Report 1Fig. 1, transmesocolic in Short Report 2/Fig. 2)
Step 2: vascular pedicle	Is there any mesenteric distortion or axial rotation?	Check for vessel stretching, crowding, or convergence toward the hernial orifice. Look for the Whirl sign (vortex-like twisting of the mesentery and vessels around the hernial ring): • Diagnostic hallmark of associated volvulus (Short Report 2/Fig. 2 & Short Report 3/Fig. 3). • Frequently absent in tight retroperitoneal spaces; its absence does not rule out IH. • Prognostic red flag for imminent strangulation.
Step 3: mechanical obstruction	Is there a closed-loop obstruction?	Identify a "U" or "C" shaped configuration of fluid-distended bowel loops with two distinct, adjacent transition points converging at the hernial defect (Short Report 1/Fig. 1), accompanied by distal bowel collapse.
Step 4: wall viability	Is there imminent or established ischemia?	Assess systematically for: • Early ischemia: decreased/absent wall enhancement, focal circumferential thickening, moderate free intraperitoneal fluid (Short Report 2/Fig. 2). • Late/irreversible ischemia: pneumatosis intestinalis, portal venous gas, or loss of wall integrity.
Step 5: surgical history correlation	Does the patient have a history of Roux-en-Y gastric bypass?	Post-RYGB patients (Petersen's hernia): search for supramesocolic jejuno-ileal clustering (Short Report 3/Fig. 3), leftward displacement of mesenteric vessels, and anterior displacement of the remnant stomach/transverse colon.
Step 6: differential diagnosis	Could these CT features represent a diagnostic mimicker?	Rule out key clinical mimickers: • Adhesive SBO: abrupt transition point without vessel convergence to a defect, abnormal visceral displacement, or focal loop clustering. • Primary volvulus: mesenteric whirl present without bowel loop entrapment through an anatomical or iatrogenic mesenterico-peritoneal defect. • Acute vascular ischemia: occlusive SMA/SMV thrombosis or non-occlusive hypoperfusion without underlying mechanical closed-loop obstruction.

SMA, superior mesenteric artery; CT, computed tomography; RYGB, Roux-en-Y gastric bypass; SBO, small-bowel obstruction; SMV, superior mesenteric vein; IH, internal hernia.

Suspecting a Petersen's hernia, emergency laparoscopic exploration was performed 120 minutes later, confirming severe SBO with jejuno-ileal loops completely herniated into Petersen's space, mesenteric root rotation, and rightward displacement of the ligament of Treitz. Laparoscopic reduction proceeded to the jejuno-jejunal anastomosis, where tenacious omental/mesenteric adhesions were encountered. Due to the high risk of iatrogenic perforation, the procedure was converted to laparotomy. After complete adhesiolysis, manual derotation restored the normal anatomical position of the ligament of Treitz and the herniated loops. Viable bowel was preserved, and the hernial defect was sutured. Recovery was uneventful, and the patient was discharged on POD 4.

Petersen's hernia is an acquired iatrogenic IH that occurs after RYGB. It develops within Petersen's space, an anatomical defect between the mesentery of the Roux limb and the transverse mesocolon. Although routinely closed during primary surgery, this space can reopen or widen due to weight loss and intraperitoneal fat depletion, predisposing the patient to small-bowel herniation [6].

Discussion

Accurate assessment of IHs depends on understanding normal peritoneal anatomy and characteristic hernial sites. Applying this anatomical approach with MPRs, alongside a systematic reporting framework, may help radiologists recognise structural defects and complications (Table 1) [3,7].

A key radiological indicator is the presence of clustered, dilated bowel loops in an anomalous position: although classic sac-like appearances are widely described, our series shows that this feature is often absent. In sac-less defects, massive herniation can severely distort pelvic anatomy

(Short Report 1) or present with atypical visceral displacement, such as retroperitoneal herniation of the gastric antrum (Short Report 2) [2,5,7]. These atypical configurations differ from the more commonly described sac-like appearances and may complicate recognition of the hernial defect on CT. In such cases, assessment of mesenteric vessel convergence and abnormal visceral displacement may provide additional clues to the location and nature of the hernia [2,5,7]. Consequently, mapping the herniation trajectory relies heavily on key vascular landmarks to differentiate IHs from common mimickers, including adhesive obstruction, primary volvulus, and non-hernial ABI.

Mesenteric vessel convergence, often presenting as a "whirl sign" (Short Report 3), localises the hernial orifice and serves as an immediate red flag for ABI [4,5,7]. Furthermore, in post-bariatric patients (Short Report 3), recognising subtle mesenteric swirling alongside anomalous loop placement is essential for identifying Petersen's hernia [6]. This case series is limited by its small sample size and descriptive nature, as well as the absence of a systematic case selection process and a comparative cohort. These limitations should be considered when interpreting the imaging findings and their clinical implications.

Conclusions

IHs remain a diagnostic challenge because of their varied aetiologies and atypical, often sac-less radiological appearances. Rather than attempting to preoperatively classify a specific hernia subtype, emergency radiologists must focus on recognising key MDCT red flags, such as mesenteric vessel convergence and anomalous loop clustering. Given the prohibitively high mortality associated with delayed intervention, identifying these indicators should prompt timely surgical evaluation and consideration of urgent exploration. Ultimately, timely surgical intervention may help limit ischaemic progression and reduce the risk of extensive bowel resection.

Availability of Data and Materials

The data analyzed are available from the corresponding author upon reasonable request.

Author Contributions

Conceptualization, LS and CM; methodology, DC, GD, GG, AF and VM; investigation and data curation, LS, CM, DC, GD and GG; validation, AF and VM; writing—original draft preparation, LS and CM; writing—review and editing, GD and DC; visualization, GG and AF; supervision, VM. All authors have been involved in revising the manuscript critically for important intellectual content. All authors gave final approval of the version to be published. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

This study consists solely of a retrospective description of existing clinical data generated during routine clinical care and does not involve any additional research-related interventions. In accordance with the institutional guidelines of Careggi University Hospital, ethical approval was not required. The study was conducted in accordance with the Declaration of Helsinki. Written informed consent for the use of anonymized clinical data was obtained from all three patients described in this short report.

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Conflict of Interest

The authors declare no conflict of interest.

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