

Imaging features of internal hernias in association with risk of small bowel strangulation

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Introduction

Internal hernia (IH) is defined as the protrusion of a abdominal viscera through a normal or abnormal aperture within peritoneal cavity and can be either congenital or acquired, which can be caused by the protrusion of small bowel loops through adhesive peritoneal bands in postoperative patients. Emergent surgical intervention is often required when IH causing small bowel obstruction (SBO). The purpose of our study is to determine the imaging features of IH in association with risk of small bowel strangulation.

Materials and Methods

January 2008 to October 2012, patients proved with IH surgically are reviewed. The CT studies were reviewed for the presence of CT signs suggestive of small bowel strangulation, including thickened bowel wall, mesenteric stranding, mesenteric edema or fluid accumulation, poor contrast enhancement of bowel wall, and Whirl sign. The CT images and operative findings between patients with and without small bowel resection were compared. Statistical analyses were carried out by the Fisher Exact Test. *P* value less than 0.05 was considered significant.

Result

A total of 15 patients were enrolled in our studies. Thirteen of them underwent contrast-enhanced CT studies, except that 2 patients received unenhanced CT studies because of poor renal function.

Table 1

Type of internal hernia	Strangulation (n = 7) No. (%)	Non-strangulation (n = 8) No. (%)
Adhesive band	5 (71)	4 (50)
Transmenstetric type	1 (14)	2 (25)
Intersigmoid type	1 (14)	1 (13)
Foramen of Winslow	0	1 (13)

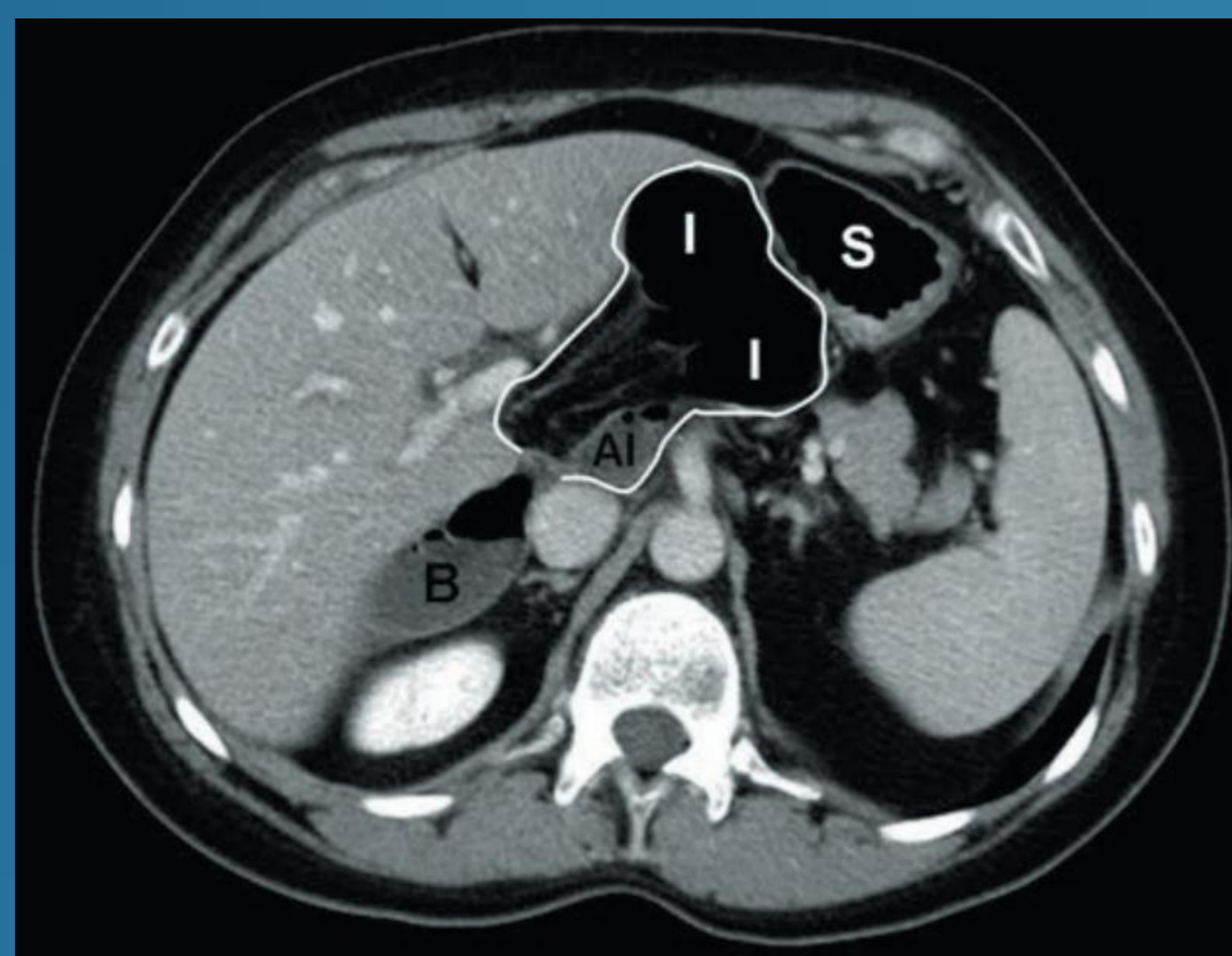


Fig. 1. A 48-year-old woman presented with SBO due to IH into lesser sac through foramen of Winslow. MDCT in axial section, revealing the clustered small-bowel loops (white I) located within the lesser sac (white line) through the foramen of Winslow, with a narrowed afferent loop (AI) passing through the foramen of Winslow. The stomach (S) is displaced anteriorly and laterally, and the bowel loops (black B) show dilatation proximal to the afferent loops.

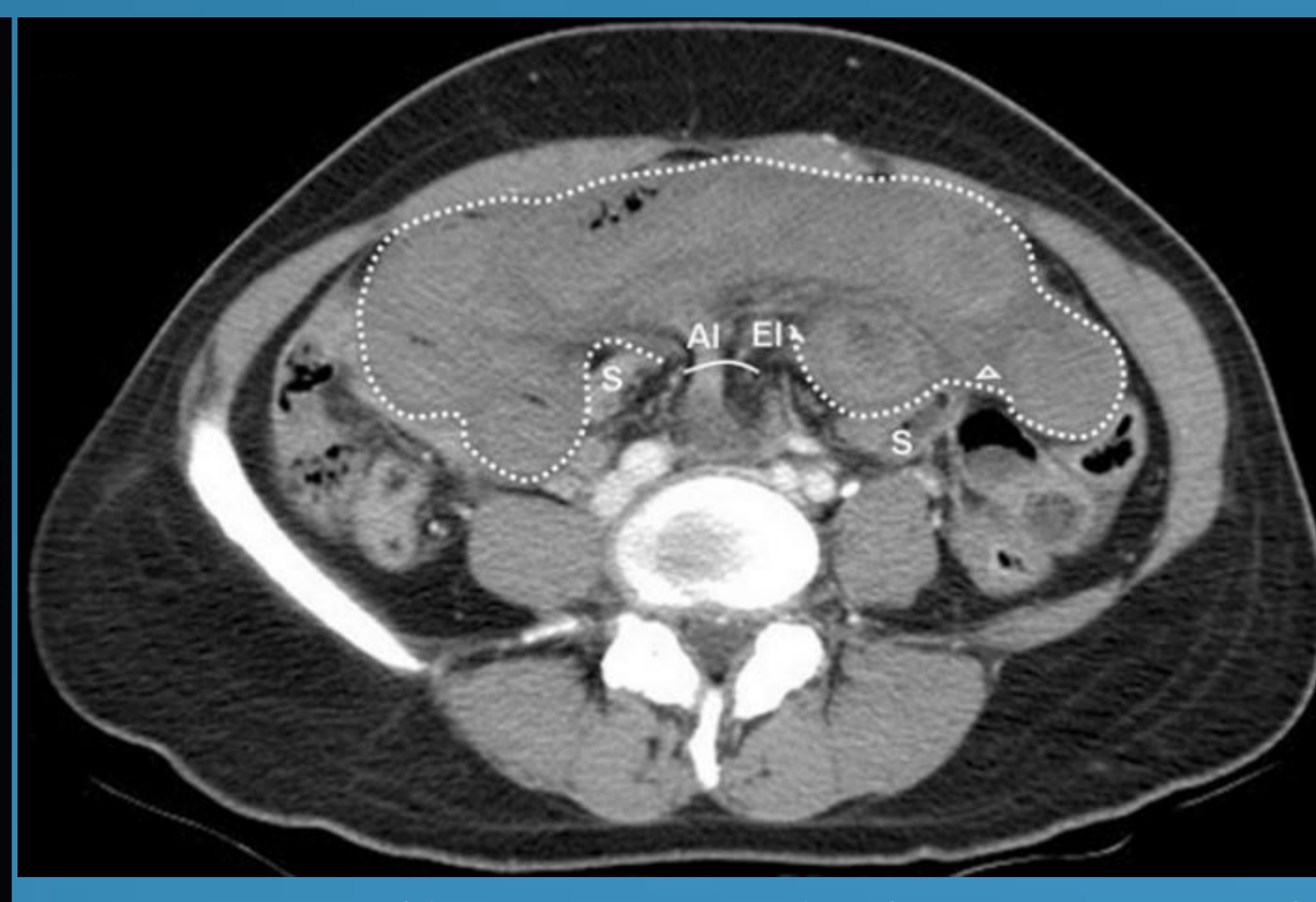


Fig. 2. A 47-year-old woman presented with epigastric pain with nausea and vomiting due to strangulated IH, intersigmoid type. Abdominal CT demonstrates a cluster of dilated small bowel loops (within dotted line) in the lower abdomen, with displacement of the sigmoid colon (S). The bowel wall of the herniated small bowel loops shows thickened, decreased enhancement, and mesenteric fluid accumulation (hollow arrowhead). Note the narrowed afferent (AI) and efferent (EI) loops were passing through the sigmoid mesocolon defect (curved line).

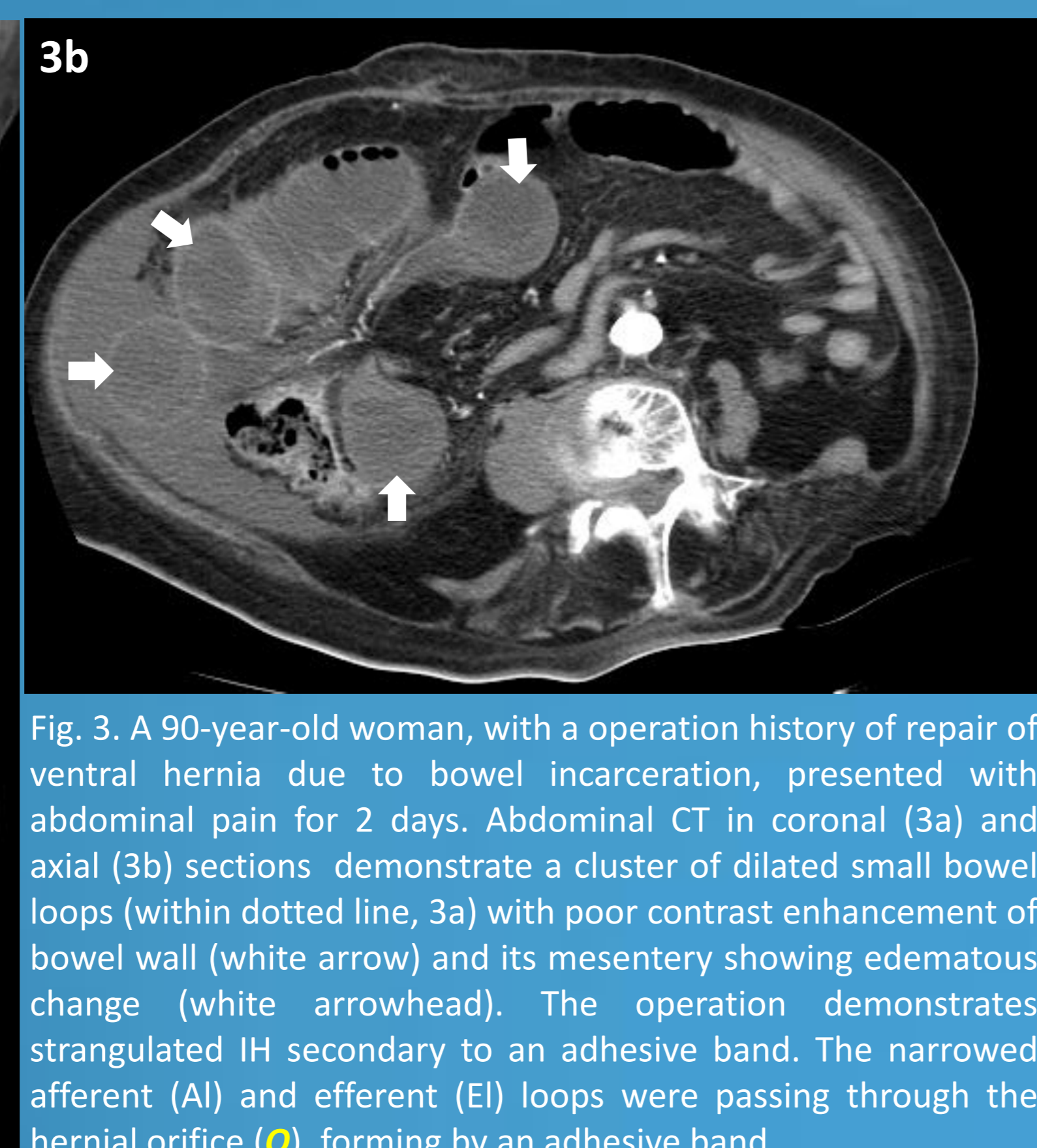
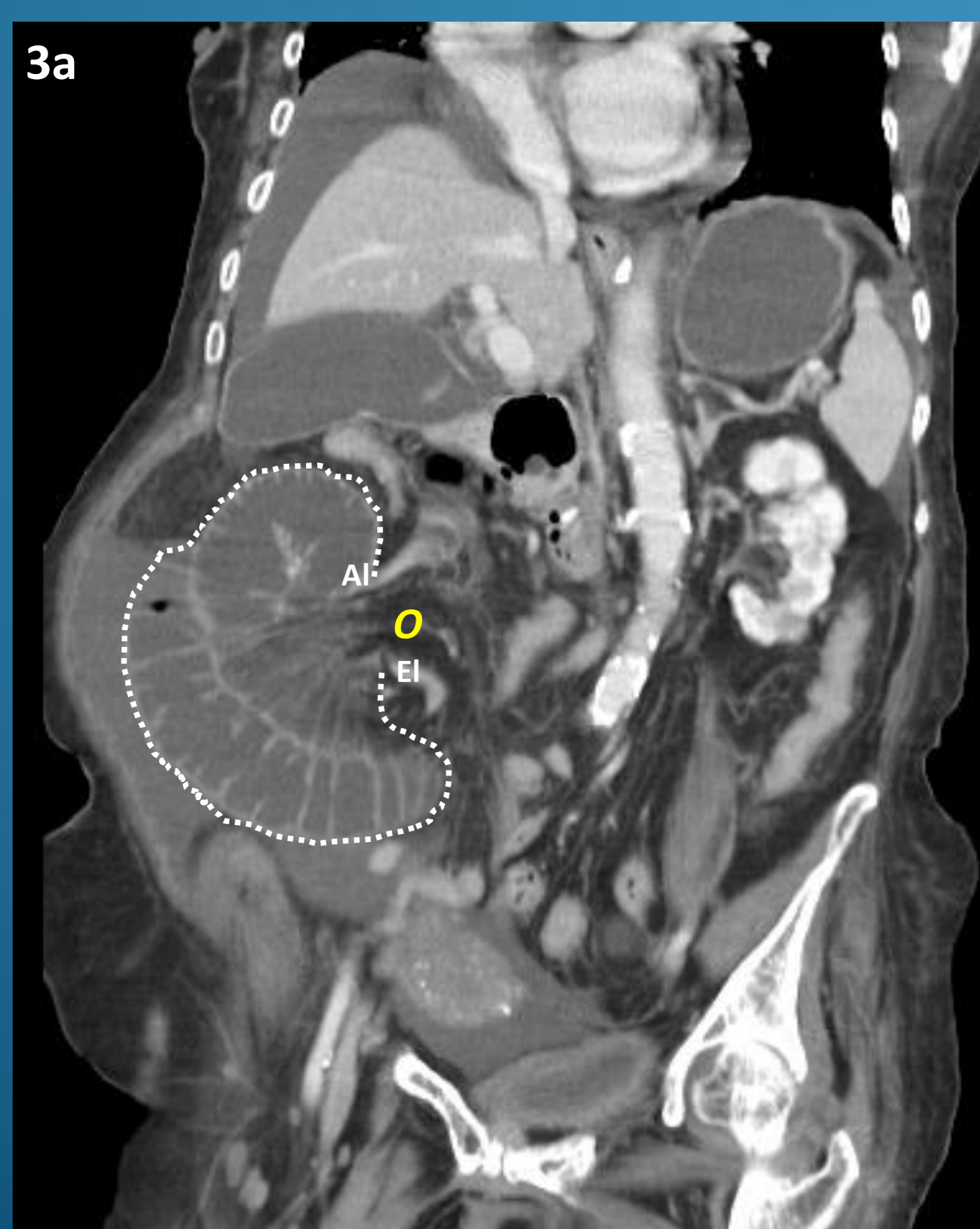


Fig. 3. A 90-year-old woman, with a operation history of repair of ventral hernia due to bowel incarceration, presented with abdominal pain for 2 days. Abdominal CT in coronal (3a) and axial (3b) sections demonstrate a cluster of dilated small bowel loops (within dotted line, 3a) with poor contrast enhancement of bowel wall (white arrow) and its mesentery showing edematous change (white arrowhead). The operation demonstrates strangulated IH secondary to an adhesive band. The narrowed afferent (AI) and efferent (EI) loops were passing through the hernial orifice (O), forming by an adhesive band.

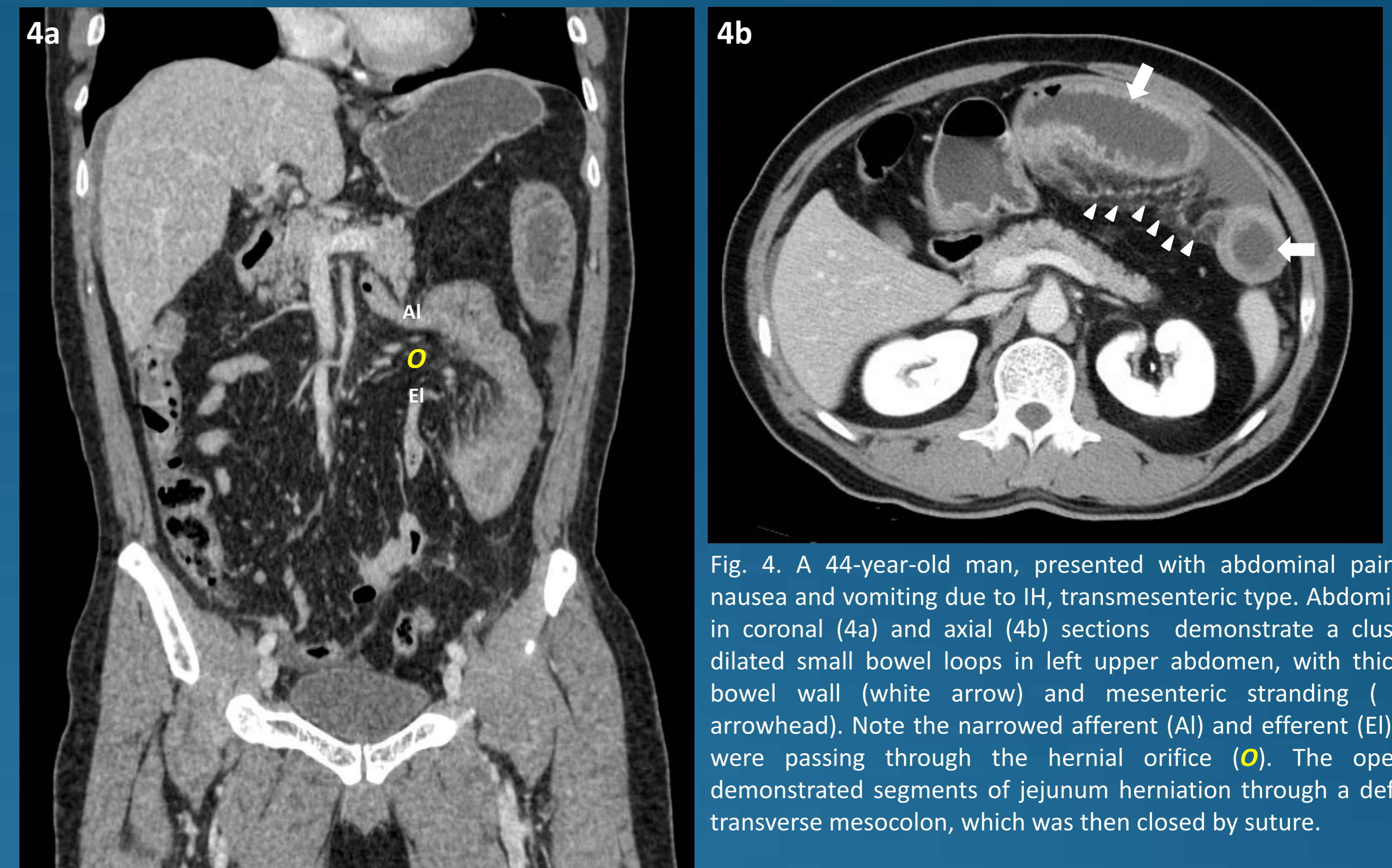


Fig. 4. A 44-year-old man, presented with abdominal pain with nausea and vomiting due to IH, transmesenteric type. Abdominal CT in coronal (4a) and axial (4b) sections demonstrate a cluster of dilated small bowel loops in left upper abdomen, with thickened bowel wall (white arrow) and mesenteric stranding (white arrowhead). Note the narrowed afferent (AI) and efferent (EI) loops were passing through the hernial orifice (O). The operation demonstrated segments of jejunum herniation through a defect at transverse mesocolon, which was then closed by suture.

Table 2

CT signs	Strangulation (n = 7) No. (%)	Non-strangulation (n = 8) No. (%)	P value
Presence of poor contrast enhancement of bowel wall	4 (80) *	1 (13)	0.032
Thickened bowel wall	6 (86)	5 (63)	0.569
Mesenteric edema or fluid accumulation	6 (86)	3 (38)	0.119
Mesenteric stranding	7 (100)	7 (88)	1

* Two patients received unenhanced CT studies because of poor renal function.

Discussion

CT imaging plays an important role in the diagnosis of IH because of its availability, speed, and multiplanar reformatting capabilities. Specific signs of IH on CT included evidence of SBO, saclike clustering of small bowel loops, encapsulation of small bowel within the hernial sac, abnormal location and disturbed arrangement of the small bowel, and crowded, and engorged mesenteric vessels.

However, IH can cause SBO with an incidence 0.5-3%, and has been rarely diagnosed preoperatively.

Most strangulated SBO are related to the closed-loop obstruction, which occurred in all of the patients in our study. In the setting of SBO, high attenuation of the bowel wall on unenhanced CT scans, thickened bowel wall, and mesenteric edema were important CT signs of small bowel strangulation, whereas poor contrast enhancement of bowel wall was highly specific CT sign of small bowel strangulation. Our study demonstrates that presence of poor contrast enhancement of bowel wall was significantly correlated with strangulated IH. Besides, thickened bowel wall and mesenteric edema occurred more frequently in strangulated IHs than non-strangulated.

Conclusion

Closed-loop bowel obstruction as IHs have high incidence of vascular compromise and are associated with risk of SBO. It is important to familiar with the imaging features in association with strangulated internal hernias so that timely surgical intervention can be promoted and resection of the involved bowel loops can be avoided.

Reference

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