Cureus
Part of SPRINGER NATURE

Open Access Case Report

Chronic and Acute Adult Intestinal Malrotation Managed by Laparoscopic and Open Ladd Procedures: A Report of Two Cases

Review began 11/09/2026
Review ended 11/12/2026
Published 11/16/2026

© **Copyright** 2026
Elalfy et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

DOI: 10.7759/cureus.119774

Tamer Elalfy [1, 2], Wael Abdelghany [2], Ab Bari Shah [2], Muhammad Bilawal [2], Rabab M. Elsaed [3]

1. General Surgery, Zagazig University, Zagazig, EGY 2. General Surgery, Mohammad Dossary Hospital, Al Khobar, SAU 3. Radiology, Ain Shams University, Cairo, EGY

Corresponding author: Tamer Elalfy, alfitamir@yahoo.com

Abstract

Intestinal malrotation is a congenital anomaly of midgut rotation and fixation that usually presents in infancy. In adults, it is uncommon and most often causes chronic, nonspecific abdominal symptoms; less often, it presents acutely with midgut volvulus. We report two adults treated at one institution, one at each end of this spectrum. A 26-year-old woman had a three-month history of right-sided abdominal pain, nausea, constipation, and bloating. Contrast-enhanced computed tomography (CT) showed the superior mesenteric vein lying anterior to the superior mesenteric artery and a cluster of mildly dilated small-bowel loops. She underwent an elective laparoscopic Ladd procedure, with counterclockwise detorsion of a low-grade twist, division of Ladd bands, widening of the mesenteric base, and appendectomy, and was discharged after three days. A 40-year-old man had a two-day history of abdominal pain, distension, vomiting, and obstipation. CT showed a whirlpool sign of the mesenteric vessels and markedly dilated small bowel, without signs of ischemia. Laparoscopy was attempted, but the distended bowel left no working space, and the operation was converted to laparotomy. The midgut volvulus was reduced by counterclockwise detorsion, Ladd bands were divided, the mesenteric base was widened, and an appendectomy was performed. The bowel was viable after detorsion; no resection was needed, and he was discharged after seven days. Laparoscopy suited the chronic case without bowel distension. In acute volvulus with severe distension, early conversion to an open procedure allowed rapid detorsion and direct assessment of bowel viability, and the entire bowel was preserved.

Categories: General Surgery, Anatomy, Gastroenterology
Keywords: adult intestinal malrotation, bowel salvage, ladd's bands, ladd's procedure, laparoscopy, laparotomy, midgut volvulus, whirlpool sign

Introduction

Intestinal malrotation results from failure of the fetal midgut to complete its normal 270° counterclockwise rotation around the axis of the superior mesenteric artery (SMA) as it returns to the abdominal cavity at about 10 to 12 weeks of gestation [1,2]. This arrest of rotation produces two anatomical vulnerabilities that govern how the anomaly later presents clinically: abnormal peritoneal attachments (Ladd's bands) that cross and compress the duodenum, and an abnormally narrow mesenteric root that leaves the midgut prone to twisting on its own axis and progressing to volvulus [1-3].

Malrotation is traditionally regarded as a disease of infancy, and in paediatric series most symptomatic patients present in the neonatal period [4]; however, a single-institution series of 170 patients of all ages found that 48% were adults at diagnosis [1]. Because many adults with malrotation remain lifelong asymptomatic carriers, true population incidence is difficult to establish, but symptomatic presentation in adulthood is rare [1,5].

When adults do become symptomatic, presentation follows one of two broadly divergent pathways. The chronic, elective pathway is far more frequent and is characterised by intermittent crampy abdominal pain, early satiety, bloating, nausea and weight loss; because these symptoms are vague, they are frequently misattributed to functional or acid-peptic disorders, and patients may be symptomatic for years before the correct diagnosis is made [1,5,6]. The acute pathway is uncommon but represents a genuine surgical emergency, typically precipitated by midgut volvulus, and carries a substantial risk of bowel ischaemia, necrosis and short bowel syndrome if intervention is delayed [5,7].

Computed tomography (CT) is central to timely diagnosis in both pathways. In the largest adult series, CT was 97.5% sensitive for malrotation; the whirlpool sign - swirling of the mesenteric vessels and bowel loops around the SMA axis - was present in 30.9% of patients and is a highly suggestive marker of volvulus that should prompt urgent surgical evaluation even in a haemodynamically stable patient without imaging signs of ischaemia [8].

How to cite this article
Elalfy T, Abdelghany W, Shah A, et al. (November 16, 2026) Chronic and Acute Adult Intestinal Malrotation Managed by Laparoscopic and Open Ladd Procedures: A Report of Two Cases. Cureus 18(11): e119774. DOI 10.7759/cureus.119774

The Ladd procedure - division of the peritoneal bands, widening of the mesenteric base, detorsion of any volvulus and appendectomy - remains the cornerstone of surgical management [9]. A laparoscopic approach has been increasingly adopted for elective, chronic presentations, with comparable safety and shorter hospital stay relative to open surgery [10-12]. Its role in acute volvulus is far less established, since severe bowel distension can rapidly eliminate the working space required for safe laparoscopic manipulation [11,12].

Published adult series are dominated by single-presentation cohorts, so the contrasting operative decisions demanded by the chronic and acute pathways are rarely compared directly. We report both variants, managed within a short interval of one another in a single department, to illustrate the anatomical basis for their contrasting operative strategies and the decision-making that allowed the acute case to be salvaged without bowel resection.

Case Presentation

Case 1: chronic (elective) presentation

A 26-year-old woman with a background of hypothyroidism presented to the surgical outpatient clinic with a three-month history of right-sided abdominal pain, nausea, constipation and gaseous distension. She reported no fever or weight loss, and she had no history of previous abdominal surgery. Symptoms had recently worsened, localising to the right hypochondrium and right iliac fossa, with mild tenderness on examination. Vital signs were stable: temperature 37.2°C, heart rate 70 beats per minute, and blood pressure 120/70 millimetres of mercury. Laboratory investigations showed a haemoglobin (Hb) of 13.5 g/dL, a total leucocyte count (TLC) of 4.5 $\times 10^9$/L and a platelet count of 227 $\times 10^9$/L, with a normal comprehensive metabolic panel and normal liver function tests (LFTs).

Contrast-enhanced CT of the abdomen and pelvis demonstrated an abnormal distribution of bowel, with small bowel predominantly on the right and colon on the left, and inversion of the normal relationship between the superior mesenteric vein (SMV) and SMA, with the SMV lying anterior to the SMA (Figure *1*). A focal cluster of mildly dilated, fluid-filled small-bowel loops was noted in the right hypochondrium, consistent with incomplete small-bowel obstruction. Incidental polysplenia, a finding recognised to co-occur with malrotation as part of the heterotaxy spectrum [13], and hepatomegaly were also identified.

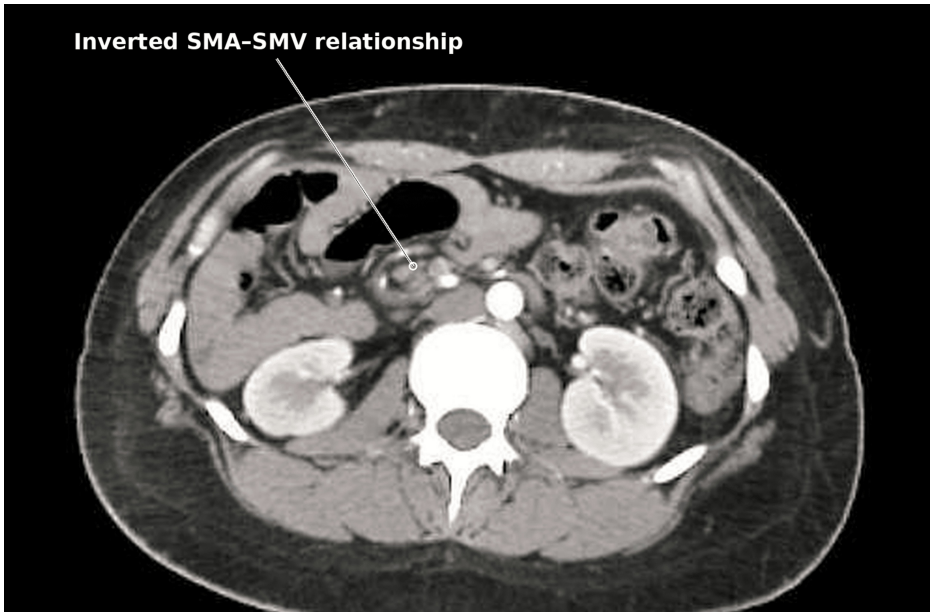


FIGURE 1: Preoperative axial contrast-enhanced computed tomography (CT) (Case 1) demonstrating inversion of the superior mesenteric vein (SMV) relative to the superior mesenteric artery (SMA) - the inverted relationship is labelled - with a cluster of mildly dilated small-bowel loops in the right hypochondrium and no high-grade dilation.

Given the subacute, non-emergent nature of her presentation, she was scheduled for an elective laparoscopic Ladd's procedure. Access was obtained through a 10-mm umbilical camera port and three 5-mm working ports. Intraoperatively, the small intestine was partially malrotated with a congested mesentery secondary to a low-grade twist. The caecum was situated on the left side of the abdomen, while

the appendix and terminal ileum were on the right. Counterclockwise detorsion was performed, Ladd's bands were divided, the duodenum was straightened, and the mesenteric base was widened. The bowel was placed in a non-anatomic but stable configuration (small bowel right, colon left), and a prophylactic appendectomy was completed. A surgical drain was placed in the pelvis, brought out on the left side, prior to closure. Her postoperative course was uneventful, and she was discharged after a three-day hospital stay, tolerating a normal diet, with resolution of her presenting symptoms. At regular follow-up visits one week, one month and three months after discharge, she remained free of abdominal symptoms, and her abdominal examination was normal.

Case 2: acute (emergent) presentation

A 40-year-old man presented to the emergency department with a two-day history of acute, progressive abdominal pain, distension, multiple episodes of vomiting and obstipation. On admission, vital signs were notably stable despite the degree of obstruction (temperature 37.3°C, heart rate 75 beats per minute, blood pressure 130/80 millimetres of mercury, peripheral oxygen saturation 99%), without clinical evidence of systemic sepsis or shock. He was alert, with a Glasgow Coma Scale (GCS) score of 15, and abdominal examination showed marked distension with exaggerated bowel sounds. Laboratory investigations showed an Hb of 17.5 g/dL and a TLC of 9.4 $\times 10^9$/L.

Contrast-enhanced CT of the abdomen showed massively dilated, fluid-filled small-bowel loops, measuring up to 35 mm in diameter, with a decompressed colon (Figure *2A*), and a "whirlpool sign" of the mesenteric vessels and ileal loops on coronal reconstruction (Figure *2B*) - a recognised sign of midgut volvulus [13]. Mild pelvi-abdominal ascites was also noted. Critically, the radiology report described no evidence of bowel ischaemia at the time of imaging.

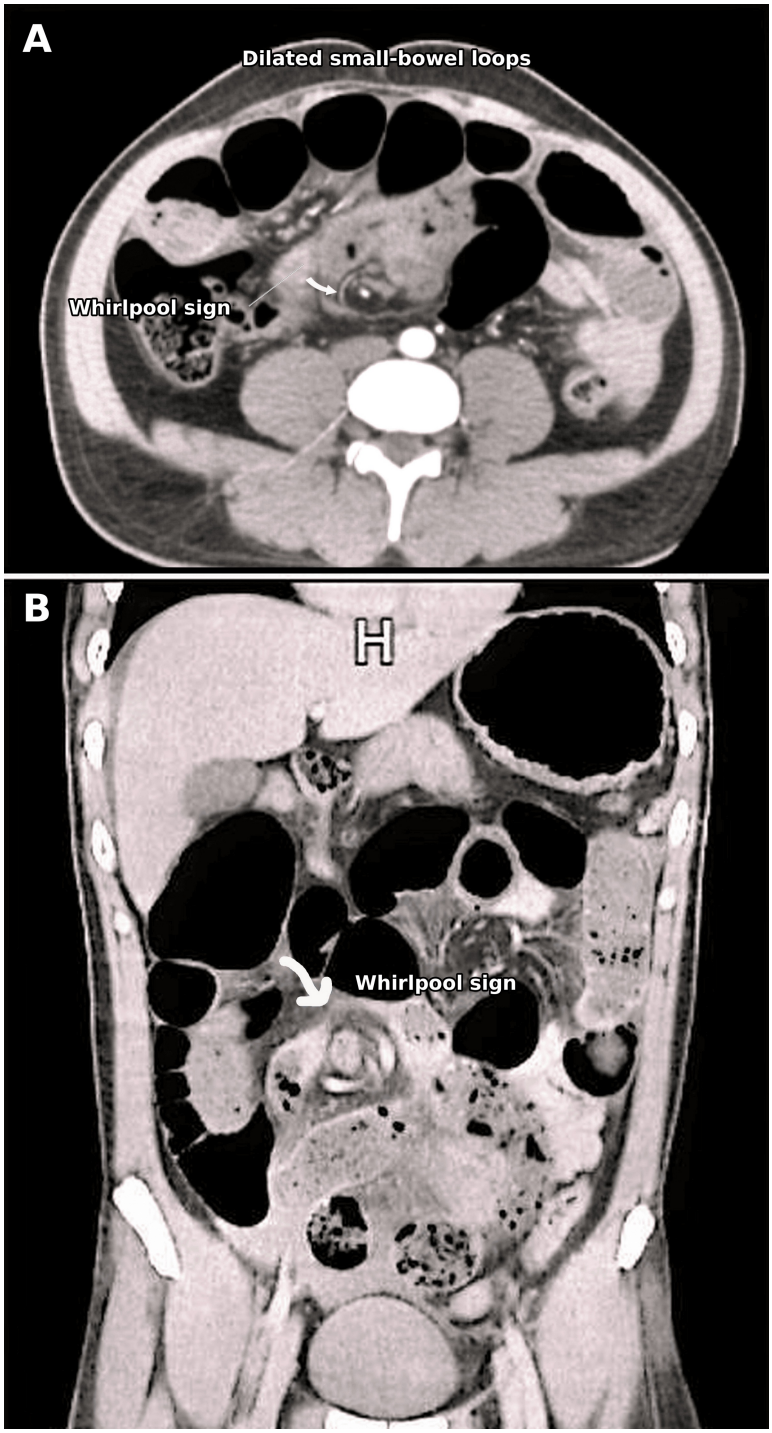


FIGURE 2: (A) Axial contrast-enhanced CT (Case 2) showing massively dilated, fluid-filled small-bowel loops (labelled) with a collapsed distal segment. The white curved arrow indicates the whirlpool sign of the twisted mesenteric vessels, which is also labelled. (B) Coronal contrast-enhanced CT (Case 2) demonstrating the "whirlpool sign" - a spiral configuration of the mesenteric vessels - characteristic of midgut volvulus. The white curved arrow indicates the whirlpool sign, which is also labelled. The letter "H" at the top of the image is a head-orientation marker.

He remained haemodynamically stable, with no CT evidence of bowel ischaemia. Following surgical

consultation - the patient having been assessed at approximately 02:00 - he was admitted and kept nil per os (NPO), with intravenous fluid resuscitation, nasogastric tube decompression and a prophylactic broad-spectrum antibiotic. As he remained haemodynamically stable, with no clinical signs of bowel deterioration, he was taken to the operating room at 08:00 the following morning, approximately six hours after his initial assessment and CT, as the first case on the operative list, for planned laparoscopic exploration with the possibility of conversion. On insertion of the laparoscope, massive small-bowel distension left no working space for safe laparoscopic manipulation; the procedure was therefore promptly converted to an open exploratory laparotomy through a 20-cm midline incision (Figure 3). Evisceration confirmed a midgut volvulus with markedly thickened, hyperaemic and congested small bowel and Ladd's bands compressing the duodenum. Manual counterclockwise detorsion of the mesenteric root was performed, followed by division of the Ladd's bands, widening of the mesenteric base and a prophylactic appendectomy. Following detorsion, warm, moist packs were applied to the bowel, which was observed for 10-15 minutes; on reassessment, the entire midgut had regained a normal pink colour, visible peristalsis and mesenteric pulsation, and the bowel was judged fully viable on both visual and tactile assessment, so no resection was required.



FIGURE 3: Intraoperative photograph (Case 2) immediately after conversion to open laparotomy, showing the eviscerated, distended, oedematous and hyperaemic small bowel, whose distension left no working space for safe laparoscopic manipulation. The white arrow indicates a Ladd band, which is labelled.

The postoperative course was uneventful. Normal bowel function (flatus) returned on postoperative day 3, and the patient was advanced to a soft diet, which he tolerated well. A follow-up erect abdominal radiograph showed reduced bowel distension, and bedside ultrasonography confirmed only mild residual bowel-wall oedema and a small volume of physiological free fluid. He remained afebrile throughout, with normal inflammatory markers and complete resolution of pain and distension. He was discharged in good condition after a seven-day hospital stay. At regular follow-up visits one week and one month after discharge, his wound had healed well, his abdominal examination was normal, and he reported no abdominal symptoms or complaints.

Table 1 presents a comparison of the clinical, radiological, and operative features of the two reported cases.

Feature	Case 1	Case 2
Presentation type	Chronic	Acute
Age (years)	26	40
Sex	Female	Male
Symptom duration	Three months	Two days
Temperature (°C)	37.2	37.3
Heart rate (beats per minute)	70	75
Systolic blood pressure (mmHg)	120	130
Diastolic blood pressure (mmHg)	70	80
Oxygen saturation (%)	Not reported	99
Key CT finding	Inverted superior mesenteric vein–artery relationship	Whirlpool sign
Small-bowel dilation on CT	Mild	Massive
Bowel ischaemia on CT	Not reported	Absent
Intraoperative finding	Low-grade mesenteric twist	Midgut volvulus
Ladd's bands	Present	Present
Initial operative approach	Laparoscopic	Laparoscopic
Conversion to open surgery	No	Yes
Reason for conversion	Not applicable	No working space
Counterclockwise detorsion	Yes	Yes
Division of Ladd's bands	Yes	Yes
Mesenteric widening	Yes	Yes
Appendectomy	Yes	Yes
Bowel resection	No	No
Postoperative course	Uneventful	Uneventful
Return of bowel function	Not reported	Postoperative day 3
Postoperative fever	Not reported	Absent
Inflammatory markers	Not reported	Normal
Symptom resolution	Yes	Yes
Length of hospital stay (days)	3	7

TABLE 1: Comparative clinical, radiological and operative features of the two reported cases.

°C: degrees Celsius; mmHg: millimetres of mercury; CT: computed tomography; Not reported: not stated in the case record

Discussion

Adult-onset intestinal malrotation is an uncommon diagnosis that surgeons are, by training, more accustomed to considering in neonates and infants [7]. The two anatomical consequences of arrested midgut rotation - Ladd's bands compressing the duodenum and a narrow, unstable mesenteric root - together explain why the same underlying anomaly can manifest across such a wide clinical spectrum, from an incidental radiological finding to a catastrophic surgical emergency [1,4]. Our institution's experience with both extremes within a short interval offered a direct comparison of the operative decision-making each pathway demands.

Laparoscopy has become an accepted, and arguably preferred, approach for the elective management of chronic adult malrotation [10,12,14]. In the absence of acute obstruction, the abdomen retains adequate working space, and pneumoperitoneum can be safely maintained, allowing magnified, precise division of Ladd's bands, mesenteric widening and appendectomy, with the recognised benefits of minimally invasive surgery - reduced postoperative pain and shorter length of stay [10,12]. This was reflected in Case 1, where, despite mesenteric congestion from a low-grade twist, the absence of high-grade distension permitted the entire procedure to be completed laparoscopically with an uncomplicated recovery.

These patterns mirror the pooled adult experience. In a systematic review of 194 adult cases, at least one chronic symptom was present in 87.6% of patients; CT was the most frequent imaging modality, with a sensitivity of 97.5%; an abnormal superior mesenteric vessel relationship was the commonest CT finding (58.0%), and a whirlpool sign was seen in 30.9% [8]. Reported conversion rates from laparoscopic to open Ladd procedures in adults range from 13.6% [14] to 33% [12], and complications have been reported in 60% of nonelective repairs, compared with 25% of elective and 22% of incidental repairs [6].

Acute midgut volvulus, as in Case 2, poses a fundamentally different problem. The narrow mesenteric pedicle acts as a fulcrum: once it twists, venous outflow is compromised first, followed by arterial inflow, so that the interval between symptom onset and irreversible ischaemia may be short [1,5,13]. Preoperative CT is central to timely diagnosis; the "whirlpool sign" - a spiral configuration of the mesenteric vessels and bowel loops around the axis of rotation - is a well-described and highly suggestive radiological marker of volvulus and should prompt urgent surgical evaluation even when, as in our patient, there is no radiological evidence of ischaemia and vital signs remain deceptively stable [13].

Our experience also illustrates why a laparoscopic-first strategy, although reasonable to attempt, can be rapidly self-limiting in this setting. Venous congestion from a twisted mesentery produces marked bowel-wall oedema and distension that can abolish the intra-abdominal working space within minutes. Attempting to manipulate friable, oedematous, potentially ischaemic bowel with laparoscopic instruments under these conditions carries a meaningful risk of iatrogenic bowel injury, and the confined view can delay the single manoeuvre that actually restores perfusion - manual detorsion of the root. For this reason, we advocate a low threshold for early conversion to laparotomy whenever acute volvulus is encountered or suspected, rather than persisting with a laparoscopic approach once distension is recognised to be severe.

An open approach in the acute setting offers three practical advantages that proved decisive in Case 2. First, immediate evisceration allows rapid decompression of the abdominal cavity. Second, it permits prompt manual detorsion of the mesenteric root, the single step that most directly restores perfusion. Third, assessment of bowel viability after detorsion is as much a tactile exercise as a visual one - palpation of mesenteric arterial pulsations and assessment of bowel-wall thickness are difficult to reproduce laparoscopically in a distended abdomen. In our patient, the classic sequence of a 10-15 minute observation period with warm, moist packs, followed by reassessment for return of colour, peristalsis and pulsations, confirmed full viability and obviated resection - the outcome most protective against short bowel syndrome and its attendant long-term nutritional morbidity [5,7].

In Case 2, surgery followed approximately six hours after CT - the patient was assessed at about 02:00 and taken to theatre at 08:00 as the first case on the operative list - an interval that was acceptable only because the patient remained haemodynamically stable with no CT evidence of ischaemia. This report is limited by its two-case design, which does not permit generalisable conclusions, and by follow-up limited to three months in Case 1 and one month in Case 2. Nonetheless, the juxtaposition of two adult malrotation phenotypes managed within one institution reinforces a practical message for the general and emergency surgeon: the operative approach to adult intestinal malrotation should be dictated by the acuity of presentation and the degree of bowel distension encountered at surgery, not by a fixed preference for a minimally invasive technique.

Conclusions

Adult-onset intestinal malrotation demands an operative strategy tailored to its clinical presentation. In our experience, a laparoscopic Ladd's procedure was feasible and effective for chronic, non-obstructed disease, in line with larger published series; two cases cannot by themselves establish its safety. In acute midgut volvulus with severe distension, we favour a low threshold for prompt conversion to open laparotomy - a case-specific intraoperative judgement rather than a universal rule - prioritising rapid decompression, manual detorsion and direct tactile assessment of bowel viability over persisting with a minimally invasive approach. Early recognition - supported by the CT "whirlpool sign" - and decisive intraoperative judgement achieved total bowel salvage in the acute case reported here, sparing the patient the long-term morbidity of short bowel syndrome. These observations come from two cases at a single institution and are offered as shared experience, not generalisable evidence.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Tamer Elalfy, Wael Abdelghany, Ab Bari Shah, Muhammad Bilawal, Rabab M. Elsaed

Acquisition, analysis, or interpretation of data: Tamer Elalfy, Wael Abdelghany, Ab Bari Shah, Muhammad Bilawal, Rabab M. Elsaed

Drafting of the manuscript: Tamer Elalfy, Wael Abdelghany, Ab Bari Shah, Muhammad Bilawal, Rabab M. Elsaed

Critical review of the manuscript for important intellectual content: Tamer Elalfy, Wael Abdelghany, Ab Bari Shah, Muhammad Bilawal

Supervision: Tamer Elalfy, Rabab M. Elsaed

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

The authors used Google Gemini Pro (Google, Mountain View, CA, USA) during the initial preparation of this manuscript, Muse (Meta, Menlo Park, CA, USA) during its revision, and Claude (Anthropic, San Francisco, CA, USA) during the final revision for drafting, language editing, reference checking, and checking compliance with journal requirements. All AI-assisted content was reviewed and edited by the authors, who take full responsibility for the accuracy and integrity of the final manuscript. No artificial intelligence tool is listed as an author.

References

1. Nehra D, Goldstein AM: Intestinal malrotation: varied clinical presentation from infancy through adulthood. Surgery. 2011, 149:386-93. 10.1016/j.surg.2010.07.004
2. Sadler TW: Langman's Medical Embryology, 15th Ed. Wolters Kluwer, Philadelphia, PA; 2023.
3. Fu T, Tong WD, He YJ, Wen YY, Luo DL, Liu BH: Surgical management of intestinal malrotation in adults. World J Surg. 2007, 31:1797-803. 10.1007/s00268-007-9018-2
4. Spigland N, Brandt ML, Yazbeck S: Malrotation presenting beyond the neonatal period. J Pediatr Surg. 1990, 25:1139-42. 10.1016/0022-3468(90)90749-y
5. von Flüe M, Herzog U, Ackermann C, Tondelli P, Harder F: Acute and chronic presentation of intestinal nonrotation in adults. Dis Colon Rectum. 1994, 37:192-8. 10.1007/BF02047549
6. Moldrem AW, Papaconstantinou H, Broker H, Megison S, Jeyarajah DR: Late presentation of intestinal malrotation: an argument for elective repair. World J Surg. 2008, 32:1426-31. 10.1007/s00268-008-9490-3
7. Emanuwa OF, Ayantunde AA, Davies TW: Midgut malrotation first presenting as acute bowel obstruction in adulthood: a case report and literature review. World J Emerg Surg. 2011, 6:22. 10.1186/1749-7922-6-22
8. Neville JJ, Gallagher J, Mitra A, Sheth H: Adult presentations of congenital midgut malrotation: a systematic review. World J Surg. 2020, 44:1771-8. 10.1007/s00268-020-05403-7
9. Ladd WE: Surgical diseases of the alimentary tract in infants. N Engl J Med. 1936, 215:705-8. 10.1056/NEJM193610152151604
10. Matzke GM, Dozois EJ, Larson DW, Moir CR: Surgical management of intestinal malrotation in adults: comparative results for open and laparoscopic Ladd procedures. Surg Endosc. 2005, 19:1416-19. 10.1007/s00464-004-8249-7
11. Seymour NE, Andersen DK: Laparoscopic treatment of intestinal malrotation in adults. JSLS. 2005, 9:298-301.
12. Frasier LL, Leverson G, Gosain A, Greenberg J: Laparoscopic versus open Ladd's procedure for intestinal malrotation in adults. Surg Endosc. 2015, 29:1598-604. 10.1007/s00464-014-3849-3
13. Pickhardt PJ, Bhalla S: Intestinal malrotation in adolescents and adults: spectrum of clinical and imaging features. AJR Am J Roentgenol. 2002, 179:1429-35. 10.2214/ajr.179.6.1791429
14. Gomaa IA, Mirande MD, Armenia SJ, Aboelmaaty S, Dozois EJ, Perry WR: Intestinal malrotation in the adult population: diagnosis, management, and outcomes after laparoscopic Ladd procedure. J Gastrointest Surg. 2024, 28:1339-43. 10.1016/j.gassur.2024.05.024