Case Report

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# A rare case of midgut reverse rotation presenting with cecal volvulus in a young adult

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**Introduction and importance:** Congenital malrotation is a disease that almost exclusively affects newborns. When it is discovered in an adult, which happens seldom, it is usually linked to a protracted history of gastrointestinal problems. Reversed rotation of the midgut is the rarest form of midgut malrotations. Small intestinal obstruction caused by volvulus or peritoneal bands is a common consequence of these conditions that typically manifest in the early stages of infancy.

**Case presentation:** Here, we present a case of 20-year-old young adult male presented with clinical signs and symptoms of small bowel obstruction. He had gangrenous cecal volvulus with reverse rotation of the midgut. We did emergency exploration and right hemicolectomy.

**Clinical discussion:** Reversed rotation of the midgut a condition where the transverse colon lay posteriorly to the superior mesenteric artery, while the third part of the duodenum lay anteriorly. Clinical diagnosis is difficult since both intestinal malrotation and cecal volvulus are rare conditions. As a result, pre-operative diagnosis of volvulus now requires abdominal computed tomography (CT). Literature has described the "whirl" sign, beak sign, intestinal twisting, and volvulus orientation. Surgery is the most effective treatment. Also documented in literature is the option of laparoscopic cecopexy and endoscopic detortion.

**Conclusion:** Reverse rotation of the midgut, though it is a very rare clinical entity, it should be considered as a differential in adults, and it can present with cecal volvulus. High index of suspicion and routine evaluation of suspected intestinal obstruction with CT scan can avoid delay in diagnosis and improve outcomes.

**Keywords:** case report, cecal volvulus, intestinal obstruction, malrotation, young adult

## Background

Reverse rotation of the midgut is the rarest type of midgut congenital rotation anomaly[1–3]. Anomalies related to the rotation of the midgut account for less than 1% of adult cases of gastrointestinal obstruction. Two to seven percent of these conditions has midgut reverse rotation, with a twofold prevalence in females[1,4,5]. For surgeons, these congenital abnormalities might present serious diagnostic issues. Moreover, these conditions may provide technical challenges during the laparotomy procedure. It is crucial that we share our expertise with this unusual instance. This case report is written in accordance with the SCARE guideline[6].

## HIGHLIGHTS

- Reverse rotation of the midgut is the rarest form of midgut malrotations.
- In adults, it usually presents with cecal volvulus.
- Abdominal computed tomography scan, barium, or angiographic studies are keys to pre-operative diagnosis.
- Emergency laparotomy and resection is the mainstay of management with low to no recurrence.

## Case discussion

A 20-year-old young adult male presented to our emergency with a 1-day history of crampy centrally located abdominal pain with a relief between episodes. Associated with the pain he had frequent episodes of vomiting of bilious matter, abdominal distention, and failure to pass feces and flatus. He presented a year back with similar complaint to our hospital, and his condition improved with nasogastric (NG) tube decompression, and he was discharged without surgery. He had no computed tomography (CT) scan done at that time. He has no other episodes of similar attack except the one mentioned, and the other part of the history was unremarkable.

On physical examination, he was acutely sick and in pain. His pulse rate (PR) was 84 beats per minute and blood pressure (BP), 100/70 mmHg. Oxygen saturation, temperature, and respiratory rate were in the normal range as well. On abdominal examination, he had prominent epigastric distention with no area of tenderness. He had soft stool in the rectum. The other part of the physical examination was unremarkable.

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He was investigated with complete blood count (CBC) which showed white cell count of 8000 with neutrophil of 67%. The other CBC parameters were in the normal range as well. Serum electrolyte and renal function tests also were normal. He had an erect abdominal film that showed a large air fluid level in the left upper quadrant, unlike the centrally located air fluid levels of smaller size noted in small bowel obstruction (Fig. 1).

We inserted NG tube and secured intravenous access and put him on crystalloids and ordered for CT scan the abdomen. The NG tube drained around 800 mL of bilious content up on insertion. Due to financial constraints, the patient was not able to have the CT scan right away, and he was waiting in the emergency room with the above-mentioned interventions.

In the meantime, on re-evaluation, 4 hour from the initial evaluation, the patient's intermittent abdominal pain changed into a continuous one, and his PR also increased to 112 beats per minute. On abdominal examination, he was having diffuse tenderness all over the abdomen with guarding and rigidity. His BP and other parameters were still within the normal range.

With this we directly took him to the operating room and explored him through midline vertical incision. Intraoperative finding was remarkable for hugely distended and hyper mobile cecum and right colon with 360-degree counter clock volvulus of the cecum and the right colon.

There were frankly gangrenous changes on the cecum and the ascending colon (Fig. 2). On further assessment of the right colon for right hemicolectomy, we found a transverse colon that runs posterior to the third part of the duodenum (D3) and the superior mesenteric artery (SMA), the superior mesenteric vessels lying between the colon and the anteriorly located third part of duodenum, contrary to the normal D3, SMA, and transverse colon orientation from posterior to anterior. The part of the transverse colon that crosses posterior to the SMA appeared constricted chronically with thickening of its wall. Figure 3 depicts the orientation of bowel loops and superior mesenteric vessels in reversed rotations.

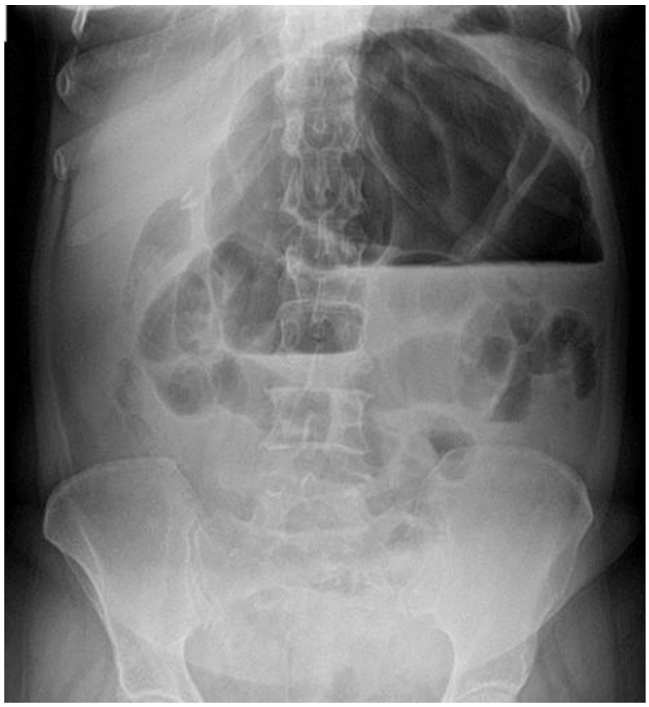


**Figure 1.** Erect abdominal film of the patient showing a large air fluid level in the left upper quadrant.



**Figure 2.** Intra-operative picture showing gangrenous changes over the cecal wall.

With this intraoperative diagnosis of midgut reverse rotation with gangrenous cecal volvulus, we did right hemicolectomy and reconstituted bowel continuity with ileo-transverse end to side anastomosis after we position the transverse colon anterior to the duodenum with the new order of SMA, D3, and transverse colon from posterior to anterior.

Post-operatively, the patient had a smooth recovery, and he was discharged on fifth post-operative day. He was evaluated on referral clinic on post-operative days 15 and 30, and he was free of symptoms and doing fine, and we discharged him from follow-up.

## Discussion

Reversed rotation of the midgut a condition where the transverse colon lay posteriorly to the superior mesenteric artery, while the third part of the duodenum lay anteriorly. This is caused by the combination of two simultaneous gut rotation aberrations: the post-arterial caudad midgut reentering prior to the pre-arterial cephalad midgut and the umbilical loop's initial 90° counter-clockwise rotation followed by a 180° clockwise rotation instead of 180° counter-clockwise rotation[1,2,5,7].

Despite its rareness, cecal volvulus constitutes the second cause of large bowel volvulus just behind sigmoid volvulus. It is responsible for nearly 30% cases of colonic volvulus. The cause is a poorly fixed cecum that rotates or flexes as a result of a colonic mesentery fusion failure that occurred

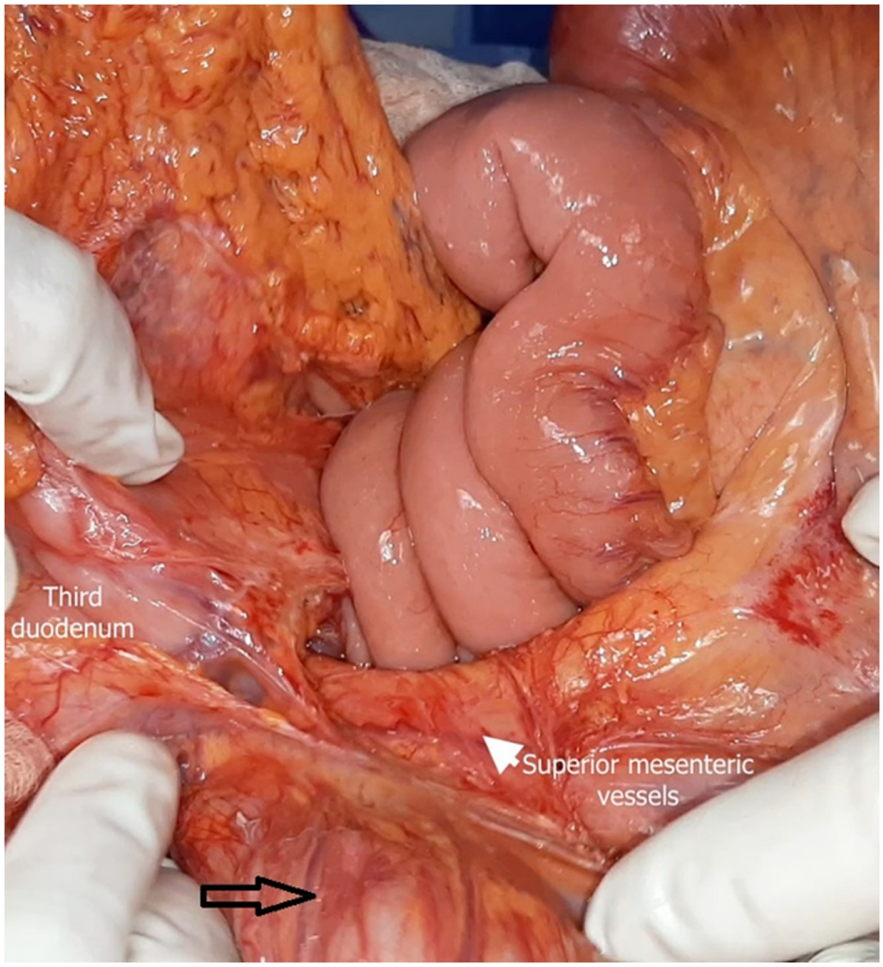



**Figure 3.** Intra-operative picture that depicts the orientation of transverse colon, third part of duodenum and superior mesenteric vessels: pre-arterial third part of duodenum (D3) and retro arterial transverse colon (black arrow).

during the fetal development[8,9]. Contrary to our case, females are more likely to experience cecal volvulus, which accounts for 1% of bowel obstructions in younger cases. With a death rate of 22%, non-viable and gangrenous cecal volvulus is found in 18%–44% of cases. Therefore, to improve prognosis as in our case, early detection and surgical treatment are essential[9].

The rareness of these two cases and both occurring in combination make the diagnosis challenging in our patient and resulted in gangrenous transformation. On top of this, the inability to have abdominal CT scan early also contribute for the in-hospital delay in surgery.

Clinical diagnosis is difficult since both intestinal malrotation and cecal volvulus are rare conditions, and there is no specific clinical finding specific to them. As a result, pre-operative diagnosis of volvulus now requires abdominal CT, barium, or angiography studies. Literature has described the "whirl" sign, beak sign, intestinal twisting, and volvulus orientation as common imaging findings[1,2,7,8].

The most effective treatment for cecal volvulus is surgery. Colectomy, cecopexy, manual detorsion, and cecostomy are the standard alternatives. The finding during operation will determine which of these alternatives to select. Primary anastomosis and resection have shown the best long-term outcomes. Also documented in literature is the option of laparoscopic cecopexy that showed promising results. Trial of endoscopic derotation is another option to try, but it fails in a significant proportion of patients and should not be tried in patients like ours which had a clear sign of peritonitis from potential gangrenous transformation[9,10].

## Conclusion

Reverse rotation of the midgut is a very rare clinical entity, and it can present with cecal volvulus in adults. Having high index of suspicion, especially in patients with a virgin abdomen presenting with intestinal obstruction, and making abdominal CT scan a routine part of the patient investigation, when there is no sign of peritonitis, helps avoid delay in surgery and associated morbidity and mortality. Non-resection management options are not recommended because of high risk of recurrence, except in friable patients.

## Ethical approval

Ethical approval is deemed unnecessary by the college's ethical committee, as this is a single case encountered during practice, and it does not involve human or animal experiment.

## Consent

Written informed consent was obtained from the patient for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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## Author contributions

H.M.: Study concept and design, writing the paper, literature review, and involved in the management of the patient. AT: Involved in the patient management and critical review of the paper 3. F.N.: Critical review of the paper. S.H.: Critical review of the paper. Y.G.: Involved in patient management and critical review. L.N.: Involved in patient management and critical review of the paper.

## Conflicts of interest disclosure

There are no conflicts of interest.

## Research registration unique identifying number (UIN)

Not applicable.

## Guarantor

Halid Melkamu.

## Provenance and peer review

Not commissioned; externally peer-reviewed.

## Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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