

Incidental Detection of Right-sided Malrotation of the Duodenum and Duodenojejunal Flexure in an Adult Male Cadaver: A Case Report

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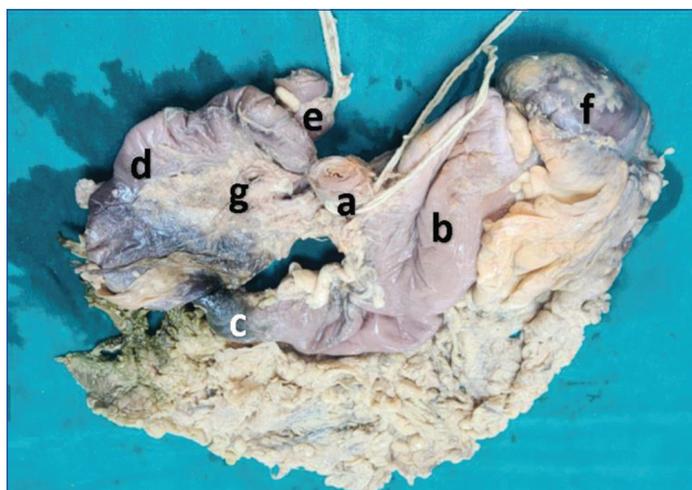
ABSTRACT

This is a rare congenital anomaly, which is characterised by abnormal rotation and fixation of the intestines during embryonic development, which may or not present symptoms in life. In present case, during dissection of the abdominal cavity of a 72-year-old male cadaver, it was found that duodenum and DJ junction was malpositioned (above the transpyloric plane), and pancreas was also present in the 'C'-loop. Its first part was positioned normally, but its second, third, fourth and duodeno-jejunal junction was placed above the transpyloric plane, which is normally present to left of the midline below transpyloric plane. This type of malrotation occurs when the midgut fails to complete its second and third 90-degree rotations during embryonic development. This case presents the anatomical variation of intestinal malrotation that can remain asymptomatic throughout the life. In symptomatic cases, life threatening complications such as volvulus can be imminent.

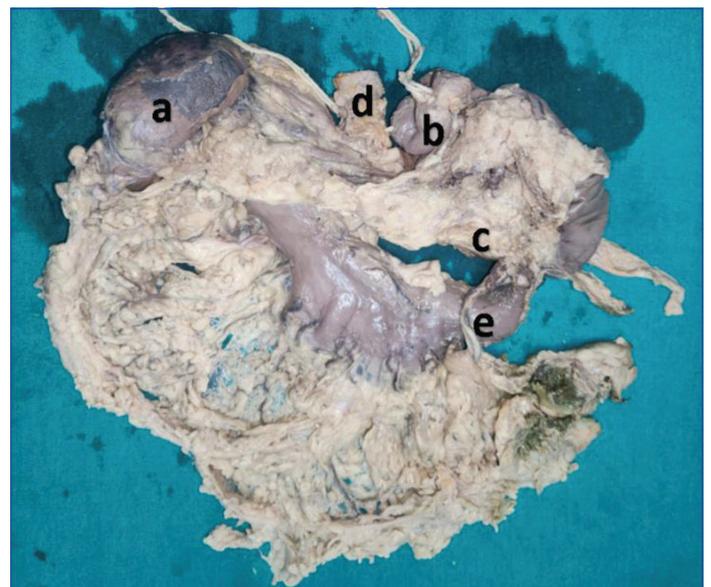
Keywords: Abdominal cavity, C loop, Midline, Transpyloric plane, Volvulus

CASE REPORT

The routine undergraduate dissection of abdominal cavity of a 72-year-old male cadaver, with no prior history of abdominal problems, no history of abdominal surgery was performed. The anterior abdominal wall was incised to expose the abdominal cavity. When the greater omentum and the stomach were retracted, the anomaly was noted. On observation [Table/Fig-1,2], it was found that the duodenum and DJ junction were malpositioned (above the transpyloric plane), and the pancreas was also present in the 'C'-loop. Its first part (D1) is normally positioned (from pylorus to superior duodenal flexure), but its second part (D2), instead of descending on the right side of aorta, was flexed to the right of the midline and ascended abnormally. Its third part (D3), typically horizontal and crossing the midline, but in this case, it remained on the right side of the aorta. The fourth part (D4) instead of ascending to the left of the aorta to form the DJ flexure, remained right-sided and ascended above the transpyloric plane. The Duodenojejunal (DJ) flexure is also malpositioned above the transpyloric plane, which is



[Table/Fig-1]: Showing marked structures as follows: a) Oesophageal stump, b) Stomach, c) Pyloric duodenal junction, d) Duodenum, e) Duodeno-jejunal junction, f) Spleen, g) Pancreas.

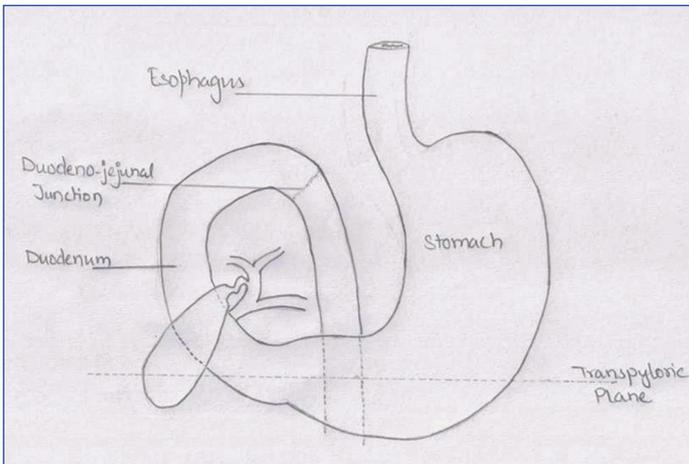


[Table/Fig-2]: Showing marked structures as follows: a) Spleen, b) Duodenojejunal flexure, c) uncinata process, d) Duodenum, e) Pyloric duodenal junction.

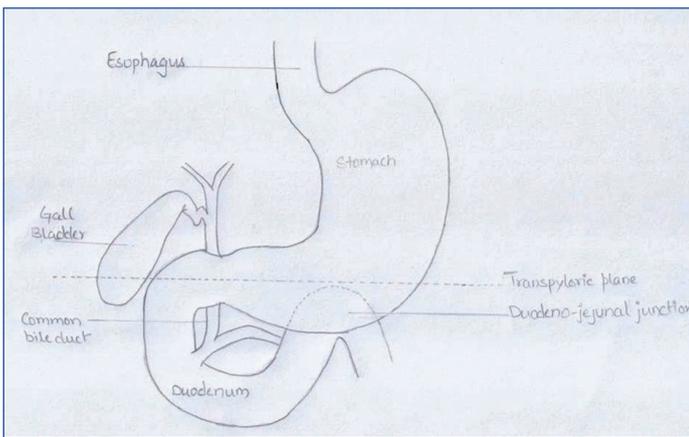
normal located at L1-L-2, left of the midline. The ligament of Treitz is present but right-displaced, contributing to the highly lying DJ flexure [Table/Fig-3,4], schematic representation of anomaly vs normal presentation). Pancreas head and uncinata process were found within the abnormally rotated duodenal 'C-loop', suggesting incomplete rotation during embryogenesis. The root of the mesentery was narrow and abnormally fixed which can lead to increasing risk of midgut volvulus in a living patient. In this case no signs of volvulus or obstruction were present, but the condition had likely existed since birth.

DISCUSSION

During normal embryogenesis, the midgut undergoes a 270-degree anticlockwise rotation around the axis of the Superior Mesenteric Artery (SMA). This process, completed in three stages (90° rotation at 6-8th week, 180° rotation at 10th week, fixation of the intestines at



[Table/Fig-3]: Schematic diagram showing current case of malrotation of duodenum and DJ flexure.



[Table/Fig-4]: Schematic diagram showing normal presentation of duodenum and DJ Flexure.

11th week), ensures the correct placement of the duodenum posterior to the SMA and the DJ junction to the left of the midline, typically around the level of the L1 vertebra [1,2]. In cases of malrotation, this sequence of events is disrupted. A common form of malrotation occurs when the midgut fails to complete its second and third 90-degree rotations. As a result, the duodenum and DJ junction may remain malpositioned to the right of the midline, potentially above the transpyloric plane. This abnormal placement reflects the incomplete rotation of the intestinal loop during its return to the abdominal cavity, often leading to the condition of malrotation [3].

Intestinal malrotation has an estimated population prevalence of approximately 1 in 500 live births, though only 1 in 6000 individuals develop symptomatic disease. Approximately 80% of case manifest within the first month of life, presenting with acute bowel obstruction characterised by bilious vomiting, abdominal distention, and failure to thrive. Severe complications, such as intestinal ischaemia, peritonitis, and shock, may arise if midgut volvulus occurs [4-6].

In contrast, adult malrotation is exceedingly rare (0.0001-0.19%) and often exhibits chronic, nonspecific symptoms, including intermittent abdominal pain, bloating, vomiting, and altered bowel habits [7-9].

Dominy M et al., (2024) discussed intestinal malrotation in 82 years old cadaver, with right sided small intestine, left sided colon, a narrowed mesenteric base, and absent appendix [5]. In our study we also find similar situation, as the duodenum and DJ flexure are to the right of the aorta (right to median plane).

Oyanagi K et al., (2024) reported on a 77-year-old female with haematemesis. CT showed the third part of the duodenum curving right of the aorta, with the DJ junction and jejunum also right-sided. Surgery revealed incomplete upper jejunal fixation, causing intermittent rightward deviation and obstruction. This led to repeated vomiting and Mallory Weiss syndrome [10]. In our case, the DJ

junction lay right of the midsagittal plane, above the transpyloric plane.

Nguyen R et al., (2020) studied two adult cases of intestinal malrotation, each presented with abdominal pain, abnormal DJ positioning, and Ladd's bands. CT and Upper Gastrointestinal (UGI) confirmed the diagnosis, and both patient underwent Ladd's procedure [11].

Bhatia S et al., (2018) reported a case of a 21-year-old male who presented with recurrent abdominal pain and bilious vomiting. Contrast-enhanced computed tomography revealed right-sided DJ flexure, small bowel loops on the right, and reversed SMA and superior mesenteric vein relation. Ladd's procedure corrected the malrotation, and the patient remained symptom free postoperatively [3]. In our cadaveric case, the duodenum and DJ flexure is present on the right side of the spine, without any malposition of SMA and vein [Table/Fig-5] [3,5,10,11].

Study	Normal DJ Flexure position	Observed DJ Flexure position	Clinical Presentation
Current cadaveric study	Left of midline at L1, below transpyloric plane	Right of midline, above transpyloric plane	Asymptomatic, incidental cadaveric finding
Dominy M et al., (2024) [5]	Left of the midline, below transpyloric plane	Right sided DJ flexure, small intestine on right, colon on left	Asymptomatic (found during cadaveric dissection)
Oyanagi K et al., (2024) [10]	Left of the midline, at/below the transpyloric plane	Right of the midline, third part of duodenum flexed to right of aorta without crossing anteriorly	Recurrent vomiting haematemesis (Mallory-Weiss syndrome)
Nguyen RK et al., (2020) [11]	Left of the midline crossing midline	DJ flexure in right hemiabdomen, failure of duodenal C-loop to cross midline	Chronic postprandial abdominal pain, nausea, weight loss, intermittent constipation
Bhatia S et al., 2018 [3]	Left of spine at L1	Right side of abdomen, DJ not crossing midline	Recurrent colicky pain with bilious vomiting

[Table/Fig-5]: Comparative table showing normal vs. observed DJ flexure position and corresponding cases [3,5,10,11].

Understanding the embryological origins of intestinal malrotations is essential for accurate diagnosis and effective surgical intervention. This knowledge is crucial in preventing serious, potentially life-threatening complications like midgut volvulus, which result from a twisted mesentery. The condition underscores the vital role of normal gut rotation in maintaining both the anatomical structure and functional integrity of the gastrointestinal tract.

CONCLUSION(S)

This case demonstrates an anatomical variation of intestinal malrotation. Recognising such congenital variations is important for clinicians and surgeons, as it helps in interpreting unusual abdominal findings and may help prevent potential diagnostic or surgical difficulties.

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