

NON-ROTATION OF MIDGUT - A CASE REPORT WITH EMBRYOLOGY AND REVIEW OF LITERATURE

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ABSTRACT

Non rotation of gut a subtype of Malrotation is an anomaly of intestinal rotation which is most often asymptomatic or incidental finding. Its incidence is 1 in 500 live births and has been described in 0.5 % autopsies. In intestinal nonrotation, the small bowel is located predominantly on the right side within the peritoneal cavity and the colon is located on the left side. During routine dissection for undergraduate teaching the non rotation of mid-gut was found and studied in detail. Location of appendicitis pain, Midgut volvulus & small bowel obstruction with necrosis are common complications of non rotation of mid-gut. Because of its rare presentation, embryological perspectives and its complications the case was presented.

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INTRODUCTION

Among the incidence of intestinal Malrotation is 1 in 500 live births (Skandalakis JE, Gray SW, Ricketts R, et al 1994, Torres AM, Ziegler MM1993) , it may be present within first week of life (40%) or diagnosed by age 1 year (75 - 80%). The diagnosis in remaining (15 - 25%) is usually in childhood or adulthood. Malrotation in adults is difficult to diagnose since they remain asymptomatic unless otherwise complications occur. Many of them are usually diagnosed intraoperatively or accidental radiographic finding or during autopsies (Gamblin TC, Stephens RE Jr, Johnson RK, Rothwell M 2003).

The gut develops from the yolk sac, which divides into three sections early in development: the fore-gut, the midgut and the hindgut. In 5-week embryo development of midgut is characterized by rapid elongation of the gut & its mesentery forming primary intestinal loop. In relation to the superior mesenteric artery, the cephalic or pre arterial limb develops in to distal part of duodenum, jejunum & part of ileum and the caudal or post arterial limb develops in to lower part of ileum, cecum, appendix, ascending colon & proximal 2/3rd of transverse colon. At 6th week of development as a result of rapid growth of primary intestinal loop and expansion of liver leading to lack of space in abdominal cavity, the intestinal loops enter the extra embryonic cavity in umbilical cord known as physiological umbilical herniation. When the midgut returns back to the intra embryonic cavity, rotation of the midgut loop takes place through 270° in anticlockwise direction in three stages. In the first stage [5-10 weeks] the midgut loop rotates through 90° in anticlockwise direction since the right lobe of liver enlarges & it pulls the left umbilical vein along with it. In the second stage [10-11

weeks] the midgut loop returns to the abdominal cavity due to reduced growth of liver & expansion of abdominal cavity. While returning the gut undergoes 180° anticlockwise rotation and the small intestine returns first & pushed to the left side of abdominal cavity underneath the superior mesenteric artery. The cecum and colon reduces next and passes anterior to the superior mesenteric artery, lie on the right side of abdomen. In the third stage of rotation [11 weeks to shortly after birth] the gut becomes fixed to the posterior abdominal wall (McGregor L 1986, TW sadler 2010, Skandalakis JE, Gray SW, Ricketts R, et al 1994). Any abnormality in these 3 stages development of gut may lead to omphalocele (I stage), nonrotation, incomplete rotation & reversed rotation (II stage) & mobile cecum, unattached cecum or small intestine (III stage) (Dott NM 1923).

CASE REPORT

During routine dissection of Abdomen for undergraduate teaching, in a 65 year old male cadaver the following findings suggestive of non-rotation of gut were noted & photographed (Fig 1, 2, 3)

1. Stomach was pushed to left hypochondrium
2. Duodeno-jejunal flexure was seen in left side
3. Whole small intestine was present on right side
4. Ileo - cecal junction was present on right side
5. Entire large intestine was seen on left side of peritoneal cavity
6. Cecum & appendix were on left iliac fossa
7. There was no proper differentiation of ascending, transverse or descending colon

8. The superior mesenteric artery was on right side of midline and the jejuna & ileal branches were arising from its left side.
 9. Superior mesenteric vein was lying right to superior mesenteric artery
- Rest of the other abdominal organs was normal. No other anomaly was found in the cadaver.

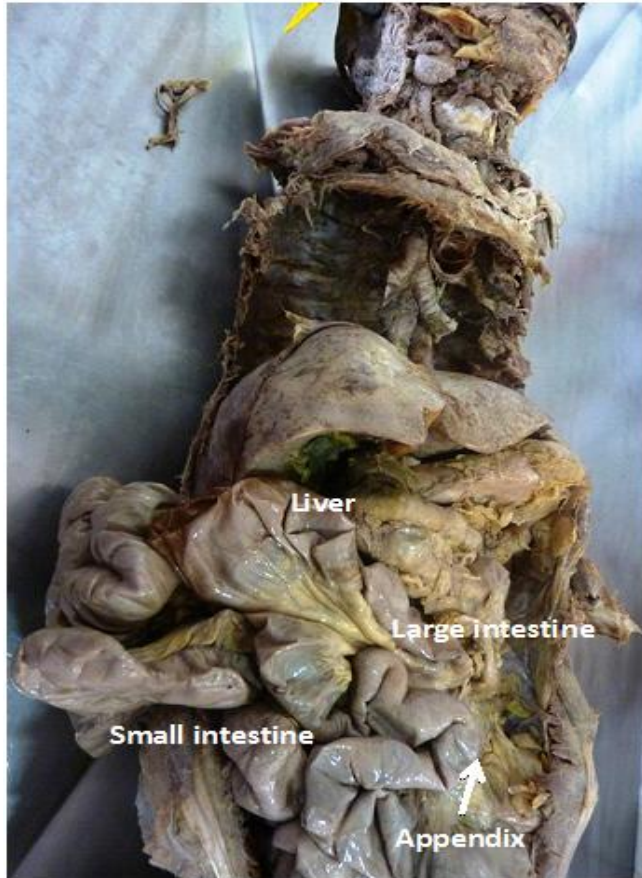


Fig 1 Non-rotation of Midgut showing Small intestine on right side & Large intestine with Cecum and Appendix on left side

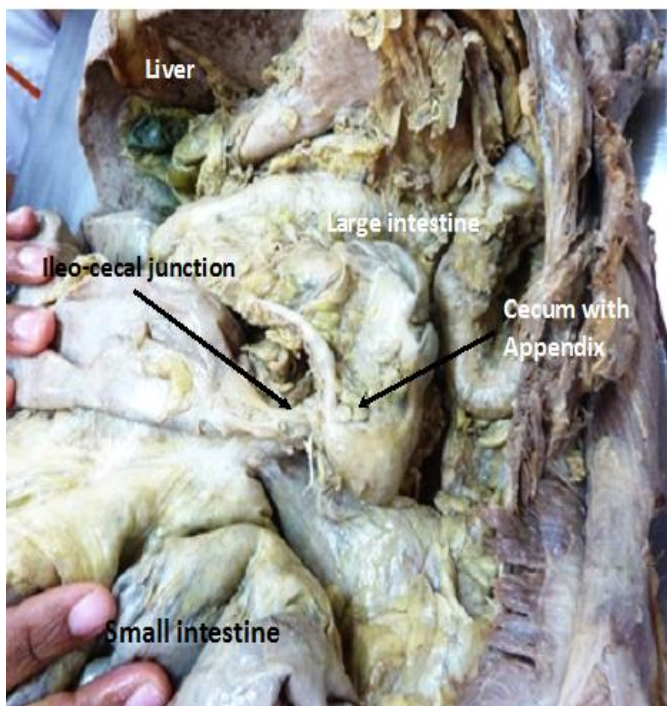


Fig 2 Non-rotation of Midgut showing Ileo-cecal junction on right side with Cecum and Appendix on left side

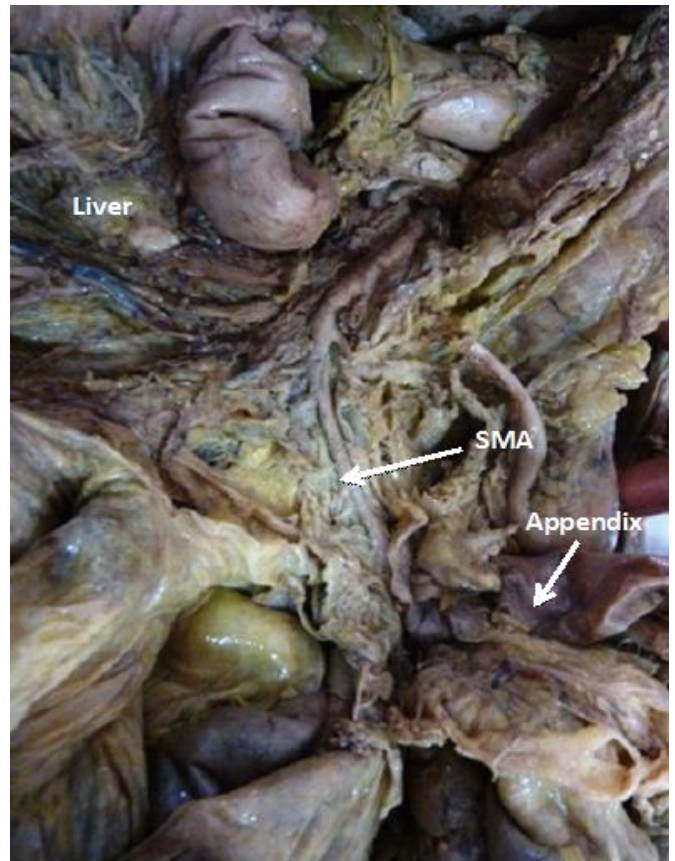


Fig 3 Non-rotation of Midgut showing Superior Mesenteric Artery (SMA) on right side.

DISCUSSION

The normal embryological development of gastrointestinal system including rotation of gut was studied in detail by Mall in 1898 and Frazer & Robbins in 1915. Dott in 1923 described the 3 classic stages of rotation of gut. Arrest in development at stage II results in nonrotation.

The anomalies of gastrointestinal system are limited mainly to midgut because of its complicated rotation during development.

Non rotation is the most common rotational abnormality and is due to failure of normal counter clockwise rotation of the prearterial segment of the small gut around the superior mesenteric artery. In nonrotation of midgut loop, the umbilical ring is lax. So the colon and cecum reduce first. The small gut follows and displaces the colon and superior mesenteric artery to the left. So the small gut lies on the right side, the terminal ileum crosses the midline to meet the cecum and enters on its right instead of left side. The colon is confined mainly to the left side of the abdomen. The whole midgut loop may be suspended in the abdominal cavity by an extremely narrow pedicle, the duodenocolic isthmus thus making it vulnerable for volvulus (Hebra A, Miller M, 2010, Snyder, W. H., JR., and Chaffin, L 1954). Bands fixing the cecum to the lateral abdominal wall develop abnormally crossing the duodenum [Ladd's band] and have potential for duodenal obstruction (Ladd WE 1932).

According to Dott's classification the term 'non-rotation of gut' refers to a complete failure of rotation of the mid-gut segment. In the 48 cases collected by Dott⁴ the erroneous fixation of the bowel was the directly 'predisposing cause of intestinal obstruction in 27% of the cases. The precipitating factor was either torsion or volvulus. The 2 main conditions which are apt to be

overlooked and misdiagnosed in patients with this anomaly are (1) the various types of intestinal obstruction associated with non-rotation, particularly volvulus neonatorum in which there is a clockwise volvulus of the mid-gut from duodenum to transverse colon around the duodeno-colic isthmus; and (2) an abnormally situated appendix becoming diseased or, in other words, a left-sided appendicitis.

All the characteristic features of non-rotation of the mid-gut were well demonstrated. According to Babaiantz and Kadruka, the characteristic radiological features of non-rotation are as follows:

1. Right-sided inversion of the 3rd part of the duodenum.
2. Absence of the duodeno-jejunal flexure.
3. The small intestine is on the right side.
4. Position of the proximal colon on the left side.
5. Absence of the hepatic flexure.
6. The terminal ileum enters the caecum from right to left instead of from left to right.

In the present case almost all of these findings were present. The non-rotation of midgut with appendicitis in some patients is recorded as complaining of pain in the right iliac fossa although the appendix is on the left side. According to Blegen, in a survey of 57 patients who were operated- on for left-sided appendicitis, 21 or 37% had pain in the right iliac fossa. Evidence suggests that in the left-sided appendix, although the viscera are transposed, the component parts of the nervous system are not reversed.

CONCLUSION

Because of its rare presentation, difficulty in diagnosis unless otherwise symptomatic, regardless of patient age, surgical treatment of quiescent malrotation should be considered as surgery remains the only real safeguard against complications (Matzke GM, Dozois EJ, Larson DW, Moir CR 2005).

Nonrotation of midgut was noted on account of the importance of recognition of abnormal situation of the small and large intestines. Failure to recognise non-rotation of Midgut may lead to grave errors in surgical procedure or injurious prolongation of an operation. Awareness of this type of anomaly may help radiologists to identify and in correct pre-operative diagnosis for

intestinal obstruction, volvulus and other complications by surgeons

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