

Malrotation in the Adult, a Forgotten Etiology of Partial Gut Obstruction: A Report of Two Cases

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Ninety percent of cases of malrotation have shown signs and symptoms of intestinal obstruction by the first year of life. It is thus an often-overlooked etiology in adult patients. Evidence-based recommendations are also limited because of the paucity of cases. This paper discusses the two cases of malrotation from diagnosis to surgical management at a tertiary academic hospital. Both are previously well adult male patients with virgin abdomen who presented with vomiting and signs of intestinal obstruction. During medical decompression, CT scan with triple contrast clinched the diagnosis of malrotation for which Ladd's procedure was done, with no operative complications. The authors' experience and previous literature support early decompression, imaging, and surgery for all cases of malrotation regardless of severity of symptoms.

Key words: intestinal malrotation, bowel obstruction, Ladd's procedure

Neoplastic and inflammatory processes dominate the etiologies for intestinal obstruction in adults. Congenital anomalies are understandably less considered because of the age group. Cases of intestinal malrotation in the adult however do exist and can be problematic when missed. Intestinal malrotation is a spectrum of physical anomalies of the gastrointestinal tract resulting from aberration in the physiologic twisting during embryologic development presenting with a range of symptoms as well. Here is the authors' experience in managing two cases of intestinal malrotation at the Philippine General Hospital, a tertiary university hospital.

The Cases

Case 1

A 59-year-old male with no previous surgery presented with sudden onset of epigastric pain, post-

prandial vomiting, and abdominal distention. Physical examination showed a distended abdomen that was tympanitic to percussion, with hypoactive bowel sounds. There was no palpable mass. Computed tomography (CT) scan with triple contrast of the abdomen (Figure 1), and an upper gastrointestinal series (Figure 2) showed no tumors but with the dilatation of the stomach and the duodenum with an abrupt cut-off at the duodeno-jejunal junction. The small bowels were predominantly located at the right hemiabdomen. The impression at this point was partial gut obstruction from a likely intestinal malrotation, and he was prepared for surgery.

Exploratory laparotomy under general anesthesia was performed where the small bowels were noted to have a 360° counterclockwise rotation around the mesenteric pedicle causing obstruction at the duodeno-jejunal junction (Figure 3). The stomach and the duodenum were markedly dilated. The small bowels were predominantly located at the right hemiabdomen. There where dense

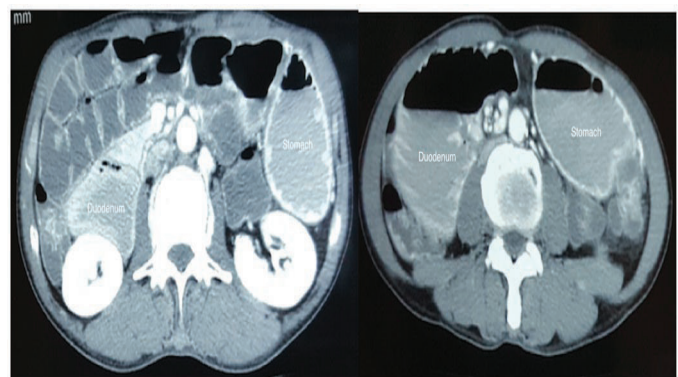


Figure 1. Abdominal computed tomography (CT) scan of the abdomen showed dilatation of the stomach and duodenum.

adhesions noted at the duodeno-jejunal junction, and at the right paracolic gutter (Ladd's bands) that were attached to the terminal ileum and cecum. (Figure 4). Ladd's procedure was completed. The adhesions at the duodeno-jejunal junction were lysed and the Ladd's bands were released (Figure 5). The cecum, ascending, and transverse colon were fully mobilized. The small bowels were detorted 360° clockwise to straighten the duodeno-jejunal junction (Figure 6). Appendectomy was done. The cecum, now located at the left upper quadrant area, was fixed with interrupted suturing to the abdominal wall. Post-operative course was unremarkable, and diet was well-tolerated. Patient was discharged on the 4th day after surgery. He had no complaints even after a month of outpatient follow-up.



Figure 2. Upper gastrointestinal series showed dilatation of the stomach and duodenum with a cut-off at the duodeno-jejunal junction.

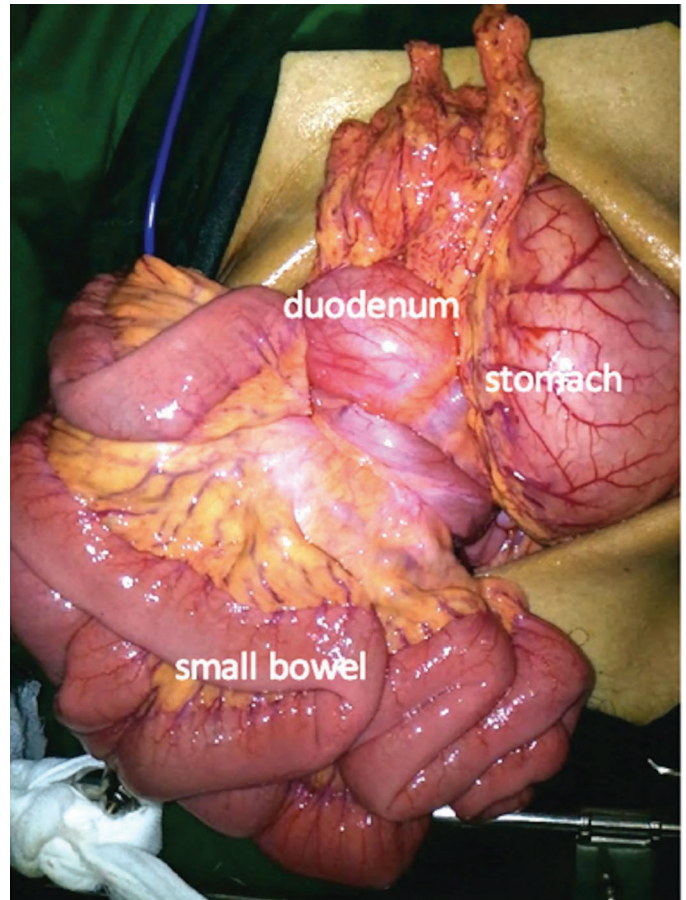


Figure 3. A 360° counterclockwise malrotation of the small bowel at the base of its mesentery was noted intra-operatively.

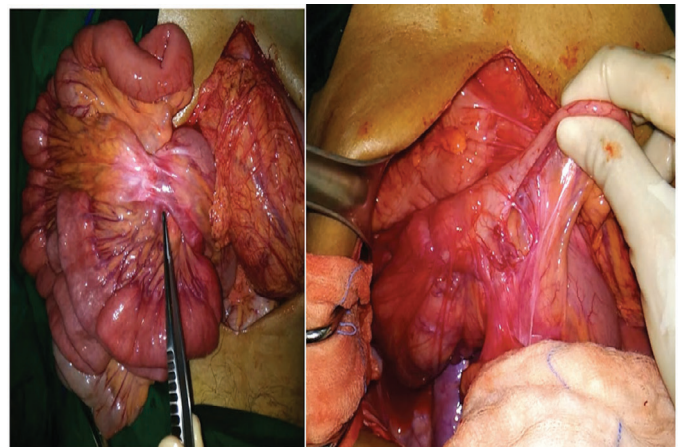


Figure 4. Dense adhesions around the duodeno-jejunal junction and Ladd's bands at the terminal ileum and cecum were also noted.

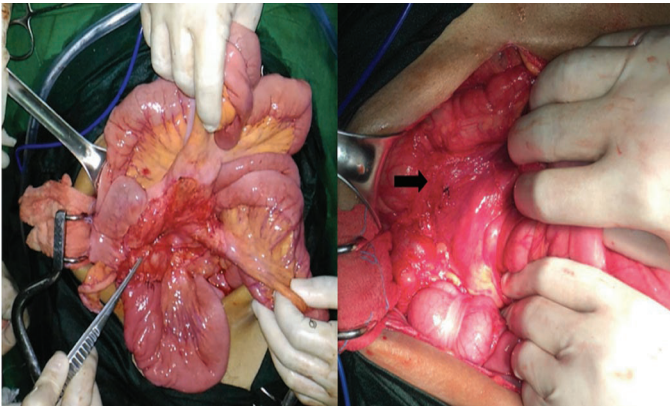


Figure 5. Adhesiolysis around the duodeno-jejunal junction (left) and release of Ladd's bands (black arrow).

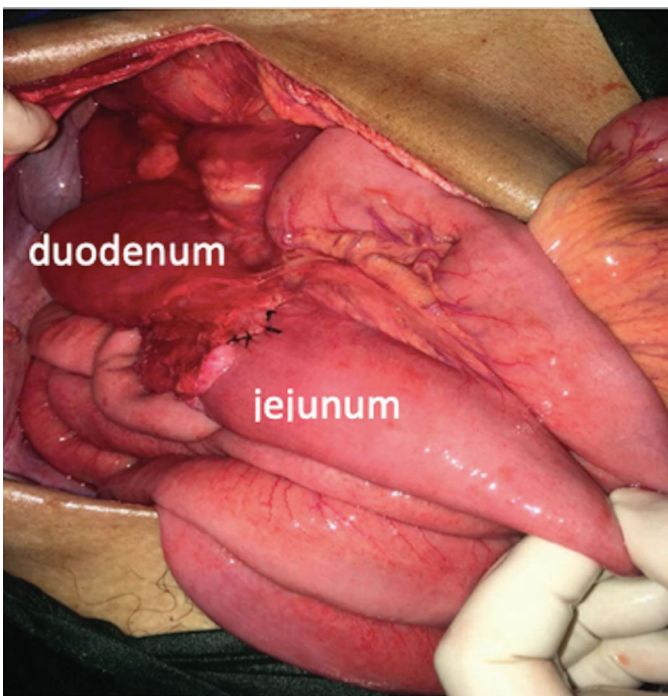


Figure 6. Straightening of the duodeno-jejunal junction after clockwise detorsion of the small bowels.

Case 2

A 37-year-old male with no co-morbidities and previous abdominal surgery, sought outpatient consult for three years' history of recurrent vomiting. His esophagogastroduodenoscopy result showed normal

gastric mucosa, and his upper gastrointestinal series was suggestive of malrotation. The symptoms however resolved so the patient was sent home and was lost to follow-up. A few months after the initial symptoms, he had bouts of vomiting for which a CT scan with triple contrast was done at a local hospital (Figure 7). This showed midgut volvulus based on an upper gut obstruction marked by gastric dilatation and cut-off at the duodenum and ligament of Treitz on the right upper abdomen, hence consult at the Philippine General Hospital (Figure 8). On assessment, the patient had normal vital signs. He was normotensive and non-tachycardic. His abdomen was scaphoid, soft, and non-tender. The bowel sounds were normoactive. Digital rectal examination showed good sphincter tone, intact rectal vault, with no stools. The rest of the physical examination was unremarkable.

Patient was prepared for an exploratory laparotomy for partial gut obstruction probably from midgut volvulus. On exploration, the stomach and proximal duodenum were dilated. There were diffuse adhesions over the small bowel. During enterolysis, the ligament of Treitz was noted on the right upper quadrant of the abdomen. The appendix was at the right lower quadrant and the fixation of the ascending and descending colon were normal (Figures 9 & 10). The authors had to rotate



Figure 7. Axial cut of the arterial phase of the abdominal CT scan which showed a displaced SMA and SMV. There is noted narrowing of the jejunum under the superior mesenteric bundle.



Figure 8. Coronal cut of the delayed phase of the abdominal CT scan showed a dilated stomach up to jejunum. The duodenum and ligament of Treitz were also noted on the right upper abdomen.

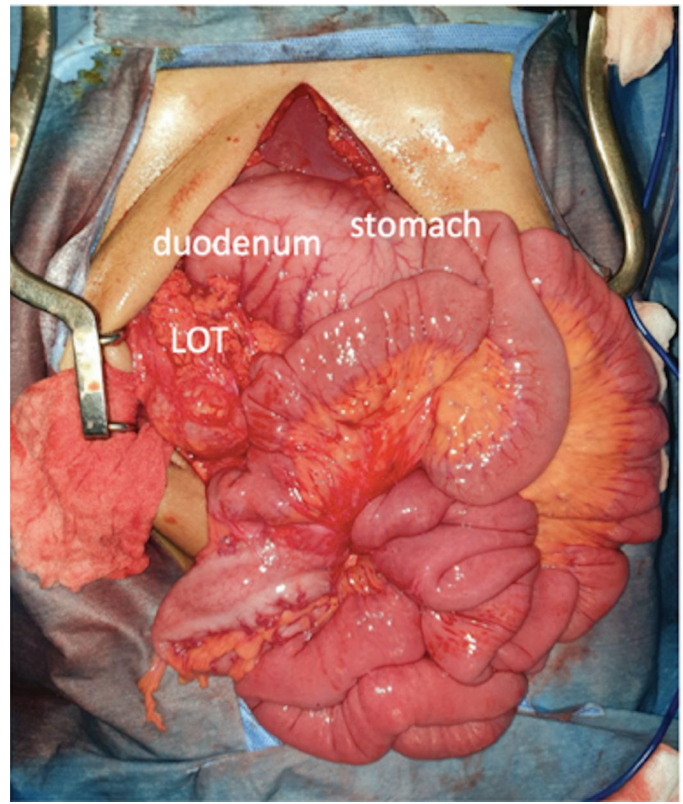


Figure 9. Upon opening of the abdomen, it was noted that the stomach was dilated, and the distal small bowels were collapsed.

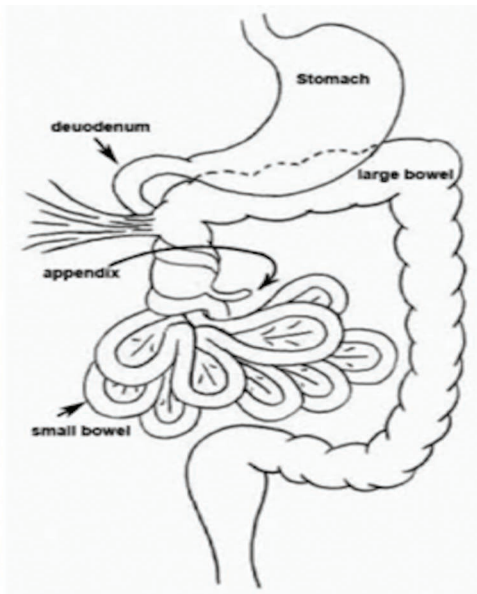
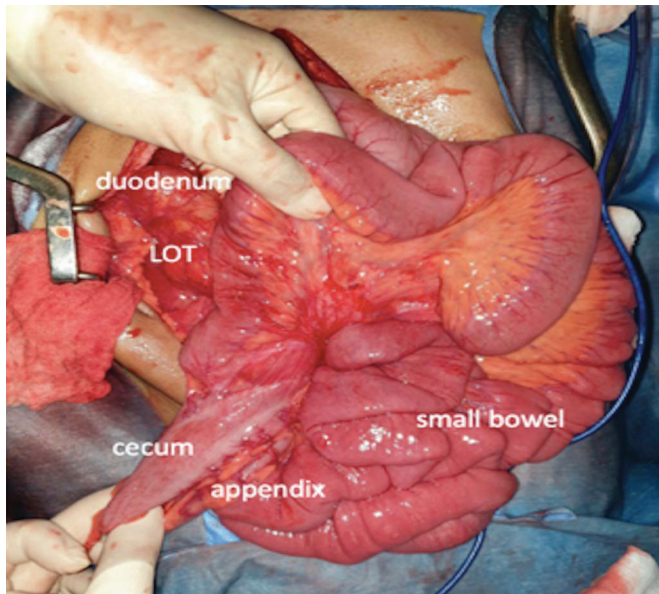


Figure 10. This is the picture and graphic representation of the malrotation in the patient. The appendix was noted at the right lower quadrant, but the collapsed small bowel was twisted caudal to it.

the small bowel clockwise, using the superior mesenteric artery (SMA) as the axis, to bring the duodenum and proximal jejunum anterior to the SMA and relieve the physical obstruction. After the repositioning, the small bowel was placed at the right hemiabdomen and the colon on the left. The surgery proceeded with appendectomy of the grossly normal appendix to complete the Ladd's procedure. Post-operative course was unremarkable, and the patient was sent home on the fourth postoperative day on full diet and with regular bowel movement. He was seen after a month with good appetite and weight gain.

Discussion

Intestinal malrotation may be any deviation from the normal 270° counterclockwise rotation of the midgut during embryologic development. It is estimated to be present in 0.2 to 0.5 percent of adults. However, an even smaller percentage manifest with symptoms that are clinically significant.^{1,2}

Review of embryology leads to a better understanding of the pathology. The first stage of gastrointestinal development happens during the first six to eight weeks when there is a physiologic herniation of the embryonic gut outside of the embryonic abdomen as it turns 90° counterclockwise. Anomalies noted when there is failure at this stage include situs inversus, duodenal inversion, and cloacal exstrophy. The second stage happens during the 10th week when the herniated bowel returns to the abdomen while rotating 180° counterclockwise more using the SMA as axis. Of the three stages, anomalies are most common at this stage and this leads to non-rotation, malrotation, reversed rotation, internal herniation, and omphalocele. The third stage of development is at the 12th to 13th week, when there is fixation of the midgut. During this time, the cecum migrates to the right lower quadrant and the 270° counterclockwise rotation of the bowels is completed. The anomalies noted when failure is encountered at this point are internal hernia and retroperitoneal positioning (paraduodenal, paracecal, intersigmoid).³

Intestinal malrotation is a better studied entity in childhood. Seventy-five percent are symptomatic in the

first month of life and ninety percent within the child's first year. The symptoms range from sudden onset vomiting to acute surgical abdomen from obstruction and ischemia, and eventually, even shock. In adulthood, it becomes a forgotten differential in patients with signs of intestinal obstruction precisely because reports show that incidence is only between 0.0001% and 0.19% in adults. The symptoms of the presented patients align with that in literature- non-specific symptoms of obstruction also like vomiting, abdominal pain, and abdominal distention, which contributes to the diagnostic challenge.^{4,5,6}

The diagnosis of a rotational anomaly is best made when the clinical presentation is supported by radiographic studies. A plain x-ray of the abdomen shows point of obstruction but has minimal value in determining exact pathology. An upper gastrointestinal series supports the diagnosis by revealing stomach dilatation and a vertical duodenum located at the right hemiabdomen.⁷ Malrotation may be diagnosed on a CT scan with triple contrast by the anatomic location of a right-sided small bowel, a left-sided colon, and an abnormal relationship of the superior mesenteric vessels. The superior mesenteric vein is located to the left of the SMA.^{7,8}

After diagnosis, the mainstay of management is still surgery at any age, whether symptoms improve or resolve, to minimize the possibility of dire complications of volvulus. Ladd's procedure is the surgical management of choice. It was first described by William Ladd for pediatric patients in 1936 and consisted of four steps: 1) division of Ladd's bands overlying the duodenum, 2) widening of the narrowed root of the small bowel mesentery by mobilizing the duodenum and division of the adhesions around the SMA to prevent further volvulus, 3) counterclockwise detorsion of the midgut volvulus, and 4) appendectomy.^{3,9} In a retrospective study conducted by Fraiser et al., the Ladd's procedure has a reoperation rate of only nine percent for recurrent malrotation and postoperative adhesions.¹⁰ In the era of minimally invasive surgery, Ladd's procedure can be done laparoscopically with the goal of minimizing length of hospital stay and postoperative pain. The choice of doing open or laparoscopic surgery is heavily dependent on surgeon competency, available resources, and patient factors (physiologic status and complexity of the case).

Conclusion

The varied and non-specific presentation of obstruction, paucity of cases, and limited literature tackling adult intestinal malrotation contributes to the challenge of prompt diagnosis. However, once diagnosis is made through clinical and radiographic imaging, Ladd's procedure should be urgently done regardless of patient age and severity of symptoms. Timely and prepared surgery best minimizes the risk of complication of intestinal malrotation. The approach whether minimally invasive or not is left to the discretion of the surgeon according to his competency, resources available to him, and his assessment of case complexity.

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