

Case report

Successful treatment of a sixteen year old patient with intestinal malrotation with Ladd procedure: case report and literature review

ABSTRACT

Introduction: Intestinal malrotation is an anomaly that occurs during foetal development and usually presents in the neonatal period. The presentation in adolescents and adults is rare and requires prompt diagnosis and surgical intervention namely Ladd's procedure.

Case Report: We present a rare case of malrotation in a sixteen year old male patient who presented with crampy generalized abdominal pain along with vomiting for a duration of three days. A contrast enhanced computed tomography abdominal scan showed malrotation of the small bowel with volvulus. Laparotomy revealed typical Ladd's bands and a distended third and fourth duodenal portion extrinsically obstructing the misplaced duodenojejunal junction. The Ladd's procedure, including widening of base of mesentery, division of Ladd's bands and appendectomy was performed. Symptoms completely resolved in follow up period. Patients with midgut malrotation may present with crampy abdominal pain, intestinal obstruction, or intestinal ischemia. The Ladd's procedure is easy and safe treatment of teenage or adult patients with intestinal malrotation.

Conclusion: In adolescents and adults presenting with the intestinal malrotation, the diagnosis should be prompt and quick. The surgical intervention includes derotation of volvulus, inspecting for viability, Ladd's band excision and fixing of gut mesentery to the posterior abdominal wall so as to decrease repeat episodes of volvulus.

Keywords-Malrotation, Laparotomy, Ladd procedure, Intestinal obstruction, Teenage

INTRODUCTION

Intestinal malrotation is a developmental anomaly of the midgut which consists of failure of normal foetal rotation of intestines around the superior mesenteric artery and their fixation in the peritoneal cavity. Rotational anomalies of the midgut are rare condition in teenagers and adults. Surgical intervention is frequently done in symptomatic patients. Although meticulous diagnosis is required; for better outcomes, immediate diagnosis and surgical intervention is needed. In the present report, a case of incidental intestinal malrotation with clinical findings of small bowel obstruction is discussed with a literature review.

Congenital midgut malrotation, a rare anomaly leading to intestinal obstruction, generally doesn't manifest beyond the first year of life. Symptomatic patients present with either acute gut obstruction, ischemic intestine with a midgut or caecal volvulus or with chronic vague abdominal pain [1]

CASE REPORT

A sixteen year old male presented to Emergency Department with sudden onset epigastric abdominal pain, which he rated as 9/10 on severity scale. The pain started 24 hours prior to admission and there was no radiation. He experienced nausea and had multiple episodes of vomiting which was non bilious and had obstipation since 8 hours. There was no history of bleeding per rectum, fever and dysuria. He had no previous abdominal operations and didn't take any regular medications. He had similar episodes of epigastric pain in the past which got relieved by pain medications.

On general physical examination his pulse rate was 130/min and respiratory rate was 24/min. He had generalised abdominal tenderness, with voluntary guarding but no evidence of peritonitis. His abdomen was mildly distended. Further systemic examination was unremarkable. Blood tests were performed which showed Haemoglobin (Hb) of 12.6 mg/dl and Total Leucocytes Count (TLC) of 17300/cumm. Urea and electrolytes and liver function tests were within normal range. Plain abdominal and chest radiograph revealed bowel dilatation without free air under the diaphragm. Initially the patient was treated with analgesic drugs and fluids and an abdominal and pelvic computed tomography (CT-scan) was requested (Fig. 1). The CT-scan demonstrated reverse rotation with overdistended stomach and D1 and D2 of duodenum with twisting of mesentery at D3 with associated volvulus but the oral contrast was seen to pass through the narrow segment.

Following the CT-scan the patient was taken to the operating room. The intraoperative findings included grossly distended stomach and the duodenojejunal junction was found to be on the right side and not crossing the midline. The duodenum as well as the duodenojejunal junction was adhered to the each other with a Ladd's band (Fig 2). The caecum and appendix were on the left upper side and also adhered with the duodenojejunal junction (Fig 3). Rest of the bowel was normal. The Ladd's band were excised and the bowel was placed according to the normal anatomy and appendectomy was done. The mesentery of gut was fixed to the posterior abdominal wall. The post operative course was unremarkable and patient was discharged in an appropriate condition after he was taking orally and passing stools. During the follow up period patient was doing well.

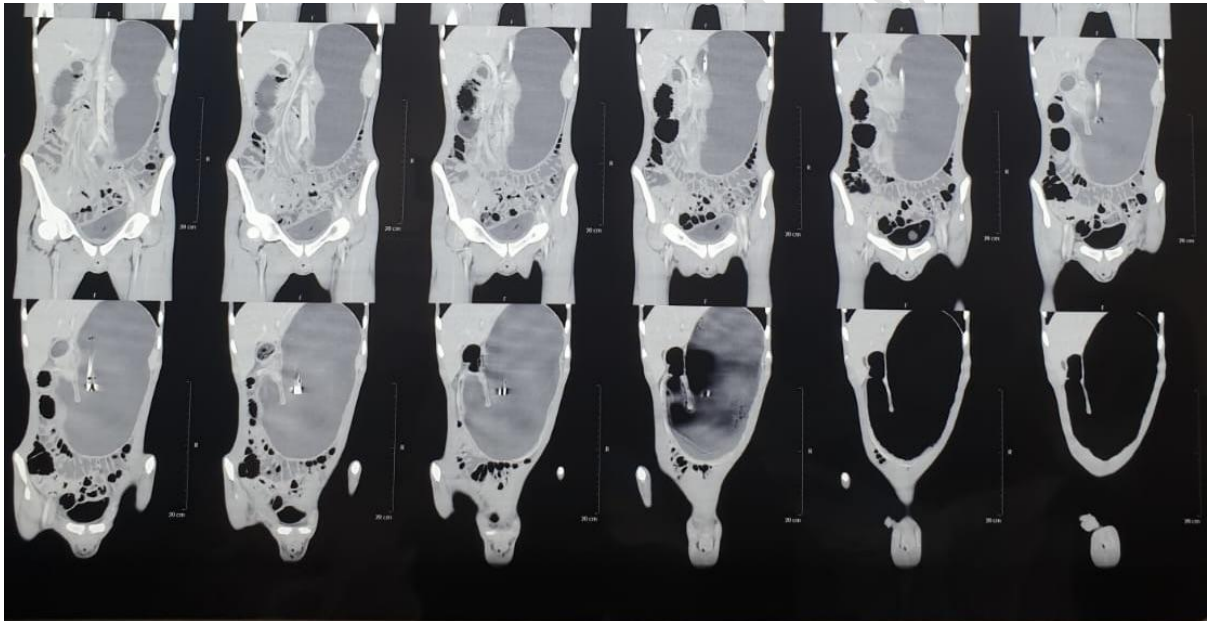


Figure 1- The Coronal section of contrast enhanced CT scan of abdomen and pelvis showing grossly distended stomach and D1 D2 with twisting of mesentery at D3 and associated volvulus



Figure 2- Ladd's band between duodenum and duodenojejunal flexure



Figure 3- Intraoperative image showing caecum and appendix on left side with dense adhesions with duodenojejunal flexure

DISCUSSION

Malrotation of the midgut is an anomaly of embryological development of the gastrointestinal tract. By the 4th intrauterine week, the gastrointestinal tract looks like an endoderm-lined tube. During the 5th week, a vascular pedicle develops and the gut gets divided into foregut, midgut and hindgut. The superior mesenteric artery is the main blood supply to the midgut. The midgut is the major intestine that gets rotated which is divided into three stages. Stage 1 occurs between 5th-10th week and involves expansion of the midgut into the extra-embryonic cavity, a 90° counter-clockwise rotation, and coming back of the midgut into the primitive abdomen. Stage 2 occurs from 11th week, comprising of more counter-clockwise rotation inside abdominal cavity, finishing a 270° counter clockwise rotation. These movements brings the “C” loop of the duodenum behind the superior mesenteric artery, ascending colon on the right, transverse colon aloft, and descending colon on the left of the abdominal cavity. Stage 3 comprises of joining and anchoring of the mesentery. The cecum descends, and the ascending and descending colon gets fixed to the posterior abdominal wall. The failure of rotation of entire midgut leads to small bowel positioned on the right side and the colon on the left side of abdominal cavity. Stage 1 failure leads to omphaloceles which is caused by failure of bowel to return to the abdominal cavity. Stage 2 aberrations consist of non-rotation, malrotation, and reversed rotation. Stage 3 aberrations consist of an mobile duodenum, cecum, and non-fixed small bowel mesentery.[2-4]

Midgut malrotation and nonrotation is led by failure of the counter-clockwise rotation of the midgut, resulting in the faulty location of the duodenojejunal junction to the right of midline.

Midgut volvulus is infrequent in adolescents and adults.[5] and commonly presents in the first month of life. In an adult with malrotation, midgut volvulus is frequent cause of intestinal obstruction,[6] which presents as crampy abdominal pain and vomiting. Acute presentation of midgut volvulus occurs mostly in neonates with the incidence of such presentation decreasing with age.[7,8] The subacute and chronic presentation is more difficult to diagnose as symptoms being non-specific like chronic abdominal pain, bloating, vomiting, constipation, and diarrhoea.[9] The gut twists around the primitive dorsal mesentery leading to constriction and compression of the superior mesenteric vessels. This will ultimately affect the venous outflow and the involved bowel will become congested. The infarcted bowel will have mucosal shedding and bleeding, and if the volvulus gets relieved spontaneously, the patient will present with bloody diarrhoea. The intestinal malrotation can be promptly diagnosed with the help of abdominal x-rays as well as contrast enhanced CT

scan of abdomen. Ladd's procedure is surgical intervention of choice in intestinal malrotation.

Ladd's procedure involves delivering the entire mass of the small bowel through midline incision, the untwisting of volvulus in a counter-clockwise direction, inspecting the viability of the bowel, resection of gangrenous bowel and restoring of the healthy bowel. Ladd's band is excised and gut is fixed to the posterior abdominal wall to prevent future episodes of volvulus.

In case the viability of the gut is uncertain, second surgery is performed 24 to 48 hours later, along with adequate resuscitation [10] Limited resection may then be possible and anastomosis of healthy bowel may be performed.

In conclusion, there should be prompt diagnosis of intestinal malrotation in the adolescents and adults which have rare incidence. Ladd's procedure is intervention of choice which can be performed by open laparotomy or laparoscopically.

Consent-Written informed consent was obtained from the patient's guardian/parent/next in keen for publication of this report and any accompanying images. A copy of the written consent is available for review by the Editor-in -Chief of this journal.

References-

1. Hsu SD, Yu JC, Chou SJ, Hsieh HF, Chang TH, Liu YC. Midgut volvulus in an adult with congenital malrotation. *Am J Surg* 2008;195:705-7.
2. Mallick IH, Iqbal R, Davies JB. Situs inversus abdominus and malrotation in an adult with Ladd's band formation leading to intestinal ischaemia. *World J Gastroenterol* 2006;12:4093- 5.
3. Stringer DA. Small bowel. In: Stringer DA, editor. *Pediatric gastrointestinal imaging*. Philadelphia: BC Decker; 1989. p. 235-9.
4. Sadler TW, Langman J. *Langman's medical embryology*. 9th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2004. p. 60-110.
5. Pelucio M, Haywood Y. Midgut volvulus: an unusual case of adolescent abdominal pain. *Am J Emerg Med* 1994;12:167- 71.
6. Gohl ML, DeMeester TR. Midgut nonrotation in adults. An aggressive approach. *Am J Surg* 1975;129:319-23.

7. Prasil P, Flageole H, Shaw KS, Nguyen LT, Youssef S, Laberge JM. Should malrotation in children be treated differently according to age? *J Pediatr Surg* 2000;35:756-8.

8. Spigland N, Brandt ML, Yazbeck S. Malrotation presenting beyond the neonatal period. *J Pediatr Surg* 1990;25:1139-42. 9. Seymour NE, Andersen DK. Laparoscopic treatment of intestinal malrotation in adults. *JLS* 2005;9:298-301. 10. Krasna IH, Becker JM, Schwartz D, Schneider K. Low molecular weight dextran and reexploration in the management of ischemic midgut-volvulus. *J Pediatr Surg* 1978;13:480-3.

9. Seymour NE, Andersen DK. Laparoscopic treatment of intestinal malrotation in adults. *JLS* 2005;9:298-301. 10. Krasna IH, Becker JM, Schwartz D, Schneider K. Low molecular weight dextran and reexploration in the management of ischemic midgut-volvulus. *J Pediatr Surg* 1978;13:480-3.

10. Krasna IH, Becker JM, Schwartz D, Schneider K. Low molecular weight dextran and reexploration in the management of ischemic midgut-volvulus. *J Pediatr Surg* 1978;13:480-3.

UNDER PEER REVIEW