



The whirlpool (Whirl) sign of the midgut volvulus, comparison of radiological and intra operative imaging -A case report

Authors

D Kakkar¹, S Kochar¹

¹Department of General Surgery, Post graduate Institute of Medical Science, Rohtak, India

Abstract

Whirl sign represents the swirling appearance of the mesentery and superior mesenteric vein around the superior mesenteric artery. The direction of swirl is counter clockwise on the CT scan. The patient was consented for an emergent operation and underwent an exploratory laparotomy and Ladd's procedure was performed.

We report a case of a 16-year-old male who presented with acute onset right upper quadrant (RUQ) abdominal pain with investigations demonstrating midgut volvulus due to malrotation causing intestinal obstruction. Although the entity is well described in the literature, diagnosis is often difficult due to its clinical presentation being similar to mesenteric ischemia.

This case report highlights the difficulty in diagnosing midgut volvulus in the adult population given the nonspecific, insidious symptoms therefore prompting awareness of its existence and a high degree of clinical suspicion.

Keywords: abdominal pain, case report, intestinal volvulus, small bowel volvulus, midgut volvulus, small bowel obstruction, whirl/whirlpool sign.

Introduction

The term volvulus is derived from the Latin word *volvulus* which means to roll^[1]. Midgut volvulus occurs when the small bowel twists greater than 180° around its mesentery. This twisting results in compression of the bowel lumen and the vasculature within the bowel wall, which if uncorrected will progress to ischaemia and infarction of the involved segment of small bowel^[2]. The twisting of the small bowel around its mesentery often results in a classic whirl sign on CT^[3]. Midgut volvulus is rare in the adult population but remains an important cause of small-bowel obstruction and one which requires early recognition and prompt intervention

Case Report

The patient was a 16-year-old male who presented to the emergency department with acute colic abdominal pain, and 6-hour history of nausea and vomiting and colicky right upper quadrant (RUQ) pain which radiated through to her back. The patient reported having a normal bowel motion the previous day and reported passing flatus that day. He denied any pale stool, diarrhoea, or dark urine. There is no significant past medical or surgical history and was on no regular medication. Permission was obtained from the patient for discussion and publication of the case.

On physical examination, there abdomen was distended and tender in the epigastric region. Vital

signs suggested mild tachycardia . Blood tests showed raised white cell counts with increased neutrophils. Lactate was elevated too.

Parameter	Units	Reference range
White cell count	17x 10 ⁹ /l	4.0-11.0
C-Reactive protein	20 mg/l	0.0-5.0
Amylase	20 IU/l	25-125
Creatinine	65 µmol/l	50-98
Urea	8 mmol/l	2.5-6.7
Lactate	2.5 mmol/l	< 1mmol/L

Taking into consideration the above findings, abdominal CT scan with IV and oral contrast in portal venous phase was obtained. The CT revealed swirling appearance of the bowel and mesentery twisted around the superior mesenteric artery axis ("whirlpool sign") (Fig.1)

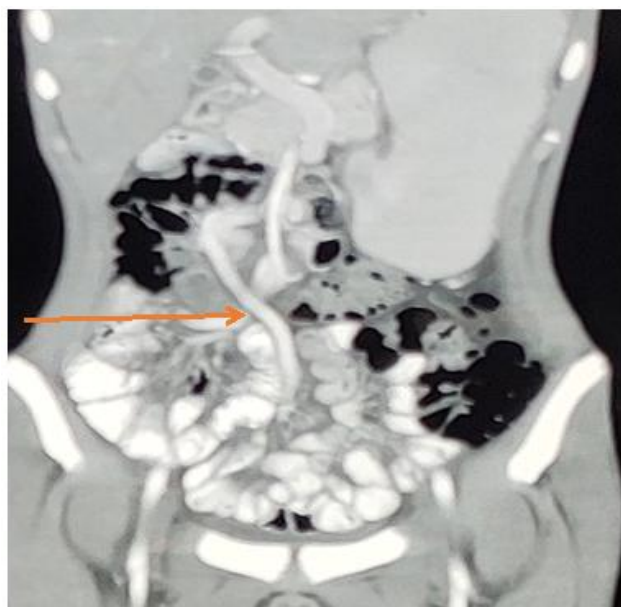


Fig 1. Whirlpool sign with twisting of bowel around SMA.(arrow)

The superior mesenteric vein (SMV) was seen to the left of the superior mesenteric artery (SMA). There was also an abnormal configuration of the small bowel, with duodenum D3 and D4 located to the right of the spine and intestinal loops predominance on the right abdomen. Moderate gastric distention was noticed, and a few colon loops were dilated on the left abdomen. The small bowel after twisting was seen in the pelvis in axial films (Fig 2 and 3)

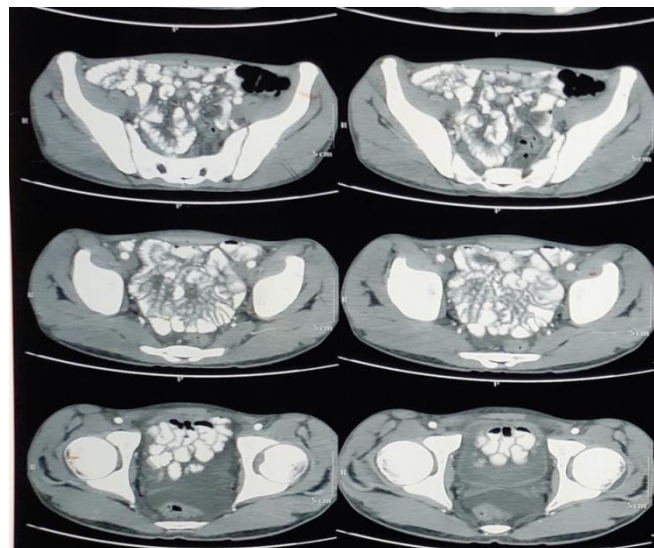


Fig 2. Small bowel loops seen in the pelvis on right side.

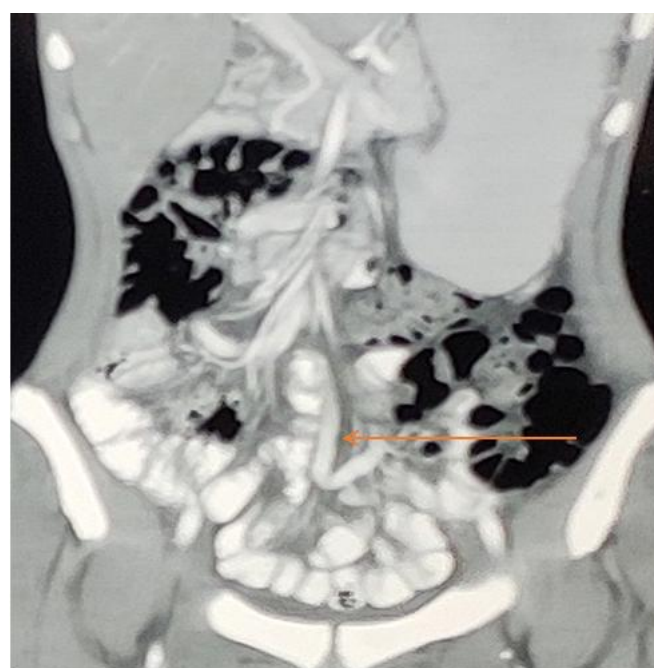


Fig 3. SMV seen to the left of SMA(arrow). Duodenum is intraperitoneal.

Nevertheless, there were no signs of vascular compromise or bowel wall thickening. There was also no intra-abdominal free fluid or pneumoperitoneum.

A decision to perform Ladd’s procedure was taken. An Exploratory Laparotomy was performed. Ladd’s bands were identified and between cecum and the duodenum (fig 4). A counter clockwise detorsion of the bowel was

performed then with meticulous dissection of any further adhesions preventing damage to any serosa. Mesentery of the small bowel is widened till the root of mesentery was performed to reduce the risk of future volvulus. A further prophylactic Appendectomy was performed, as the cecum is not fixed in the right lower quadrant, and thus, the presentation of the appendicitis will not be typical. An inversion-ligation appendectomy is the technique of choice to avoid contamination of the otherwise clean Ladd procedure. Finally the cecum was placed in the left lower quadrant to allow small bowel mesentery to be broadened maximally. Final picture after performing all the steps of Ladd's procedure is shown in (Fig 5). Abdomen was then closed in layers.

Patient was started on ERAS protocol where he was started on liquid diet and further progressing to semi solid and solid diet as tolerated. Patient passed flatus and stools on the 3rd post op day and subsequently discharged the next day. A further review after 2 weeks in the clinic ensured adequate post op recovery.

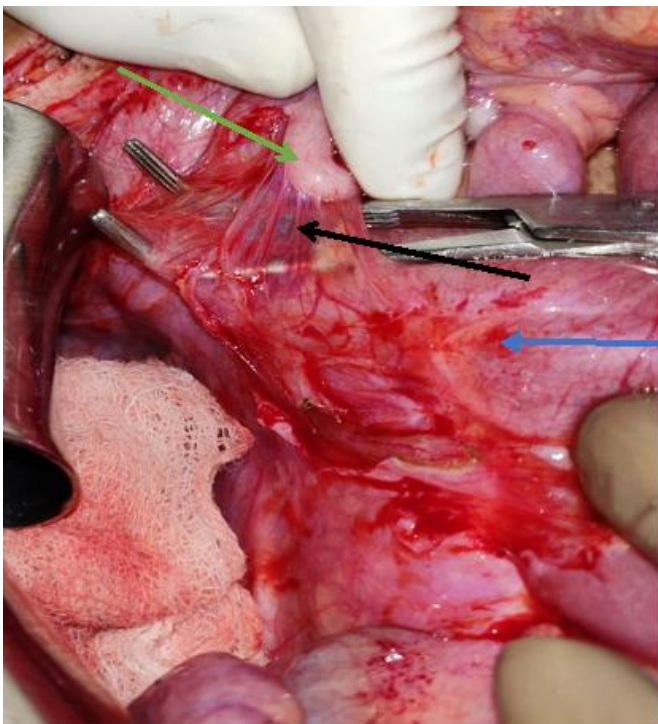


Fig 4. Showing Ladd's bands (black) between appendix (green) and duodenum (blue).

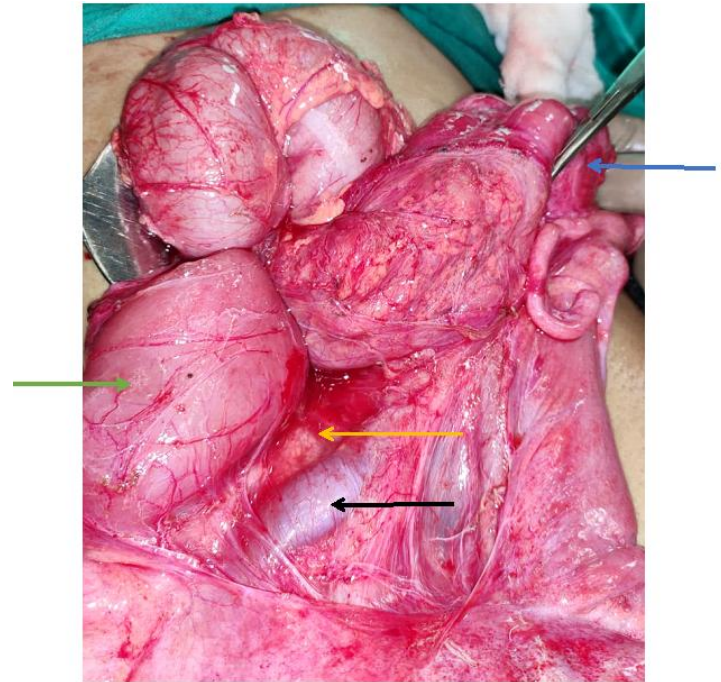


Fig 5. Showing final picture after detorsion, SMA (yellow), SMV (blue), Duodenum (green), Cecum (black) respectively.

Case Discussion

The whirl sign appears as the twist of bowel wrapping around single constrictive focus of mesentery that may contain intestinal blood vessels. The extent of the swirling correlates with the degree of bowel rotation and degree of vascular compromise^[4].

In our case report, we found classical whirl sign where small bowel is seen twisting around SMV (Fig 1). When we compared CT Images with intra operative findings we found the twist along with Ladd's bands (Fig 4) which were responsible for the obstruction and the twist. Final anatomical picture (Fig 5) shows cecum and appendix on the left side and 2nd part of duodenum to be intra peritoneal whereas ascending colon was seen at the place of transverse colon. SMV was seen to be clearly exposed by widening of the mesentery till the root of mesentery. Other features of bowel obstruction like bowel wall dilatation and transition point were also prominent which directed us towards operative management before signs of bowel ischemia developed. Subsequently patient had positive outcome of surgery and made adequate recovery.

Conclusion

Whirl sign is an important radiological finding in the diagnosis of midgut volvulus. A patient with whirl sign on CT is 25.3 times as likely as a patient without the sign to have small bowel obstruction which warrants surgery^[5]. Timely identification of the sign along with other features of small bowel obstruction on CT can help clinicians to take the decision for operative management and can prevent impending bowel ischemia and further bowel resection. Operative approach can be both laparoscopic or open depending on patient factors, surgeon expertise and resource availability. Therefore whirl sign plays an important role in assessment of treatment options for patients with clinical and radiological signs of small bowel obstruction.

References

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