CASE REPORT

Reverse intestinal rotation: a rare case of volvulus around a vitelline duct remnant

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SUMMARY

We present a rare case of reverse intestinal rotation with volvulus around a Meckel's diverticulum attached to a vitelline duct remnant. The diagnosis was established by CT. The patient was treated with exploratory laparotomy and small bowel resection. The patient made a full recovery and was discharged home on the seventh postoperative day.

BACKGROUND

Reversed intestinal rotation (RIR) is the rarest form of midgut congenital rotation anomalies.¹ Midgut rotation anomalies are responsible for less than 1% of presentations of gastrointestinal obstruction in adults. Of these RIR was reported in 2–7% of cases, with a twofold female predominance.^{1 2} To the best of our knowledge, this is the first case report describing RIR with intestinal volvulus around the Meckel's diverticulum attached to the vitelline duct remnant.

These congenital anomalies can cause significant diagnostic challenges for surgeons. Furthermore, such cases can be technically demanding at the time of laparotomy. Therefore, it is important to report our experience of this rare case.

CASE PRESENTATION

A 73-year-old female patient presented with a 6 h history of central abdominal pain. This was of sudden onset and radiated to the back. The patient was recently seen in the outpatient department for change of bowel habit. She reported a 3-month history of increasing frequency of bowel motions. There was no associated rectal bleeding, weight loss or any other symptoms of note. The only medical history is type II diabetes mellitus, no previous abdominal surgery. A recent flexible sigmoidoscopy found no abnormalities. There was no significant family history.

On admission the patient was non-feverish and no evidence of haemodynamic compromise. Abdominal examination revealed tenderness in the umbilical and epigastric regions but there was no peritonism present. There were no masses, hernia or abdominal aortic aneurysm palpable. The lower limb pulses were intact.

INVESTIGATIONS

Initial blood results demonstrated a white cell count of $13 \times 10^9/L$ and C reactive protein was 3 mg/L. Liver function tests, amylase, urea and electrolytes were normal. Arterial blood gas sampling demonstrated a lactate of 3.5 mmol/L and plain

abdominal radiography did not reveal any abnormalities.

Owing to the sudden onset of the pain CT of the abdomen was performed to establish the diagnosis. This demonstrated free fluid within the peritoneal cavity with a 50 cm long segment of dilated small bowel (SB) loop in the right hemiabdomen and right iliac fossa; with a shorter segment of SB wall thickening and mesenteric haziness. Additionally, there was a thin walled slightly irregular 5 cm cystic lesion in the left parametrium suggestive of an ovarian tumour.

DIFFERENTIAL DIAGNOSIS

Differential diagnosis included closed loop SB obstruction, SB ischaemia or inflammatory bowel disease. An ovarian malignancy could also not be excluded by the CT findings.

TREATMENT

The patient was treated with intravenous fluids and taken to the operating theatre in the morning for exploratory laparotomy. This revealed the duodenal-jejunal (DJ) flexure in the midline of the abdomen, with a very mobile right colon medially located and crossing the midline (figure 1). The transverse colon was running posterior to the SB mesentery and duodenum (figure 2). The left colon, stomach and liver were in normal anatomical positions. Furthermore, a Meckel's diverticulum was found adherent by the vitelline duct remnant to the anterior abdominal wall. This caused SB volvulus with closed loop obstruction. A short segment of SB was resected containing the

Figure 1 An axial image demonstrating transverse colon (yellow arrow) posterior to first part of duodenum (blue arrow).

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Figure 2 A coronal image demonstrating the ileocaecal valve in the left iliac fossa (yellow arrow).

Meckel's diverticulum. A palpable cystic lesion in the left ovary was felt to be benign and excised.

OUTCOME AND FOLLOW-UP

The patient made a swift and uneventful postoperative recovery. Histopathology demonstrated no microscopic abnormalities of the resected SB, and confirmed a benign ovarian cyst.

DISCUSSION

RIR is a rare congenital anomaly of midgut rotation.¹ Midgut rotational anomalies rarely present in adults, and are responsible for less than 1% of presentations of gastrointestinal obstruction in adulthood.¹ Of these RIR is the rarest form of midgut rotation anomaly and is seen in only 2–7% of cases, with a twofold female predominance.^{1 2}

During the fourth week of gestation, the midgut herniates out of the abdominal cavity into the umbilical cord. At this stage, the prearterial (proximal to the superior mesenteric artery (SMA)) midgut undergoes an initial 90° anticlockwise rotation around the SMA. Between the 5th and 11th weeks the second phase of the 270° anticlockwise rotation takes place. This delivers the duodenum posterior to the superior mesenteric vessels and the DJ flexure at the ligament of Treitz.¹ Failure of this stage leads to the development of RIR. The distal part of the midgut (caecum) rotates 90° in a clockwise direction around the SMA axis.^{1 3 4} This delivers the ascending colon posterior to the superior mesenteric vessels and duodenum remains anterior to the vascular pedicle with the DJ flexure located in the midline.

RIR was first described in the 19th century and since the 1950s less than 30 cases have been reported in the literature. The most common presentation is that of a gastrointestinal

obstruction and several mechanisms have been implicated. First, the right colon or the entire midgut can undergo a volvulus.² Second, the ascending colon can become obstructed from pressure created by the narrow tunnel posterior to the superior mesenteric vessels through which it passes. Finally, a duodenal obstruction, usually at the DJ flexure can develop secondary to mesenteric bands arising from the colon that extend over the duodenum to the retroperitoneum (Ladd's bands).^{1 2} To the best of our knowledge, this is the first published case in the literature of RIR with intestinal volvulus around a Meckel's diverticulum attached to a remnant vitelline duct.

The literature describes three cases of RIR that are co-incidental findings in patients undergoing intra-abdominal surgery for other pathology.^{5–7} Preoperative identification of RIR allowed for surgical planning prior to oesophagectomy for cancer of the oesophagogastric junction.⁶ A rare case is described of cholecystectomy for a gallbladder located left of the ligamentum teres associated with RIR.⁷

Several techniques have been proposed as means of a surgical correction, and these include bypass of the transverse colon, transection and displacement of the transverse colon anterior to the superior mesenteric vessels and right hemicolectomy with ileocolic anastomosis. However, the evidence is limited to a handful of case reports. It is impossible to draw definitive conclusions and decision regarding a surgical treatment should always be carefully balanced against the risks of a major intra-abdominal surgery on an individual case basis.

Learning points

- ▶ Reverse intestinal rotation is a rare cause of intestinal obstruction in adults.
- ▶ Anatomical variation can make diagnosis and surgical treatment technically challenging.
- ▶ Intestinal malrotation should be considered as a differential diagnosis in patients with intestinal obstruction and unusual CT findings.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Lileyman A, Levy RD, Sillar R. Reversed intestinal rotation: report of two cases and review of the published reports. *ANZ J Surg* 2006;76:947–9.
- 2 Balamoun H, Mohammad R, Hamade A. Reversed rotation of the midgut in adults: a case report. *Ann R Coll Surg Engl* 2010;92:3–5.
- 3 Sakellariou BK, Pavlopoulos PM. A case of reversed intestinal rotation presenting as duodenal ileus. *Ann Gastroenterol* 2000;13:58–60.
- 4 Singer JA, Korn R. Reversed rotation of the midgut presenting as duodenal and transverse colon obstruction in a 19 year-old man. *J Am Coll Surg* 2003;197:1048–9.
- 5 Jagannath P, Albuquerque K, de Souza LJ, et al. Reversed rotation of midgut which caused problems during Whipple's procedure. *Eur J Surg* 1995;161:765–6.
- 6 Makino I, Ninomiya I, Fujimura T, et al. Radical esophagectomy for a patient with reversed intestinal rotation and complicated vascular anomalies in the abdomen. *J Gastrointest Surg* 2011;15:229–31.
- 7 Stagg LH, Sheiner HJ. Reversed rotation of the gut incidental to cholecystitis in a left-sided gall-bladder. *Br J Surg* 1973;60:413–16.

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