# Image for Surgeons

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## Chronic Adhesive Small Bowel Volvulus : “Whirl Sign” on CT-scan

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**Key words.** Small bowel ; volvulus.

### Case report

A 58-year-old woman was seen at the outward clinic. She had a 13-year progressive history of acute intermittent colicky peri-umbilical pain. This pain was lately associated with nausea. Five years ago she was admitted for a small bowel obstructive episode treated conservatively. She had undergone 14 years earlier an elective laparotomy for an asymptomatic abdominal mass. This mass of 8 × 7 × 7 cm and weighing 350 g was discovered within the mesentery of the first jejunal segment and located on the left side of the superior mesenteric artery (Fig. 1). At the same time a biliairy cyst in segment III was marsupialised. Histological analysis showed a benign mesenteric cystic lymphangioma.

On admission abdominal examination showed no anomalies and normal bowel sounds were present. Laboratory findings revealed only slightly elevated potassium of 5.6 mEq/l. Abdominal computed tomography scan revealed bowel loops encircling the superior mesentery artery in a whirl-like pattern (Fig. 2). This “whirl sign” was first described in a case of malrotation by FISHER (1).

At laparotomy a 50-cm long volvular twisted segment (Fig. 3a) was found at one meter from the angle of Treitz. Three twists based on adhesions near the base of the superior mesenteric artery were seen. The affected bowel loops did not seem to be dilated or ischemic. There were no signs of recurrent cystic lymphangioma. However the presence of mesenteric varices was noted. An extensive 60-cm adhesiolysis of the affected ileum segments was performed, the small bowel was anatomically repositioned in the abdominal cavity (Fig. 3b), and 200.000 units of Aprotinine were instilled in the peritoneal cavity before closure. She was discharged on the 10th postoperative day. At 12 months follow-up she remained symptom free.

*Fig. 1*
Contrast-enhanced CT : A large mesenteric cystic mass, which surrounds and splays small bowel loops. Note the absence of dilated bowel loops and the proximity of the cystic mass to the superior mesenteric artery.

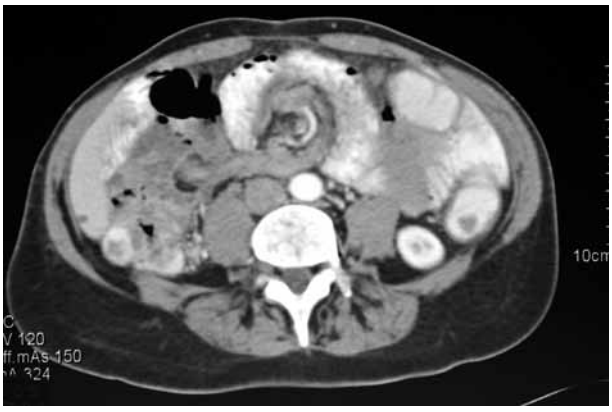


*Fig. 2*
Contrast enhanced CT : a *whirl-like* mass encircling around the superior mesenteric artery like a typhoon on a weather map. Note the absence of dilated bowels and beak sign.

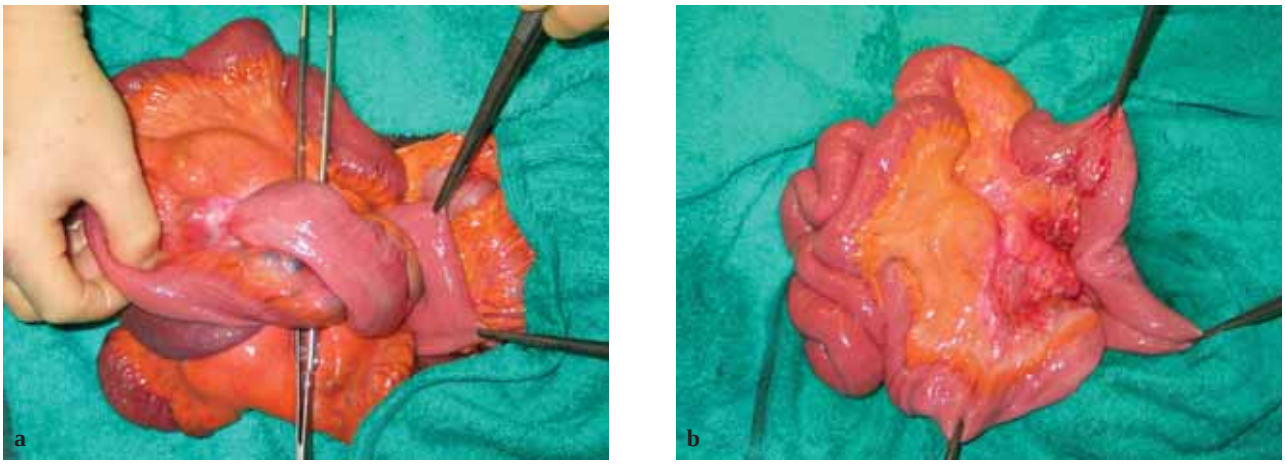


*Fig. 3*
Intra-operative findings : a) three volvular twist near the base of the mesentery. There are no signs of obstruction and ischemia. Note the presence of congested mesenteric venules ; b) After performing adhesiolysis of the affected segments. Note the site of the adhesions at the level of the benign mesenteric cystic lymphangioma previously resected close to the mesenteric base.

**Discussion**

The "whirl sign" was first described in a case of malrotation by FISHER (1) as closed bowel loops encircling the superior mesenteric artery and having an appearance of a typhoon on a weather map (Fig. 2).

Fisher advocated that any disturbance in the normal 270° embryological counter-clockwise return of the intestine into the abdominal cavity could produce abnormal attachment and the lack of normal peritoneal attachment predisposes to volvulus. The superior mesenteric artery provides the fulcrum whereby the bowels twist around. Later on other authors have described the same sign in sigmoid volvulus (2), even caecal volvulus (3) and adhesive mid-gut volvulus (4, 5).

Small-bowel volvulus can be differentiated according to its etiology into two types : primary idiopathic volvulus, in which no anatomical abnormalities can be shown, and secondary volvulus, in which embryological or post-operative adhesions are responsible (6). The result of mesenterial adhesions near the base of the superior mesenteric artery whereby the bowel loops are pinched together and allowed to rotate around a pivot – the superior mesenteric artery – can explain the pathophysiology of adhesive mid gut volvulus as suggested by BALTHAZAR *et al.* (6). In our case the prior resection of the mesenteric cystic lymphangioma was most likely responsible for the damage and the resulting adhesions, near the base of the superior mesenteric artery.

Even though the whirl sign was claimed as a specific sign in the CT-diagnosis of small bowel volvulus, it can not be apparent if the mesenteric axis is not parallel to the tomographic sections. Perhaps 3-D reconstructions with different axial tomographic sections can increase the sensivity ? Other CT signs described in the literature are the triangular configuration in the efferent bowel loop and the beak sign in the afferent bowel loop, both not seen in our case. These additional signs actually accentuate the obstructive and acute character of the volvulus. In our case the whirl sign was already present 13 years earlier. Previous plain abdominal radiographs never showed distended bowel loops or a beak sign confirming the chronic sub-obstructive character of our case. It might therefore be useful to review 3D reconstruction CT-scans with intra operative data of confirmed small bowel volvulus. At present no such study has provided an answer to the sensitivity of the whirl CT sign. Indeed if chronic adhesive sub-volvulus has the tendency to evolve to acute ishemic volvulus then early diagnosis can reduce the mortality.

Damage of the mesentery does not obligatory cause an adhesive volvulus. Other factors such as the length of the mesentery or the site of manipulations are important.

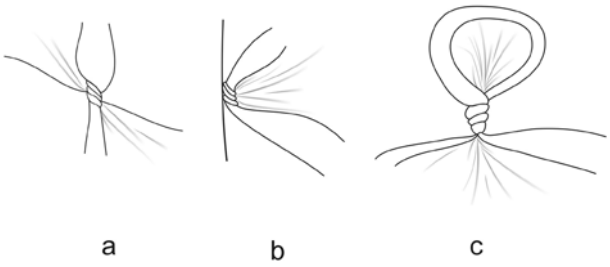


*Fig. 4*
a) *Entero-enteric* adhesions ; b) *Entero-extra-enteric* adhesions ; c) *mixed* type of adhesions.

A study from MAETANI *et al*. (7), in which 88 intraoperative observations for adhesive small bowel obstruction were made, adhesions were divided into *entero-enteric* type, *entero-extra-enteric* type and *mixed* type (Fig. 4). They noted that obstructive adhesions were those that extended from one side of the mesenteric margin to the other. This site of fixation not only served as a point where the bowel is bent but acted as a pivot by which random movement of the bowel are transformed into a rotation producing a torsion of the bowel on its long axis. This in turn usually led to constriction of the affected bowel lumen. So, if the adhesions is of the entero-enteric type such as in our case, it can then provide enough torsion and constriction of the bowel around its axis leading to a volvulus. This can only be achieved if the adhesion pinches the two adjacent segments at the root of the mesentery, creating a low base of attachment around which the closed loops can rotate to render a small bowel volvulus. Minimising iatrogenic tissue damage, antibiotic prophylaxis, meticulous surgical techniques, adequate hemostasis and adjuvant therapy should be applied in order to limit adhesion formations.

In conclusion, the whirl sign is a specific sign for any intestinal volvular process, but the sensitivity has yet to be determined. We believe that 3D reconstruction in the three axes will increase the sensitivity of early CT-diagnosis in patients presenting with intestinal sub-obstruction and prevent life threatening acute ishemic volvulus. Future studies need to confirm this hypothesis. However, not all intestinal adhesions will lead to volvulus. For complete small bowel volvulus to occur, adhesions have to pinch at the low base of the mesentery with enough remaining free length of small bowel that can further rotate around the pivot made by the superior mesenteric artery.

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