

## Case Report

# Laparoscopic Treatment of a Small Bowel Volvulus Secondary to an Uncommon Omphalomesenteric Remnant

Yannick Hurni<sup>1\*</sup>, Mario Mendoza-Sagaon<sup>1</sup>, Flurim Hamitaga<sup>1</sup>, Natalia Voumard<sup>1</sup>, Giorgia Pellanda<sup>1</sup>, Antonio Braghetti<sup>2</sup>, and Stefano Crippa<sup>3</sup>

<sup>1</sup>Department of Pediatric Surgery, Ospedale Regionale Bellinzona e Valli, Switzerland

<sup>2</sup>Department of Radiology, Ospedale Regionale Bellinzona e Valli, Switzerland

<sup>3</sup>Department of Pathology, Luton & Dunstable University Hospital, United Kingdom

**\*Corresponding author**

Yannick Hurni, Department of Pediatric Surgery, Ospedale Regionale Bellinzona e Valli - Bellinzona, 6500 Bellinzona, Switzerland, Tel: 41-0-91 811 91 65; Fax: 41-0-91-811-87-87; Email: yhurni@gmail.com

Submitted: 10 April 2017

Accepted: 25 September 2017

Published: 27 September 2017

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**OPEN ACCESS****Keywords**

- Intestinal obstruction
- Vitelline duct
- Minimally invasive surgical procedures
- Volvulus

**Abstract**

**Introduction:** Intestinal obstruction is a well-known complication in the presence of various types of omphalomesenteric duct remnants. The omphalomesenteric duct is an embryologic communication between the yolk sac and the primitive midgut. Failure of complete reabsorption results in a variety of anomalies, like an omphalomesenteric fistula, a sinus tract or cyst, fibrous connection of the ileum to the umbilicus, or most frequently, a Meckel's diverticulum. These conditions can remain asymptomatic or present with several complications. Intestinal obstruction is the second most common complication and typically results secondary to twisting of the small bowel around a remnant band. Anomalies derived from the vitelline vascular system are rarely encountered, but may be associated with poor outcome. Laparoscopic surgery currently represents a reliable resource for the diagnosis and treatment of these cases.

**Case presentation:** We report a case of a 9-year-old boy who presented a small intestine volvulus secondary to an uncommon lipovascular cord, compatible with a vitelline artery remnant. Laparoscopic diagnosis and treatment were successfully performed.

**Discussion:** Isolated vitelline vascular remnants are rarely encountered, but their careful management is essential. With this case, we highlight the reliability of the laparoscopic approach for both diagnosis and treatment of these rare causes of intestinal obstruction.

**ABBREVIATIONS**

OMD: Omphalomesenteric Duct

**INTRODUCTION**

Intestinal obstruction is a well-known complication in the presence of various types of omphalomesenteric duct (OMD) remnants like an omphalomesenteric fistula, a sinus tract, fibrous bands, or a Meckel's diverticulum [1]. Laparoscopic surgery currently represents a reliable resource for the management of these causes of intestinal obstruction [1-5]. We report a case of small bowel volvulus in a child, secondary to an uncommon omphalomesenteric lipovascular remnant. A similar case has been reported only twice previously [6].

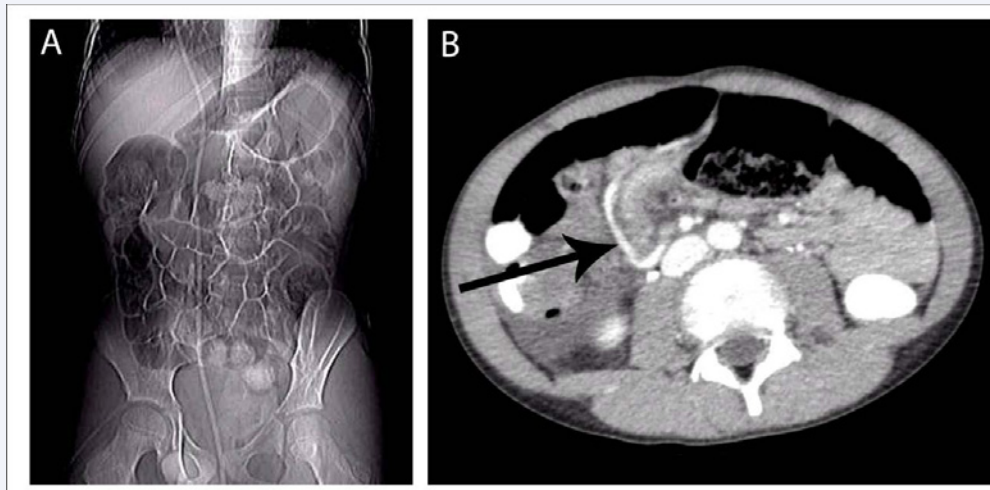
**CASE PRESENTATION**

A 9-year-old boy was admitted to our service with a complaint of intense abdominal pain associated with biliary vomiting and abdominal distension. The child was known for recurrent episodes of severe abdominal pain with spontaneous resolution and for previously treated glandular hypospadias. A clinical exam showed a painful distended abdomen with a palpable mass in the right quadrants. An abdominal computed tomography scan

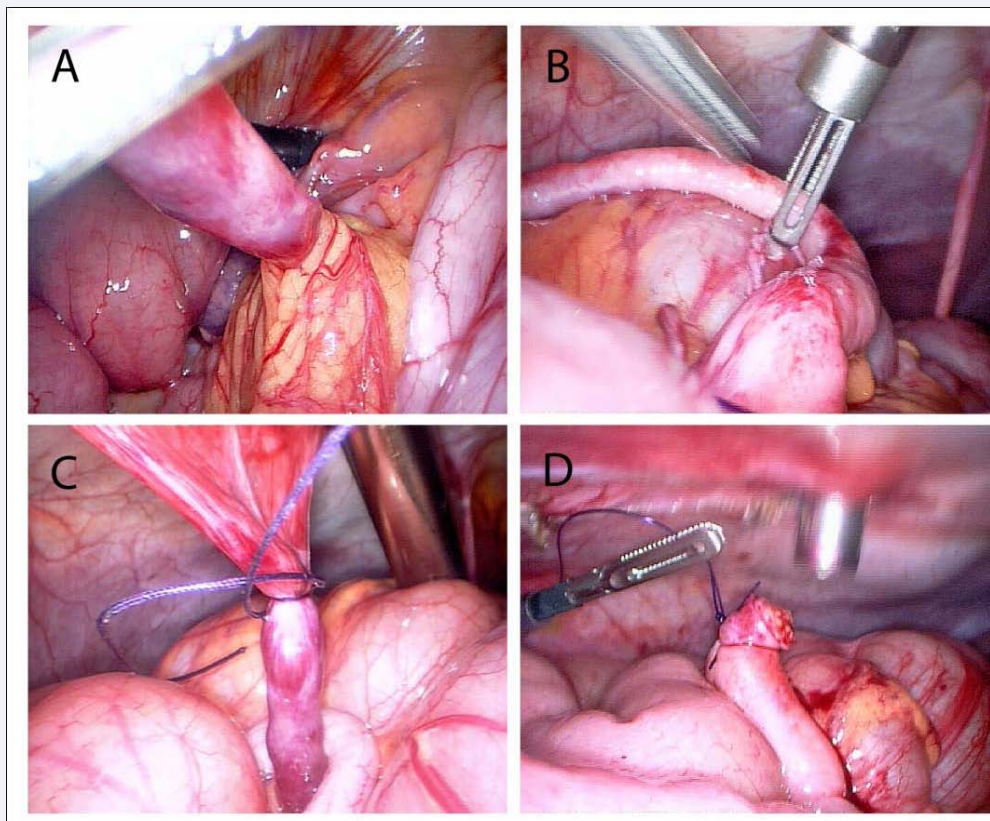
showed a picture consistent with small bowel obstruction. In addition, a vascular structure coming from the umbilicus to the area of the intestinal obstruction was noted (Figure 1a,b). The child underwent laparoscopic exploration, and an ischemic small bowel volvulus was diagnosed. Careful observation revealed the presence of a single lipovascular cord at the base of the volvulus, stretching between the ileal mesentery and the periumbilical abdominal wall. After intestinal detorsion and cord resection, the previously twisted intestinal segment recovered its normal color and peristalsis. Therefore, no intestinal resection was necessary (Figure 2a-d). Inspection of the small bowel excluded the presence of a Meckel's diverticulum or any other intestinal OMD remnant. Macroscopic examination of the resected cord revealed the presence of vascular structures. Histopathologic analysis confirmed the presence of multiple vascular components surrounded by fibroadipose tissue (Figure 3a,b). The child was discharged on postoperative day 3 in good condition.

**DISCUSSION**

We report a case of intestinal obstruction secondary to an uncommon omphalomesenteric remnant compatible with a vestige of the vitelline (omphalomesenteric) artery. The OMD is an embryologic communication between the yolk sac and the



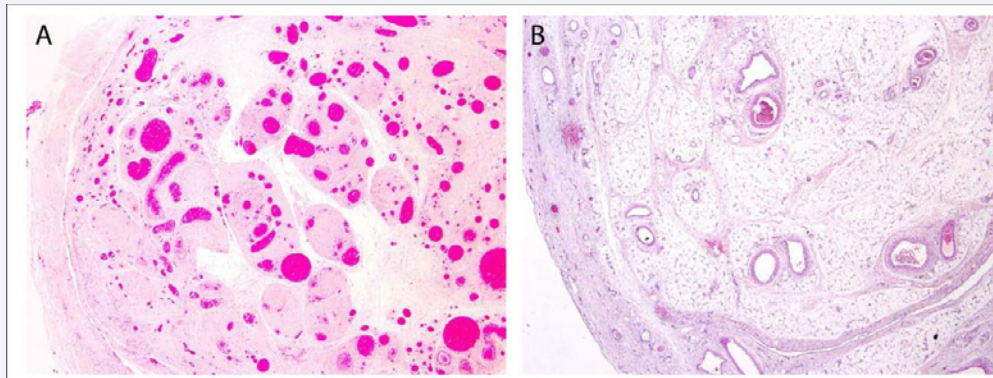
**Figure 1** (A) Scout and (B) axial abdominal computed tomography scan views showing a picture compatible with small bowel obstruction. The presence of a vascular structure coming from the umbilicus to the area of the suspected intestinal obstruction is highlighted (arrow).



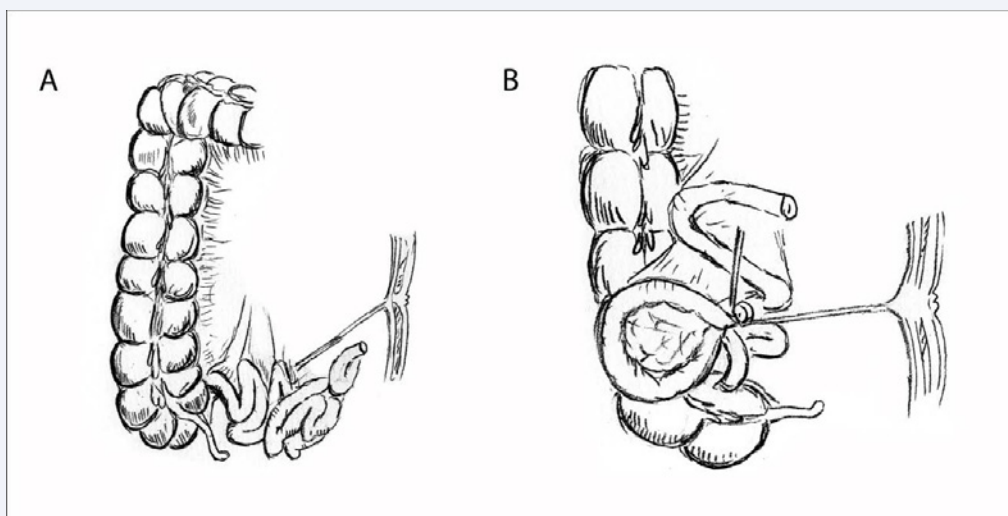
**Figure 2** (A) Laparoscopic view of the lipovascular cord coming from the umbilicus to the mesentery. (B) Ligature of the umbilical side. (C) Ligature and (D) resection of the mesenteric side.

primitive midgut. Its involution usually occurs between the eighth to ninth week of gestational age [7], but postnatal reabsorption has also been reported [8]. Failure of complete reabsorption results in a variety of anomalies, like an omphalomesenteric fistula, a sinus tract or cyst, fibrous connection of the ileum to the umbilicus, or most frequently, a Meckel's diverticulum [1].

These conditions can remain asymptomatic or present with gastrointestinal hemorrhage, bowel obstruction, diverticulitis, intussusception, or rarely, neoplasia development [1,9]. Complications of the OMD remnants typically occur before 10 years of age, but late presentations may occur throughout life [1]. Intestinal obstruction is the second most common complication



**Figure 3** (A, B) Histological specimens of the resected cord showing several vascular components surrounded by fibroadipous tissue.



**Figure 4** (A) Remnant of the vitelline artery coursing from the umbilicus to the ileal mesentery. (B) Small bowel volvulus secondary to an intestinal twist around the vitelline artery remnant.

after hemorrhages, and typically results secondary to twisting of the small bowel around a remnant band [1]. These bands can be composed of OMD residues, vitelline vascular remnants, or a combination of these two. Anomalies derived from the vitelline vascular system are less commonly encountered [10]. They generally present in combination with a Meckel's diverticulum [10], but, as in our case, observations in the absence of any OMD remnants have also been reported [6,11-13].

During the embryonal development, the two vitelline arteries supply the yolk sac by passing through the umbilical cord. When the yolk sac involutes, so does the left vitelline artery. The right vitelline artery persists and, after losing its portion connected to the abdominal wall, becomes the superior mesenteric artery. If that distal segment fails to degenerate, it generally appears as a peritoneum-covered cord that may present completely, partially, or not pervious [14]. The following four major types of anatomic manifestation have been described [6,11-19]. The cord is typically fixed at its two ends, coursing from the ileal mesentery (1) to a Meckel's diverticulum or (2) to the periumbilical abdominal wall. (3) It can also course from the anterior to the posterior mesenteric leaf, crossing over the bowel and forming a ring-like band around

it. (4) Less commonly, it hangs free in the abdominal wall, only attached to the mesentery. As a result, vitelline vascular remnants can be associated with intestinal obstruction resulting from an intestine volvulus around a band, ring-like bands strangulating the bowel or secondary to intestinal entrapment in mesenteric pouches created by the abnormal course of these vestiges.

Although uncommonly encountered, intestinal obstruction resulting from the presence of vitelline vascular vestiges may be associated with poor outcome [15,16]. Their early recognition and prompt surgical management are, therefore, required. In addition to the well-known complications associated with bowel obstructions, this condition can present specific surgical risks. In the presence of umbilical attached bands, it can be difficult for the surgeon to differentiate between vitelline vascular vestiges and the more frequently encountered OMD remnants. The nonrecognition of these potential vascular components can cause life-threatening haemorrhage during dissection [20]. Therefore, they should be presumed vascular in nature until proven otherwise. The observation of their anatomical course may be helpful to distinguish them. While OMD remnants are fixed at the antimesenteric intestinal border, vascular remnants

generally run beyond the small bowel to its mesentery [21]. However, before resection, the careful ligation of any suspect band is strongly suggested. There are important risks associated with the technical difficulties in reaching pneumoperitoneum with bowel distension. In order to avoid intraabdominal organ lesions, peritoneal cavity access must be performed with care, preferably using an open technique (Hasson technique) rather than closed technique (Verres needle). In addition, particular difficulties could be encountered trying to untwist the bowel laparoscopically.

The patient we describe presented with a small bowel volvulus, secondary to an intestinal twist around a lipovascular cord coursing from the umbilicus to the ileal mesentery (Fig. 4a,b). This apparent vitelline vascular remnant was observed in the absence of any OMD remnant. Possible previous episodes of spontaneous intestinal torsion and detorsion could explain the patient's history of abdominal pain. We decided upon a complete laparoscopic management, with successful intestinal obstruction resolution and band resection. To our knowledge, this is the first reported case of the laparoscopic treatment of an intestinal obstruction caused by such a type of vitelline artery remnant in a child. Thanks to technological and surgical skill advancements, laparoscopic surgery currently represents a reliable resource for the diagnosis and treatment of intestinal obstruction secondary to omphalomesenteric remnants in both adults and children. Several reports have described the success of this practice as well as the benefits of laparoscopy compared to the conventional open approach [1-5].

In conclusion, isolated vitelline vascular remnants are rarely encountered, but their careful management is essential. With this case, we highlight the reliability of the laparoscopic approach for both diagnosis and treatment of these rare causes of intestinal obstruction.

## ACKNOWLEDGEMENTS

Our special thanks go to Bettina who helped us with the drawings preparation.

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### Cite this article

Hurni Y, Mendoza-Sagaon M, Hamitaga F, Voumard N, Pellanda G, et al. (2017) Laparoscopic Treatment of a Small Bowel Volvulus Secondary to an Uncommon Omphalomesenteric Remnant. *JSM Pediatr Surg* 1(1): 1004.