


# Laparoscopic treatment of patent omphalomesenteric duct: a new surgical approach

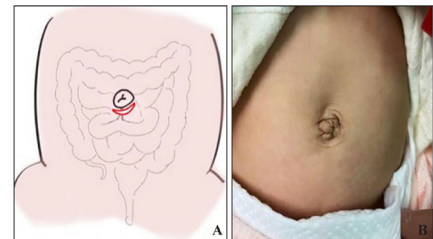
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Patent omphalomesenteric duct (POMD) is formed due to the incomplete closure of the duct connecting the distal ileum and the umbilicus during the development of the vitelline duct. The morbidity of POMD is about 1:2000.<sup>1</sup> The exposed intestinal mucosa is susceptible to injury and bleeding and can cause many complications such as soft tissue infection and sepsis (*figure 1*).<sup>2</sup> The standard treatment is resection operation. The current surgical methods for the treatment of POMD include laparotomy and laparoscopy assisted with a small incision (*figure 2*).<sup>3-6</sup> All of these methods may affect umbilical appearance. Therefore, we improved the existing surgical method and used the cavity structure of the fistula to treat neonatal POMD by laparoscopic surgery. We believe that this surgical method is a safe and feasible minimally invasive operation.

Seven neonatal POMD infants hospitalized in the Department of Neonatal Surgery of Hunan Children's Hospital from August 2020 to October 2021 were retrospectively analyzed. All the patients were male, with a mean gestational age of 39 (38~40) weeks, and a mean surgical age of 11 (9~11) days. The mean body weight of the patients was 3.75 (2.90~3.85) kg. Among all the 7 patients,



**Figure 2** Traditional infraumbilical incision in a neonate: the situation of incision (A) and scar after procedure (B).

3 showed umbilical stool and gas, 2 presented with umbilical mass and the other 2 presented with repeated umbilical exudate. One case of umbilical exudate was associated with umbilical infection. All children were diagnosed with POMD by fistulography through the umbilicus. For all the suspected children, we routinely perform umbilical ultrasound examination. In the meantime, we also inserted a 6F catheter into the fistula and performed fistulography to observe whether the contrast medium entered the intestine (*figure 3*).

All children underwent laparoscopy in the supine position under general anesthesia, and the drapes were sterilized. There was granulation tissue in the umbilicus and a fistula in the center (*figure 4A*). A 5mm skin incision was made at the midpoint of the line connecting the umbilicus and the xiphoid process in the upper abdomen, and an artificial pneumoperitoneum was established. The pressure was set to 8mm Hg (1 mm Hg=0.133kPa). Then, a 5mm Trocar was placed, and laparoscopic exploration was performed. Next, a 3mm Trocar and an operating instrument (three holes in total) were placed on the lateral border of the upper and middle rectus abdominis after the POMD diagnosis was confirmed (*figure 4A*). The fistula was clamped to maintain a certain tension, and the end of the fistula wall was removed by wedge-shaped resection with

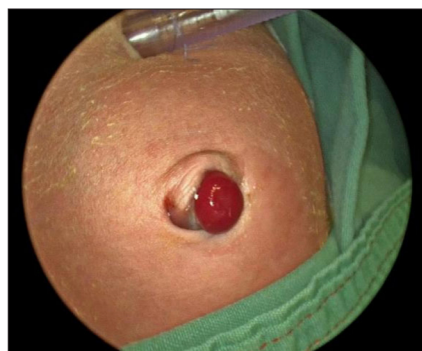


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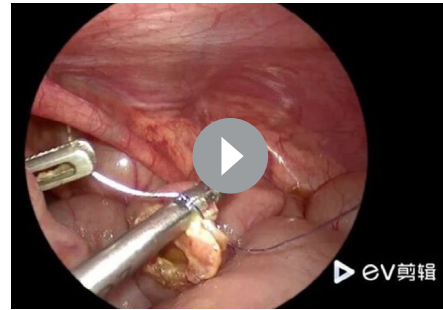


**Figure 1** Umbilical mass in a neonate with POMD. POMD, patent omphalomesenteric duct.



**Figure 3** Fistulography: 6F catheter was inserted through the umbilicus, a few of contrast medium was injected through the catheter and the ileum and intestine below the fistula were visualized.

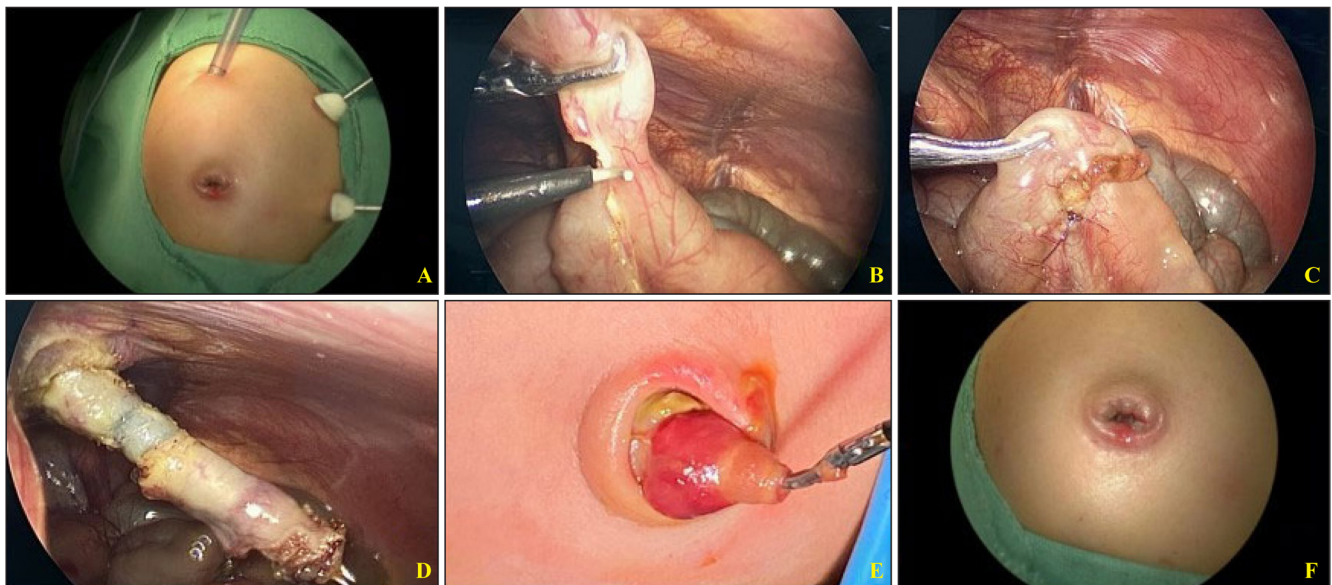
electrocoagulation hook (**figure 4B**). Absorbable thread (5-0) was inserted through the abdominal wall, and the serosa of the anastomosis at the incision edge of the intestinal wall was passed through to suspend the intestine. Then, a single layer of continuous suture was used. The anastomosis was completed by continuous valvulus suture from the top to bottom (**figure 4C**). After checking the anastomosis was satisfactory, tissue forceps were inserted into abdomen from the fistula lumen, and the bottom of the fistula was clamped back out of the abdominal cavity (**figure 4D,E**). Then, the fistula was resected at the



**Video 1** The video shows the detail steps of traditional surgery modification.

skin junction, and the residual fistula mucosa was cauterized at the ligation of the umbilical fistula (**figure 4F**). The detailed procedures of the surgery were displayed in the uploaded **video 1**. All patients had no anastomotic leakage, infection or dehiscence of the abdominal wound. All of them were discharged after recovering from adequate feeding. After a mean follow-up time of 12 (6-16) months, all patients recovered well with no complications such as intestinal obstruction or fistula recurrence.

POMD is caused by abnormal closure of the vitelline duct.<sup>1</sup> It mainly manifests as umbilical stool or gas defecation, mass and repeated exudation and can cause repeated tissue infections, and even sepsis may occur if the diagnosis and treatment are not on time.<sup>2</sup> Surgical fistula resection is the preferred treatment. Several laparotomy methods have been mentioned previously.<sup>3-5</sup> Bertozzi *et al* treated umbilical fistula through a small umbilical incision assisted by laparoscopy. Current treatment methods may cause injury to the umbilicus during fistula resection and affect the aesthetics of the umbilicus. Our treatment



**Figure 4** The steps of modified laparoscopic surgery. The location of Trocars (A), removed the fistula by wedge-shaped resection (B), sutured the anastomosis by continuous valvulus suture (C), tissue forceps were inserted into abdomen from the fistula lumen (D), clamped the fistula back out of the abdominal cavity from fistula lumen (E), the postoperative umbilical appearance (F).

concept is similar to that of Bertozzi.<sup>6</sup> We have improved the laparoscopic-assisted small incision operation and invented a new surgical method for treating umbilical fistula. Tissue forceps were inserted from the duct of POMD, and the distal end of the fistula was clamped and pulled back out of the abdomen under laparoscopy. The fistula was ligated and excised, and then the intestinal anastomosis was performed laparoscopically. We believe that this surgical method can completely preserve the anatomy and appearance of the umbilicus. During the follow-up, none of the children had an intestinal obstruction or fistula recurrence, and the short-term outcome was satisfactory.

This treatment method preserves the normal structure and shape of the umbilicus while excising the fistula and can assist in a clear diagnosis. We think this treatment is safe, feasible and worth promoting.

**Contributors** CZJ contributed to study design, drafting of manuscript and critical revision. BL contributed to study design, analysis and interpretation of data and drafting of manuscript. YX contributed to analysis and interpretation of data. GX contributed to study design. RX, ML and YF contributed to acquisition of data. CZG contributed to drafting of manuscript and critical revision.

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**Competing interests** None declared.

**Patient consent for publication** Parents/guardians gave their written informed consent for their child's personal or clinical details along with all identifying images/video to be published in this study.

**Ethics approval** The new technique for the treatment of POMD was approved by the ethics committee of Hunan children's hospital and was performed in accordance with the ethical standards set by the Declaration of Helsinki.

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**Data availability statement** Data are available in a public, open access repository.

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