

Clinical Analysis of Rare Chylous Mesenteric Cyst in Children

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【Abstract】

Background:

Chylous Mesenteric Cysts (CMCs) are rare intra-abdominal masses in children, and definitive preoperative diagnosis remains challenging. This study reviews the diagnosis and management of CMCs at a single institution, with particular attention to clinical characteristics and the effectiveness of laparoscopic surgery.

Methods:

A retrospective analysis was performed on the records of all patients diagnosed with CMCs and treated with laparoscopic surgery at our institution between January 2020 and May 2026. Clinical manifestations, preoperative imaging data, surgical techniques, postoperative complications, and patient outcomes were evaluated.

Results.

The cohort consisted of three girls and five boys, with ages ranging from 0.1 to 9.0 years (mean 4.0 ± 2.8 years) and weights ranging from 4.9 to 32.5 kg (mean 15.7 ± 8.4 kg). Abdominal pain and vomiting were the most common symptoms, occurring in 62.5% of cases. Four patients experienced cyst-related complications: three developed intestinal volvulus, and one presented with intestinal volvulus accompanied by intestinal obstruction. Sole cyst excision was conducted in two cases, while en bloc resection of the cyst with bowel was performed in six cases. Laparoscopic surgery was completed successfully in seven patients; one case required conversion to open surgery. The mean operative time was 103 ± 31 minutes. Pathological examination

identified lymphangioma or lymphatic malformation containing chylous fluid in all patients, findings consistent with mesenteric chylous cyst. No peritoneal infection, anastomotic leakage, or cyst recurrence was observed during short- and medium-term follow-up.

Conclusion

Chylous mesenteric cysts are most often definitively diagnosed during surgery. Once confirmed, prompt removal is recommended to prevent complications. In pediatric patients with uncomplicated chylous mesenteric cysts, laparoscopic cyst excision or cyst excision with bowel resection are effective treatment options.

Keywords: Chylous mesenteric cysts; Mesenteric cysts; Laparoscopy; Children; Prognosis

Introduction

Mesenteric cysts (MCs) are relatively common in adults; however, they are rare in children and infants, with an incidence of approximately 1 per 20,000 pediatric admissions^[1-2]. MCs may develop at any location within the mesentery of the gastrointestinal tract and can extend from the base of the mesentery into the retroperitoneum. The ileal mesentery represents the most frequent site of occurrence^[3]. A mesenteric cyst containing chylous fluid is termed a chylous mesenteric cyst. CMCs are rare, accounting for approximately 7.3% of all abdominal cysts. Limited reports exist regarding the laparoscopic management of CMCs in children, and the safety and effectiveness of these procedures remain inadequately defined. This article presents a summary of laparoscopic management in eight pediatric patients with CMCs at a single institution, integrates relevant literature, and aims to characterize the clinical features of the disease as well as the effectiveness of laparoscopic treatment in children.

Materials and Methods

1. Clinical information

A retrospective analysis was performed on clinical data (Tables 1, 2) from eight children diagnosed with CMC at the institution between January 2020 and May 2026. The cohort comprised three girls and five boys, with ages ranging from 0.1 to 9 years (mean age 4.0 ± 2.8 years). Patient weights ranged from 4.9 to 32.5 kg (mean 15.7 ± 8.4 kg). Five patients presented with acute abdominal symptoms, including abdominal pain and vomiting; one case was diagnosed prenatally, and two were identified by abdominal ultrasound during routine physical examination. The duration of symptoms ranged from 8 hours to 1 year. Blood tests revealed normal white blood cell counts and C-reactive protein (CRP) levels, with an elevated percentage of neutrophils observed in only two patients. Biochemical analyses showed no evidence of hypoproteinemia, and coagulation function remained within normal limits. Preoperative ultrasound demonstrated a multiloculated cystic mass with internal septations in the abdominal cavity (Figure 1A), suggesting the presence of abdominal cysts. Computed tomography (CT) identified a cystic low-density lesion in the

abdominal cavity with thin linear septations. Contrast-enhanced scans revealed enhancement of the septations and cyst wall, further supporting the diagnosis of abdominal cysts (Figure 1B). Of these cases, three were complicated by intestinal volvulus (Figure 1C), and one case involved intestinal volvulus with intestinal obstruction.

Table 1 Preoperative clinical data of 8 patients with CMC

Case	Sex	Aae (years)	Weight (kg)	Presentations	White blood cell count ($\times 10^9/L$)	Neutrophils (%)	CRP (mg/L)	Albumin (g/L)
1	Boy	4.6	14.0	Abdominal pain and vomiting	10.9	76.4	<0.2	44.8
2	Girl	3.8	15.0	Abdominal pain	9.1	43.7	<0.2	42.0
3	Girl	1.5	10.2	-	7.9	52.0	<0.2	43.4
4	Boy	5.4	21.0	Abdominal pain	11.6	78.6	<0.2	47.8
5	Boy	0.1	4.9	-	6.4	19.1	<0.2	37.6
6	Boy	9.0	32.5	-	5.0	41.3	<0.2	43.3
7	Boy	2.1	10.5	Abdominal pain and vomiting	9.3	57.0	<0.2	43.5
8	Girl	5.8	17.5	Abdominal pain and vomiting	7.4	66.7	<0.2	51.7

CMC, Chylous Mesenteric Cyst; CRP, C-reactive protein

Table 2 Intraoperative and postoperative clinical data of 8 patients with CMC

Case	Cyst complicati ons	Size of CMC (cm)	Surgical procedure	Operation time (min)	Pain score	Fasting duration (days)	Hospital ization days (days)	Follow up time (months)
1	Intestinal volvulus	7.2*5.2*7.6	Cyst excision + bowel resection	120	2	2	7	3
2	-	6.5*4.6*6.9	Cyst resection	100	2	1	3	5
3	-	13.6*7.0*1 3.5	Cyst excision + bowel resection	170	2	3	8	22
4	Intestinal volvulus	8.1*5.6*8.4	Cyst excision + bowel resection	100	2	2	7	50
5	-	5.1*4.3*6.2	Cyst excision	70	3	4	6	57

			+ bowel resection					
6	-	9.7*8.9*10. 1	Cyst resection	85	3	1	4	63
7	Intestinal volvulus	4.4*6.2*11. 5	Cyst excision + bowel resection	110	3	4	7	72
8	Intestinal volvulus with intestinal obstruction	8.7*8.5*4.4	Cyst excision + bowel resection	75	2	3	6	75

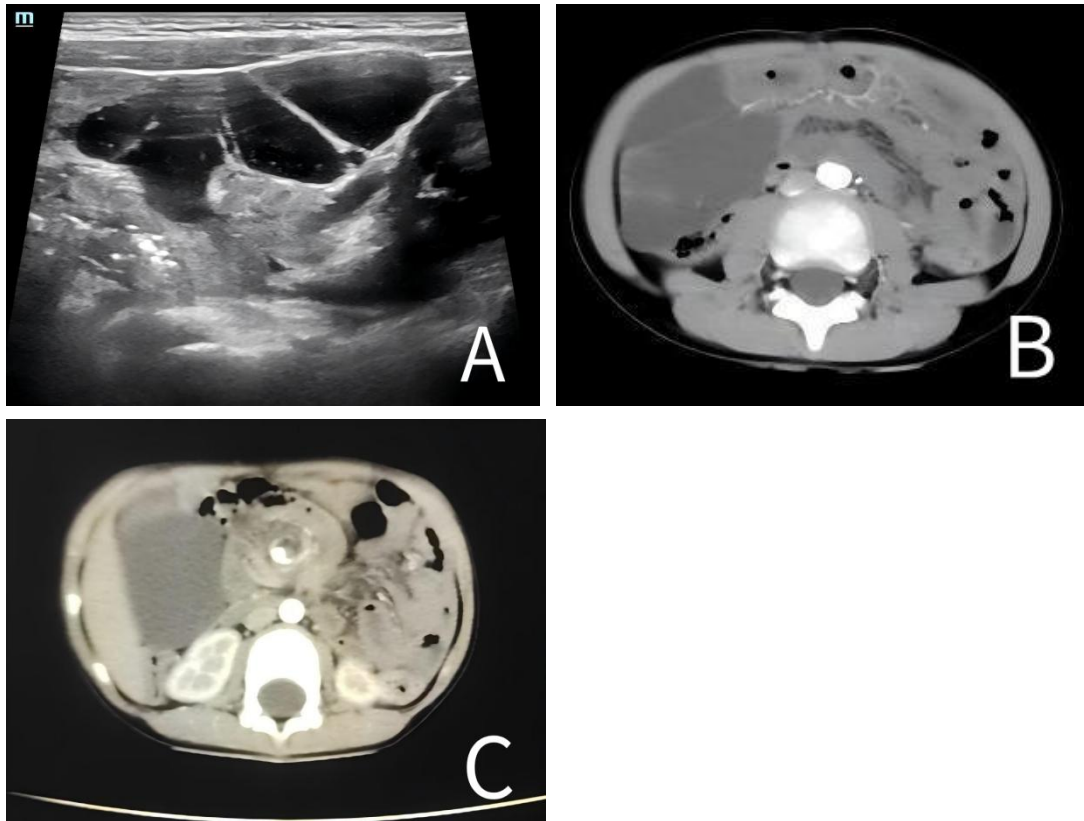
CMC, Chylous Mesenteric Cyst

2.Methods

All patients underwent transumbilical single-port laparoscopic surgery. After induction of general anesthesia using a laryngeal mask, patients were placed in the supine position. A longitudinal incision was created along the navel, extending 0.5 cm above and below the umbilical ring, and a disposable multichannel single-port laparoscopic puncture device was inserted (Figure 2A). Pneumoperitoneum was maintained at 5 - 11 mmHg throughout the procedure.

During the operation, chylous ascites was identified (Figure 2B). The cyst originated from the ileal mesentery, traversed the mesentery, and encircled the bowel. The cyst contained chylous fluid. Various degrees of chyle accumulation were observed in the surrounding mesentery, and chylous-like changes were present on the surfaces of certain bowel segments. When the cyst was clearly demarcated from the bowel, simple cyst excision was performed. If the margin was indistinct, cyst excision with resection of the involved intestinal segment was necessary.

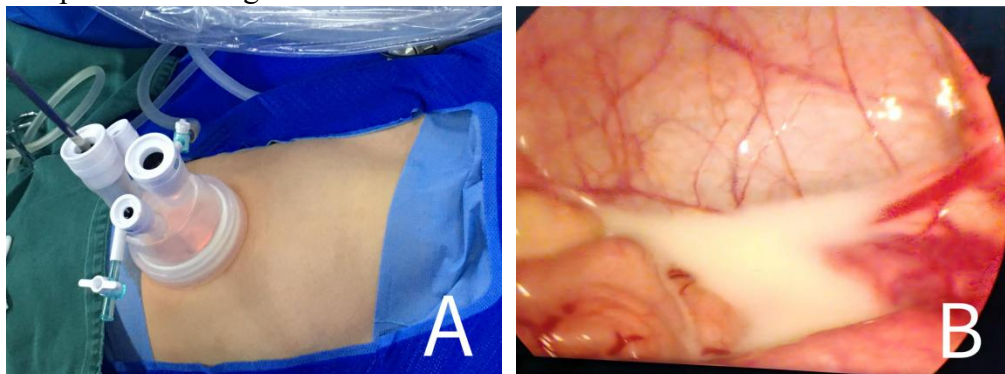
Post-operatively, the patient was given intravenous therapy for hemostasis, prophylactic antibiotics. Oral intake was resumed on postoperative day 1 for individuals who underwent simple cyst excision. In cases involving bowel anastomosis, fasting was maintained for 2 to 4 days, contingent upon the recovery of bowel function. Routine blood tests, C-reactive protein (CRP) levels, and abdominal ultrasound examinations were performed every 3 days after surgery. Patients were discharged once blood test results remained within normal limits and no ascites was detected.



Figures 1: A: Ultrasound imaging revealed a multiloculated cystic mass containing several septations of moderate echogenicity.

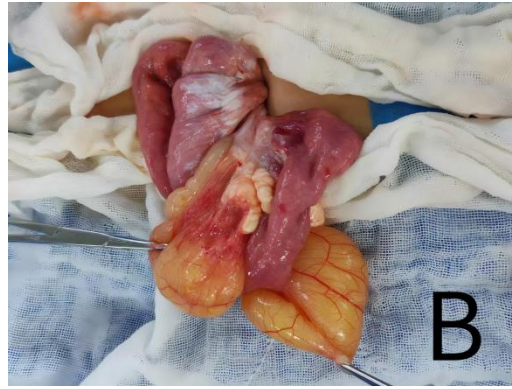
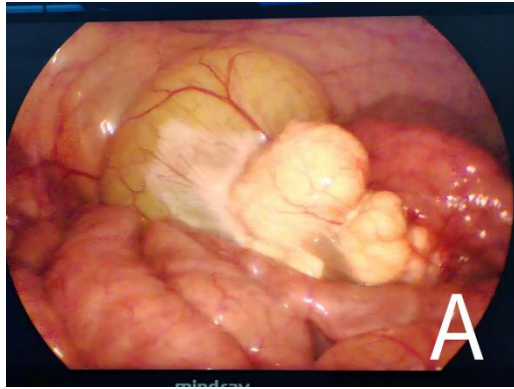
B: CT identified a cystic low-density lesion in the abdominal cavity with thin linear septations.

C: When intestinal volvulus occurs, the mesenteric vessels show a whirlpool-like change.



Figures 2: A: Umbilical incision and disposable multichannel single-hole laparoscopic puncture device (50 × 150 mm)

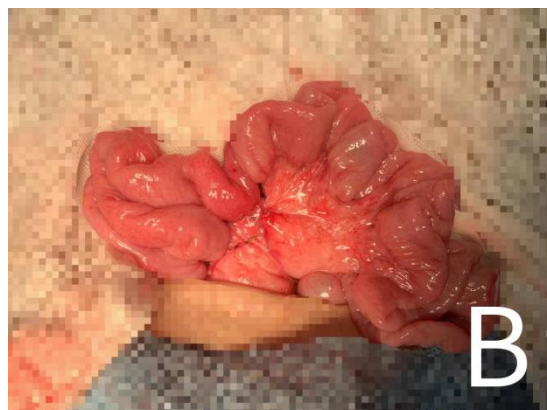
B: Chylous ascites exuding in the peritoneal cavity



Figures 3: A: The cyst originated from the mesentery, contained chylous fluid, chylous-like changes were noted on the surface of some bowel segments.

B: After decompression, the cyst was brought out of the abdominal cavity through the umbilical incision.

C: When the cyst is well-demarcated from the mesentery and the adjacent intestinal wall, cyst excision alone may be performed.

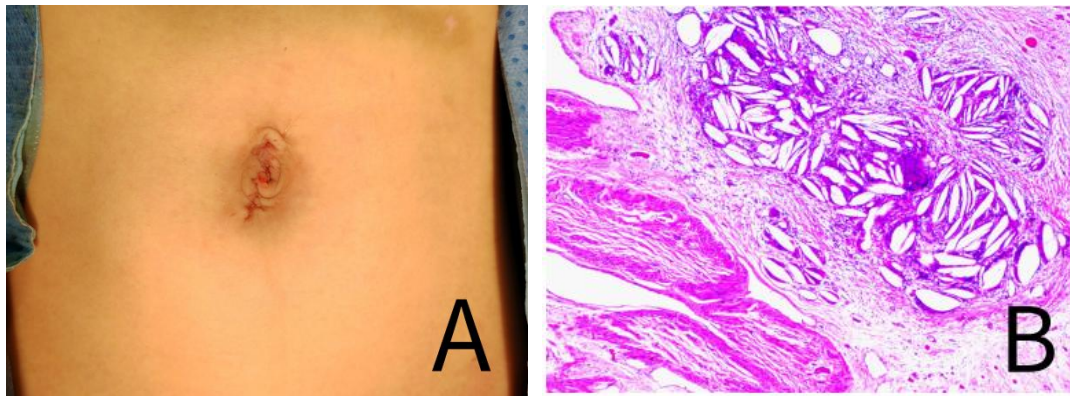




Figures 4: A: The mesentery is edematous and thickened, with diffuse chylous cysts visible.

B: When the cyst is poorly demarcated or severely adherent to the mesentery and the adjacent intestinal wall, excision of both the cyst and the involved bowel segment is required.

C: Surgical specimen: mesenteric chylous cyst and involved bowel segment.



Figures 5: A: Inconspicuous postoperative umbilical incision

B: Histopathological examination revealed a multiloculated cyst with thin, smooth fibrous walls and focal cholesterol granuloma formation.

Results

All patients underwent transumbilical single-port laparoscopic surgery. The procedure was completed successfully in seven patients, while one case required conversion to open surgery. Simple cyst excision was performed in two patients (Figure 3A-3C), whereas cyst excision with resection of the involved intestine was necessary in six cases (Figure 4A-4C). The mean operation time was 103 ± 31 minutes, with a range of 70 to 170 minutes. Intraoperative findings included intestinal volvulus in three cases and intestinal volvulus with obstruction in one case.

All patients were discharged without incident, with a mean postoperative hospital stay of 6.0 ± 1.7 days (range, 3 to 8 days). Macroscopic examination revealed that the cyst was multilocular and contained a white, viscous chylous fluid. Histopathological analysis demonstrated that the fibrous wall was thin and smooth, with focal cholesterol granuloma formation (Figure 5B). No complications, such as peritoneal infection, anastomotic leakage, or recurrence, were identified during a

mean follow-up period of 43 months.

Discussion

Chylous mesenteric cysts are rare benign intra-abdominal cysts, initially described by the Italian anatomist Benevieni in 1507^[4]. Von Rokitansky provided a subsequent description in 1842^[5]. The pathophysiology of CMCs remains unclear. Multiple factors may contribute to their formation. Congenital factors primarily involve abnormal development of embryonic lymphatic vessels, where some vessels fail to connect to the main lymphatic trunks, leading to an imbalance of chyle inflow and outflow in the small intestine. These are essentially intestinal lymphangiomas containing chyle^[6]. Additional hypotheses include failure of embryonic lymphatic vessels to join the venous system and non-fusion of mesenteric leaves, resulting in lymphatic fluid accumulation within this space^[7-9]. Acquired factors may include trauma, infection, and parasitic infestation. CMCs exhibit a slight male-to-female preponderance of 1.4:1^[10]. In the present study, the observed male-to-female ratio was 1.7:1, consistent with previous reports.

Clinically, patients may be asymptomatic or may present with various symptoms, such as abdominal pain, abdominal distension, and an abdominal mass, primarily resulting from cyst compression or related complications. In this cohort, 62.5% (5/8) of patients exhibited symptoms, and 50.0% (4/8) experienced cyst complications. All cases were diagnosed as MCs based on characteristic imaging features of multilocularity and cystic septations, identified through preoperative ultrasound and computed tomography (CT). Ultrasonography effectively delineates cyst-tissue separation and provides diagnostic value for MCs, whereas enhanced CT offers superior differentiation of the cyst from adjacent tissues, particularly blood vessels^[11-12].

However, it is difficult to make a definitive preoperative diagnosis of CMCs. Rifkin^[13] reported that CMCs may demonstrate a fluid-fluid level of chyle and lymphatic fluid on computed tomography (CT); however, this radiological sign was not observed in any cases within the present cohort. A review of the literature on pediatric CMCs published between 2016 and 2026 was conducted (Table 3). After excluding studies that did not meet the inclusion criteria, eight studies comprising sixteen patients were included in the final analysis. Including the eight cases from the current study, only 20.8% (5/24) of pediatric patients received a definitive preoperative diagnosis of CMC. All five cases originated from a single study, in which the authors reported confirmation of CMC by ultrasound, but did not provide specific diagnostic criteria. These findings indicate that, in most instances, CMC is diagnosed intraoperatively.

Table 3 Cases and extracted data(2016-2026)

Year	Author	Sex	Age (years)	Presentatio ns	Localizatio n	Treatm ent	Surgical procedure	Preoperati ve diagnosis
2025	Ghafoor A ^[14]	Boy	15	Chronic abdominal	Ileocecal mesentery	O	Cyst excision +	MC

				pain			bowel resection	
2025	Singh JK ^[10]	Boy	5	Acute abdomen	Ileum mesentery	O	Cyst excision + bowel resectio	CMC
		Boy	3	Acute abdomen	Jejunal mesentery	O	Cyst excision + bowel resectio	CMC
		Girl	8	Acute abdomen	Ileum mesentery	O	Cyst excision + bowel resectio	CMC
		Boy	9	Acute abdomen	Jejunal mesentery	O	Cyst excision + bowel resectio	MC
		Girl	5	Subacute intestinal obstruction	Ileum mesentery	O	Cyst excision + bowel resectio	CMC
		Girl	1.5	Abdominal distension	Ileum mesentery	O	Cyst excision + bowel resectio	CMC
2022	Gasparella P ^[15]	Girl	4.5	Chronic abdominal pain	Jejunal mesentery	LO	Cyst excision + bowel resection	LM
		Boy	11.7	Acute abdominal pain	Jejunal mesentery	LO	Cyst excision + bowel resection	LM
		Boy	5.1	Abdominal distension	Jejunal mesentery	O	Cyst excision	LM
		Girl	13.2	Chronic abdominal pain	Jejunal mesentery	O	Cyst excision + bowel resection	LM
2022	Aihole JS ^[16]	Boy	2	Abdominal distension	Ileum mesentery	O	Cyst excision + bowel resectio	MC

2021	Mohamed F ^[17]	Boy	1	Abdominal distension	Jejunal mesentery	O	Cyst excision + bowel resection	MC
2021	Salatto A ^[6]	Boy	37 weeks	Vomiting	Ileum mesentery	L	Cyst excision + bowel resection	MC
2020	Kusuma FSP ^[18]	Boy	4	Abdominal pain	Ileum mesentery	O	Cyst excision + bowel resection	LM
2016	Kweyamba V ^[19]	Boy	4	Abdominal pain	Ileum mesentery	O	Cyst excision + bowel resection	MC

O, open surgery; LO, laparoscopic exploration and open excision; LM, Lymphatic Malformation; L, laparoscopic surgery

CMC most frequently occurs in the mesentery of the small intestine. As the cyst increases in size, it may cause intestinal volvulus or compress the bowel, resulting in obstruction. Additional presentations include rupture, infection, or hemorrhage. In severe cases, CMC can be life-threatening in pediatric patients. Consequently, once a diagnosis is established, surgical intervention is recommended regardless of symptomatology. The choice of surgical approach depends on the anatomical relationship between the cyst, the mesentery, and the adjacent intestinal wall. If the cyst is clearly separated from the mesentery and adjacent intestinal wall, excision of the cyst alone is appropriate. If the cyst is poorly defined or firmly attached to the mesentery and adjacent intestinal wall, excision of both the cyst and the affected bowel segment is necessary. In cases where cysts are multiple or closely associated with major mesenteric vessels, and resection could result in excessive bowel loss, only the majority of the cyst should be removed. The remaining cyst wall adherent to the vessels should be widely opened and cauterized using 2% tincture of iodine^[20-21]. Among the cases included in this study, only 12.5% (3/24) underwent cyst excision alone, whereas the remaining cases required excision of both the cyst and the involved bowel segment. Some scholars have suggested that simple excision of cysts without bowel resection for CMC may lead to lymph spillage from the preserved loop, potentially resulting in postoperative chylous ascites. However, chylous ascites or cyst recurrence was not observed during the treatment course. Therefore, when feasible, complete simple cyst excision appears to be a reliable approach^[15].

The literature indicates that open surgery remains the preferred treatment for CMC among most pediatric surgeons. However, with the increasing adoption of laparoscopic technology, laparoscopic MC excision is becoming more prevalent^[12,15,20-23]. At this institution, transumbilical single-port laparoscopy was performed on

patients with MC. Of these, eight cases were diagnosed intraoperatively as MCM and were included as study subjects in this article.

The diagnosis of MCM was confirmed intraoperatively. The cyst was elevated beneath the umbilical incision, moderately punctured, and decompressed under direct visualization, then extracted from the abdominal cavity through the umbilical incision. The anatomical relationship among the cyst, mesentery, and intestinal wall determined the surgical resection approach. Puncture decompression was performed only to the extent necessary to reduce the cyst for delivery through the umbilical incision, thereby preventing collapse prior to resection, which could obscure boundaries with surrounding tissues, result in incomplete cyst removal, and increase the risk of postoperative recurrence. During laparoscopic exploration, Case 3 demonstrated extensive distribution of CMC, accompanied by significant edema and thickening of the mesentery at the cyst site. Consequently, the procedure was converted to open surgery. Intraoperatively, the cyst and 100 cm of the affected small intestine were resected. Postoperatively, there were no occurrences of chylous ascites, anastomotic leakage, intra-abdominal infection, or incisional infection. No intestinal obstruction or cyst recurrence was observed during short- and medium-term follow-up.

Transumbilical single-port laparoscopic surgery offers several advantages compared to conventional laparoscopic and open approaches for CMC resection. Similar to conventional laparoscopic surgery, it facilitates both diagnosis and treatment, but requires fewer incisions. Additionally, the umbilical incision utilized in this technique (Figure 5A) is comparable in size to that of conventional laparoscopic surgery, as the latter also necessitates enlargement of the umbilical incision for specimen extraction. Second, in comparison to open surgery, the incision length is significantly reduced, which minimizes surgical trauma, decreases postoperative pain, accelerates recovery, and results in less noticeable postoperative abdominal wall scarring. Third, the disposable multi-channel single-port laparoscopic access device employed during the procedure incorporates an incision protector as its base. This feature both retracts the incision to fully expose the surgical field and prevents contamination during bowel anastomosis, thereby reducing the incidence of postoperative wound infection. All cysts were completely removed, with only one case requiring conversion to open surgery. The mean operation time was 103 ± 31 minutes and was not significantly longer than that reported for other laparoscopic procedures.

Several limitations are present in this study. As a retrospective single-center and small sample size investigation, the surgical method has not been utilized for an extended period, resulting in a limited number of cases and a short follow-up duration. Increasing the sample size and extending the follow-up period are necessary for a more objective evaluation. Future research should include comprehensive, multicenter studies with larger sample sizes.

A chylous mesenteric cyst is a rare congenital benign malformation of the lymphatic system, most commonly located in the small bowel mesentery. Patients may be asymptomatic or may present with abdominal pain, abdominal distension, vomiting, or an abdominal mass. Physical examination and imaging are often

insufficient for diagnosis; therefore, preoperative identification of chylous mesenteric cysts is challenging, and most cases are confirmed intraoperatively. Preliminary treatment experience with a small sample suggests that transumbilical single-port laparoscopic surgery is a safe, effective, and feasible approach. This technique may represent an alternative surgical option for the management of pediatric chylous mesenteric cysts.

Conclusions

In conclusion, CMCs are relatively rare clinical scenarios. Although preoperative diagnosis is difficult, they should be removed promptly once the diagnosis is confirmed to avoid cyst complications. Laparoscopic management should be the treatment of choice for most cases of CMCs. For uncomplicated mesenteric cysts, laparoscopic cyst excision or cyst excision with bowel resection can be safely performed in children. While for complicated CMCs, open surgery should be considered. When complete removal is unlikely, fully opening the cyst cavity and cauterizing it with 2% tincture of iodine may be considered.

Declarations

List of abbreviations

CMC - Chylous Mesenteric Cyst
MC - Mesenteric cyst
CRP - C-reactive protein
CT - Computed tomography
LM - Lymphatic malformation

Ethics declarations: This study was performed in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from the parents of the participants, and the study was approved by the Medical Ethics Committee of Quanzhou Maternal and Children's Hospital (Quanzhou Children's Hospital) (Approval No: 168 of 2026).

Consent for publication statement: Not applicable. The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Data Availability Statement: The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declaration of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Authors' contributions: YH and YW contributed to the study conception and design. HW, WC, YC, and QW contributed to data acquisition. HW, QW, CS, and HZ contributed to analysis and data interpretation. YH and HW contributed to drafting of the manuscript, while YW contributed to critical revision. All authors contributed to the article and approved the submitted version.

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