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Laparoscopic Management of Abdominal Cystic Lymphangiomas in Pediatric Patients: A Review of Eight Cases in the Queen Fabiola Children's University Hospital, Brussels

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Abstract

Objective: This study aimed to demonstrate the feasibility of laparoscopic-resection of the abdominal cystic lymphangiomas in Pediatric Surgery and describe the morbidity associated to this management in Queen fabiola children's university hospital (HUDERF) in Brussels. **Methods:** We retrospectively conducted a study at the Pediatric Surgery Department of HUDERF, Brussels. The studied period was from January 1, 2014, to January 1, 2024; a span of 10 years. All patients with a confirmed diagnosis of cystic lymphangiomas and who underwent laparoscopic surgery were included in our study. Those who have been operated exclusively by open surgery have been excluded. The technique involved either total laparoscopic resection or laparoscopic-assisted with extra-abdominal resection of the tumor. Parameters that were studied included age, sex, weight, symptoms, preoperative diagnosis, imaging assessment, location, size of the tumor, type of mass, surgical procedure, duration of the surgery, conversion to open surgery, morbidity, and histopathology. Data were analyzed using Microsoft Office Excel 2010 and SPSS. **Results:** We retrieved 10 files of patients presenting with abdominal cystic lymphangiomas within two patients underwent exclusive open surgery and have excluded from our study. Then our sample was constituted with 8 patients. The mean age of the patients was 6.4 years (standard deviation: 3.6

years, range: 1 to 11 years). Male patients were predominant. The mean weight was 26.7 kg (standard deviation: 14.7 kg, range: 10 to 55 kg). The most common symptom was abdominal pain. Preoperative diagnosis of abdominal cystic lymphangioma was made in 8 cases. Abdominal ultrasound was performed in all patients. MRI was done in 5 patients, and CT scan in 2 patients. All patients presented a multicystic mass. Pure laparoscopic resection of the cyst was done in 2 cases. Laparoscopic-assisted resection in 4 cases (with extraperitoneal with small bowel resection and mesenteric detorsion in 1 case), and conversion in 2 cases due to the complex location of the cyst. After a follow-up period of 5 years, morbidity was noted in one patient (Patient 3) who developed postoperative bowel obstruction 1 month post-surgery. This patient was re-operated on with a favorable clinical outcome following conventional small bowel resection and anastomosis. The other patients (1, 2, 4, 5, 6, 7 and 8) had a simple clinical course, and no recurrence was observed in our series. **Conclusion:** Laparoscopic-resection of the abdominal cystic lymphangiomas is feasible in Pediatric Surgery. As minimally invasive surgery it gives many advantages even for complex abdominal cystic lymphangiomas with less morbidity as shown in our series.

Keywords

Abdominal Cystic Lymphangioma, Laparoscopic Management

1. Introduction

Cystic lymphangioma is a benign malformative tumor of the lymphatic system.

Their anatomical localization is almost exclusively cervicofacial and their clinical revelation is generally very early in the neonatal period [1]. This malformation represents 2.6% - 5% of congenital cervical masses in children. Their location is ubiquitous and the cervico-mandibular or facial regions remain the most frequent locations (75%) [2] or the axilla (20%), and is typically discovered in childhood. Its abdominal location is much rarer (5%) [3]. and the tumor can be located at the mesenteric or retroperitoneal region. This anomaly occurs during the formation of the lymphatic system in embryonic life, with a developmental defect in the lymphatic structures arising under the influence of genetic and other extrinsic factors. Cystic lymphangiomas can be classified into macrocystic forms (with cysts larger than 1 cm) and microcystic forms (with cysts less than 1 cm). The severity of symptoms depends on the size, location, and progression of the malformation. This tumor often compresses surrounding tissues and can affect vital functions; Spontaneous regression can be possible in some cases. The surgical treatment is considered when sclerotherapy is not efficient, particularly for cervical lymphangiomas or in the case of microcystic forms that are not amenable to sclerotherapy. The effectiveness of sclerotherapy, as reported by Chaudry *et al.* [4] is generally good, with ultrasound-guided doxycycline injection being used in intra-

abdominal cysts. However, some lymphangiomas are difficult to excise, and the risk of complications (such as hematoma or inflammation) should be carefully considered before any intervention. Some cases of recurrences have been reported in the literature. Although such controversial methods for the treatment of abdominal cystic lymphangiomas either by sclerotherapy or by surgery; we have been using laparoscopy in the past few years to treat this pathology. Recently, we retrospectively conducted a descriptive study about the issue of patients presenting with the abdominal cystic lymphangioma in our department. This study aimed to present laparoscopic outcomes in the treatment of the abdominal cystic lymphangiomas at the Pediatric Surgery Department of HUDERF, Brussels.

2. Methods

During 3 months, we retrospectively reviewed files of children who have been treated for abdominal cystic lymphangiomas at the Pediatric Surgery Department of the Queen fabiola children's university hospital. We got a clearance from the ethics committee of HUDERF and no consent statement has been done with patients as we collected data from patient's records. The studied period was from January 1, 2014, to January 1, 2024; a span of 10 years. All patients with a confirmed diagnostic of cystic lymphangiomas and who underwent laparoscopic surgery were included in our study. Those who have been operated exclusively by open surgery were excluded. The radiological assessment of the mass was performed by the radiologist, measuring the length, width, and height. Alternatively, the volume of the mass was simply measured. The technique involved either total laparoscopic resection or laparoscopic-assisted with extra-abdominal resection of the tumor. During the procedure, the patient was placed in the supine position with arms by their sides. A 5-mm optical trocar was inserted through an open technique at the umbilicus, and two additional 5-mm working trocars were placed on either side of the abdomen according to the triangulation technique. The abdominal exploration was done first with 30-degree optical camera (**Figure 1**). Aspiration of the mass will be performed using an 18-gauge catheter, which will be inserted through the skin at the site of the mass. A forceps will then be used to advance the catheter into the mass, and fluid will be aspirated until the mass is drained, utilizing a 60 cc syringe connected to the catheter (**Figure 1**). The cyst was dissected after aspiration, using either a dissecting hook or a simple clamp, then dissection with extraction of the rest of cyst was performed (**Figure 2**). In cases the mass involved a bowel loop, an extra-corporeal anastomosis was performed.

We converted the procedure to open surgery due to several factors, including the unfavorable location of the mass, its non-mobilizable nature, the presence of multiple adhesions, and its proximity to major blood vessels, all of which made dissection challenging.

Parameters that were studied included age, sex, weight, symptoms, preoperative diagnosis, imaging assessment, location, size of the tumor, type of mass, surgical procedure, duration of the surgery, conversion to open surgery, morbidity, and

histopathology. Data collection was done using the X-Care software and analyzed with Microsoft Office Excel 2010 and SPSS.

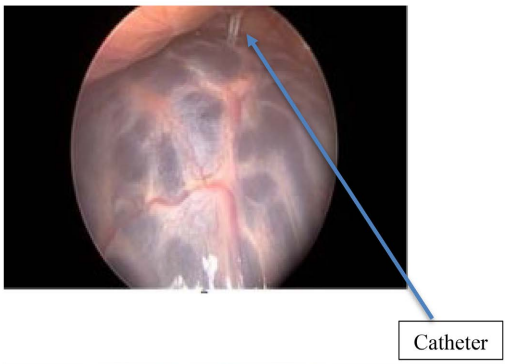

Figure 1. Drainage of the cyst and collection of fluid for analysis.

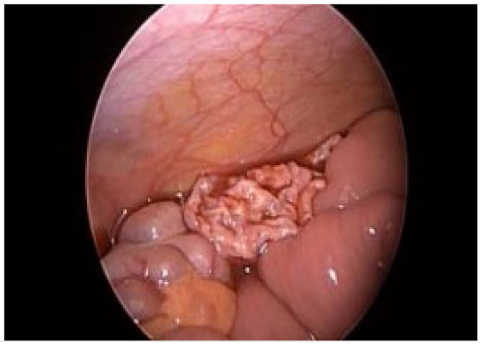

Figure 2. Cyst wall after drainage.

3. Results

During the study period, we included 10 patients who underwent surgery for abdominal cystic lymphangioma. Two patients who underwent exclusive conventional surgery (laparotomy) were excluded.

The average age of the patients was 6.4 years (standard deviation: 3.6 years, range: 1 to 11 years), with a predominance of male patients (5 boys, 3 girls). The average weight was 26.7 kg (standard deviation: 14.7 kg, range: 10 to 55 kg).

The most common symptom was abdominal pain in 5 cases, followed by intractable vomiting in 3 cases, and constipation in 1 case.

Abdominal cystic lymphangioma was the preoperative diagnosis in 8 cases. Abdominal ultrasound was performed in all patients (8 cases). The combination of abdominal ultrasound and abdominal MRI was used in 5 cases, and abdominal CT scan was performed in 2 cases.

During surgery, the mass was located mesenterically in 7 patients and was multicystic. One case involved a mesogastric and pelvic location, and one case had a retroperitoneal location. The surgical procedure performed in all patients was laparoscopic excision of the mass. Treatment consisted of pure laparoscopic resection of the cyst in 2 cases (patients 2 and 6), laparoscopic-assisted resection of the

cyst in 4 cases (patients 1, 4, 5, 8) with extra-peritoneal small bowel resection and anastomosis, mesenteric detorsion for volvulus in 1 patient, and conversion to an open procedure in 2 cases (patients 3 and 7) due to the complex positioning of the cyst with involvement of a bowel loop (small intestine).

Table 1. Summary of study results.

Patients	1	2	3	4	5	6	7	8
Age	5 years	11 years	13 months	10 years	5 years	4 years	9 years	5 years
Sex	M (Male)	F (Female)	F (Female)	M (Male)	M (Male)	F (Female)	M (Male)	M (Male)
Weight	17 kg	55 kg	10 kg	33 kg	28 kg	18 kg	26 kg	19 kg
Symptoms	Abdominal pain	Abdominal pain	Constipation (antenatal diagnosis)	Abdominal pain	Intractable vomiting	Abdominal pain	Abdominal pain + Vomiting	vomiting
Preoperative Diagnosis	Abdominal cystic lymphangioma (ACL)	ACL	ACL	ACL	Small bowel volvulus	ACL	ACL	ACL
Imaging	Ultrasound (US) + MRI	US + MRI	US	US + MRI	US	US + CT + MRI	US + CT + MRI + MRI	US + MRI
Location	Mesentery	Mesogastric and Pelvic	Mesentery	90 cm distal ileum	Mesentery: 80 cm from Treitz angle, 160 cm from cecum	Mesentery	Retroperitoneal	Mesenteric
Size	US: 340 ml MRI: 10 × 10 × 7 cm	US: NP MRI: 13 × 12 × 13 cm (mesogastric) 7 × 5 × 3 cm (pelvic)	US: 4.5 × 2.5 × 3.5 cm	US: 78 × 53 × 31 mm MRI: 50 ml	US: NP; CT: 133 × 106 × 54 mm	US: NP	NP	NP
Mass Type	Multicystic	Multicystic	Multicystic	Multicystic	Multicystic	Multicystic	Homogeneous cystic mass	Multicystic
Surgical Procedure	Resection + Anastomosis	Excision of masses	Excision of mass	Resection + Anastomosis	Detorsion + Resection + Anastomosis	Excision of mass and extraction via umbilicus	Excision of mass	Excision of mass and extraction via umbilicus
Surgical Duration	4 hours	1 hour 30 minutes	NP	NP	NP	1 hour 45 minutes	NP	2 hours
Conversion	+/−	No	Yes	+/−	+/−	No	Yes	+/−
Histopathology	ACL	ACL	ACL	ACL	ACL	ACL	ACL	ACL
Morbidities	Postoperative obstruction 1 month later	-	-	-	-	-	-	-

Legend: **US**: Ultrasound; **MRI**: Magnetic Resonance Imaging; **CT**: Computed Tomography; **ACL**: Abdominal Cystic Lymphangioma; **NP**: Not Precise.

At a follow-up of 12 months, morbidity was noted in only one patient (Patient

3), who developed postoperative bowel obstruction 1 month after surgery. This patient was re-operated on with a favorable clinical outcome after conventional small bowel resection and anastomosis.

Patients 1, 2, 4, 5, 6, and 7 had a simple clinical course, with no recurrence observed in our series (see **Table 1**).

4. Discussion

Cystic lymphangiomas are rare benign tumors that predominantly develop in childhood. The majority of lymphangiomas (90%) are diagnosed before the age of 2, with a male-to-female ratio favoring males [5]. In our study, we also observed a predominance of male patients, with an average age of 6.4 years (range: 1 to 11 years). In Patient 3, who underwent surgery at the age of 1 year, the diagnosis was made antenatally, although the patient was managed at the age of 1. We chose to monitor the progression of the mass, which contrasts with the approach of Esposito *et al.* [6], who advocate for intervention during the neonatal period. Qianlong Liu *et al.* [7] also recommend early intervention upon diagnosis, arguing that the tumor will grow as the child develops, and thus early surgical intervention is beneficial.

In the case of our 11-year-old patient (Patient 2), the mass was discovered incidentally during follow-up for persistent abdominal pain. Abdominal ultrasound is the imaging modality of choice for any persistent abdominal pain. It is a non-invasive examination, and it would be prudent to perform this imaging at least to establish the initial diagnosis of abdominal cystic lymphangioma [3] [8].

Abdominal pain was the most common symptom in our study, followed by intractable vomiting in 3 cases and constipation in 1 case. According to several studies [3] [4] [6]-[11], clinical manifestations of abdominal cystic lymphangiomas are varied and may include abdominal pain, abdominal distention, and sometimes symptoms of gastroenteritis or volvulus with vomiting, as seen in Patient 5 in our study. Most often, the clinical presentation is not typical, but chronic abdominal pain remains the most commonly reported symptom in other series (80%) [7] [12].

The majority of masses in our study were located in the mesentery and presented as multilocular cystic masses, as reported in most other series [3] [6] [8] [9].

The definitive diagnosis of cystic lymphangioma remains histological [3], and in our study, all cases were confirmed by histopathology.

Due to the varied clinical manifestations of cystic lymphangiomas, making a preoperative clinical diagnosis is challenging [5] [12]. However, with the use of imaging, the preoperative diagnosis in our study was consistent with the postoperative diagnosis. In our study, the preoperative diagnosis was always confirmed by abdominal ultrasound (**Figure 3**), which was performed on all patients. Generally, the diagnosis of abdominal cystic lymphangioma is radiological [3] [8] [12]-[14], with abdominal ultrasound being the dominant imaging modality. This is because, clinically, there are often very few signs to guide the diagnosis. The evolution of prenatal ultrasound has also made it possible to diagnose the condition even during the neonatal period [6]. Abdominal ultrasound remains the

"gold standard" for diagnosing cystic lymphangiomas.

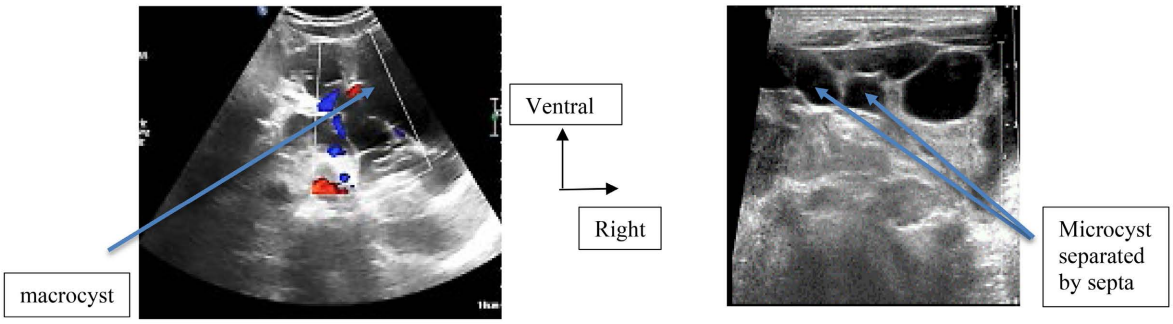

Figure 3. Ultrasonographic of an abdominal cystic lymphangioma: macrocyst (left) and microcyst (right).

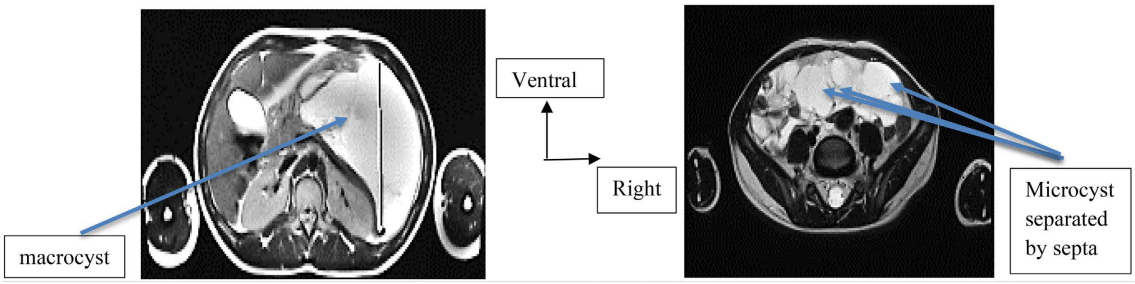

Figure 4. MRI of an abdominal cystic lymphangioma: macrocyst (left) and microcyst (right).

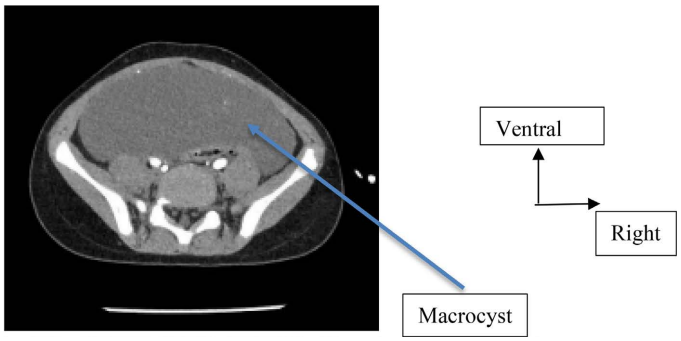

Figure 5. CT scan of an abdominal cystic lymphangioma.

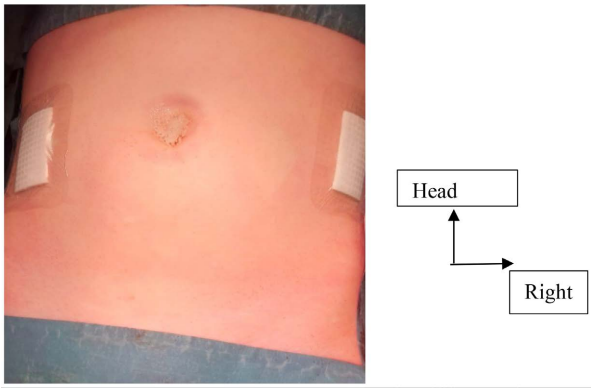

Figure 6. Final appearance of the abdomen at the end of the procedure.

The combination of abdominal ultrasound and abdominal MRI was most commonly used to confirm the diagnosis. Abdominal MRI (**Figure 4**) is more specific and allows for precise determination of the cystic content, exclusion of malignancy, and assessment of the mass's relationship with neighboring organs [5]. Abdominal CT scans were performed in some of our patients (**Figure 5**), but they involve significant radiation exposure for children and are not always recommended in pediatric cases.

The surgical management of cystic lymphangioma can be performed via conventional surgery (laparotomy), pure laparoscopy, or laparoscopic-assisted surgery. However, the majority of pediatric surgeons prefer the conventional approach [5]. Endoscopic resection of cystic lymphangiomas must take into account factors such as the mass's location, size, and the risk of complications related to the resection of neighboring organs such as the spleen, small intestine, and pancreas.

In our study, all patients were treated laparoscopically: 2 cases by pure laparoscopy, 4 cases by laparoscopic-assisted surgery for resection and anastomosis, and 2 cases required conversion to laparotomy. We share the conviction of several authors [3] [9] [15] that excision of the mass via laparoscopy remains the best choice for managing cystic lymphangiomas due to its minimally invasive approach and the associated benefits of this surgical technique. The size of the lymphangioma does not influence the choice of approach, as the fluid can be aspirated and the mass drained. This step creates more space for proper dissection (**Figure 2**), and the mass can be easily extracted through an umbilical incision.

In cases where the mass has strong adhesions to nearby bowel loops, laparoscopic-assisted surgery provides a minimally invasive approach. It allows extraperitoneal anastomosis by exteriorizing the bowel loops through a small incision at the umbilicus (optical site), which helps avoid abdominal scarring. Additionally, laparoscopic surgery offers excellent cosmetic results (**Figure 6**), better pain management, fewer respiratory complications, and enhanced postoperative comfort for the patient [6] [7] [9] [13].

Laparoscopy, in addition to being used for excising cystic lymphangiomas, also leads to fewer postoperative adhesions. It can be employed for injecting sclerosing agents into the mass [4] [5] [12]. Furthermore, in cases presenting with an acute abdomen, laparoscopy can help confirm the diagnosis. It offers more advantages in managing cystic lymphangiomas compared to laparotomy.

We had 2 cases that required conversion to laparotomy, either due to the mass's location or its relationship with the vascular structures of neighboring organs, making the laparoscopic procedure more challenging. The literature also reports cases of conversion [4] [5], but this approach still benefits the patient, as the risk of postoperative complications is much higher, particularly the risk of recurrence in cases of incomplete resection.

After a follow-up period of five years, we had one case of postoperative obstruction in our series, observed in Patient 3. This patient initially underwent

conversion to open surgery during the first intervention, and one month later, he returned with a bowel obstruction. Postoperative obstruction is a complication reported in other studies [5], although this risk is reduced in cases of minimally invasive surgery.

In patients 1, 2, 4, 5, 6, 7, and 8, no recurrences were observed after 5 years. Recurrence is the most commonly encountered complication in the literature. It is a real risk, often related to the multifocal nature of the disease [12], and is the most feared complication by surgeons who do not use laparoscopic techniques. According to these surgeons, there is a higher risk of incomplete resection of the mass via laparoscopy, leading to a greater chance of recurrence. Recurrence is often associated with incomplete resection of the mass. However, our team does not share this view. On the contrary, we believe that laparoscopy provides better visualization, and for an experienced laparoscopic surgeon, the risk of incomplete resection is minimal.

5. Conclusion

Abdominal cystic lymphangioma is a rare condition with non-specific symptoms, which makes its clinical diagnosis challenging. Imaging, particularly abdominal ultrasound, plays a crucial role in diagnosing the condition, while abdominal MRI aids in characterizing the mass, evaluating its content, and assessing its relationship with surrounding organs. The definitive diagnosis remains intraoperative and histological. The treatment consists of complete excision of the cystic mass. Although open surgery is commonly reported in the literature, excision is entirely feasible via laparoscopy, even for large masses, and cases utilizing trocar-laparoscopy have been reported. Based on our experience, laparoscopic management of abdominal cystic lymphangiomas is both indicated and feasible, even in cases involving giant lymphangiomas. A pure laparoscopic approach is recommended, or a laparoscopic-assisted approach depending on the cyst's location. This approach allows the child to benefit from the multiple advantages of minimally invasive surgery, with very few postoperative complications. Further prospective studies are needed to evaluate the long-term outcomes of laparoscopic management of pediatric lymphangiomas in our context.

Conflicts of Interest

No conflicts of interest were noted.

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