

Laparoscopic deroofing of a recurrent non-parasitic splenic cyst in a paediatric patient: A case report and review of literature

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Abstract

Splenic cysts are uncommon lesions, often discovered incidentally during imaging studies. Recurrent splenic cysts pose a clinical challenge due to their potential for complications such as rupture, haemorrhage or infection. Management options range from observation and percutaneous drainage to partial or total splenectomy. Laparoscopic deroofing has emerged as a minimally invasive, spleen-preserving approach with favourable outcomes, although recurrence remains a concern, particularly in incompletely excised cysts. This report presents a rare case of recurrent non-parasitic splenic cyst that was successfully managed by laparoscopic deroofing. This case highlights the clinical utility of laparoscopic deroofing as a safe, spleen-conserving minimal invasive surgical option for recurrent splenic cysts. It offers reduced morbidity, faster recovery and lower risk of post-splenectomy complications. While the risk of recurrence persists, meticulous surgical technique and careful patient selection can optimise the outcomes. A literature review supports laparoscopic deroofing as an effective strategy in managing selected cases of recurrent splenic cysts with low complication and recurrence rates.

Keywords: Laparoscopic deroofing, non-parasitic splenic cyst, partial splenectomy, splenectomy, splenic cyst

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Submitted: 29-Jul-2025, **Revised:** 13-Sep-2025, **Accepted:** 19-Nov-2025, **Published:** 13-Mar-2026

INTRODUCTION

Primary splenic cysts are rare entities in children (<1000 cases), with a reported incidence of about 0.07%–0.3%.^[1,2] They are mostly asymptomatic and diagnosed incidentally during imaging studies.^[2] These cysts are classified as primary (true) or secondary (false), with true cysts comprising congenital and parasitic aetiologies, while false cysts typically occur from post-trauma and infarction.^[2] Increased use of imaging

has led to more incidental findings of asymptomatic cysts.^[3-5] Small cysts are usually asymptomatic. Larger cysts may result in palpable mass, early satiety, nausea and vomiting.^[3,4] Complications, although rare, include infection, compression of adjacent structures, rupture, peritonitis, hemoperitoneum and shock.^[4,6] Although abdominal ultrasound is the first modality of investigation, computed tomography scan and magnetic resonance

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How to cite this article: Patil VL, Chavan D, Madagond S, Sindagikar V, Nyamannawar B, Goudar A, *et al.* Laparoscopic deroofing of a recurrent non-parasitic splenic cyst in a paediatric patient: A case report and review of literature. J Min Access Surg 0;0:0.

Access this article online	
Quick Response Code:	Website: https://journals.lww.com/JMAS
	DOI: 10.4103/jmas.jmas_328_25

imaging (MRI) help to assess cyst size, location, wall thickness, characteristics, septations and relationships to nearby organs.^[7-9] Serological tests are crucial when a parasitic origin is suspected.^[10] Their management is controversial, as there are no definite guidelines for management described in the literature. Surgical management of splenic cysts has evolved significantly, with a paradigm shift from total splenectomy to minimally invasive spleen-preserving surgical techniques. Here, we report an unusual case of recurrent non-parasitic splenic cyst (NPSC) that was treated using minimally invasive surgery and discuss the literature for the same.

CASE REPORT

A 15-year-old female presented with intermittent complaints of mild left upper abdomen pain, abdominal fullness, early satiety and nausea for the past 4 months. The patient had no history of trauma or infection in the past. Past history of asymptomatic splenic cyst of size 4 cm × 3 cm × 3 cm diagnosed incidentally at the age of 10 years during abdominal ultrasound examination, for which no treatment was given. During the 4 years of follow-up, serial ultrasound revealed a gradual increase in the size of the cyst to the present size. She was evaluated and was diagnosed with a splenic cyst in the upper pole

of the spleen of approximately 14 cm × 10 cm × 10 cm by abdominal ultrasound. Contrast-enhanced computed tomogram (CECT) of the abdomen confirmed a solitary, well-defined, multilocular, thin-walled, homogenous cystic lesion in the upper pole of the spleen, which measured 14 cm × 10 cm × 10 cm with septations and no calcifications, cyst displacing the stomach anteriorly and the kidney posteriorly [Figure 1].

There was no involvement of adjacent organs, nor signs of rupture or haemorrhage. The serological test for *Echinococcus granulosus* is negative. Because the child was symptomatic and the size was increasing, an ultrasound-guided pigtail catheter drainage of 800 mL of serous fluid was done. Recurrence was noted within 8 weeks of drainage. In view of recurrence, we decided on laparoscopic excision of the cyst. Considering the young age and to avoid the future risk of post-splenectomy sepsis, the preferred option was splenic preservation surgery. Despite the technical challenges, laparoscopic excision of the cyst was planned to offer a better cosmetic outcome and faster recovery. The procedure was performed under general anaesthesia. After administering antibiotic prophylaxis, the patient was positioned in supine with right lateral tilt. Three laparoscopic ports were placed: 10-mm umbilical port for the camera, a 10-mm subxiphoid auxiliary port and a 5-mm port in the left flank at the umbilical level [Figure 2]. Upon diagnostic laparoscopy, a large, thin-walled cyst (approximately 0.5 mm thick) was identified on the anterior surface of the spleen at the upper pole. It contained clear, serous fluid and was well demarcated from the surrounding splenic parenchyma, with omental adhesions to the surface, diaphragm and lateral abdominal wall at the previous site of pigtail insertion. Laparoscopic omental adhesiolysis followed by deroofing was performed using an ultrasonic energy device. Approximately 1000 cc of serous fluid was aspirated from the cyst. The fluid was collected and sent for microbiological culture, which showed no bacterial growth.

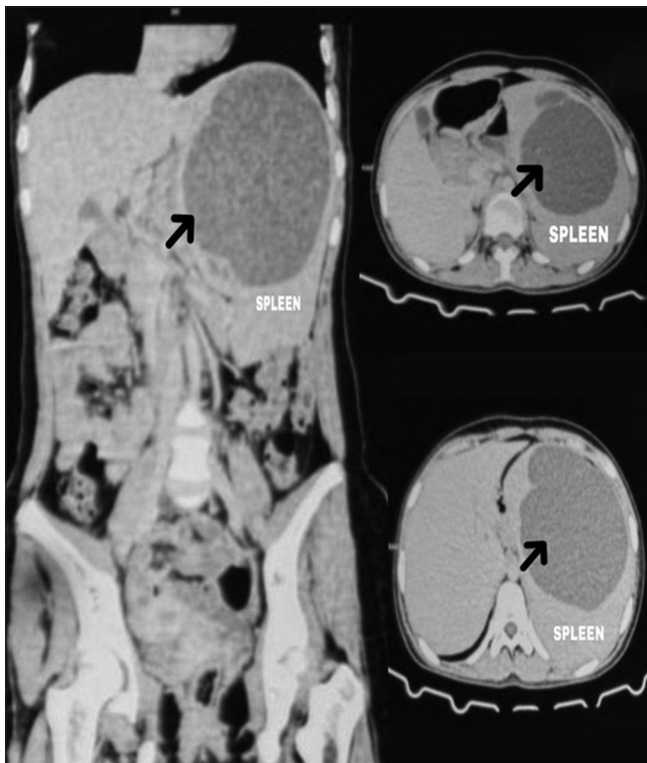


Figure 1: Contrast-enhanced computed tomogram abdominal scan showing a huge splenic cyst displacing stomach and kidney (transverse section). Arrow indicated huge splenic cyst in CT imaging

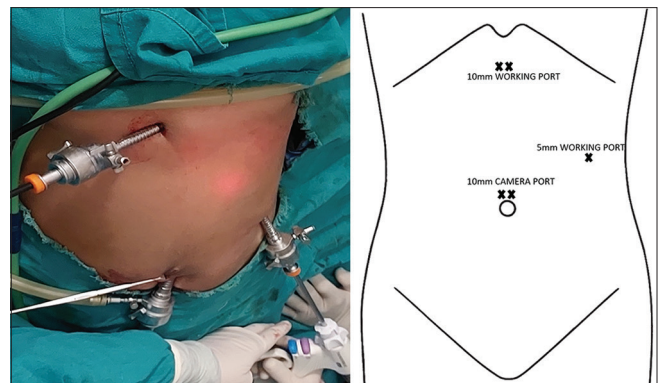


Figure 2: Port placement for laparoscopic management of the splenic cyst

Endothelial lining of the remaining cyst wall was ablated using a monopolar energy spatula, and omentopexy was done [Figures 3 and 4]. The drain was kept in the cavity.

The post-operative course was uneventful, and the patient was discharged on the 4th post-operative day after drain removal. Histology confirmed a pseudo-cyst as shown by a fibrocollagenous wall [Figure 5]. There was no recurrence noted during the follow-up period of 3 months and 6 months on serial ultrasound scans.

The patient was discharged on the post-operative day 4 (total ~96 h). Post-splenectomy vaccines were not administered, as the spleen was preserved in this case.

DISCUSSION

Epidemiology and pathophysiology

Splenic cysts are infrequent lesions posing a diagnostic and therapeutic challenge for the surgeon. Although splenic cysts can occur at any age, they are seen in children and younger adults.^[1,2] Most splenic cysts are asymptomatic and detected as incidental findings; however, large cysts can become clinically significant due to mass effect, rupture or secondary infection.^[3-6] Larger cysts may cause vague upper abdominal pain as a result of capsular distention or pressure on adjacent organs.^[3,4] According to Ingle *et al.*, the most common symptoms include left upper quadrant pain, nausea and vomiting, which are attributed to the mass effect of the cyst.^[5] In our case, the patient presented with abdominal pain and early satiety due to the pressure effect on the stomach.

Diagnostic approaches and management strategies

Clinical evaluation, imaging techniques and histopathological investigations are useful in the diagnosis of a splenic cyst. Diagnostic imaging is crucial for identifying and classifying splenic cysts.

Ultrasound is often the first-line modality to reveal splenic cysts as well-defined, anechoic (fluid-filled) lesions with posterior enhancement.^[6-8] The mainstay of radiological investigations is a CECT abdominal scan and an MRI. CECT abdomen provides information about types of cysts and their size, location, morphology, nature of fluid and its relation with adjacent structures.^[9-12] MRI offers precise differentiation of cysts between parasitic and non-parasitic origin by analysing their contents. It has an added advantage in the detection of complications such as haemorrhage, infection and cyst rupture.^[11,12] Further MRI can assess vascular involvement, which aids in better planning of treatment options. It is imperative to perform a serological

test to confirm a parasitic cyst before proceeding to surgery, which was negative for *E. granulosus* in our case.

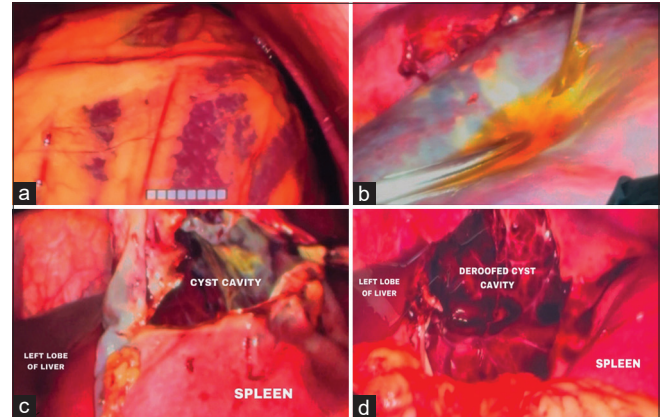


Figure 3: Intraoperative laparoscopic view, (a) demonstrating huge splenic cyst with omental adhesions to the surface and lateral abdominal wall and diaphragm, (b) aspiration of the cyst, (c) deroofing of the cyst wall, (d) deroofed cyst cavity

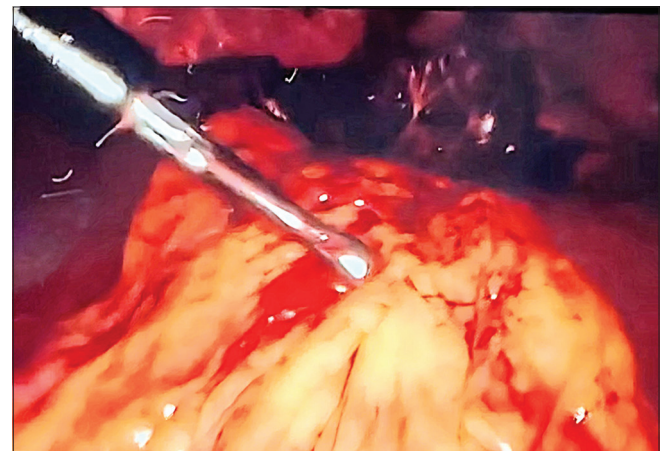


Figure 4: Intraoperative laparoscopic view demonstrating omentopexy

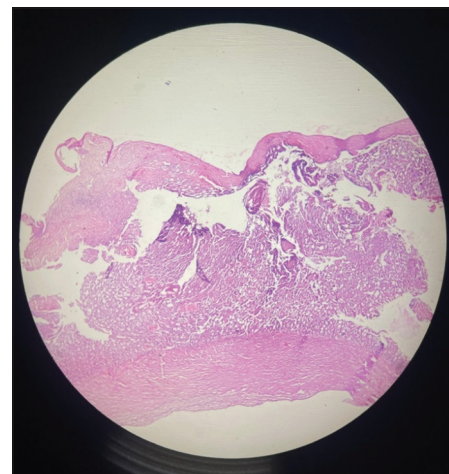


Figure 5: Histopathology slide showing fibrocollagenous cyst wall showing areas of necrotic foci of calcification, diffuse mixed inflammatory cell infiltrate and occasional multinucleated histiocytic giant cell. 4x magnification

Fine-needle aspiration cytology or core needle biopsy is usually avoided due to increased risk of rupture, infection and anaphylaxis.^[13,14] It is seldom performed in cysts suspicious of malignancy.^[13]

MANAGEMENT STRATEGIES

The age of the patient, size and location of the cyst, clinical presentation and potential complications all have a significant impact on selecting management options for a splenic cyst.^[12,14-18] As per the literature review, there are no clear guidelines for the management of splenic cysts. However, a recent review by Hansen and Moller was the first to suggest the appropriate management options for this clinical entity in an organised manner.^[18] The principles of management include splenic preservation, nil recurrence, with minimal morbidity. These procedures include percutaneous drainage, percutaneous sclerotherapy, partial splenectomy, total cystectomy, marsupialisation and fenestration, which are recommended in the case of superficially located cysts,^[8,10,16] especially advised in children and young adults.^[11,13,14,17-19] The treatment of splenic cysts has been completely transformed with the advent of laparoscopic and robotic-assisted surgeries, which have led to a paradigm shift towards a minimally invasive, spleen-preserving approach. These approaches, although technically challenging, offer advantages of less pain, faster recovery, better cosmesis and enhanced patient satisfaction.^[19-24]

Conservative treatment

Medical management is the primary option for small parasitic cysts.^[9] Asymptomatic, small NPSCs <5 cm can be managed conservatively with regular monitoring, as they tend to resolve spontaneously.^[13] Kenney *et al.* found that using a cut off cyst size in choosing surgical intervention is irrelevant, and treatment should be based on symptoms.^[17] However, most studies reported that symptomatic patients with cyst size more than 5 cm should be considered for surgical excision because of the increased risk of complications.^[2,16,18]

Percutaneous drainage and sclerotherapy

As per very few studies, this method of managing splenic cyst has controversial results. In view of the high risk of recurrence with ultrasound-guided aspiration of the cyst is reserved only for surgical high-risk patients.^[15] Kenney *et al.* reported ethanol ablation of cyst wall following aspiration as a safe and effective therapy for symptomatic cyst and recurrent cyst. In his study, he noticed complete resolution in 50% cases and a significant reduction in the size of the cyst in the remaining 50% cases, with cyst size

more than 5 cm.^[17] Systematic review and meta analysis by Gasparetto *et al.* reported ultrasound guided percutaneous sclerotherapy of splenic cysts as a safe, feasible technique, which showed a high rate of recurrence of about 38% for cysts ≥ 8 cm and 7% for cysts of size.^[15] However, despite a high recurrence rate, percutaneous drainage, with or without chemical sclerotherapy, can be used as a pre-operative method to decrease the size of large cysts and also in recurrent cases.^[10,17,25] In our case, we had a recurrence of the cyst within 8 weeks following ultrasound sonography-guided aspiration.

Minimally invasive approach

Laparoscopic decapsulation or peri-cystectomy or deroofting is indicated for superficial cysts and cysts involving <50% of the spleen.^[12-14,18,19] It includes opening the cyst, partial excision of the cyst wall with marsupialisation into the peritoneal cavity and ablating the inner lining using an energy source, thereby preventing a recurrence.^[19-21,26] Recent studies revealed that laparoscopic deroofting is a safe and effective method for treating non-parasitic cysts (including giant splenic cysts) and should be considered the treatment of choice.^[21,22] While the recurrence rate is slightly higher with unroofing compared to splenectomy, the benefits of preserving splenic function and avoiding long term immunological consequences are substantial in the management of splenic cysts.^[10,22,23,27] A study by C palanivelu *et al.* (2008) demonstrated that laparoscopic marsupialisation or partial cystectomy for large cyst is acceptable modality of treatment with reasonable success rate in his case series with advantage of preserving spleen function and reduced morbidity.^[23]

McColl *et al.* reported that splenic cysts are best managed with laparoscopic marsupialisation with endothelial ablation using an energy source and omentopexy to prevent recurrence, which is in alignment with other studies.^[21-23] We followed the same principle of ablating the endothelium with omentopexy following laparoscopic partial excision of the cyst with marsupialisation into the peritoneal cavity. Guidelines about the extent of cyst wall resection and whether deroofting should be partial or radical are unclear.

Spleen-conserving treatment: Partial splenectomy

Amongst all spleen-conserving treatment options described for NPSC, partial splenectomy is the gold standard with the least recurrence rate.^[12,16,24] The risk of overwhelming post-splenectomy infection can be reduced, and splenic function can be preserved with the partial splenectomy procedure that preserves a minimum of 25% of splenic parenchyma.^[10,11,16] It is reserved for peripheral cysts and cysts at the poles and is also preferable in recurrent splenic

cysts.^[10,24] Currently, laparoscopic partial splenectomy is the recommended treatment for splenic cyst due to advancements in laparoscopic techniques and the advantage of understanding the splenic segmental anatomy on imaging.^[9,11,12,24] Another study by Liu G, Fan Y. (2019) reported that laparoscopic partial splenectomy appears to be a safe and feasible option for managing benign, non parasitic cysts with minimal surgical complications and early recovery.^[24] Surgical complications such as haemorrhage can be minimised if attempted after pre-operative angiographic evaluation of the splenic vasculature.^[16] In addition, the use of advanced energy devices such as ultrasonic scalpel, Ligasure and Thunderbeat has made laparoscopic partial splenectomy as bloodless, with nil haemorrhagic complications.

Total splenectomy

Conventionally, total splenectomy (either open or laparoscopic) has been the preferred treatment method of management of splenic cysts as it ensures complete resolution and eliminates recurrence risk but leads to permanent immune compromise of the patient.^[16,18] Hence, it is reserved only for complicated cysts, multiple, deep-located hilar splenic cysts, very large cysts and suspected malignancy.^[8,16] A meta analysis by Akhmedov *et al.* (2020) showed post operative infection rates as high as 9.7% in splenectomised patients, reinforcing the need for vaccination and long term prophylaxis.^[9] Considering the immunologic role of the spleen and increased prevalence and severity of post-splenectomy infections, spleen-preserving minimally invasive procedures are currently recommended. Mertens *et al.* (2007) reported good long term results with total splenectomy for NPSCs, with a recurrence rate of 0%, compared to 25% with conservative procedures.^[11]

Laparoscopy, though technically demanding, is a safe and practical option if well planned, offering early recovery and minimal scarring. Standardised patient-specific guidelines and long-term follow-up are needed to assess immunological and growth outcomes. Management of NPSCs requires a multimodal approach considering patient factors, surgical expertise and cyst features. Future large-scale, multicentre studies should aim to establish the evidence-based protocols focusing on organ preservation and quality of life.

CONCLUSION

Based on our experience and literature review, we suggest the following optimal surgical treatment options.

1. Conservative management, involving regular monitoring, is for asymptomatic cysts smaller than

5 cm. In recurrent cases, small-sized cysts can be best managed with percutaneous drainage and sclerotherapy

2. Laparoscopic deroofting or partial excision with endothelial ablation of the remnant cyst wall with omentopexy is best suited for a superficial peripheral cyst
3. Laparoscopic partial splenectomy is the treatment of choice for cysts located deep in the splenic parenchyma at one of the poles and should be performed by experienced surgeons. Total splenectomy (open or laparoscopic) must be performed only for a complicated large cyst, a cyst involving the hilum, suspicious of malignant cyst.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that the names and initials will not be published and due efforts will be made to conceal patient identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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