

Ultrasound-Guided Catheter Drainage of a Large Multiloculated Pediatric Splenic Abscess Caused by *Streptococcus anginosus*: A Case Report

Mohammadmoein Mokhtarezadeh¹, MD; 
Mehran Karimi², MD;  Mohammad
Hossein Ahrar³, MD

¹Student Research Committee, Shahid Sadoughi University of Medical Sciences, Yazd, Iran;

²Children Growth Disorder Research Center, Comprehensive Research Institute for Maternal and Child Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran;

³Radiology Department, Shahid Sadoughi Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Correspondence:

Mehran Karimi, MD;
Shahid Sadoughi Hospital, Ebne Sina Blvd.,
Postal code: 81589-54155, Yazd, Iran
Tel: +98 35 38224000

Email: drmehrankarimi@yahoo.com

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What's Known

- Although splenic abscesses are rare, they are potentially life-threatening conditions in children, typically necessitating prolonged antibiotic therapy or splenectomy.
- *Streptococcus anginosus* is an uncommon etiology of splenic abscesses, despite its well-known propensity for abscess formation. Furthermore, multiloculated splenic lesions are particularly challenging to manage with conservative approaches.

What's New

- This case report described the spleen-preserving management of a large, multiloculated pediatric splenic abscess caused by *Streptococcus anginosus* via ultrasound-guided catheter drainage and targeted antibiotic therapy.
- This case highlighted the feasibility and efficacy of conservative, image-guided interventions for complex abscesses, thereby avoiding splenectomy and preserving splenic immune function.

Abstract

While splenic abscesses are rare, they are potentially life-threatening conditions in children, with an estimated incidence of 0.05 to 0.7%. *Streptococcus anginosus*, a member of the *S. anginosus* group, is an infrequent yet important etiology in this context due to its pronounced propensity for abscess formation. We reported the successful spleen-preserving management of a large, multiloculated pediatric splenic abscess caused by *S. anginosus* using ultrasound-guided catheter drainage and targeted antibiotic therapy.

A 10-year-5-month-old Iranian boy presented with a 2-week history of persistent fever and left upper quadrant (LUQ) pain. Laboratory studies revealed leukocytosis (12,900/ μ L), thrombocytosis (699 $\times$ 10³/ μ L), microcytic anemia, and a markedly elevated erythrocyte sedimentation rate (ESR, 125 mm/h). Coronavirus disease 2019 (COVID-19) polymerase chain reaction (PCR) testing was positive despite the absence of respiratory symptoms. Abdominal ultrasound and contrast-enhanced computed tomography (CECT) demonstrated splenomegaly with a large, multiloculated abscess (maximum diameter: 13.5 cm; estimated volume $\approx$ 526 mL). Ultrasound-guided pigtail catheter drainage yielded purulent fluid. Gram staining revealed Gram-positive cocci, and culture grew *S. anginosus* susceptible to penicillin, ampicillin, ceftriaxone, and vancomycin.

The patient became afebrile by hospital day 3, and interval ultrasound on day 5 showed marked abscess reduction, allowing for catheter removal. He was discharged after 7 days and completed a 6-week antimicrobial course (2 weeks intravenous, 4 weeks oral). At the 4-week follow-up, he was asymptomatic, with normalization of inflammatory markers (ESR: 2 mm/h, white blood cell [WBC] count: 7,900/ μ L) and complete radiological resolution on ultrasound, confirming effective spleen preservation without complications.

This case illustrated the effectiveness of ultrasound-guided drainage and targeted antibiotics for large pediatric splenic abscesses due to *S. anginosus*. It highlighted the importance of early recognition, appropriate imaging, microbiological confirmation, and a multidisciplinary approach to optimize clinical outcomes while preserving splenic function.

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Keywords • Splenic abscess • *Streptococcus anginosus* • Child • Drainage • Conservative treatment

Introduction

Splenic abscesses are rare; nonetheless, they are potentially life-threatening conditions in children, with reported incidence rates in clinical and autopsy series generally ranging from 0.05% to 0.7%.^{1, 2} Their clinical presentation is often nonspecific, most commonly manifesting as fever and left upper quadrant (LUQ) pain. Consequently, diagnostic delays are common and can lead to adverse outcomes.³ Ultrasonography is a valuable initial modality. However, contrast-enhanced computed tomography (CECT) remains the reference standard, with a reported sensitivity of 95-100% and characteristic findings of low-attenuation lesions with peripheral rim enhancement.^{4, 5}

The microbial spectrum includes aerobes, anaerobes, and mixed infections. Among Gram-positive cocci, the *Streptococcus anginosus* group (SAG), comprising *S. anginosus*, *Streptococcus intermedius*, and *Streptococcus constellatus*, is notable for its pronounced propensity for abscess formation across various anatomic sites, including intra-abdominal foci.⁶⁻⁸ Recent literature highlighted an increasing recognition of SAG infections, which are associated with higher morbidity in the presence of deep-seated abscesses.⁹ Since splenectomy confers a lifelong risk of overwhelming post-splenectomy infection (OPSI), spleen-preserving strategies are particularly crucial in the pediatric population.¹⁰

The management of splenic abscesses has shifted from routine splenectomy to conservative, spleen-preserving approaches that combine targeted intravenous antibiotics with image-guided percutaneous drainage when anatomically feasible.⁴ Pediatric case reports and reviews demonstrated high success rates with percutaneous catheter drainage combined with antimicrobial therapy in hemodynamically stable children, establishing nonoperative management as the first-line treatment when safe source control can be achieved.¹⁰

We present the case of a 10-year-old Iranian boy who developed a splenic abscess caused by *S. treptococcus anginosus*, which was successfully managed with targeted antibiotic therapy and ultrasound-guided drainage. This case highlighted the importance of early recognition and conservative management in achieving optimal clinical outcomes while preserving splenic function.

Case Presentation

A 10-year and 5-month-old Iranian boy from Kahnuj (Kerman Province) presented with a 2-week history of persistent high-grade fever and

progressive LUQ abdominal pain. He was the fifth child of consanguineous parents (gravida 5, para 5, abortus 0), born at term via uncomplicated vaginal delivery with no neonatal intensive care unit (NICU) admission. His past medical and surgical histories were unremarkable, with no history of recurrent infections, trauma, or recent procedures. He had no known drug allergies and had received acetaminophen and ibuprofen with only partial fever control. The fever, measuring 38.2 °C, was continuous and accompanied by decreased appetite and early satiety. The LUQ pain developed after the onset of fever and was described as dull, non-radiating, and non-positional. There was no nausea, vomiting, change in bowel habits, respiratory symptoms, chest pain, myalgia, night sweats, or urinary symptoms.

On admission, the patient was alert and comfortable, without respiratory distress. Vital signs were as follows: blood pressure (BP): 95/60 mmHg, heart rate (HR): 110 beats/min, respiratory rate (RR): 28 breaths/min, peripheral oxygen saturation (SpO₂): 95% on room air, and weight: 29 Kg. Physical examination was notable only for mild LUQ discomfort on deep palpation. There was no guarding, rebound tenderness, or palpable hepatosplenomegaly. Cardiopulmonary and neurologic examinations were unremarkable. Laboratory findings revealed leukocytosis, microcytic anemia, thrombocytosis, and a markedly elevated erythrocyte sedimentation rate (ESR; table 1). Renal and liver function were within pediatric reference ranges, except for mildly elevated aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) levels. The coagulation profile showed mildly prolonged prothrombin time (PT) and international normalized ratio (INR). Blood and urine cultures were negative. Brucella serology (Wright, Coombs Wright, and 2-mercaptoethanol [2ME] test) and influenza A/B polymerase chain reaction (PCR) were negative. Coronavirus disease 2019 (COVID-19) PCR was positive. However, serum antibody levels were normal, and the patient remained entirely asymptomatic from a respiratory standpoint.

Abdominal ultrasonography (Samsung Medison Co., Ltd., Seoul, South Korea) demonstrated splenomegaly with a complex, hetero-hypoechoic lesion (97×92 mm) containing internal septations, consistent with an abscess. The CECT (Siemens Healthineers, Erlangen, Germany) confirmed splenomegaly (spleen length 145 mm) with a large, multiloculated, peripherally enhancing splenic fluid collection measuring 135×105×71 mm (largest diameter: 135 mm; estimated ellipsoid volume≈526 mL) and capsular irregularity along the medial surface (figure 1).

Table 1: Laboratory results on admission and at follow-up

Parameter	Units	Admission	Follow-up
Hematology			
WBC	/ μ L	12,900	7,900
Hb	g/dL	10.8	11.4
Hct	%	33.1	33.8
PLT	$\times 10^3/\mu$ L	699	689
MCV	fL	68.96	73.45
ESR	mm/h	125	2
Biochemistry			
Glucose	mg/dL	97	—
Urea	mg/dL	16	28
Creatinine	mg/dL	0.6	0.6
AST	U/L	42	—
ALT	U/L	39	—
LDH	U/L	366	—
Sodium	mEq/L	134	—
Potassium	mEq/L	4.4	—
Coagulation			
PT	s	16.3	—
PTT	s	41	—
INR	—	1.29	—
Hemoglobin electrophoresis			
Hb A	%	97.0	—
Hb A $\square$	%	3.0	—

WBC: White blood cells; Hb: Hemoglobin; Hct: Hematocrit ; PLT: Platelets; MCV: Mean corpuscular volume; AST: Aspartate Aminotransferase; ALT: Alanine Aminotransferase; PT: Prothrombin Time; PTT: Partial Thromboplastin Time; INR: International Normalized Ratio; ESR: Erythrocyte sedimentation rate; LDH: Lactate dehydrogenase



Figure 1: Contrast-enhanced abdominal computed tomography (CT) demonstrates a well-defined hypodense lesion within the spleen, consistent with a splenic abscess.

Other abdominal organs appeared normal. On hospital day 1, under ultrasound guidance, an 8-French (Fr) pigtail catheter (Biotech, China) was percutaneously placed into the largest locule. An initial aliquot of approximately 1 mL of thick, dark-brown purulent material was aspirated at the time of catheter insertion and sent for microbiological analysis. The catheter was then immediately connected to a closed gravity drainage system for continuous therapeutic drainage. Following catheter placement, purulent fluid continued to drain passively; daily output progressively declined

from moderate purulent drainage during the first 48 hours to negligible serous output by days 3–4. By hospital day 5, the output was minimal, and interval ultrasonography confirmed marked abscess reduction. The catheter was removed after a total indwelling period of 5 days without complications. Gram staining showed Gram-positive cocci in chains, a few Gram-positive bacilli, and occasional Gram-negative bacilli. Culture grew *S. anginosus* susceptible to penicillin, ampicillin, ceftriaxone, vancomycin, erythromycin, linezolid, cefoxime, and ciprofloxacin (table 2). Mycological studies were negative. The discordance between the polymorphic Gram stain morphology and the monomicrobial culture result likely reflected the absence of dedicated anaerobic cultures, which might have hindered the detection of fastidious or anaerobic co-pathogens; specimen contamination, while possible, was considered less likely. Nevertheless, the favorable clinical response to targeted anti-streptococcal therapy confirmed *S. anginosus* as the predominant pathogen.

Empirical antimicrobial therapy was initiated on admission with intravenous vancomycin (15 mg/Kg every 6 hours; Jaber Ebne Hayyan Pharma, Tehran, Iran) and intravenous meropenem (20 mg/Kg every 8 hours; Alborz Daru Co., Tehran, Iran). Intravenous metronidazole

Table 2: Microbiological and serological results

Test	Result
Blood culture	Negative
Urine culture	Negative
Wright/Coombs Wright/2ME (Brucella)	Negative
BK test (Brucella)	Negative
COVID-19 PCR	Positive (asymptomatic)
Influenza A/B PCR	Negative
Splenic aspirate culture	<i>Streptococcus anginosus</i> (susceptible to penicillin, ampicillin, ceftriaxone, vancomycin, erythromycin, linezolid, ceftiofime, ciprofloxacin)

2ME: 2-mercaptoethanol; PCR: Polymerase chain reaction; BK: Bacteriological/Koch examination; COVID-19: Corona virus disease

(7.5 mg/kg every 8 hours; DarouPakhsh Pharmaceutical Co., Tehran, Iran) was subsequently added to broaden anaerobic coverage. After culture results confirmed *S. anginosus* with broad beta-lactam susceptibility, therapy was de-escalated to a beta-lactam-based regimen (penicillin G or ceftriaxone, per susceptibility) to complete the intravenous phase, which was followed by an oral beta-lactam step-down to complete a 6-week total course (2 weeks intravenous, 4 weeks oral).

The patient became afebrile by hospital day 3, with improvements in appetite and energy levels noted by days 4–5. Interval ultrasonography on day 5 showed a marked reduction in abscess size with no significant residual collection. The catheter was removed, and the patient was discharged in stable condition on oral antibiotics with scheduled follow-up.

The overall clinical outcome was favorable, with complete resolution of the splenic abscess achieved via a spleen-preserving, conservative approach. The total duration of hospitalization was 7 days. At the 4-week post-discharge follow-up visit, the patient remained clinically asymptomatic with no recurrence of fever or abdominal pain. Laboratory evaluation demonstrated normalization of previously deranged inflammatory markers, most notably a decline in ESR from 125 mm/h at admission to 2 mm/h at follow-up, and a decrease in WBC count from 12,900/ μ L to 7,900/ μ L (table 1). Hemoglobin showed modest improvement (10.8 to 11.4 g/dL), while thrombocytosis persisted (699 to 689 $\times 10^3$ / μ L), likely reflecting ongoing reactive changes. Repeat abdominal ultrasonography confirmed complete radiological resolution of the previously documented multiloculated splenic abscess, with restoration of normal splenic parenchymal echotexture. No complications related to the percutaneous drainage procedure, including hemorrhage, catheter-site infection, or splenic rupture, were observed during hospitalization or follow-up. Ultimately, the spleen was successfully preserved, thereby avoiding the

long-term immunological sequelae associated with splenectomy in the pediatric population.

Written informed consent was obtained from the patient's legal guardian for the publication of this case report. This study was reviewed and approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences (Approval Code: IR.SSU.REC.1404.160).

Discussion

Percutaneous drainage combined with targeted antibiotic therapy has become the preferred management strategy for splenic abscesses in hemodynamically stable pediatric patients, offering a spleen-preserving alternative to splenectomy. Multiple pediatric series reported high success rates with this conservative approach, demonstrating high rates of complete resolution and consistently avoiding the need for splenectomy.⁷

S. anginosus, a member of the *S. anginosus* group (SAG), is infrequently implicated in splenic abscesses, yet is well recognized for its propensity to cause deep-seated abscesses via hematogenous spread.^{7, 8} Although most case reports in the literature involve *S. intermedius*, the pathophysiological mechanism and management principles remain similar across the SAG members.⁷ The rarity of SAG-associated splenic abscesses underscores the value of percutaneous drainage for both diagnostic confirmation and microbiological guidance, particularly because blood culture-positivity rates are often low.^{7, 8}

Imaging is central to both diagnosis and intervention planning. CECT remains the diagnostic reference standard, demonstrating excellent sensitivity (95–100%) and enabling the characterization of abscess morphology essential for percutaneous approaches.⁴

In our case, a large, multiloculated abscess was successfully managed with ultrasound-guided catheter drainage. This management strategy demonstrated that even complex

abscesses could respond to conservative treatment when patients are clinically stable and image-guided access is feasible, which was consistent with previous reports of successful percutaneous management in similar challenging cases.¹⁰

Despite the clear advantages of conservative therapy, surgical options remain necessary in certain scenarios. Splenectomy may be required when percutaneous drainage is contraindicated, such as in cases of coagulopathy, inaccessible or necrotic abscesses, or treatment failure.¹ The clinical decision must carefully balance the immunologic cost of splenectomy (i.e., the lifelong risk of overwhelming post-splenectomy infection) against the risk of uncontrolled sepsis.²

The presence of an asymptomatic positive COVID-19 PCR result in our patient raised intriguing questions about potential viral-bacterial interactions. However, the exact relationship between SARS-CoV-2 infection and secondary bacterial complications remains uncertain and requires further investigation.

This report had several limitations. First, the findings from a single patient could not be generalized to the broader pediatric population, and the efficacy of ultrasound-guided catheter drainage for large, multiloculated splenic abscesses caused by *S. anginosus* requires validation through larger case series or comparative studies. Second, the clinical significance of the incidental positive COVID-19 PCR result could not be fully elucidated; whether SARS-CoV-2 co-infection played a contributory role in abscess formation or was merely coincidental remains speculative in the absence of targeted immunological investigations. Third, the underlying etiology and portal of entry for *S. anginosus* bacteremia were not definitively identified despite a thorough diagnostic workup, limiting our understanding of the pathogenesis in this specific case. Fourth, the follow-up period was limited to 4 weeks post-discharge; longer-term surveillance would be valuable to confirm the durability of the treatment response, assess for late recurrence, and monitor splenic function. Finally, dedicated anaerobic cultures were not obtained from the aspirated material, which might have resulted in the underdetection of polymicrobial infection, given that mixed aerobic-anaerobic flora is frequently encountered in deep-seated abscesses. Despite these limitations, this case contributes to the scarce pediatric literature on SAG-associated splenic abscesses and supports the role of conservative, spleen-preserving management in appropriately selected patients.

Conclusion

This case demonstrated that large, multiloculated splenic abscesses in hemodynamically stable pediatric patients could be effectively managed with spleen-preserving strategies that combine image-guided percutaneous catheter drainage and culture-directed antimicrobial therapy. The successful outcome in our patient, whose abscess was caused by *S. anginosus*, reinforces the growing evidence supporting conservative management as the first-line treatment in children, thereby avoiding the long-term immunological risks associated with splenectomy. Early recognition, prompt cross-sectional imaging, and timely microbiological diagnosis are critical to guide targeted therapy and achieve optimal clinical and radiological resolution. Furthermore, multidisciplinary collaboration between pediatrics, pediatric infectious disease specialists, radiologists, and surgeons remains essential to tailor management to individual patient profiles and preserve splenic function.

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Authors' Contribution

M.M: Conceptualized and designed the study, contributed to data identification and collection, and participated in drafting and revising the manuscript. M.K: Conceptualized and designed the study, contributed to data identification and collection, participated in drafting and revising the manuscript, and provided critical review and intellectual input. M.H.A: Contributed to data identification and collection, participated in drafting and revising the manuscript, and provided critical review and intellectual input. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declaration of AI

The AI tool, ChatGPT (version 4), was used for grammar checking and translation.

Conflict of Interest: None declared.

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