

The Surgical Management of Splenic Abscess

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ABSTRACT

Splenic abscess is a rare but potentially fatal intra-abdominal infection that requires prompt antimicrobial therapy and effective source control. Historically, total splenectomy was considered the standard treatment because it provided definitive eradication of infected splenic tissue. Contemporary management has shifted toward individualized, spleen-preserving strategies, particularly image-guided percutaneous drainage in patients with accessible, unilocular, and predominantly fluid collections. Splenectomy remains the most reliable option for multiloculated or multiple abscesses, splenic rupture, fistulization, severe sepsis, failed drainage, inaccessible collections, or extensive parenchymal destruction. Laparoscopic splenectomy may be feasible in hemodynamically stable patients, whereas open surgery remains appropriate for unstable or anatomically complex disease. Partial splenectomy and operative drainage without splenectomy have been reported in selected patients, especially children, but evidence is limited. Antibiotics are required in all patients and should be tailored to cultures whenever possible. Available comparative evidence suggests that percutaneous drainage may be associated with lower morbidity and mortality than splenectomy in appropriately selected patients, although current studies are predominantly retrospective and affected by selection bias. This review summarizes the diagnosis, indications, operative options, percutaneous treatment, special populations, complications, and proposed decision-making algorithm for splenic abscess.

KEYWORDS: splenic abscess; splenectomy; percutaneous drainage; laparoscopic splenectomy; source control; spleen-preserving surgery; intra-abdominal infection.

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INTRODUCTION

Splenic abscess is an uncommon but serious infectious condition characterized by a localized or multifocal collection of purulent material within the splenic parenchyma. Its rarity, nonspecific presentation, and frequent association with systemic illness can delay diagnosis and increase the risk of rupture, sepsis, and death.

Historically, splenectomy combined with antimicrobial therapy was considered the treatment of choice because untreated or inadequately drained splenic abscesses were associated with high mortality [1,2]. Advances in computed tomography, ultrasonography, interventional radiology, and antimicrobial treatment have expanded the role of spleen-preserving management.

The current therapeutic question is no longer whether source control is required, but which form of source control is most appropriate. Percutaneous drainage may preserve splenic immune function and avoid major surgery in selected patients, while splenectomy provides definitive treatment for complex or refractory disease [3,4].

Management should therefore be individualized according to abscess morphology, number and location of collections, fluid characteristics, presence of rupture or fistula, hemodynamic status, immune function, associated disease, and institutional expertise. This review was developed from the uploaded literature synthesis on surgical management of splenic abscess.

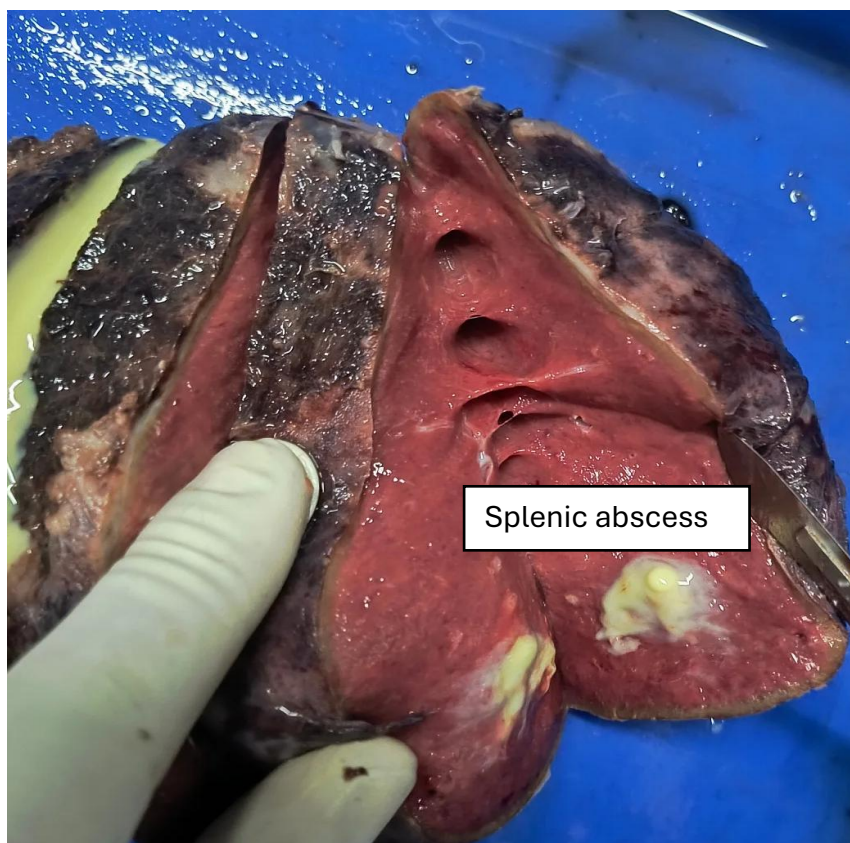


Figure 1. Gross pathological appearance of a splenic abscess

Methods

This narrative review was based on the provided literature synthesis, including systematic reviews, meta-analyses, retrospective studies, clinical series, pediatric reports, and technical case reports addressing splenectomy, percutaneous drainage, partial splenectomy, laparoscopic surgery, endoscopic drainage, and special clinical scenarios. References are numbered according to their first appearance in the manuscript.

Epidemiology and Predisposing Factors

Splenic abscess may develop through hematogenous dissemination, contiguous infection, splenic infarction with secondary infection, trauma, or iatrogenic mechanisms.

Common predisposing conditions include:

- Infective endocarditis
- Hematologic malignancy
- Immunosuppression
- Diabetes mellitus
- Intravenous drug use
- Splenic trauma or infarction
- Hemoglobinopathy
- Abdominal infection
- Recent abdominal or bariatric surgery
- Pancreatic or gastric fistulation
- Metastatic infection

Immunocompromised patients may present with multiple abscesses or atypical organisms and frequently require more aggressive source control [5].

Clinical Presentation

The clinical presentation is variable and often nonspecific. Fever, left upper-quadrant abdominal pain, and leukocytosis are traditionally described, but the complete triad is not consistently present.

Other manifestations include:

- Chills or persistent bacteremia
- Left shoulder pain
- Pleuritic pain
- Splenomegaly
- Anorexia or weight loss
- Sepsis or septic shock
- Left pleural effusion
- Subphrenic irritation

Persistent infection despite appropriate antibiotics

Splenic abscess should be considered in patients with unexplained fever or bacteremia, particularly when risk factors such as infective endocarditis, immunosuppression, splenic infarction, or recent upper abdominal surgery are present.

Diagnosis

Contrast-enhanced computed tomography is the preferred imaging modality because it defines:

- Abscess size and number
- Unilocular or multiloculated morphology
- Fluid versus solid or necrotic content
- Presence of gas
- Capsular disruption
- Perisplenic extension
- Fistulation

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Pleural or diaphragmatic involvement

Accessibility for percutaneous drainage

Ultrasonography may identify hypoechoic or complex collections and is useful for guiding drainage. However, overlying bowel gas, body habitus, and subdiaphragmatic location may limit visualization.

Blood cultures and aspirate cultures should be obtained whenever possible. Microbiology may be polymicrobial and can include gram-positive cocci, gram-negative bacilli, anaerobes, fungi, or mycobacteria depending on host factors and infection source.

Principles of Management

The central components of management are:

Hemodynamic stabilization.

Broad-spectrum antimicrobial therapy.

Identification of the infection source.

Effective drainage or removal of infected splenic tissue.

Culture-directed antibiotic adjustment.

Monitoring for treatment failure or recurrence.

Antibiotics alone are generally insufficient for large, organized, multiloculated, or complicated abscesses. They may be considered in carefully selected small collections, patients with prohibitive procedural risk, or unusual situations in which drainage is not technically feasible [6,7].

Antimicrobial Therapy

Empiric antimicrobial therapy should cover likely gram-positive, gram-negative, and anaerobic organisms until culture results are available. Treatment should then be narrowed according to blood or aspirate cultures.

Antifungal therapy may be required in immunocompromised patients or when *Candida* species are isolated. Prolonged treatment is often necessary when splenic abscess is associated with infective endocarditis, osteomyelitis, persistent bacteremia, or immunosuppression.

The duration of treatment depends on source control, pathogen, clinical response, and associated infection. Antibiotic therapy should not delay drainage or surgery when urgent source control is indicated.

Percutaneous Drainage

Image-guided percutaneous drainage has become the principal spleen-preserving intervention for selected patients. It may be performed under ultrasonographic or computed tomographic guidance using needle aspiration or catheter drainage.

Ideal Candidates

Percutaneous drainage is most appropriate when the abscess is:

Unilocular

Solitary or limited in number

Peripherally located

Well-defined

Accessible through a safe trajectory

Predominantly fluid

Not associated with rupture or uncontrolled hemorrhage

Clinical stability and the ability to perform close radiological follow-up are also important.

Advantages

Potential benefits include:

Preservation of splenic immune function

Avoidance of major surgery

Lower physiologic stress

Shorter recovery

Lower risk of postoperative complications

Ability to obtain cultures directly from the abscess

A systematic review and meta-analysis found numerically lower pooled mortality and complication rates with percutaneous drainage than with splenectomy, although the differences were not statistically definitive because of heterogeneity and selection bias [3].

Limitations

Percutaneous drainage may fail because of:

Multiloculation

Thick or necrotic material

Multiple noncommunicating cavities

Inaccessible location

Catheter obstruction

Inadequate source control

Fungal or unusual infection

Associated fistula

Extensive splenic destruction

Failure requires catheter repositioning, repeat drainage, or salvage splenectomy. Contemporary observational data indicate that nonoperative intent may fail in a substantial proportion of patients, emphasizing the need for close monitoring [8].

Splenectomy

Splenectomy remains the most definitive treatment because it removes the entire infected organ and allows complete intra-abdominal exploration.

Indications

Upfront splenectomy should be strongly considered in patients with:

Multiple splenic abscesses

Multiloculated collections

Splenic rupture

Diffuse parenchymal destruction

Severe sepsis or hemodynamic instability

Failed percutaneous drainage

Abscess inaccessible to drainage

Gastrosplenic or other fistulation

Associated intra-abdominal disease requiring surgery

Recurrent abscess

Suspicion of infected necrotic tumor

Splenectomy is also frequently required in immunocompromised patients with multiple lesions or poor response to antimicrobial treatment [5,9].

Advantages

Definitive source control

Low risk of local recurrence

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Ability to address rupture or hemorrhage

Direct inspection of adjacent structures

Tissue for microbiologic and pathologic assessment

Disadvantages

Major operative morbidity

Bleeding risk

Injury to adjacent organs

Pancreatic fistula

Subphrenic collection

Postoperative thrombosis

Lifelong risk of overwhelming postsplenectomy infection

The immune consequences of splenectomy are particularly important in children and young adults.

Open Splenectomy

Open splenectomy is generally preferred in:

Hemodynamic instability

Ruptured abscess

Severe peritonitis

Massive splenomegaly

Dense adhesions

Complex fistulation

Extensive infection involving adjacent organs

Need for rapid broad exposure

The open approach facilitates hemorrhage control and management of associated abdominal pathology. However, it is associated with greater postoperative pain, longer hospitalization, wound morbidity, and slower recovery.

Laparoscopic Splenectomy

Laparoscopic splenectomy may be feasible in clinically stable patients without rupture, massive splenomegaly, or extensive adhesions.

Potential advantages include:

Reduced postoperative pain

Shorter hospitalization

Lower wound morbidity

Faster recovery

Improved visualization in selected cases

A small clinical series reported successful laparoscopic splenectomy for splenic abscess without postoperative mortality or major complications, although the sample was limited [10].

Laparoscopy should be converted to open surgery when exposure is inadequate, bleeding cannot be controlled, or extensive inflammatory adherence prevents safe dissection.

Partial Splenectomy

Partial splenectomy aims to remove the infected segment while preserving sufficient vascularized splenic tissue to retain immune function.

It may be considered when:

The abscess is localized to one pole

The remaining spleen appears viable

Vascular anatomy allows segmental resection

The patient is young

Long-term preservation of splenic function is a priority

Successful partial splenectomy has been reported in pediatric patients, but evidence remains limited to isolated reports and small series [11].

Potential complications include bleeding, residual infection, recurrent abscess, infarction of the remnant, and need for completion splenectomy.

Operative Abscess Drainage Without Splenectomy

Open surgical drainage without splenectomy may be considered when percutaneous drainage is unavailable or impossible and total splenectomy would carry excessive risk.

The procedure may include:

Direct abscess evacuation

Debridement of necrotic tissue

Irrigation

Placement of surgical drains

Management of associated pleural or subphrenic collections

This approach has been described in resource-limited settings and selected high-risk patients [12]. However, recurrence or incomplete source control remains a concern.

Endoscopic Ultrasound-Guided Drainage

Endoscopic ultrasound-guided transluminal drainage has been reported for splenic or parasplenic collections adjacent to the stomach when percutaneous access is difficult.

Lumen-apposing metal stents may create internal drainage into the stomach. Potential advantages include avoidance of external catheters and minimally invasive access.

However, the evidence is limited to case reports and expert-center experience [13,14]. Risks include hemorrhage, stent migration, perforation, fistula, and incomplete drainage. It should not be considered standard treatment.

Splenic Abscess in Infective Endocarditis

Splenic abscess may result from septic embolization in infective endocarditis. Management requires coordination between infectious disease, cardiac surgery, general surgery, and interventional radiology teams.

Important issues include:

Persistent bacteremia

Risk of recurrent embolization

Timing of splenic source control

Timing of valve surgery

Anticoagulation and bleeding risk

Hemodynamic stability

Splenic source control is often recommended before or at the time of cardiac surgery to reduce the risk of prosthetic valve infection. However, the optimal sequence remains uncertain and should be individualized [15].

Post-Bariatric Splenic Abscess

Splenic abscess is a rare complication after sleeve gastrectomy and may be associated with:

Staple-line leak

Gastrosplenic fistula

Splenic ischemia

Hematoma infection

Subphrenic contamination

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Conservative therapy alone is frequently unsuccessful when a leak or fistula persists. Treatment may require drainage, endoscopic management, splenectomy, gastric repair, or combined procedures [16,17].

Pediatric Splenic Abscess

Children should be managed with greater emphasis on splenic preservation because loss of splenic immune function carries lifelong infectious consequences.

Potential treatment options include:

Antibiotics and observation for highly selected small abscesses

Needle aspiration

Percutaneous catheter drainage

Partial splenectomy

Total splenectomy for multiple, refractory, or complicated disease

Pediatric reports support drainage-first management when anatomy is favorable, but immunocompromised children and those with multiple abscesses may require total splenectomy [9,18].

Immunocompromised Patients

Patients with malignancy, transplantation, neutropenia, acquired immunodeficiency, or immunosuppressive treatment may have:

Multiple abscesses

Atypical organisms

Fungal infection

Blunted inflammatory responses

Higher failure rates with conservative management

Early aggressive source control should be considered. Culture acquisition is particularly important because empiric antibacterial therapy may be inadequate.

Postsplenectomy Care

Patients undergoing splenectomy require measures to reduce the risk of overwhelming postsplenectomy infection.

Recommended care includes vaccination against:

Streptococcus pneumoniae

Neisseria meningitidis

Haemophilus influenzae type b

Annual influenza vaccination is also recommended. Vaccination timing should follow local guidelines and may be performed preoperatively in elective cases or after recovery from emergency surgery.

Patients should receive education regarding:

Lifelong infection risk

Need for urgent medical evaluation for fever

Travel-related infection risks

Animal-bite prophylaxis

Medical identification indicating asplenia

Antibiotic prophylaxis when indicated by age or risk profile

Thrombocytosis and thromboembolic risk should also be monitored after splenectomy.

Outcomes

The prognosis depends on:

Timing of diagnosis

Adequacy of source control

Number and complexity of abscesses

Hemodynamic stability

Immune status

Underlying infection

Presence of rupture or fistula

Treatment response

Meta-analytic estimates suggest pooled mortality of approximately 12% after splenectomy and 8% after percutaneous drainage, with complication rates of approximately 26% and 10%, respectively [3]. These figures should be interpreted cautiously because patients undergoing splenectomy generally have more severe or complex disease. Salvage splenectomy after failed drainage does not appear to produce clearly worse mortality than immediate splenectomy, supporting an initial drainage attempt in appropriately selected patients [4].

Proposed Management Algorithm

Confirm the diagnosis with contrast-enhanced computed tomography.

Stabilize the patient and begin broad-spectrum intravenous antibiotics.

Obtain blood cultures and aspirate cultures when feasible.

Assess abscess anatomy: number, size, loculation, contents, location, rupture, and fistulation.

Select percutaneous drainage for stable patients with accessible, unilocular, predominantly fluid collections.

Select splenectomy for multiple, multiloculated, ruptured, inaccessible, fistulizing, or refractory abscesses.

Use open splenectomy for instability, rupture, peritonitis, or complex associated disease.

Consider laparoscopic splenectomy in stable, anatomically suitable patients.

Consider partial splenectomy in selected localized disease, particularly in children.

Monitor drainage response clinically, biochemically, microbiologically, and radiologically.

Perform salvage splenectomy if drainage fails or sepsis persists.

Provide vaccination and asplenia education after total splenectomy.

Discussion

The principal therapeutic objective in splenic abscess is effective source control. Both splenectomy and percutaneous drainage can be successful, but they serve different clinical populations.

Percutaneous drainage is most effective when the abscess is technically accessible, unilocular, and fluid. It preserves splenic function and may reduce perioperative morbidity. However, it should not be used indiscriminately in multiloculated, necrotic, ruptured, or clinically unstable disease.

Splenectomy remains the most definitive intervention and should not be delayed when drainage is unlikely to succeed.

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The main tradeoff is between reliable source control and the lifelong immune consequences of asplenia.

The available evidence does not establish universal superiority of drainage or splenectomy. Comparative studies are affected by major selection bias because patients undergoing surgery often have more severe disease. Consequently, treatment should be guided by anatomy, physiology, host factors, and local expertise rather than pooled outcome estimates alone.

Minimally invasive surgery and endoscopic drainage are promising, but the supporting literature remains limited. Future multicenter registries should identify imaging and clinical predictors of drainage failure, clarify sequencing in infective endocarditis, and compare long-term outcomes after spleen-preserving versus definitive surgical treatment.

CONCLUSION

Splenic abscess requires antimicrobial therapy combined with timely source control. Percutaneous drainage is an effective spleen-preserving strategy for selected stable patients with accessible, unilocular, predominantly fluid abscesses. Splenectomy remains the definitive treatment for multiple, multiloculated, ruptured, fistulizing, inaccessible, or refractory disease. Open surgery is appropriate for unstable or complicated cases, while laparoscopic splenectomy may be feasible in selected stable patients. Partial splenectomy and endoscopic drainage may preserve splenic function in highly selected situations, but current evidence is limited. Optimal management depends on matching the intervention to abscess anatomy, severity of illness, immune status, and available expertise.

Table 1. Comparison of Treatment Strategies for Splenic Abscess

Treatment strategy	Best candidates	Main advantages	Main limitations
Antibiotics alone	Small selected abscesses or patients unable to undergo intervention	Noninvasive; avoids procedural risk	High risk of inadequate source control or recurrence
Needle aspiration	Small, simple, accessible collections	Diagnostic culture and minimally invasive decompression	Higher recurrence; may require repeat aspiration
Percutaneous catheter drainage	Unilocular, accessible, predominantly fluid abscesses in stable patients	Preserves splenic function; lower physiologic burden	Failure with thick, multiloculated, multiple, or inaccessible collections
Open splenectomy	Rupture, instability, multiple abscesses, fistula, extensive destruction	Definitive source control and broad operative exposure	Higher morbidity and lifelong asplenia-related risk
Laparoscopic splenectomy	Stable patients with surgically manageable anatomy	Less pain, shorter stay, reduced wound morbidity	Difficult in rupture, severe inflammation, massive spleen, or dense adhesions
Partial splenectomy	Localized polar abscess with viable remaining spleen	Preserves some immune function	Bleeding, recurrence, infarction, technically demanding
Open surgical drainage	Cases unsuitable for percutaneous access when spleen preservation is desired	Direct drainage without total splenic removal	Possible incomplete source control and recurrence
Endoscopic ultrasound-guided drainage	Selected collection adjacent to stomach and inaccessible percutaneously	Internal minimally invasive drainage	Limited evidence; bleeding, perforation, and stent-related risks

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