

Surgical Treatment of Ruptured Splenic Artery Aneurysm. A Clinical Case and Review Literature

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Abstract

Introduction: Ruptured splenic artery aneurysms (SAAs) are rare but life-threatening vascular emergencies. Prompt diagnosis and intervention are crucial for patient survival.

We present a case of a 54-year-old male who presented with We describe the case of a 54-year-old male who presented with an acute onset of diffuse abdominal pain radiating to the left shoulder, tachycardia, and hemodynamic stability without signs of hypovolemic shock.

The diagnostic process includes imaging examinations such as abdominal echo, AngioCT abdomen, and laboratory examinations. After 12 hours of observation, the head of the general surgery service and vascular surgeons consulted, and the decision was made to perform an exploratory laparotomy.

The patient underwent laparotomy, which revealed hemoperitoneum and rupture of the splenic artery aneurysm, requiring Splenectomy.

The patient had an uneventful postoperative course and was discharged home on postoperative day 7.

Ruptured splenic artery aneurysms represent a challenging clinical scenario requiring prompt recognition and intervention. Surgical management remains the cornerstone of treatment, aiming to prevent life-threatening bleeding and preserve splenic function when feasible. Multidisciplinary collaboration and adherence to evidence-based practices are essential for optimizing patient outcomes in this rare but critical condition. Ongoing research and advancements in surgical techniques continue to refine the approach to splenic artery aneurysms, enhancing the quality of care provided to affected patients.

Conclusion: This case report highlights the importance of a high index of suspicion for ruptured SAA in patients with suggestive clinical presentations. Prompt surgical intervention with appropriate technique selection is essential for optimal patient outcomes.

Keywords: Splenic artery aneurysm, Ruptured aneurysm, Splenectomy

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Introduction

A splenic artery aneurysm (SAA) is an abnormal dilatation of a splenic artery more than 1 cm in diameter [1]. It was first reported in 1770 by Beaussier and was described in a living person by Winkler in 1903[2]

The splenic artery is aneurysmal when a focal dilation is observed in a diameter greater than 50% compared to the average vessel diameter. [3] The standard diameter of the splenic artery ranges from 0.43 cm to 0.49 cm.

True splenic artery aneurysms (SAAs) involve all artery wall layers. [3]

Splenic artery aneurysms (SAAs) account for over half of all visceral artery aneurysms. [4, 5]

These aneurysms are most commonly found near the splenic artery's middle or distal third, near its bifurcation. The splenic artery is the third most frequent intra-abdominal aneurysm after aneurysms of the abdominal aorta and iliac arteries [6]. The true prevalence is unknown, and it ranges from 0.2% to 10.4% [7, 8]. Although once thought to be rare, splenic artery aneurysms are being diagnosed with increasing frequency as an incidental finding [9]. As uncommon as true splenic artery aneurysms are, pseudoaneurysms are rare, with fewer than 200 cases reported in the English-language literature [10]. This is the most common aneurysm in the visceral arteries, accounting for approximately 60% to 70% of patients diagnosed with visceral artery aneurysms. [11]

SAAs can potentially be life-threatening due to spontaneous intraperitoneal rupture, rupture into the neighboring hollow organs, and fistulization into the pancreatic duct.[12]

Rupture of a splenic artery aneurysm (SAA) is accompanied by a high mortality rate of up to 60% [13]

Most small SAAs are asymptomatic and are diagnosed incidentally during radiologic investigations. [14, 15, 16]

The most common symptoms for symptomatic cases are epigastric and left hypochondriac pain. However, patients can also present with general gastrointestinal complaints of a feeling of fullness, loss of appetite, nausea, or vomiting.[17]

While rupture is a rare complication of splenic artery aneurysm, it is life-threatening. It can present with acute diffuse abdominal pain and hypovolemic shock, with signs and symptoms of an acute surgical abdomen.[18]

Aneurysm of the lienal artery, an Anatomical general information.

The splenic artery is one of the main branches of the celiac trunk. It traverses the upper side of the body, and the tail of the pancreas rises towards the spleen, but its course can be variable. The artery is usually tortuous, divided into separate branches that provide a segmental blood supply to the spleen. (Fig. 1)

Aneurysms arise in the middle or distal third of the splenic artery near its bifurcation. AASs are usually saccular as opposed to fusiform. (Fig. 2, 3) [19]

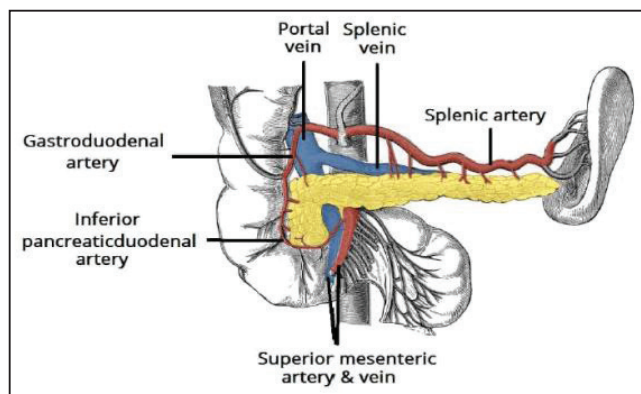


Figure 1. The vascular supply to the spleen

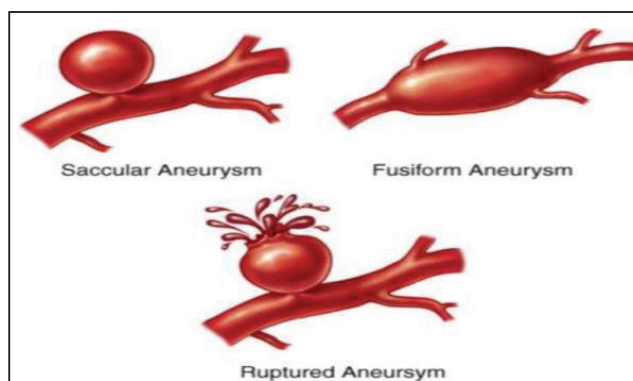


Figure 2. Type of splenic artery aneurysm and pseudoaneurysm

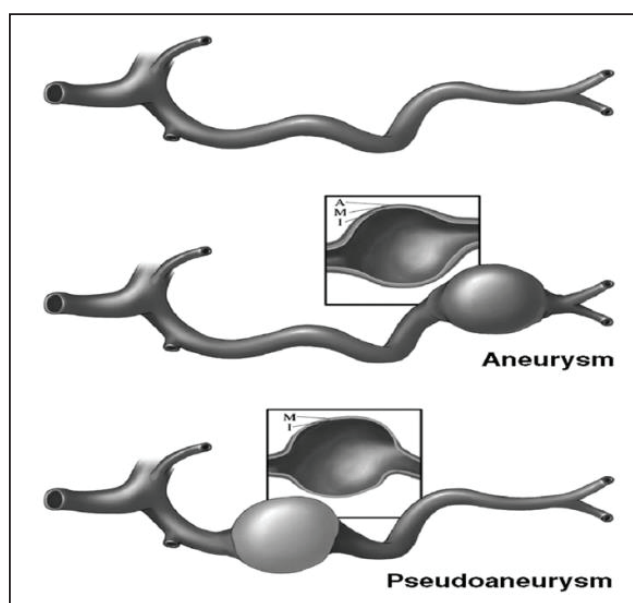


Figure 3. Schematic of the normal splenic artery, splenic artery aneurysm, and pseudoaneurysm. In a true aneurysm, the wall is composed of intima (I), media (M), and adventitia (A); in comparison, a pseudoaneurysm wall contains only intima and media. In pancreatitis, splenic artery pseudoaneurysm may result from the weakening of the wall by pancreatic enzymes [8] (Illustration by Frank Corl)

Etiology

Modifiable risk factors include atherosclerosis, hypertension portal, liver transplant, pregnancy, and connective tissue disorders such as syndrome Marfan or Ehler-Danlos. Recent studies show that pseudoaneurysms of the spleen occur in up to 21% of patients diagnosed with chronic pancreatitis. [20]

Non-modifiable risk factors include advanced age and feminine gender. Pseudoaneurysms of the splenic artery have been associated with trauma sharp and penetrating, as well as iatrogenic trauma during instrumentation. [21]

Epidemiology

The prevalence of SAA in the general population is reported to be less than 1%, as most SAA remain asymptomatic and, therefore, undetected. [3]

A recent retrospective study found that 78% of SAA occurs in women.[22]

Mortality due to splenic aneurysm rupture in nonpregnant patients varies from 25% to 40%. [23] However, maternal mortality due to rupture of the SAA increases up to 75%, and fetal mortality rises up to 95%. [24, 25]

Physiopathology

The exact pathophysiology of visceral aneurysms has not been established. Recent literature suggests that true aneurysms develop due to weakness of the arterial wall due to several causes. These include atherosclerosis (32%), medial degeneration or dysplasia (24%), abdominal trauma (10%), hypertension,

connective tissue diseases, and necrotizing vasculitis such as polyarteritis nodosa or Wegner's granulomatosis. [26]

Pseudoaneurysms are periarterial hematomas that develop as a result of iatrogenic trauma or inflammatory processes such as chronic pancreatitis. Pseudoaneurysms lack an actual wall, so they are more prone to rupture.[27]

Clinical presentation and diagnosis

The most common presenting symptom is vague epigastric pain or upper left abdominal quadrant that can be irradiated towards the left shoulder. Other symptoms include gastrointestinal bleeding with hematemesis or subsequent hematochezia or hemorrhage in the pancreatic duct [28]

True aneurysms can be silent and asymptomatic; however, pseudoaneurysms are always symptomatic. Rupture is a rare but severe complication of SAA that can manifest with acute diffuse abdominal pain and hypovolemic shock with signs and symptoms of an acute surgical abdomen. The incidence of rupture is increased in women multiparas and patients with portal hypertension due to increased blood flow portal blood. [29] T

he reported risk of SAA rupture is 2% to 10%, which increases to 76% to 83% in symptomatic patients.[1]

Computed tomography (CT) with IV contrast is the ideal imaging modality diagnostic to diagnose AAS and other visceral aneurysms. CT is useful in detecting small SAA and assessing anatomy for operational planning. Magnetic resonance imaging (MRI) is an alternative to CT, especially in patients with chronic renal failure. Angiography with contrast (CA) is the most specific imaging test to identify MSAs and can be therapeutic. Endoscopic ultrasound can distinguish reliable AAS from other external lesions, such as pancreatic pseudocysts. [30]

In splenic artery aneurysm rupture cases, the clinical picture contains objective data of hemodynamic

compromise, which is attached to the data objectives of the surgical abdomen.[31]

Undoubtedly, in the case of splenic artery aneurysm rupture, laparotomy or open surgical intervention remains the best life-saving option. [1-22]

Clinical case report

A 54-year-old male presented to the emergency department with diffuse abdominal pain radiating to the left shoulder, which started immediately.

The history of the above complaints is about 1 hour. However, the patient reports that he has had a heavy feeling of discomfort in the upper abdominal quadrants for about two days, but without nausea, vomiting, or intestinal transit disorders.

The patient has these accompanying diseases such as Arterial hypertension under medication and dyslipidemia under medication. In the objective examination, it is found that sensitivity during palpation, mainly in the upper abdominal quadrants, is more pronounced in the sinister hypochondrium; from the hemodynamic side, it is presented with SBP 100/80 mmHg and FC 98 beats/min.

In laboratory tests, RBC 3.2 million; Hb 9.8g\dl is found.

In imaging examinations, Abdominal US found minimal intra-abdominal fluid; Angio CT scan of the abdomen with IVC revealed fluid with hemorrhagic density in the minor of the omental bursa, retro gastric, and at the level of the pancreas and liquid in moderate amounts intra-abdominal. (Fig. 4)



Figure 4. Angio CT scan of the abdomen with IVC

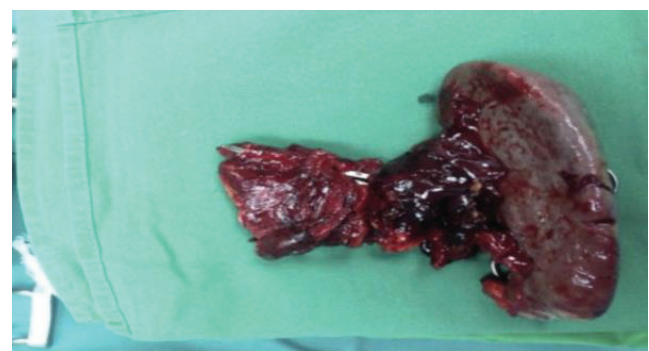


Figure 5. Splenic arterial aneurysm and Splenectomy

Surgical management

The case was consulted with vascular surgeons and observed for about 2 hours; after performing the abdominal US, it was found that there was a difference in the amount of liquid and its presence in other intra-abdominal quadrants, accompanied by hemodynamic instability. However, in the meantime, he got 1000 ml Sol. Ringer Lactate perfusion and 2 UI of whole blood and 2UI of PNF, the hemodynamics were unstable, and the decision was made to perform an exploratory laparotomy, according to the treatment protocol. (Fig. 6) [23]

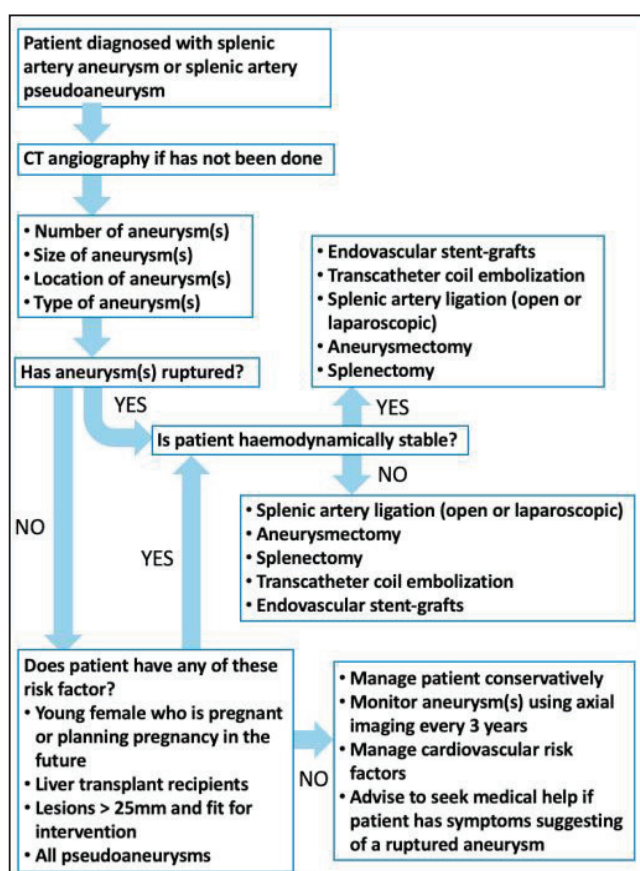


Figure 6. Management flowchart for splenic artery aneurysm or pseudoaneurysm.

During exploratory laparotomy, hemoperitoneum, large clots at the level are found of the minor omental bursa and a ruptured aneurysm of the splenic artery, with 32mm size, near the Lienal hilus with close relationships with the tail of the pancreas, splenectomy is performed. (Fig. 5)

Due to the aneurysm's localization proximal to the ileal hilus and the lack of inflammation and adhesions of the aneurysmal wall to the tail of the pancreas, distal pancreatectomy is not performed.

Postoperative course

The patient underwent prophylactic therapy with antibiotics and anticoagulants. Post-operative progress was uneventful. According to the post-splenectomy vaccination protocol, the patient underwent vaccination on the 14th day

postoperatively. Follow-up: The check-up after one month was within the norm, without any relevant findings.

Discussion

The pathogenesis of SAAs is not fully understood [2] It is observed to occur in the majority of patients with hypertension, hepatitis B or C virus, chronic or acute pancreatitis, portal hypertension, cholelithiasis, liver cirrhosis, trauma, diabetes, segmental arterial dialysis, pregnancy, and atherosclerosis. [33]

Ologun et al. mentioned that the pathogenesis of SAAs includes hypertension, hormonal factors (associated with degeneration of internal elastic lamina and elastin formation), hemodynamic changes (increased blood volume, cardiac output, and portal congestion), and medial degeneration. Histological changes include atherosclerotic changes, artery dysplasia, fibromuscular dysplasia, calcifications, cystic medial degeneration, and intimal hyperplasia [33]. Sadat et al. describe that in pregnancy, hormones (estrogen, progesterone, and relaxin) and psychological changes affect the arterial wall, causing medial degeneration and stress on the arterial wall that leads to aneurysmal dilatation [34, 35]

The management of SAA has always been decided based on the choice of the doctor/surgeon performing the intervention and the patient's decision, with no general consensus to follow [36]. Traditionally, the threshold for repair of asymptomatic SAA has always been > 20 mm [37]. Some literature has suggested a few guidelines for the management of SAA. Corey et al. suggested guidelines on the management of asymptomatic SAA, recommending repairing all SAA for young women who are pregnant or are planning to be pregnant, liver transplant recipients, SAA >25 mm in patients who are fit for an operation, and all pseudoaneurysms [37]. The article also suggested that endovascular treatment can manage most lesions as a less invasive intervention with a lower mortality rate [38]. Corey et al. also recommended guidelines for surveillance of asymptomatic SAA for lesions ≤ 25 mm with axial imaging every 3 years to monitor the growth of the aneurysm [37]. Goldberg et al. also recommended using a multidisciplinary approach and treating all splenic artery pseudoaneurysms regardless of the size at presentation due to the high risk of rupture and mortality [15].

The type of intervention for SAA is decided after careful consideration by the surgeon, considering age, sex, aneurysm location, dimension, complications, adequacy of collateral flow to the liver, and severity of clinical findings [36]. On the other hand, open surgery carries a risk of mortality, which is reported to be 1%–3%, and also has a high perioperative complication rate of 9%–25% [37, 39]. A management flowchart has been synthesized to help determine the type of intervention for patients diagnosed with SAA or SAPA (Figure 6) [31].

In the presented case, the intraoperative discussion among the surgical team focused on the need to perform a distal pancreatectomy.

Factors that contribute to deciding whether distal pancreatectomy is necessary in splenic artery aneurysm rupture include the extent of rupture: The size and severity of the rupture may affect the need for more radical surgical intervention; Location of the aneurysm; The proximity of the aneurysm to the pancreas and surrounding structures may affect the surgical approach; General condition of the patient: The patient's age, co-morbidities, and general health condition are decisive in determining the appropriate surgical strategy; Expertise of the surgical team: The surgical team's experience and expertise in managing vascular emergencies and pancreatic operations may influence the chosen treatment approach; Presence of complications; Complications such as pancreatic injury, hemorrhage, or infection may require more aggressive surgical management; Patient preferences: In some cases, patient preferences and goals of care may also influence the decision-making process.[39, 40, 41]

Conclusion:

This case report highlights the importance of a high index of suspicion for ruptured SAA in patients with suggestive clinical presentations. Prompt surgical intervention with appropriate technique selection is essential for optimal patient outcomes.

By introducing a management pathway for SAA, we hope to improve the management of patients with SAA. The management algorithm will require further validation through application and careful and complete follow-up of all cases to enhance the pathway depending on patient outcome.

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