

Delayed Rupture of a Splenic Artery Pseudoaneurysm After Biliopancreatic Diversion

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Abstract Splenic artery pseudoaneurysm (SAP) is a known but rare complication of pancreatitis and blunt abdominal trauma. SAP caused by operative trauma has been rarely reported. We present a patient who presented with massive upper gastrointestinal (GI) bleed in shock. On exploratory laparotomy, a SAP was diagnosed. He must have sustained injury to his splenic artery while undergoing reinforcement of sleeve gastrectomy during an open biliary pancreatic diversion procedure 2 years back. Alternatively, the prolene suture might have eroded into the splenic artery to cause the SAP. Literature on iatrogenic SAP is reviewed. SAP should be considered in patients with history of foregut surgery with GI bleed and equivocal endoscopic findings.

Keywords Pseudoaneurysm · Splenic · Iatrogenic · Bariatric surgery

Background

Splenic artery pseudoaneurysm (SAP) are rare entities usually associated with chronic pancreatitis and blunt abdominal trauma. They can remain clinically silent but can present with massive gastrointestinal (GI) hemorrhage and shock. SAP after an operative procedure is extremely rare and is hardly ever suspected. We present a patient with massive upper GI bleed who had to undergo exploratory laparotomy because of hemodynamic compromise. He had undergone open biliopancreatic diversion with duodenal switch (BPD-DS) 2 years back. The cause of the bleed was found to be a pseudoaneurysm of the splenic artery.

Case Report

A 54-year-old man was admitted from the emergency room (ER) after presenting with massive hematemesis and syncope. His past history was significant for an open BPD-DS 2 years ago. His body mass index had reduced from 47 to 33 after the obesity surgery. He had presented to the ER 1 week ago with similar although mild symptoms. An upper endoscopy and colonoscopy done at that time was normal. Patient was also started on anticoagulation with coumadin for new onset atrial fibrillation. On this admission, his hemoglobin was found to have dropped from 10.4 a week ago to 6.9 now. After aggressive resuscitation and reversal of anticoagulation, an emergency gastroesophagoscopy was done. The source of bleeding could not be identified owing to large amount of clots in the stomach and jejunum. We decided to perform emergency exploratory laparotomy because of patient's persistent hemodynamic compromise. In the operating room, the

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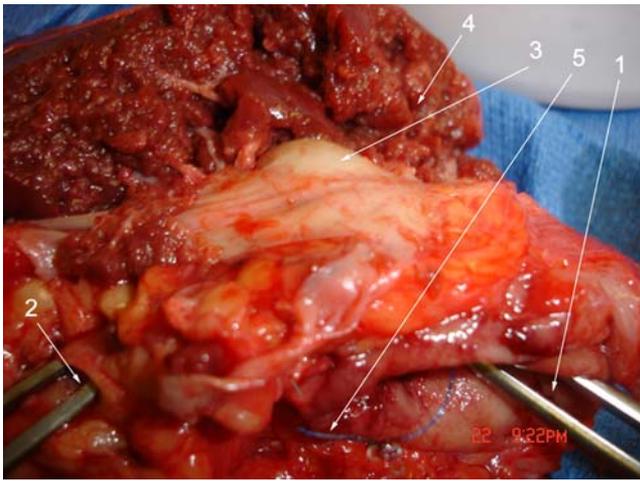


Fig. 1 Fresh specimen illustrating SAP abutted against the stomach. Note the prolene suture issuing out of the luminal surface of the stomach. 1 Luminal surface of stomach, 2 splenic artery, 3 SAP, 4 spleen, 5 prolene suture

stomach found to be distended and adherent to underlying viscera. The remnant gastric fundus was adherent to the spleen. We initially attempted to exclude the gastroesophageal junction by cutting across the stomach from the remnant fundus with a linear stapler. This had no effect on the bleeding. A decision to perform splenectomy was then made. The bleeding totally ceased on dissecting and clamping the proximal splenic artery at the level of pancreas. We proceeded to do en bloc splenectomy along with removal of the portion of adherent stomach. On visual examination of the specimen upon opening up of the stomach, we identified a prolene stitch used in the

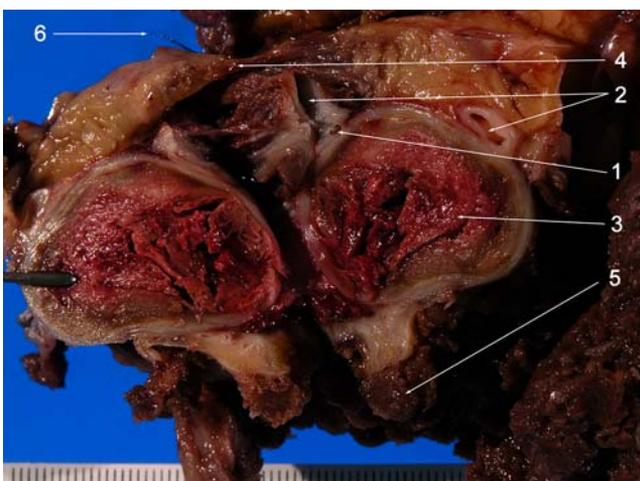


Fig. 2 Formalin-preserved specimen showing cut surface of pseudoaneurysm. Note the prolene suture eroding through the splenic artery into the pseudoaneurysm. 1 Prolene suture, 2 splenic artery, 3 pseudoaneurysm; 4 serosal surface, stomach, 5 spleen, 6 prolene suture in the gastric lumen



Fig. 3 Fresh specimen illustrating prolene suture seen entering the stomach. The probe is entering the pseudoaneurysm through the gastric wall. 1 Prolene suture, 2 gastric ulcer, 3 normal gastric mucosa

reinforcement of sleeve gastrectomy to be abutted against a SAP and entering into the stomach (Fig. 1). This pseudoaneurysm, 3 cm in diameter, was opening into the stomach through the sleeve gastrectomy anastomosis (Figs. 2 and 3). Because of patient’s serious condition, we elected to leave the proximal and distal halves of the stomach unconnected and placed a wound vacuum-assisted closure on the open abdomen as part of damage control surgery. The nasogastric tube was left to drain the proximal stomach. Two days later, the patient was taken up for surgery again and the stomach continuity restored by end-to-end anastomosis after extensive adhesiolysis. A new feeding jejunostomy was placed in the biliopancreatic limb. The fascia was closed utilizing a thin segment Alloderm® (Lifecell Corporation) patch in an inlay fashion. The patient had a prolonged recovery owing to his comorbidities (obesity, atrial fibrillation, diabetes, angina, methicillin-resistant *Staphylococcus aureus* pneumonia, and prolonged intubation) but managed to leave the hospital in a healthy condition.

Discussion

SAPs are rare conditions. They are most commonly associated with acute [1] and chronic pancreatitis [2]. Blunt abdominal trauma has also been known to precipitate SAP, especially in the pediatric population [3]. Pseudoaneurysms typically lack a true vessel wall and tend to rupture with devastating consequences. The mortality in a bleeding SAP in chronic pancreatitis can be as high as 40% [4].

The presentation of splenic pseudoaneurysm is variable and ranges from chronic anemia because of slow blood loss to massive GI bleed and shock because of rupture into stomach [5] or colon [6]. Hemosuccus pancreaticus occurs because of opening of the SAP into the pancreatic duct, causing anemia and melena. Bleeding into the viscera or the

peritoneum can be intermittent but typically requires intervention because of associated shock.

Iatrogenic causes of SAP are very rare. In a review of 157 cases of SAP over 35 years, the authors found four cases because of presumed iatrogenic causes [7]. One of them presented as an intraperitoneal rupture 14 years after splenectomy for trauma that was complicated at that time by a subphrenic abscess [8]. Other iatrogenic causes were Roux-en-Y pancreaticojejunostomy [9] and placement of percutaneous transgastric catheter for a pancreatic pseudocyst [10].

Distinction has been made between true aneurysms and pseudoaneurysms. SAP usually present with massive or intermittent bleeding and is managed definitively by splenectomy or splenopancreatectomy. In contrast, in true asymptomatic aneurysms, spleen and pancreas should be preserved [11]. All peripancreatic fluid collections should undergo color duplex US evaluation to rule out pseudoaneurysms [12].

Various modalities for management of SAP exist. SAPs have been conventionally treated with surgical or endovascular techniques, including transcatheter embolization [13]. Because of the high mortality of a pseudoaneurysm, surgical resection or interventional radiology should be done as early as possible [14]. Laparoscopic management of GI bleed because of SAP has been reported [15].

Our case is unique in that the cause of SAP was iatrogenic. The adventitia of the distal splenic artery was probably damaged by the prolene stitch taken during placement of the reinforcing layer to the gastric sleeve anastomosis. Alternatively, the prolene suture could gradually have eroded into the splenic arterial wall to form the SAP. The diagnosis was made intra-operatively. Initiation of anticoagulation for his new onset atrial fibrillation could also have played a role. Review of the operative records of the original surgery revealed that mobilization of the stomach was extremely tedious owing to patient's extreme obesity. The prolene suture reinforcement of the sleeve gastrectomy staple line was performed with laparoscopic Jared needle drivers owing to limited exposure.

The splenic artery is in close proximity to the stomach and is likely to be injured during stomach mobilization. The most important factor in detecting a pseudoaneurysm is considering the diagnosis. The patient had come to the ER 1 week ago with a herald bleed that was investigated with an esophago-gastroscopy. No bleeding source was identified at that time. Further investigations with Doppler ultrasound and/or computed tomography angiography at that

time might have potentially detected the SAP. The possibility of SAP, however, was not entertained because of the extremely rare incidence.

As illustrated by this case, the possibility of SAP should be kept in mind in cases of GI bleeds in patients having undergone surgery in the peripancreatic area, especially with an inconclusive upper GI endoscopy.

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