

case report

Giant splenic artery aneurysm treated surgically with spleen and pancreas preservation

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Aneurysms of the splenic artery represent a rare clinical entity, even though they account for 60-70% of all visceral artery aneurysms. Splenic artery aneurysms larger than 5 cm are extremely rare, and they are considered to be giant. Possible causes of splenic artery aneurysm development include: trauma, hormonal and local hemodynamic changes in pregnancy, portal hypertension, arterial degeneration, infection and postsplenectomy occurrence. Surgical treatment of giant splenic artery aneurysms includes procedures that frequently require pancreatectomy and splenectomy. We present a case of a 10.2 cm giant splenic artery aneurysm, firmly adhered to the pancreas, which was treated surgically, with spleen and pancreas preservation.

SIMILAR CASES PUBLISHED: Although many cases on treatment of giant splenic artery aneurysm have been published, the majority have described additional visceral resections associated with aneurysmectomy, which is in contrast with our report. Furthermore, aneurysms reaching 10 cm in size were extremely rare.

Splenic artery aneurysms (SAA) are the third most frequent intra-abdominal aneurysms, after aortic and iliac aneurysms.¹ The incidence of SAAs in the general population varies from 0.1% to 10.4%, according to different autopsy studies.² It is four times more common in females compared to males.^{3,4} The size of SAAs rarely exceeds 3 cm. In one of the largest series published to date, the mean diameter of non-ruptured SAAs was 2.2 cm, while ruptured SAAs had the mean diameter of 3.1 cm.⁴ SAAs larger than 5 cm are extremely rare, and they are considered to be giant.⁵ However, because of intimate relations with other abdominal structures, the treatment of giant aneurysms remains a great therapeutic challenge, even for highly experienced surgeons. We present a case of a giant SAA (10.2 cm), which was treated surgically, with spleen preservation and without additional visceral resections. Informed consent has been obtained from the patient for publication of the case report and accompanying images.

CASE

A 76-year-old woman was admitted to the clinic for vascular surgery, because of a large pulsatile mass in the left upper abdominal quadrant discovered during a routine physical examination. Abdominal ultrasonography showed a 10 cm hypoechoic lesion in close association with the splenic artery. Her past medical history included hypertension and diabetes. There was no history of trauma, smoking, any pancreatic disease or coronary heart

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disease. Likewise, there was no family history of aneurysms. The patient complained about light abdominal pain radiating to the back in the last 2 months, with no other symptoms. The blood analysis and biochemical parameters including pancreatic enzymes were within the reference range.

Upon admission, multislice computed tomography (MSCT) angiography (Lightspeed VCT; GE Healthcare, Milwaukee, WI, USA) scan revealed a large proximal SAA (10.2 cm), with a tortuous course of the splenic artery in the distal part (**Figure 1**). There were no concomitant intraabdominal or femoropopliteal aneurysms. Additional evaluation of the abdominal MSCT scan showed normal findings on the pancreas and spleen. Preoperative investigations were otherwise unremarkable.

The indication for elective surgery was made upon agreement of a vascular surgeon, an angiologist, and an interventional radiologist. We performed the modification of the Mercedes Benz laparotomy and the lesser omental sac was opened through the hepatogastric ligament. We dissected out the splenic artery and vein with division from the other structures. With the omental bursa approach, we avoided visceral rotation and the consequences that would have otherwise fol-

lowed because of this maneuver. Splenic artery tortuosity allowed us to avoid unnecessary celiac trunk and the branches preparation with a potential injury of the celiac plexus. Aneurysm was saccular, located in the proximal segment of the splenic artery, deeply adhered within the pancreatic parenchyma. The normal proximal and distal part of the splenic artery was isolated for vascular control (**Figure 2**). Systemic heparin was administered in doses of 100 units/kg with the activated clotting time (ACT) between 250 and 300 seconds. After opening the aneurysmatic sac, we noticed retrograde bleeding of two orifices of pancreatic branches that were sutured, and its anterior wall was resected thus leaving the posteroinferior wall intact, since it was firmly adherent to the pancreas (**Figure 3**). Despite the fact that the spleen would receive adequate perfusion through short gastric collaterals in case of proximal artery ligation, tortuosity of the distal part of the splenic artery allowed us to perform a direct arterial reconstruction with end-to-end anastomosis, with Prolen suture 5.0.

The patient had an uneventful postoperative course and was discharged on the 7th postoperative day. The patient was followed-up at 1, 3, 6, and 12 months after surgery and annually thereafter. No complications were detected after surgery.

DISCUSSION

Aneurysms of the splenic artery represent a rare clinical entity, even though they account for 60-70% of all visceral artery aneurysms.¹ Nevertheless, in recent years, the widespread use of different high-resolution imaging modalities and their constant technical improvement has led to an increased identification of SAAs as incidental finding.⁶

SAAs are classified as either true aneurysms or pseudoaneurysms, which are even more uncommon, with fewer than 200 cases reported in the literature.⁷ There are several causes of SAAs: trauma, hormonal and local hemodynamic changes in pregnancy, portal hypertension, arterial degeneration, infection, postsplenectomy occurrence and pancreatitis.⁸ However, giant SAAs, especially larger than 10 cm, have risk factors typical for the aneurysmal development at other sites.⁹ Usually, the common SAAs are rarely symptomatic, while giant aneurysms frequently present with different symptoms, such as abdominal pain as the most common, hemodynamic instability due to bleeding caused by a ruptured aneurysm, and symptoms due to an abdominal mass effect.^{5,9,10} Rupture of the SAA is reported to occur in 2-10% of cases, with mortality rate of 25-70% depending on the underlying pathology.¹¹ On the other hand, the rupture risk for giant SAAs is nearly 30%.¹⁰

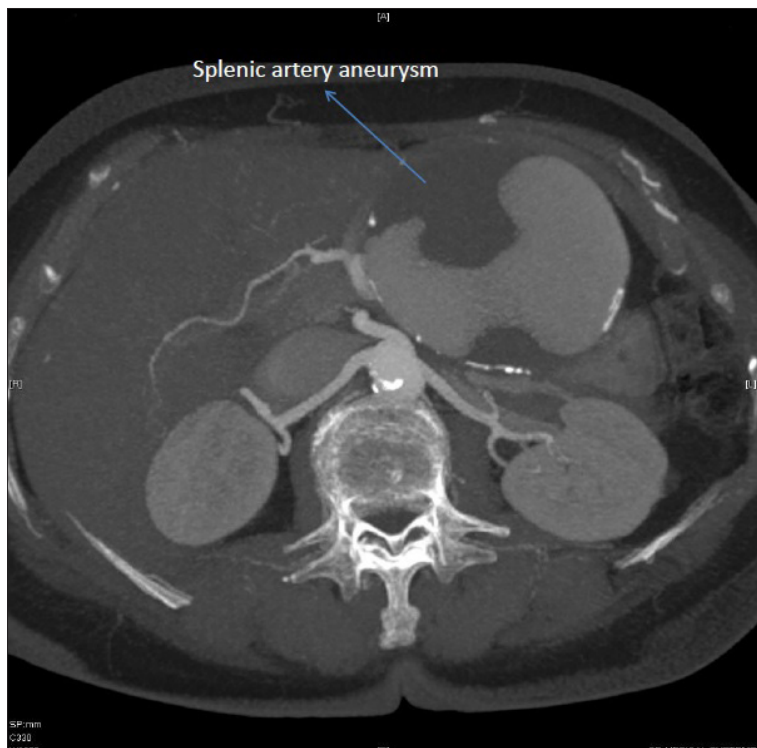


Figure 1. MDCT angiography showing a giant splenic artery aneurysm (transverse view).

The majority of the previously reported studies have highlighted the importance of splenic preservation to prevent potential infectious complications. Still, the complex anatomy and usually tight interaction with adjacent organs, which is a significant characteristic of giant SAAs, may explain the high frequency of additional visceral resections with aneurysmectomy and the simple ligation of splenic artery. A recent meta-analysis on the management of true giant SAAs, with the mean aneurysm diameter of 8.6 cm, showed that the most frequently performed procedure was aneurysmectomy with splenectomy.¹⁰ The splenectomy rate was 76%, regardless of the size of the aneurysm. Furthermore, in 34% of cases in which splenectomy was done, distal pancreatectomies were performed concomitantly.¹⁰ On the other hand, aneurysmectomies with vascular reconstructions, as well as the spleen and pancreas preservation, were performed in 15% of cases.¹⁰ The high rate of splenectomies could not be explained simply by the unsuitable location of SAA, since in more than half cases, aneurysms were located in the proximal part of the splenic artery.¹⁰ The possible causes might be the pathological changes of the spleen, such as hypersplenism and splenic infarction, which are commonly present in patients with SAA.^{10,12} Also, an unsalvageable splenic injury during surgery is another possible reason for splenectomy.^{10,13} Moreover, usually tight adhesion of the aneurysm to the distal pancreas makes aneurysm inseparable from the pancreatic tissue, which requires en-bloc resection of the aneurysm and distal pancreas.^{10,12,14}

In our case, the patient presented with 10.2 cm symptomatic SAA. Besides hypertension and advanced age, no other predisposing factor for SAA development was identified. The aneurysm was completely excluded from the circulation. The tortuosity of the splenic artery allowed us to perform a direct reconstruction of the splenic artery with termino-terminal anastomosis in order to preserve the immunological and hematological function of the spleen. The proximal splenic artery ligation is usually well tolerated, considering sufficient collateral perfusion of the spleen through the short gastric arteries. However, we decided to perform a direct arterial reconstruction since it was technically feasible. Furthermore, no additional pancreatectomy was performed, despite the fact that the aneurysm was deeply embedded in the pancreatic parenchyma. Similarly to the results of the previously mentioned systematic review, in which the majority of patients had symptomatic giant SAA with abdominal pain as the most common, our patient presented with abdominal pain.¹⁰ Also, the majority of

patients had no identified specific risk factor for giant SAA, which correlates with our case. Regarding the type of surgery performed, a high rate of splenectomies and additional visceral resections was described, which is in contrast with our result. The causes were hypersplenism, splenic infarction, splenic injury during

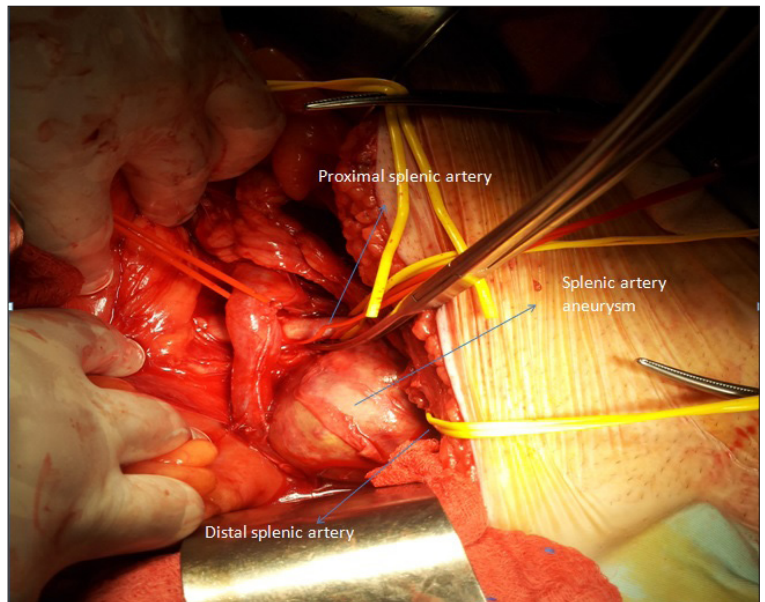


Figure 2. Laparotomy revealed giant aneurysm of the splenic artery occupying the lesser omental sac.

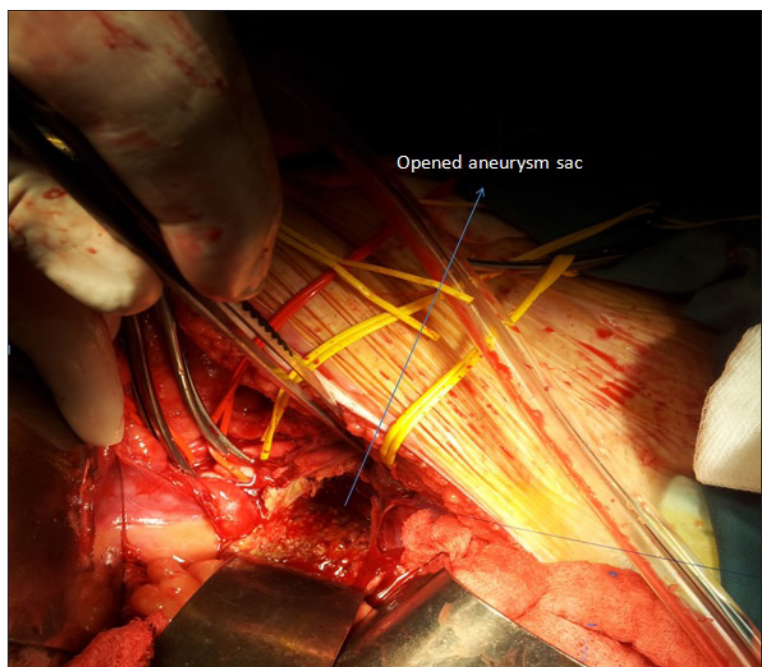


Figure 3. Resection of the anterior aneurysmal wall.

the surgery, the presence of multiple aneurysms, as well as fistula formation and tight adherence to adjacent organs.¹⁰ However, except for tight adhesion to the pancreas, there were no fistula formation and adhesions to other organs, in our case. Also, the aneurysm was solitary and there were no pathologic findings on the spleen.

The indications for surgical repair focus on possible factors of aneurysm rupture. All symptomatic SAAs should be treated as a matter of urgency as well as all asymptomatic aneurysms larger than 2 cm in diameter.⁴ There are three available treatment modalities: open surgery, endovascular treatment, and recently, laparoscopic surgery.^{15,16} Open surgical repair is the mainstay of therapy, especially for giant SAAs, nonetheless, with constant technical progress, endovascular techniques have gained a significant place in the management of SAAs. The most commonly used technique is embolic occlusion.¹⁷ Likewise, endovascular stent graft exclusion of SAAs, which preserve blood flow through the artery, has been reported with a higher success rate.¹⁸

However, giant SAAs are a great challenge for endovascular treatment, because of their complex anatomy and size, which may limit the efficacy of procedures. The aforementioned meta-analysis on true giant SAAs found nearly a 90% success rate after endovascular interventions.¹⁰ Nevertheless, the majority of aneurysms treated by endovascular techniques were less than 10 cm in size.¹⁰

In conclusion, giant aneurysm of splenic artery is a rare clinical entity, with high potential risk of rupture and hemorrhage. The selection of appropriate treatment strategy should be made individually for each patient, based on anatomic characteristic of the SAA, aneurysm size, symptoms, as well as the patient's general condition. There were no complications during open surgical repair in the presented case, especially considering that spleen and pancreas were successfully preserved. We consider that this approach can reduce the rate of visceral resections with consequent complications, which can have a significant impact on quality of life.

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