Clinical Case Report

Medicine®

OPEN

Treatment of distal splenic artery aneurysm by laparoscopic aneurysmectomy with end-to-end anastomosis

A case report

Yuhua Zhang, MD, FACS[a], Zhenjie Liu, MD, PhD[b], Guoliang Shen, MD[a], Jungang Zhang, MD, PhD[a], Carmel Rebecca Assa, BS[c], Defei Hong, MD, PhD, FACS[a,*]

Abstract

Rationale: Splenic artery aneurysm (SAA) is the most common visceral artery aneurysm, while most SAAs are treated by endovascular or open procedures.

Patient concerns: Here we present a case of SAA treated by laparoscopic aneurysmectomy with end-to-end anastomosis.

Diagnoses: A 40-year-old woman was incidentally found to have an asymptomatic distal SAA. CT scan revealed the SAA to be located at the hilum of the spleen, with a maximal diameter of 2.7 cm.

Interventions: To prevent sudden rupture, the patient received laparoscopic aneurysmectomy. During the operation, end-to-end anastomosis was also performed since a tortuous proximal splenic artery prevented delivery of the stent graft.

Outcomes: The patient was ambulated 12 hours after surgery and discharged 5 days later. Postoperative recovery was smooth without hemorrhage, infarction, infection, or splenic artery thrombosis. At 10-month follow-up,no hemorrhage, aneurysm recurrence, spleen infarction, splenic artery stenosis, or thrombosis had occurred.

Lessons: Patients with distal SAA can be treated by laparoscopic aneurysmectomy with end-to-end anastomosis to preserve the spleen. The laparoscopic procedure is safe and feasible in the selected patients.

Abbreviations: CT = computed tomography, MDT = multidisciplinary treatment, OPSI = overwhelming postsplenectomy infection, PES = postembolization syndrome, SAA = splenic artery aneurysm.

Keywords: anastomosis, aneurysmectomy, laparoscopy, splenic aneurysm

1. Introduction

Splenic artery aneurysm (SAA) is the most common visceral artery aneurysm accounting for 60% of all cases.[1,2] Most SAAs are asymptomatic and found incidentally on imaging. The indications for treating SAA include symptomatic aneurysms, an aneurysm larger than 2 cm, and aneurysms in woman who are pregnant or of childbearing age, since these aneurysms are associated with a high incidence of rupture.[1,2] Traditional treatment options for SAA are endovascular or open procedures.[1–3] Although laparoscopic procedures have become increasingly accepted due to the advantages of its minimally invasive nature,[4] most laparoscopic procedures are ligation or resection of SAA[5,6]; few publications reported reconstruction of the splenic artery by laparoscopic operation.[7] Here, we present a case of a 40-year-old woman with distal SAA, which was treated by laparoscopic aneurysmectomy with end-to-end anastomosis of the splenic artery.

2. Case presentation

A 40-year-old female was found to have an asymptomatic distal SAA by abdominal ultrasound during an annual health-screening medical examination 1 year ago. She had no history of aneurysm, pancreatitis, trauma or connective tissue diseases, and no positive signs on physical examination. She was then referred to our hospital for further diagnosis and treatment. After admission, we used 2-dimensional color Doppler ultrasound to find that the aneurysm was located in the splenic hilum, with a maximum diameter of 2.7 cm. This was confirmed by CT scan (Fig. 1A). A multidisciplinary treatment (MDT) meeting was held to discuss the therapeutic strategy for this patient. Since the proximal splenic artery was tortuous, interventional radiology suggested coil embolism of the splenic aneurysm inflow and outflow. Considering the high risks of postoperative splenic infarction, postsplenectomy thrombocytosis and potential immunodeficiency, the patient

Editor: Wilhelm Mistiaen.

This study was approved by Faculty of Medicine at the Zhejiang Provincial People's Hospital Ethics Committee/Institutional Review Board.

The authors have no funding or conflicts of interest to disclose.

[a] Division of Hepatobiliary & Pancreatic Surgery and Minimally Invasive Surgery, Zhejiang Provincial People's Hospital, [b] Department of Vascular Surgery, The Second Affiliated Hospital of Zhejiang University, School of Medicine, Hangzhou, China, [c] University of Wisconsin School of Medicine and Public Health, WI.

[*] Correspondence: Defei Hong, Division of Hepatobiliary & Pancreatic Surgery and Minimally Invasive Surgery, Zhejiang Provincial People's Hospital, Hangzhou, China (e-mail: hongdefi@163.com).

Medicine (2017) 96:19(e6260)

Received: 19 October 2016 / Received in final form: 7 February 2017 / Accepted: 8 February 2017

http://dx.doi.org/10.1097/MD.0000000000006260

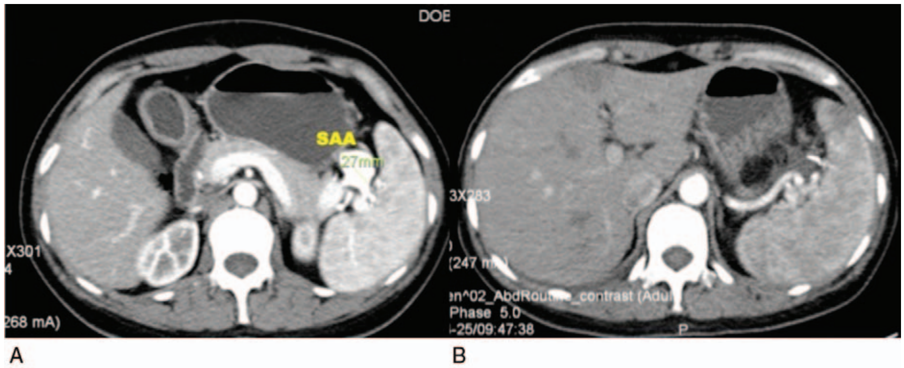

Figure 1. Pre- and postoperative computer tomography (CT). (A) Preoperative CT showed a distally located SAA (27 mm) near the hilum of spleen. (B) Postoperative (3 days) CT scan found no stenosis or thrombosis of splenic artery, and no infraction of spleen. CT = computer tomography, SAA = splenic artery aneurysm.

preferred laparoscopic aneurysmectomy with reconstruction of the splenic artery in order to preserve the spleen.

The laparoscopic technique was performed with the patient in the supine position. The patient was put under general anesthesia and received endotracheal intubation, a nasogastric tube, and urinary catheterization. The surgeon stood to the patient's left, and the first assistant and camera assistant stood to the patient's right. After the pneumoperitoneum was established, another 3 trocars were inserted and the port sites positioned, as depicted in Fig. 2A. Part of the gastrocolic ligament was opened and the stomach was retracted upward to expose the splenic artery and SAA. The portion of the splenic artery proximal to the SAA was dissected and looped to prevent injury (Fig. 2B). The inflow tract of the SAA was carefully dissected, and temporarily clipped to evaluate the residual blood supply to the spleen (Fig. 2C). Most of the spleen appeared ischemic after clamping SAA inflow. Next, the SAA was resected and the splenic artery reconstructed by end-to-end anastomosis, using a running 5-0 prolene suture (Fig. 2D and E). Blood supply to the spleen was recovered after reconstructing the splenic artery (Fig. 2F).

The laparoscopic procedure was completed in 170 minutes without blood transfusion. Total blood loss was 100 mL. The patient was ambulated 12 hours postoperation and discharged 5 days after surgery. On the third day after operation, CT showed no thrombosis or stenosis of the splenic artery and a well-perfused, homogeneous splenic parenchyma (Fig. 1B). Splenic function was normal per the postoperative blood count. Postoperative recovery was smooth without hemorrhage,

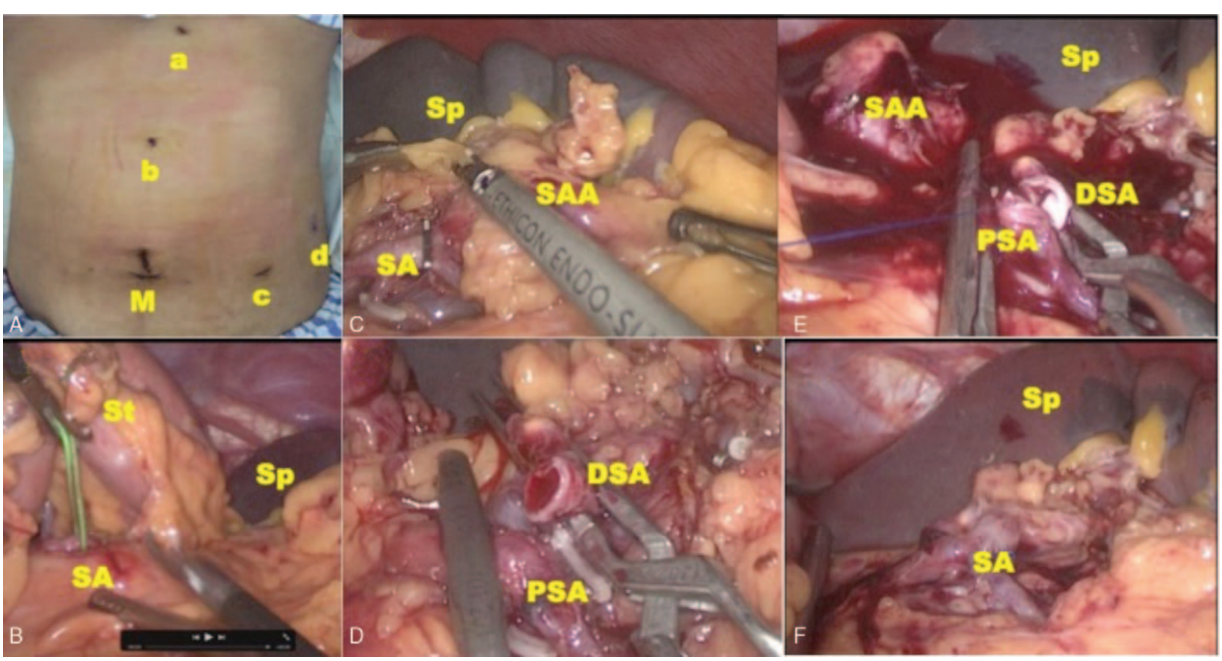

Figure 2. (A) Trocar position, (a) a 3-mm incision to insert a catheter to hang the stomach, (b and d) 5 mm, (c) 10 mm, M: monitor. (B) Dissect the splenic artery. St: stomach, Sp: spleen, SA: splenic artery. (C) Occluded the inflow of SAA to check the splenic perfusion; a dusky color was detected in the spleen. (D) After the SAA has been resected, the proximal and distal splenic arteries were visualized. PSA = proximal splenic artery, DSA: distal splenic artery. (E) Splenic artery reconstruction using 5–0 prolene. (F) After reconstruction of splenic artery, the color of spleen became normal. DSA = distal splenic artery, M = monitor, PSA = proximal splenic artery, SA = splenic artery, SAA = splenic artery aneurysm, Sp = spleen, St = stomach.

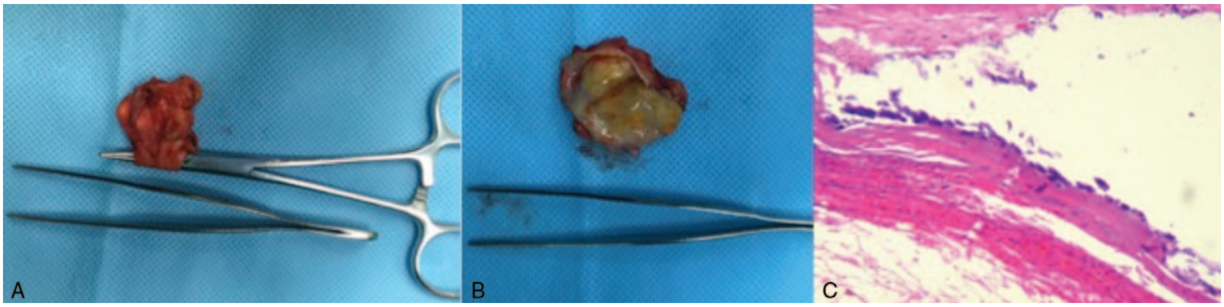

Figure 3. Macroscopic and microscopic of true SAA. (A) Surgical excision of splenic aneurysm; (B) the profile of splenic aneurysm; (C) H&E shows the expansion of blood vessels and vascular wall thinning with the deposition of calcium salt. SAA = splenic artery aneurysm, H&E = hematoxylin and eosin.

infarction, splenic abscess, or splenic artery thrombosis. Postoperative pathological results show that this was a true splenic aneurysm (Fig. 3). No hemorrhage, aneurysm recurrence, splenic infarction, splenic artery stenosis, or thrombosis occurred in the 10 months following.

3. Discussion

SAA is one of the most common visceral aneurysms, accounting for nearly 60% of reported splanchnic aneurysms.[2] The decision to intervene is dependent on confounding factors. Any patient who has symptoms attributed to a nonruptured SAA should undergo intervention. In the asymptomatic patients, the threshold for intervention is based primarily on the size of the aneurysm and/or the rate of growth. Current guidelines regarding indications for SAA intervention include aneurysms greater than 2 cm in diameter and aneurysms occurring in female patients who are pregnant or of childbearing age, since these patients have a high risk for aneurysm rupture. Current therapeutic strategies for SAAs include endovascular therapy, open surgery, and laparoscopic approach.

Endovascular therapy is an effective option in the management of SAAs. This approach usually includes coil embolization, application of cyanoacrylate glue, or exclusion with a covered stent. Although endovascular therapy has advantages over open surgery, specific complications include femoral access site hematoma, artery access site injuries, splenic abscess, and postembolization syndrome (PES). The long-term prognosis of endovascular therapy is not comparable to open intervention.[3] Covered stent implantation is believed to be superior to coil embolization for exclusion of the aneurysm and preservation of the splenic artery.[8,9] However, the covered stent approach is limited to treating proximal SAAs, since the stents are not suitable for distal lesions. In our case, the SAA was in the hilum of spleen and the proximal splenic artery was very tortuous, making stent delivery unfeasible.

Open surgery is widely used to treat SAAs, especially for ruptured SAAs. Goals of open surgery include complete aneurysm resection with splenectomy, proximal and distal ligation of the aneurysm, or ligation with arterial reconstruction.[3] The choice of operation depends mostly on the location of the SAA. Ligation of the SAA inflow and outflow or aneurysmectomy are options for proximal SAAs. Distal SAAs require aneurysmectomy with splenctomy.[3] Sometimes, distal SAAs further necessitate pancreatectomy if the aneurysm is too closely adherent to the tail of pancreas.[10]

Laparoscopic repair of SAA was firstly reported in 1993.[4,11] Only 2 publications have reported 31 cases of laparoscopic repair of SAA.[5,7] In experienced hands, the laparoscopic procedure is safe and feasible with distinct advantages such as small incisions, fewer complications, and shorter hospital stays compared to the open procedure.[5,7] Several laparoscopic techniques for SAA treatment including simple laparoscopic resection, laparoscopic ligation of the inflow and outflow of SAA, laparoscopic resection of sacciform aneurysm, laparoscopic aneurysmectomy combined with splenectomy or pancreatectomy, and laparoscopic resection with end-to-end anastomosis, have been reported.[5–7] Deciding which procedure to perform depends mainly on the location of the lesion. For instance, in cases of SAAs distal to the left gastroepiploic artery, splenectomy is indicated regardless of splenic artery reconstruction.[12] Aneurysmectomy with end-to-end reconstruction is rarely reported. The only publication to describe an end-to-end anastomosis was done so in the proximal splenic artery, in order to restore the blood flow to the spleen rather than to prevent splenic infarction.[7] Recently, robotic surgical repair using the da Vinci system has allowed for extremely accurate dissection, as well as the performance of vascular anastomoses. The application of da Vinci in management of SAAs thus far has remained limited, but it offers a promising alternative modality for treatment.

Although laparoscopic splenectomy is a well-established procedure with low risk of postoperative morbidity and mortality,[13] spleen preservation is always advocated to avoid postsplenectomy thrombocytosis and potential immunodeficiency. Postsplenectomy thrombocytosis occurs particularly in patients with myeloproliferative disorders, which can result in thrombosis of the mesenteric, portal, and renal veins and can be life-threatening because it can lead to hemorrhage and thromboembolism. Another morbidity after splenectomy is overwhelming postsplenectomy infection (OPSI), which is the most common fatal complication of splenectomy. The exact incidence of OPSI is difficult to determine, because infection in postsplenectomy patients is likely to be under-reported. In fact, OPSI may occur at any time after splenectomy.[14] As a result, aneurysmectomy with spleen preservation should be advocated if conditions permit.

In this case, the distal SAA was located in the splenic hilum region, indicating that splenic artery reconstruction was required to preserve the spleen.[15] To the best of our knowledge, laparoscopic aneurysmectomy followed by reconstruction of the distal splenic artery to treat SAA has never been documented before. As far as we know, splenic artery ligation may not even cause infarction of the spleen, because of sufficient collateral splenic circulation. There are circumstances in which short gastric artery shares a trunk with cranial splenic arteries. For this patient, we clamped the inflow of the SAA temporarily and evaluated blood perfusion to spleen during the operation. Blood flow did decrease dramatically after the proximal splenic artery was clipped. Thereafter, aneurysmectomy followed by splenic artery reconstruction was performed for the sake of spleen preservation.

Consummate laparoscopic surgical skills are required for the accurate and fine dissection and the performance of laparoscopic end-to-end arterial anastomoses. Our surgical team had experience in vascular anastomosis during laparoscopic pancreatoduodenectomy. Venous patch or artificial vascular patch is widely used in cases of open vessel reconstruction, which seems impractical in the laparoscopic procedure without robotic surgical system aid. In this case, we reconstructed the splenic artery by running suture without vascular patch to facilitate the procedure and reduce the incidence of leakage.

4. Conclusions

Patients with distal SAA can be treated by laparoscopic aneurysmectomy with end-to-end anastomosis to preserve the spleen. The laparoscopic procedure is safe and feasible in the selected patients, who receive rigorous preoperative examination, sufficient preoperative preparation, careful operation, and intensive postoperative care.

References

[1] Trastek VF, Pairolero PC, Joyce JW, et al. Splenic artery aneurysms. Surgery 1982;91:694–9.
[2] Abbas MA, Stone WM, Fowl RJ, et al. Splenic artery aneurysms: two decades experience at Mayo clinic. Ann Vasc Surg 2002;16:442–9.
[3] Hogendoorn W, Lavida A, Hunink MG, et al. Open repair, endovascular repair, and conservative management of true splenic artery aneurysms. J Vasc Surg 2014;60:1667.e1–776.e1.
[4] Hashizume M, Ohta M, Ueno K, et al. Laparoscopic ligation of splenic artery aneurysm. Surgery 1993;113:352–4.
[5] Pietrabissa A, Ferrari M, Berchiolli R, et al. Laparoscopic treatment of splenic artery aneurysms. J Vasc Surg 2009;50:275–9.
[6] Arca MJ, Gagner M, Heniford BT, et al. Splenic artery aneurysms: methods of laparoscopic repair. J Vasc Surg 1999;30:184–8.
[7] Tiberio GA, Bonardelli S, Gheza F, et al. Prospective randomized comparison of open versus laparoscopic management of splenic artery aneurysms: a 10-year study. Surg Endosc 2012;DOI 10.1007/s00464-012-2413-2. [Epub ahead of print].
[8] Moyer HR, Hiramoto JS, Wilson MW, et al. Stent-graft repair of a splenic artery aneurysm. J Vasc Surg 2005;41:897.
[9] Briard RJ, Lee J, Doyle T, et al. Endovascular repair of a portal hypertension-related splenic artery aneurysm using a self-expanding stent-graft. Cardiovasc Intervent Radiol 2009;32:1111–3.
[10] Grover BT, Gundersen SB 3rd, Kothari SN. Laparoscopic distal pancreatectomy and splenectomy for splenic artery aneurysm [Video]. Surg Endosc 2010;24:2318–20.
[11] Saw EC, Ku W, Ramachandra S. Laparoscopic resection of a splenic artery aneurysm. J Laparoendosc Surg 1993;3:167–71.
[12] Geroulakos G, Wright JG, Tober JC, et al. Use of the splenic and hepatic artery for renal revascularization in patients with atherosclerotic renal artery disease. Ann Vasc Surg 1997;11:85–9.
[13] Hong D, Cheng J, Wang Z, et al. Comparison of two laparoscopic splenectomy plus pericardial devascularization techniques for management of portal hypertension and hypersplenism. Surg Endosc 2015; 29:3819–26.
[14] Horowitz J, Smith JL, Weber TK, et al. Postoperative complications after splenectomy for hematologic malignancies. Ann Surg 1996;223:290–6.
[15] Carr SC, Pearce WH, Vogelzang RL, et al. Current management of visceral artery aneurysms. Surgery 1996;120:627–33.