

Surgical repair of a celiac artery aneurysm using a sutureless proximal anastomosis device

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ABSTRACT

Some celiac artery aneurysms are not suitable for endovascular therapy. We describe the case of a 63-year-old man with a celiac trunk aneurysm extending to the hepatosplenic bifurcation. The aneurysm was resected and oversewn at the origin from the abdominal aorta. A saphenous vein bypass from the supraceliac aorta to the celiac artery bifurcation was performed using a sutureless anastomotic device (PAS-Port system; Cardica, Redwood City, Calif) to create the proximal anastomosis, eliminating the need for aortic clamping. This system is thought to make direct proximal aortic anastomosis safe and easy in patients requiring surgical reconstruction of celiac artery aneurysms. (*J Vasc Surg Cases and Innovative Techniques* 2017;3:221-4.)

Celiac artery aneurysms are rare, representing 4% of visceral aneurysms and only 0.01% of all aneurysms.¹ Intervention is generally suggested for aneurysms >2 cm in diameter because of the high mortality rate associated with their rupture.² Despite the advantages associated with the use of endovascular techniques to manage some celiac aneurysms, surgical repair is required for many owing to the lack of appropriate landing zones for the placement of covered stents and the extension of the aneurysms to the origin of the hepatic and splenic arteries, which was the case of the patient in this case report.³

Many surgeons would consider the creation of the proximal anastomosis to the supraceliac aorta to be the most challenging portion of the surgical management of this problem. We present the case of a celiac aneurysm that was repaired using a sutureless proximal anastomotic device, enabling creation of a vein graft reconstruction of the aneurysm but not requiring aortic clamping.

Written informed consent was obtained from the patient for the publication of this case report and accompanying images.

CASE REPORT

A 63-year-old man was referred to our institution for the management of a 35-mm celiac artery aneurysm. His history

was remarkable for an intestinal injury from a traffic accident 8 years earlier treated with an emergency intestinal resection at another hospital. At the current presentation, a computed tomography (CT) scan revealed an incidental 35-mm celiac artery aneurysm (Fig 1), which was located close to the celiac artery origin and extended to its bifurcation into the hepatic and splenic arteries. Other CT findings included diffuse atherosclerotic calcified plaques of the entire abdominal aorta. We decided to treat the aneurysm because of the risk of rupture.

Although endovascular stenting in conjunction with coil embolization was considered, a conventional surgical approach was thought to be more appropriate because of the lack of an adequate seal zone for a stent both proximally and distally in the aneurysm. We planned resection of the aneurysm and revascularization from the abdominal aorta to the common hepatic and splenic arteries, using an autologous saphenous vein graft.

Under general anesthesia, a midline upper laparotomy was performed to approach the celiac artery aneurysm, with the patient in the supine position. An autologous saphenous vein graft was harvested through a small skin incision with the aid of endoscopy. The numerous adhesions encountered on entering the abdominal cavity were lysed. Opening of the lesser omentum exposed the celiac artery, which was dissected from the upper aspect of the pancreas and surrounding structures. The branches arising from the celiac artery aneurysm, including the left gastric, hepatic, and splenic arteries, were also exposed. The left triangular ligament of the liver was disconnected from the diaphragm, and the left lobe of the liver was mobilized to the right, allowing excellent surgical exposure around the supraceliac abdominal aorta. By dissection of the median arcuate ligament and the celiac ganglion, the anterior aspect of the aorta was exposed. We considered that the performance of a hand-sewn anastomosis to the supraceliac aorta with partial aortic clamping was a technically challenging step in the operation. Instead, use of a sutureless proximal anastomosis device was considered safe and reliable, and the quality of the aorta seemed to be satisfactory for the use of the PAS-Port system (Cardica,

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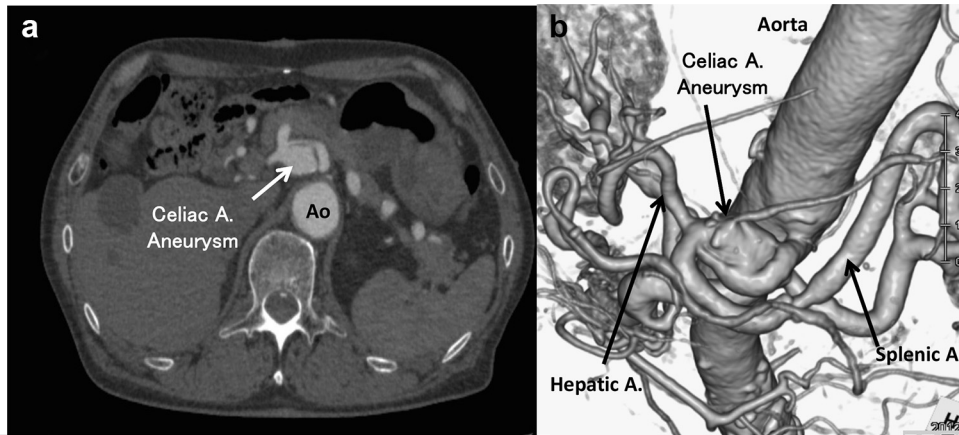


Fig 1. a, Computed tomography (CT) scan shows the aneurysm of the celiac artery, approximately 35 mm in size. **b**, Reconstructed three-dimensional images demonstrate that the aneurysm is located close to the celiac artery origin and extends to the hepatosplenic bifurcation. A, Artery; Ao, aorta.



Fig 2. a, PAS-Port device (Cardica, Redwood City, Calif). **b**, Schematic drawing of the anastomosis with the PAS-Port system. **c**, Inside view of the anastomosis.

Redwood City, Calif).⁴ The harvested autologous great saphenous vein was loaded into the PAS-Port system (Fig 2). After systemic heparinization, the common hepatic, left gastric, and splenic arteries were clamped. The aneurysm was resected, and the origin of the celiac artery was oversewn by direct over-and-over suture. The target anastomotic site of the aorta was identified, and we created a proximal anastomosis using the PAS-Port system. After its successful deployment, the distal portion of the saphenous vein was anastomosed to the hepatosplenic bifurcation; the left gastric artery was ligated (Fig 3, a and b).

Gross and microscopic evaluation of the surgical specimen confirmed that it was an atheromatous celiac artery aneurysm. An association between this arterial dissection and the past history of blunt abdominal trauma was highly suspected. The patient had no episodes of postoperative atherosclerotic emboli or other complications. The patient

was discharged on postoperative day 10. CT performed 7 days after the operation showed patency of the saphenous vein graft (Fig 3, c). The patient was in good health at his 6-month follow-up visit.

DISCUSSION

A celiac trunk aneurysm is rare, and detection is incidental in most cases. Approximately 15% to 20% of cases are complicated by rupture, with a mortality rate of approximately 80%.² Celiac artery aneurysms tend to rupture into the lesser sac initially, with subsequent intraperitoneal rupture. It is generally recommended that elective repair be considered in patients with aneurysms >2 cm.⁵

Recently, with advancements in endovascular techniques, traditional surgical therapy is increasingly being replaced by endovascular aneurysm exclusion, such as

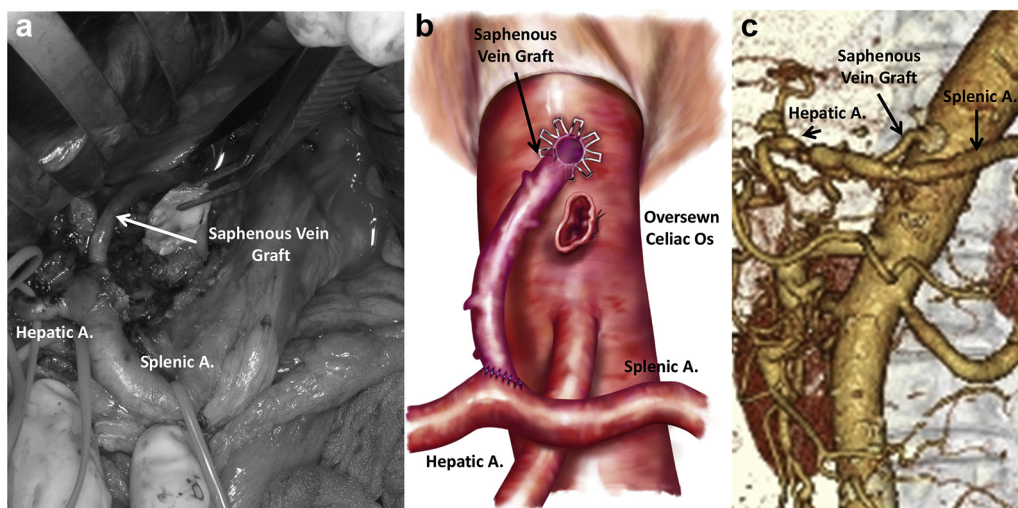


Fig 3. **a**, Intraoperative photograph shows vascular reconstruction of the celiac trunk to the hepatosplenic bifurcation with an autologous saphenous vein graft. **b**, Schematic drawing shows the resection of the celiac artery aneurysm and revascularization of the aorta-common hepatic and splenic arteries. A proximal anastomosis is performed using the PAS-Port system (Cardica, Redwood City, Calif). The origin of the celiac artery is oversewn. **c**, Reconstructed image of the postoperative computed tomography (CT) scan. A, Artery.

stent graft implantation and embolization.^{3,6,7} In contrast, to complete endovascular repair, technical difficulties are occasionally encountered in patients with unsuitable anatomic findings. In our patient, the endovascular procedure was not feasible because of an inadequate landing zone and its location; therefore, we performed conventional surgical repair consisting of revascularization of the aorta-common hepatic and splenic arteries with the use of an autologous saphenous vein graft.

Celiac artery aneurysms are associated with an abdominal aortic aneurysm in 18% of cases.² Thus, patients with celiac artery aneurysms often have a high frequency of atherosclerotic plaques of the supraceliac abdominal aorta. Proximal anastomosis of the saphenous vein graft requires clamping of the abdominal aorta to perform a hand-sewn technique. However, manipulation of the diseased aorta with partial occlusion is associated with an increased risk of distal aortic atheroemboli⁸ and aortic dissection.

With the accepted advantages of off-pump coronary bypass procedures, a proximal anastomotic device, the PAS-Port system, is widely used in Japan.⁹ This product has many advantages, such as avoiding placement of clamps on the diseased aorta, saving time, facilitating limited access surgery, and standardizing the anastomosis compared with hand-sewn anastomosis. We consider it an ideal device for proximal anastomosis to avoid clamping of the abdominal aorta, especially in patients with atherosclerotic disease. The PAS-Port system was originally developed for use in coronary bypass surgery; therefore, our modification in this case represents an off-label use. This device is single use for proximal vein graft

anastomosis. The process of sutureless anastomosis was accomplished by the appropriate loading of the vein graft inside the device, followed by the creation of the aortotomy and deployment in one single motion. For successful sutureless anastomosis with this device, care should be taken to confirm suitable conditions: vein graft diameter, 4 to 6 mm; aortic wall thickness, 1 to 4 mm; and mean aortic pressure at deployment, >50 mm Hg. In the case of bleeding at the anastomosis site due to misdeployment of staples, rescue methods should be considered. From our experience, purse-string sutures around the staples and some additional interrupted stitches were effective at controlling bleeding. We need to consider backup plans in situations arising from technical failure of this novel device.

To our knowledge, this is the first report of a celiac trunk aneurysm extending to the hepatosplenic bifurcation that was repaired by the PAS-Port system. This device could contribute to a safe and accurate anastomosis to the supraceliac aorta compared with the conventional hand-sewn technique. The PAS-Port system could minimize the operative risk, enabling sutureless proximal anastomosis of a saphenous vein graft in patients with celiac artery aneurysm.

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