Iliohepatic artery bypass for hepatic ischemia after repair of mycotic celiac artery aneurysm

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ABSTRACT

An 81-year-old woman presented to our institution with a contained ruptured mycotic aortic aneurysm involving the takeoff of the celiac artery that required ligation of the celiac trunk, resulting in foregut ischemia and the need for revascularization. The technique of aortic reconstruction with delayed hepatic artery revascularization by a common iliac artery to hepatic artery bypass is described. (J Vasc Surg Cases and Innovative Techniques 2019;5:160-2.)

Keywords: Mycotic aneurysm; Celiac artery aneurysm

CASE REPORT

An 81-year-old woman with a history of hypertension and breast cancer presented to our institution with complaints of back pain radiating to the groin. The pain started 6 weeks earlier and was associated with intermittent fever. A computed tomography (CT) scan showed inflammatory changes and aneurysmal degeneration of the aorta at the level of the celiac axis, consistent with aortitis of an unknown cause. The white blood cell count was 18,000 cells/μL, and blood cultures were positive for methicillin-sensitive *Staphylococcus aureus*. The decision was made to treat her nonoperatively with intravenous antibiotic therapy while a metastatic workup for recurrent cancer was completed secondary to new lung nodules seen on chest CT. Six days later, worsening pain prompted repeated CT, which showed marked worsening aneurysmal change with degeneration and contained rupture (Figs 1 and 2). Oncologic workup was negative, and her lung nodules were attributed to septic emboli. Urgent operative intervention ensued.

The patient underwent open repair with an interposition polytetrafluoroethylene (PTFE) bypass through a retroperitoneal thoracoabdominal approach. After initial exposure, the decision was made to place an intravascular shunt to maintain distal and renal perfusion while aortic débridement and repair were performed. This was accomplished by sewing in a 10-mm ringed PTFE graft from the midthoracic aorta to just below the renal arteries. This shunt could then go on to be used for celiac artery revascularization at the completion of aortic débridement should it be needed. The thoracic aorta was clamped proximally just below the shunt and distally just above the renal arteries. The superior mesenteric artery (SMA) was controlled with a vessel loop, and the dissection was carried to the level of the celiac axis, where the area of contained rupture was opened. There was a dense inflammatory reaction, making the dissection difficult. The degenerated area of aorta and the proximal celiac artery were débrided to healthy tissue. Approximately 5 cm of infected aorta and inflammatory rind was excised. Interposition reconstruction of the aorta was then performed from the descending thoracic aorta to just above the SMA using a 20-mm PTFE graft, anastomosed with 3-0 Prolene suture. After unclamping, significant backbleeding was noted from the débrided celiac artery, and hemostasis was achieved using a Fogarty catheter. Attempts were made at dissecting out the distal celiac artery further with consideration for revascularization, but the artery was friable and exposure was difficult. Because of the significant pulsatile backbleeding, the decision was made to oversew this vessel and to rely on collateral circulation from the SMA and gastroduodenal artery (GDA) to provide hepatic perfusion. The shunt was removed, and the peritoneal cavity was entered to examine the viability of the liver and small bowel. Both appeared normal. The patient tolerated the surgery well and was extubated the following day.

At 48 hours postoperatively, the patient developed an acute transaminitis with aspartate aminotransferase of 2712 U/L, alanine aminotransferase of 760 U/L, and alkaline phosphatase of 417 U/L and a leukocytosis of 35,800 cells/μL. She was taken to the operating room for exploration and possible hepatic revascularization. A laparotomy was performed, which revealed a gangrenous gallbladder and mildly ischemic liver. The patient underwent an open cholecystectomy followed by hepatic artery (HA) revascularization.

The right common iliac artery (CIA) was chosen as inflow for the HA bypass on the basis of the preoperative CT scan and clinical inspection. The HA was exposed medial to the porta hepatis and proximal to the takeoff of the GDA. A weak Doppler signal was present, but no pulse could be palpated. A Kocher maneuver was then performed to further facilitate the tunneling of the bypass. The patient was systemically heparinized, and an 8-mm thin-walled ringed PTFE graft was anastomosed in an end-to-side fashion to both the CIA and HA using 5-0 Prolene

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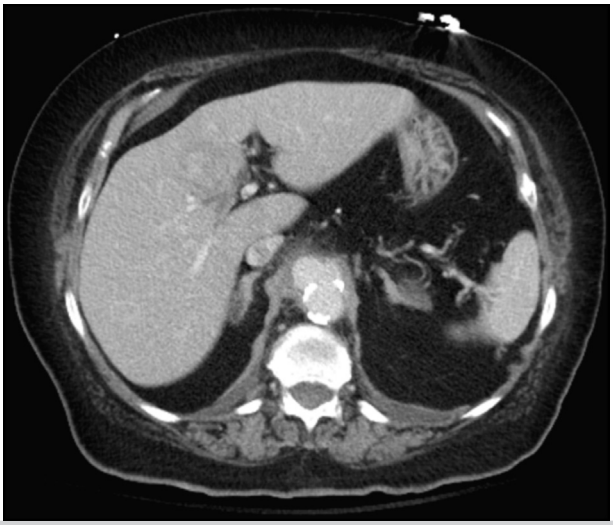

Fig 1. Computed tomography (CT) showing aneurysmal dilation of the origin of the celiac artery measuring up to 1.6 cm.

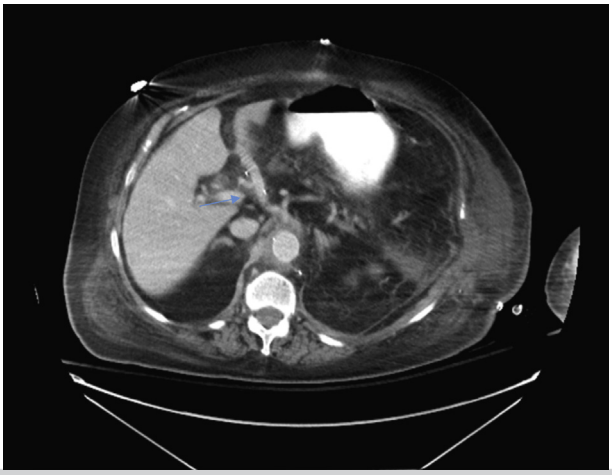

Fig 3. Computed tomography (CT) demonstrating the hepatic artery (HA) anastomosis with significant filling of adjacent vessels.

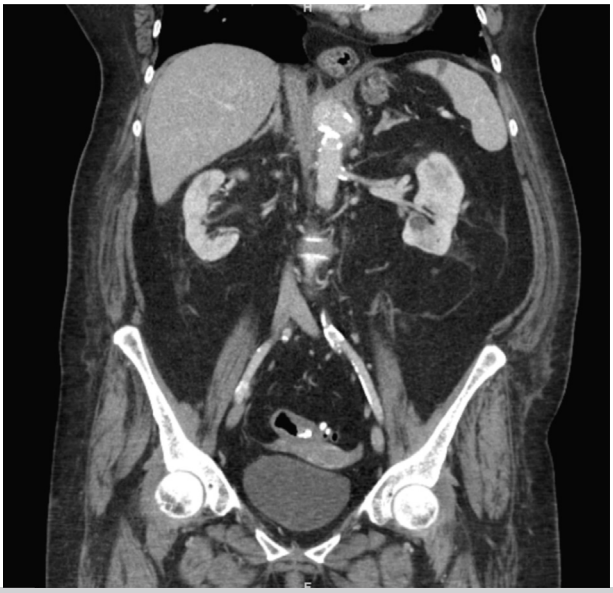

Fig 2. Computed tomography (CT) demonstrating aortitis with associated celiac artery pseudoaneurysm.

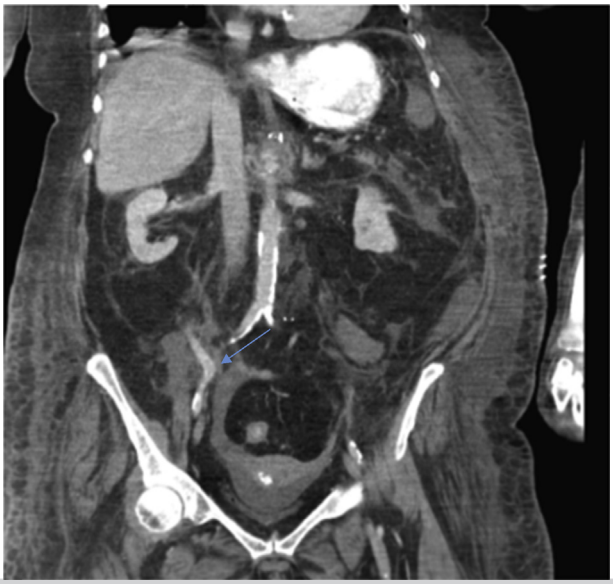

Fig 4. Computed tomography (CT) demonstrating the common iliac artery (CIA) anastomosis.

running suture (Figs 3 and 4). The graft was tunneled away from the operative field of the cholecystectomy. At completion, there was a strongly palpable pulse in the distal HA and GDA. The hepatic and gastric parenchyma appeared normal. She tolerated this procedure well and was extubated within 48 hours. Her hepatic function study results normalized by postoperative day 6. Her intraoperative culture specimens grew methicillin-sensitive *S. aureus*, and she was discharged to rehabilitation 2 weeks after her second operation on intravenous cefazolin with plans for lifelong antibiotic therapy. She was seen in follow-up at 2 weeks and was doing well. She was followed up by our infectious disease colleagues, and repeated imaging at 2 months showed no periaortic infection. Laboratory values also reflected improvement of her infection with a decrease in C-reactive protein level and erythrocyte sedimentation rate at 2 months to values of 18 mg/L and 81 mm/h, respectively, from preoperative values of 181 mg/L and 116 mm/h. She was seen at 6 months and was doing well from a surgical standpoint.

We received the patient's consent to publish this case.

DISCUSSION

Mycotic aortic aneurysms are a rare and morbid subset of aortic aneurysms constituting only 1% to 3% of all arterial aneurysms.[1] They can be classified as either

primary or secondary, depending on whether they occur in a previously nonaneurysmal aorta or a pre-existing aneurysm, respectively.[1,2] Increased mortality has been noted for suprarenal compared with infrarenal iliac artery aneurysm.[3-5] Most visceral mycotic aneurysms involve the SMA and are manifested as mesenteric ischemia; however, cases affecting the celiac,[6] hepatic, splenic, renal, pulmonary, and coronary arteries have been reported.[1] The natural pathogenesis of untreated mycotic aneurysms is fatality from massive hemorrhage or fulminant sepsis.[1]

Patients with positive blood cultures and arterial aneurysms should be considered to have an infected aneurysm until proven otherwise. Fever and localized back pain are the most notable feature at presentation for mycotic abdominal aortic aneurysms.[3] The majority of mycotic aneurysms are bacterial in nature, with *S. aureus* and *Salmonella* being the most commonly identified organisms in 45% and 40% of cases, respectively.[1,3] Medical therapy alone is associated with poor outcome, with in-hospital mortality of 50% and event-free 1-year survival of only 32%.[7] The treatment of choice is surgical resection, wide débridement of infected periaortic tissue, oversewing of the arterial stump, and revascularization of aortic flow through uninfected tissue planes.[3,8] Some areas of the aorta are not amenable to extra-anatomic bypass and require in situ replacement with a prosthetic graft.[3] The proposed merits of in situ aortic reconstruction are better patency and superior hemodynamic property compared with axillobifemoral bypass. To reduce the risk of aortic graft infection, several graft materials and adjuvant procedures have been introduced, including antibiotic-releasing beads, graft wrapping with omentum, use of rifampin-soaked grafts, silver-coated Dacron, cryopreserved allograft, and even autogenous femoropopliteal vein graft.[9] In the absence of severe purulent infection and for patients with less virulent gram-positive bacterial infections, repair using prosthetic graft is recommended and achieves durable results.[9,10] Our choice of PTFE graft was largely based on the urgent nature of the procedure and the graft's availability at our institution. We thought that we could achieve durable and safe results while treating the patient in a timely fashion.

The celiac artery can usually be ligated without danger of hepatic and gastric ischemia if the SMA is patent.[11] The circulation to the liver is maintained by collateral flow, namely, the SMA, which feeds the GDA in a retrograde fashion.[6] Because of the extensive débridement required to the proximal celiac artery, reimplantation was not feasible, nor was an aortic to HA bypass possible because of limited HA exposure from the initial thoracoretroperitoneal approach. It was recognized at that time that should HA revascularization be needed, it could easily be accomplished by a transperitoneal approach. The preferred operative procedure in celiac artery aneurysm is aneurysmectomy with revascularization of the foregut.[12] Although our patient had an infected pseudoaneurysm of the celiac axis, the same principles can be applied.

CONCLUSIONS

Mycotic aneurysms are a rare but morbid subset of aortic aneurysms. Reports of successful medical management of iliac artery aneurysms are scarce, and definitive surgical treatment should be planned promptly. Should ligation of the celiac artery be needed, revascularization of the HA through an aortic or CIA bypass should be considered when it is feasible; however, most patients will survive off of collateral flow. Whereas there is ample literature regarding graft choice in mycotic aneurysm repair and PTFE is the least desired option, it can be used to achieve safe and durable results in the absence of frank purulence, with débridement of the infected tissue, and when the pathogenesis is attributable to less virulent organisms.

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