Open repair of a *Coxiella burnetii*-associated abdominal aortic endovascular stent graft infection with a cryopreserved allograft using visceral artery pump perfusion

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ABSTRACT

Coxiella burnetii, the causative organism of Q fever, has been increasingly reported to be associated with infections of abdominal aortic aneurysms and endovascular stent grafts. We have added to the current literature by presenting a case of the surgical management of chronic Q fever that had infected a prior aortic endovascular stent graft placed for a contained rupture of an infrarenal aortic aneurysm in a 68-year-old woman. We presented our case of the surgical management of the excision and explantation of the infected aorta and stent graft, with reconstruction of the aorta using a cryopreserved aortic graft and visceral artery pump perfusion. (J Vasc Surg Cases Innov Tech 2022;8:89-92.)

Keywords: Chronic Q fever; *Coxiella burnetti*; Infected stent graft; Q fever; Visceral artery pump perfusion

Coxiella burnetii, the causative organism of Q fever, has been increasingly reported to be associated with infections of abdominal aortic aneurysms and endovascular stent grafts.[1-4] Chronic Q fever has a unique affinity to intravascular pathology, and this indolent organism can survive in macrophages present in the thrombus of the aortic aneurysm.[5] Untreated chronic Q fever incurs significant morbidity and mortality.[6,7] Limited cases describing the medical or surgical management of *Coxiella burnetii*-associated mycotic aortic aneurysms have been reported.[8-10] We have added to the current literature by presenting a case of the surgical management of chronic Q fever involving an abdominal aortic endovascular stent graft in a 68-year-old woman with a history of endovascular aneurysm repair (EVAR) (Supplementary Video 1).

CASE REPORT

Three years before her presentation, a 68-year-old woman with a medical history significant for hypertension and hyperlipidemia had undergone EVAR of what had been thought to be a contained rupture of an infrarenal aortic aneurysm at another institution (Fig 1). The patient recovered well, with surveillance computed tomography angiography (CTA) at the 3-month follow-up examination showing good positioning of the endovascular stent graft but with continued inflammation around the aortic aneurysm (Fig 2).

Three years later, the patient had presented to our hospital with worsening lower back pain and intermittent fevers for months. She was afebrile on admission, and the findings from her abdominal examination were benign. The only laboratory abnormality was elevated inflammatory markers.

Her CTA on admission showed inflammation around the EVAR extending to the pararenal aorta, with an associated fluid collection into the left psoas muscle (Fig 3). The tagged white blood cell scan was normal. Magnetic resonance imaging of her lumbar spine showed L2-L4 cortical abnormalities from the inflammatory and/or infectious process of the aorta.

The patient lived in rural Southern California in Riverside County with frequent contact with numerous farm animals. Because of her unique animal exposure, she was evaluated for zoonotic infections, revealing significantly elevated *Coxiella* IgG titers (*Coxiella* IgG phase I, 1:16384; IgG phase 2, 1:8192; reference range, < 1:16 [considered negative]). This finding confirmed the diagnosis of chronic Q-fever infection. It was possible, she had had undiagnosed Q fever aortitis when she had originally undergone EVAR 3 years earlier, allowing chronic Q fever to seed the endovascular stent graft and extend into the pararenal aorta.

Hydroxychloroquine and doxycycline were started for chronic Q fever infection. Surgery was planned to remove the infected

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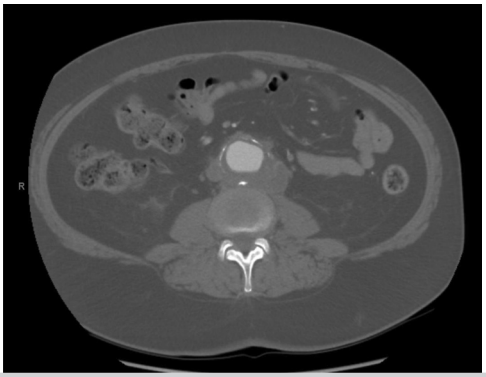

Fig 1. Imaging scan before endovascular aneurysm repair (EVAR) of our patient's abdominal aortic aneurysm with findings concerning for rupture.

Fig 2. Imaging scan after endovascular aneurysm repair (EVAR) of our patient's abdominal aortic aneurysm with continued surrounding inflammation present.

graft and pararenal aorta, with reconstruction using a cryopreserved cadaveric graft.

SURGICAL MANAGEMENT AND TECHNIQUE

The repair was performed via a right lateral decubitus position for a left retroperitoneal approach. The bilateral external and internal iliac arteries were controlled. The tissue around the infrarenal aneurysm and the juxtarenal aorta was inflamed and friable. Given the juxtarenal aorta dilation and infection, the supraceliac aorta, celiac artery, superior mesenteric artery (SMA) and left renal artery were controlled. Given the exposure, the right renal artery could not be controlled before opening the aneurysm.

To minimize visceral ischemia during the supraceliac aortic cross-clamp time, we planned to use selective visceral perfusion. A 19F venous cannula (Medtronic, Minneapolis, Minn) was placed into the left common femoral vein and advanced into the right atrium using the Seldinger technique and fluoroscopy. We used 100% fraction of inspired oxygen to hyperoxygenate the venous blood, and a Biomedicus 560 centrifugal pump (Medtronic) was used to deliver this blood through three individual 9F balloon perfusion catheters prepared for the SMA and bilateral renal arteries.[10-12] We had not planned to cannulate the celiac artery, given the limited exposure of the orifice with the supraceliac clamp.

The patient was given systemic heparin, and the supraceliac aorta and iliac arteries were clamped. The aneurysm and pararenal aorta were opened. The orifices of the native celiac artery, SMA, and right renal artery were not involved with the infection; however, the origin of the left renal artery was involved with inflammation. The right renal orifice was controlled with a Fogarty balloon until it could be dissected out and controlled. Perfusion catheters were placed into the bilateral renal and SMA orifices. The flow rates were increased by 200 mL/min as each visceral artery was serially cannulated.

The main body to the EVAR was removed. The infected aorta was debrided. The aorta was beveled to include the celiac artery, SMA, and right renal artery, and the left renal artery was transected near the orifice. A cadaveric cryopreserved aortoiliac graft (CryoLife, Inc, Kennesaw, Ga) had been previously prepared, with an additional side limb using a cryopreserved femoropopliteal artery segment (CryoLife, Inc) on the back table. Although autologous femoral veins and rifampin-soaked grafts could have been used, we preferred cryopreserved allografts to avoid the time and morbidity of femoral vein harvest. We have also found it more resistant to infection than rifampin-soaked grafts.

The modified cryoaortoiliac graft was anastomosed to the beveled aorta. The selective perfusion catheters were removed after the proximal anastomosis had been completed. The total perfusion time was 27 minutes for the SMA and 29 minutes for the right renal artery.

The arteriotomy was carried onto the left common iliac artery past the endograft limb, which was then removed. The left limb of the aortoiliac graft was sewn end-to-end to healthy left common iliac artery. With the redundancy removed from the aortoiliac graft, the additional graft limb for the left renal artery bypass was brought to length to avoid redundancy and anastomosed end-to-end to the left renal artery. The total perfusion time for the left renal artery was 93 minutes. The arterial reconstruction was completed with anastomosis of the right limb of the graft to healthy right common iliac artery, after removal of the right limb of the endograft.

Any residual infected aorta and thrombus were debrided. The left psoas abscess was drained. The anterior spinal ligament was seen and not violated. The effects of heparin were reversed, and the venous sheath for visceral artery perfusion was removed. The incision was closed in layers.

On postoperative day (POD) 1, the glomerular filtration rate was slightly decreased to 50 mL/min/body surface

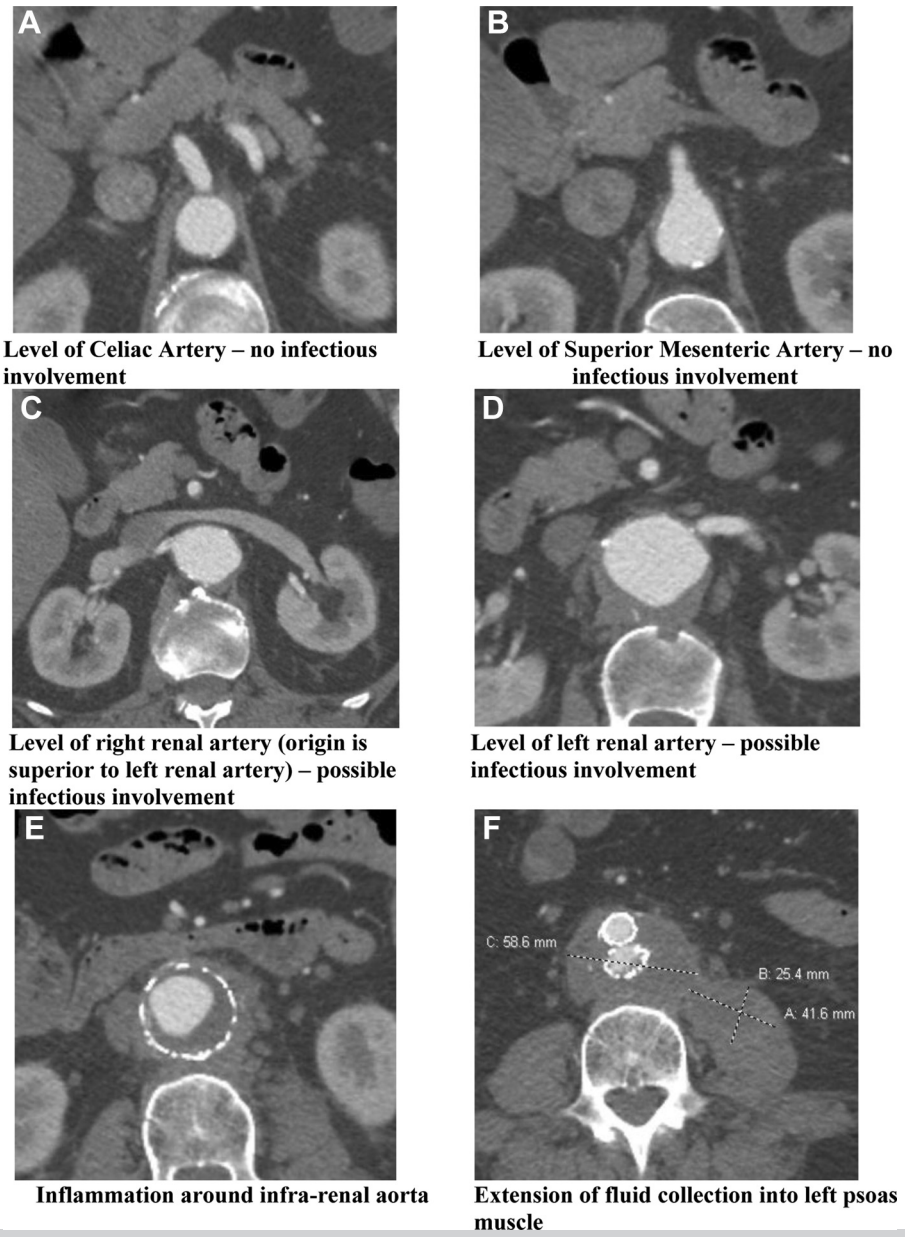

Fig 3. Computed tomography angiogram (CTA) at presentation to the hospital, including segmental cuts at the levels of each visceral and renal arteries.

area (baseline, 65 mL/min/body surface area), and the creatinine was slightly elevated to 1.12 mg/dL (baseline, 0.98 mg/dL). By POD 2, it had normalized. Her highest lactate level immediately postoperatively had been 4.5 mmol/L and had normalized by POD 3. She had had an otherwise uneventful postoperative course and was discharged home on POD 9 with a prescription for antimicrobial therapy.

Surveillance imaging at 12 months showed a patent repair with significant improvement of inflammation and resolution of the psoas abscess (Fig 4). We have planned to monitor the aorta with biannual CTA studies. Her 12-month Coxiella titers (IgG phase 1, 1:2048; IgG phase 2, 1:1:2048) had continued to show improvement. She has been treated with doxycycline and hydroxychloroquine with a planned duration of 24 to 36 months or, possibly, indefinitely until her Coxiella phase IgG titers have decreased to <1:200.[7,13]

CONCLUSIONS

We have described the successful surgical management of chronic Q fever involving an EVAR stent graft. The diagnosis of *Coxiella burnetii* vascular infection requires a high index of suspicion, and many noncardiac endovascular infections could be underrecognized. Without surgical resection and removal of the infected

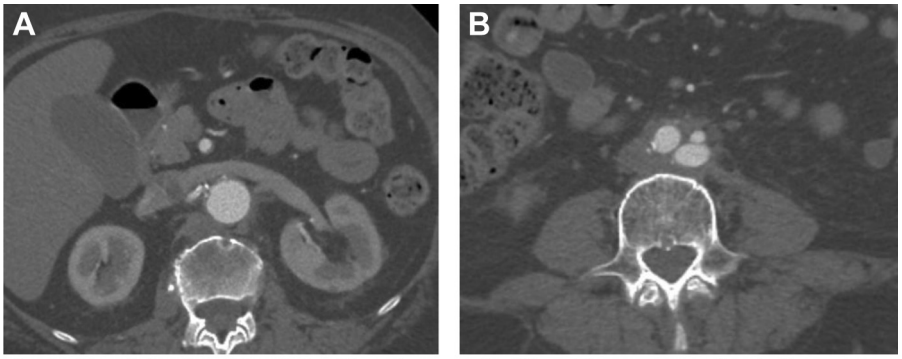

Fig 4. Axial view of a 12-month surveillance computed tomography angiogram (CTA) after open repair of the abdominal aortic aneurysm with new aortoiliac bypass.

intravascular graft, the prognosis will likely be poor. For extensive dissection during repair of the infected aneurysm and anticipated prolonged ischemia time, selective perfusion of the visceral vessels can be used to reduce ischemia during the surgery.

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