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

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Case Report

Statement:
This report has been presented as a plenary session at the Society of Vascular Surgery – Vascular Annual Meeting on 8/18/2021. This report has not been previously published or submitted elsewhere for publication and will not be sent to another journal until a decision is made concerning publication by Journal of Vascular Surgery Cases, Innovation and Techniques.
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 add to the current literature by presenting a case of the surgical management of chronic Q fever that infected a prior aortic endovascular stent graft placed for a contained rupture of an infrarenal aortic aneurysm in a 68-year-old female. We present our case of the surgical management of the excision and explantation of the infected aorta and stent graft, and reconstruction of the aorta using cryopreserved aortic graft using visceral artery pump perfusion.

Keywords:
Coxiella burnetti, Q fever, Chronic Q fever, infected stent graft, visceral artery pump perfusion

Conflict of Interest:
None

Sources of Outside Support:
None
MANUSCRIPT:

Introduction:

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 intra-vascular 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). There have been limited case reports describing the medical or surgical management of Coxiella burnetii associated mycotic aortic aneurysms (8,9,10). We add to the current literature by presenting a case report of the surgical management of chronic Q fever involving the abdominal aortic endovascular stent graft in a 68-year-old woman with prior history of endovascular aneurysm repair (EVAR).

Case Report:

Three years prior, a 68-year-old female with past medical history significant for hypertension and hyperlipidemia had an EVAR repair of what was thought to be a contained rupture of an infrarenal aortic aneurysm at another institution (Figure 1). The patient recovered well, with surveillance imaging at 3-month follow up with computed tomographic angiography (CTA) showing good positioning of the endovascular stent graft but with continued inflammation around the aortic aneurysm (Figure 2).

Three years later, the patient presented to our hospital with worsening lower back pain and intermittent fevers for months. She was afebrile on admission, and her abdominal exam was benign. The only laboratory abnormality was elevated inflammatory markers.
Her CTA on admission showed inflammation around the EVAR extending to the para-renal aorta, with an associated fluid collection into the left psoas muscle (Figure 3). Tagged white blood cell scan was normal. A magnetic resonance imaging (MRI) of her lumbar spine showed L2-L4 cortical abnormalities from the inflammatory/infectious process of the aorta.

The patient lived in rural Southern California in Riverside County with frequent contact to numerous farm animals. Due to her unique animal exposure, she was worked up for zoonotic infections, revealing significantly elevated Coxiella IgG titers, her Coxiella IgG phase I: 1:16384, and IgG phase 2: 1:8192 (reference range: < 1:16 is considered negative). This confirmed the diagnosis of chronic Q-fever infection. It was possible, she had undiagnosed Q fever aortitis when she originally treated with an EVAR three years prior, leaving chronic Q fever to seed the endovascular stent graft and extend into the para-renal aorta.

She was started on hydroxychloroquine and doxycycline for chronic Q fever infection. Surgery was planned to remove the infected graft, para-renal aorta, and reconstruction with 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 juxta-renal aorta was in flamed and friable. Given the juxta-renal aorta dilation and infection, the supra-celiac aorta, celiac artery, super mesenteric artery (SMA) and left renal artery were controlled. Given the exposure, the right renal artery was unable to be controlled prior to the opening of the aneurysm.
To minimize visceral ischemia during the supra-celiac aortic cross clamp time, we planned on using selective visceral perfusion. A 19 Fr venous cannula (Medtronics, Minneapolis, MN) was placed into the left common femoral vein and advanced into the right atrium via Seldinger technique and fluoroscopy. 100% FiO2 was used to hyper-oxygenate the venous blood and a Biomedicus 560 centrifugal pump (Medtronic) was used to deliver this blood through three individual 9 Fr balloon perfusion catheters prepared for the SMA and bilateral renal arteries (10, 11,12). We did not plan on cannulating the celiac artery given limited exposure of the orifice with the supra-celiac clamp.

The patient was given systemic heparin and the supra-celiac aorta and iliac arteries were clamped. The aneurysm and para-renal aorta were opened. The orifices of the native celiac artery, SMA and right renal artery were not involved with the infection while 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. 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, SMA and right renal artery, and the left renal artery was transected near the orifice.

A cadaveric cryopreserved aortoiliac graft (Cryolife, Kennesaw GA) had been previously prepared with an additional side limb using a cryopreserved femoral-popliteal artery (Cryolife) 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, and we also find it more infection resistant than rifampin-soaked grafts.
The modified cryoaortoiliac graft was anastomosed to the beveled aorta. The selective perfusion catheters were removed after the proximal anastomosis was 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 aortoiliac graft pulled to length, 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 the 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. Heparin was reversed and the venous sheath for visceral artery perfusion was removed. The incision was closed in layers.

The postoperative day (POD) one glomerular filtration rate (GFR) was slightly decreased to 50 mL/min/BSA (baseline 65 mL/min/BSA) and creatinine slightly elevated to 1.12 mg/dL (baseline 0.98 mg/dL). By POD 2, it normalized. Her highest lactate level immediately postoperatively was 4.5 mmol/L and normalized by POD3. She had an otherwise uneventful postoperative course and was discharged home POD 9 on antimicrobial therapy.

Surveillance imaging at 12 months showed patent repair with significant improvement of inflammation and resolution of psoas abscess (figure 4). The aorta will be monitored with biannual CTA. Her 12-month Coxiella titers, IgG phase 1: 1:2048, and IgG phase 2: 1:1:2048, continue to show improvement. She is treated with doxycycline and hydroxychloroquine with
planned duration of 24-36 months, or possibly indefinitely until her Coxiella phase IgG titers
decrease to < 1:200 (7,13).

Conclusion:

Our case 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 may be under-recognized. Without
surgical resection and removal of the infected intravascular graft, prognosis is likely 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.
References:


Figure 1. Pre-EVAR repair of patient’s abdominal aortic aneurysm with concerns of rupture
Figure 2. Post-EVAR repair of patient’s abdominal aortic aneurysm with continued surrounding inflammation
Figure 3. CT Angiogram upon presentation to the hospital, including segmental cuts at the levels of each visceral and renal arteries.
Figure 5. Twelve-month surveillance CT angiogram after open repair of abdominal aortic aneurysm with new aortoiliac bypass – axial view