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Running Head: LEGMO

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ABSTRACT

Mycotic aneurysm management balances the urgency of excising infected vasculature with the need to re-vascularize in or near an infected field. We present a case of a 47-year-old male with Pseudomonas sepsis, a failed kidney transplant and a ruptured, previously stented, right external iliac pseudoaneurysm. Following excision of the infected pseudoaneurysm/stents, lower extremity revascularization was delayed through the innovative use of isolated limb perfusion using extra-corporeal membrane oxygenation followed by staged extra anatomic femoral-femoral bypass. This technique provided limb perfusion while allowing the patient’s sepsis to resolve in order to reduce the risk of recurrent infection after definitive revascularization.
Mycotic aneurysms and infected pseudoaneurysms require urgent intervention and can be complicated by rupture or systemic infection. Rupture mandates immediate excision of the affected vasculature with re-vascularization to maintain distal perfusion (1). In-situ revascularization during active infection, however, significantly increases risk of post-operative graft infection, leaving extra-anatomic bypass grafting as the modality of choice, especially in high-risk patients (2). We present a novel use of extra-corporeal membrane oxygenation (ECMO) as a bridging therapy to maintain distal limb perfusion between excision of an infected pseudoaneurysm in the external iliac artery and revascularization.

A 47-year-old male with a failed kidney transplant presented to our hospital with sepsis, a tender pulsatile right lower quadrant mass and generalized weakness. Patient had a three-year history of end-stage renal disease managed with peritoneal dialysis. Three months prior to presentation to our institution, the patient had undergone a kidney transplant complicated by right external iliac artery (EIA) dissection leading to an infarcted kidney transplant. A thrombectomy of the right EIA and transplant kidney explant was performed with need to place a bare metal stent in the EIA to treat a localized dissection. The patient recovered and was discharged on aspirin/clopidoogrel and restarted on peritoneal dialysis. Four weeks later the patient was re-hospitalized for fevers and was found to have pseudomonas bacteremia and an EIA pseudoaneurysm involving the prior bare metal stent. The outside hospital implanted 3 I-CAST (Atrium Medical, Hudson, NH) covered stents with effective isolation of pseudoaneurysm and the patient was discharged on antibiotics. Computed tomography performed one week later at the treating hospital demonstrated no evidence of pseudoaneurysm and antibiotics were discontinued. The patient subsequently developed recurrent fevers, malaise and failure to thrive and presented to our institution with sepsis, a tender pulsatile RLQ mass, healed right flank incision and palpable pedal pulses.
CTA of the abdomen/pelvis/lower extremities revealed a recurrent EIA pseudoaneurysm with a contained rupture (Figure 1A) with evidence for infection involving the previously placed I-CAST and bare metal stents; in line arterial runoff to the right foot was noted. Blood was positive for Gram negative rods with subsequent cultures growing Pseudomonas. Intravenous antibiotics were initiated and plans for emergent surgery to resect the infected ruptured pseudoaneurysm and previous vascular stents undertaken. Considering the Pseudomonas sepsis and proximity of the infection to the inguinal ligament, limb salvage with in-situ reconstruction or immediate femoral-femoral reconstruction was deemed very high risk for recurrent infection. Plan was to provide isolated limb perfusion using ECMO with delayed revascularization once sepsis was resolved.

The right superficial femoral artery and vein were exposed via a longitudinal incision in the mid-thigh avoiding the groin and future site for femoral-femoral bypass and to facilitate decannulation. Percutaneous access was obtained through the skin distal to the incision with placement of 11 French sheaths in the exposed vein and artery. The arterial access was then used to obtain vascular control of the contained rupture by placing a covered iliac stent which would ultimately be resected. An 0.035 wire was directed into the abdominal aorta and a 10 x 10 Viabahn (Gore, Newark, NJ) graft was positioned and deployed providing vascular control and effectively excluding the pseudoaneurysm. No angiographic filing of the pseudoaneurysm was noted and the RLQ mass was no longer pulsatile. The retroperitoneum, which was exposed through the prior flank incision, revealed a grossly infected field with stents visible through the eroded iliac artery. Gross contamination and proximity to the groin was felt to preclude inline reconstruction or immediate femoral-femoral reconstruction. Following resection of all infected material which required over sewing of the common/internal/external iliac arteries, the wound was packed with antibiotic soaked laparotomy pads.

Distal limb perfusion was now initiated using ECMO by exchanging the previously placed superficial femoral vein and artery sheaths respectively with a 12-French cannula (Edwards, Irvine, CA) and a 17-French X 30 cm long multi-hole cannula (Medtronic, Minneapolis, MN) with the tip positioned
in the inferior vena cava (Figure 1B). ECMO was initiated at 800 ml/minute and a non-pulsatile, doppler signal was noted in the right foot with stable hemodynamics; the thigh incision was closed after reinforcing the cannula insertion sites with purse string sutures. Retroperitoneal packing was exchanged on postoperative day 3 and on postoperative day 5, after local control of infection and resolution of sepsis, the patient was decannulated and a femoral-femoral bypass constructed for definitive revascularization. Patient was discharge on postoperative day 10 with normal extremity perfusion (Figure 1C). Follow up at three years demonstrates palpable pedal pulses without evidence of recurrent infection.

COMMENT

Standard of care for mycotic aneurysms/pseudoaneurysms involves excision of the infected vascular segment with revascularization to maintain distal perfusion. Complications such as systemic infection and inopportune aneurysm location generally dictate the choice of operation. Several techniques exist for revascularization, including in-line reconstruction, endovascular repair, and extra-anatomic bypass grafting. In-line reconstruction has been demonstrated to have improved mortality, amputation, and patency compared to other bypass methods while endovascular repair, if possible, may reduce post-operative pain and recovery time, sometimes serving as a bridge to more definitive repair. Both methods, however, involve graft placement within, or near the infected field, and are contraindicated in cases where gross pyogenic infection is suspected (3).

While axillofemoral and femoral-femoral bypass are commonly used for mycotic aneurysms in the aorta and iliac arteries, infrarenal mycotic aneurysms and infections in proximity to the groin are at higher risk for developing recurrent graft infections when performed immediately, particularly with gram negative infections.(4,5) Pseudomonas mycotic aneurysms, although relatively rare compared to other bacterial etiologies, are significantly less likely to resolve without complications, including higher
mortality and lower limb salvage rates\(^{(6,7)}\). The patient in this case had both a mycotic pseudoaneurysm in the external iliac artery as well as blood cultures positive for Pseudomonas.

The innovative use of ECMO in this case allowed limb perfusion to be maintained while both local and systemic infection control could be achieved prior to revascularization with the goal of reducing recurrent graft infections. This case illustrates how a multidisciplinary approach involving vascular and cardiac surgery, perfusion services and critical care can work together to achieve superior results. Although the use of ECMO in this case was successful, a key limitation of generalization of this technique is the need for a hospital infrastructure that can support ECMO.
REFERENCES


LEGEND

Figure 1: (A) Contained rupture of infected external iliac artery pseudoaneurysm with prior covered stents visible (B) ECMO cannulation of the superficial femoral artery and vein via a separate upper thigh incision. (C) Postoperative doppler demonstrating normal lower extremity waveforms and ankle/brachial index.
Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: