Title:

Endovascular repair of a 63-year-old complication: post-traumatic anterior tibial
artery arteriovenous fistula

Running Head

Endovascular repair of a post-traumatic anterior tibial artery arteriovenous fistula

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Number of Figures

2

Word Count

Manuscript

References

Key Words:

Anterior tibial artery

Arteriovenous fistula

Endovascular

Covered stent

A 74-year-old female presented with an incidentally detected arteriovenous fistula (AVF) arising from the left anterior tibial artery (ATA). She was referred following lumbar spinal surgery, complicated by postoperative left leg pain. Her past history included left proximal tibiofibular fracture, treated with open reduction and internal fixation (ORIF) at the age of 11 and a left total knee replacement at the age of 68. Clinical investigation demonstrated an aneurysmal left popliteal pulse, diminished pedal pulses, and an infrapopliteal thrill, palpable over the anterior compartment of the leg near the pretibial ORIF scar. Duplex ultrasonography and computed tomography angiogram (CTA) demonstrated the AVF arising from the proximal ATA, in the region of the previous ORIF, with diameters of 11mm proximal to the AVF and tapering from 7 to 3mm beyond the AVF (see Figure 1).

The patient underwent endovascular repair of the AVF with a left common femoral artery antegrade puncture and deployment of a 11 x 50mm Gore® (Flagstaff Arizona, USA) Viabahn® expanded polytetrafluoroethylene (ePTFE) covered self-expanding stent in the proximal ATA, across the AVF site. This was selected to maximise conformation to tortuosity in the proximal ATA and reduce excessive oversizing in the distal ATA. Angiographic views demonstrated complete exclusion of the AVF. This was confirmed on selective angiography (see Figure 2). There were no perioperative complications. At six-month follow-up there was complete resolution of symptoms. CTA and duplex ultrasound confirmed a patent ATA stent with excluded AVF, and repair has been durable out to 3 years.

Endovascular management of post-traumatic AVF of the lower limb with covered stent grafts is a recognised treatment technique. The use of stent grafts has been

extensively documented in the iliofemoral region, however few reports exist of its use in infrapopliteal lesions. To our knowledge this is the first case report of endovascular repair with a stent graft of a post-traumatic ATA AVF occurring as an orthopedic complication. At 63 years, it also documents the longest delay to presentation for a post-traumatic lower limb AVF, previously recorded by Huang et al¹ at 51 years.

Traumatic fistulae of the ATA are uncommon. Described repair techniques arterial ligation, primary repair with or without vein patch and venous interposition grafting. Numerous minimally invasive management strategies have been described such as direct pressure, embolization with coils or balloons, thrombin injection and endovascular stenting.

Of the other minimally invasive techniques available, direct pressure is ineffective for AVFs, as the physical low-resistance outflow channel remains patent until it is occluded or obstructed. Embolization with coils or other agents is not possible unless a long fistulous tract can be established, and otherwise risks unintended thrombosis of the originating artery, recipient vein, and distal embolization to the heart and lung. Thrombin injection, whilst well described for false aneurysms, risks introduction of a potent pro-coagulant into the systemic circulation due to the high-flow nature of AVFs. Endovascular stenting with covered stents is ideal for vessels without major side branches or where such side branches can be safely sacrificed.

We suggest that endovascular management of lower limb AVFs with covered stent grafts has been shown to be a safe and effective technique and may be considered a

new standard for treatment. In contrast with the extensive reports on the role of stenting in iliofemoral lesions, there is a relative paucity of reports describing this technique for infrapopliteal AVFs. Good outcomes have been reported in lesions involving the tibioperoneal trunk (TPT)², posterior tibial artery (PTA)^{3,4} and ATA^{5,6}. Spirito et al demonstrated the effective use of a covered stent graft for early treatment of an ATA AVF following a penetrating injury, similar to the lesion in our case, with graft patency and resolution of symptoms at a follow-up of six months ⁶.

Post-traumatic AVF is an uncommon complication and presentation after fracture of the lower limb. While the successful use of covered stent grafts in the management of these lesions is documented, further study is warranted to investigate the long-term patency of stent grafts, a consideration particularly important in evaluating the technique's use amongst young patients.

Figure 1

Angiogram demonstrating ATA AVF

Figure 2

Angiogram post covered stent deployment

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Date:

2015

Citation:

Dawes, B., Mees, B. & Chuen, J. (2015). Endovascular repair of a 63-year-old complication: Post-traumatic anterior tibial artery arteriovenous fistula. ANZ Journal of Surgery, 87 (7-8), pp.E52-E53. <https://doi.org/10.1111/ans.12968>.

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