Novel surgical reconstruction of a mycotic abdominal aortic aneurysm using cryopreserved femoral arterial allograft from the NHS tissue bank: a new resource for UK vascular surgeons

K Abbas, J Davies, I Kabir, M Ahmad, ML Baroni, SP Cavanagh

York Teaching Hospitals NHS Foundation Trust, York, UK.

ABSTRACT

The treatment of mycotic abdominal aortic aneurysms remains a significant surgical challenge associated with significant morbidity and mortality. In the following case report, we describe our successful management of a patient with a mycotic abdominal aortic aneurysm using two cryopreserved superficial femoral artery allografts (available from the UK NHS tissue bank) to create a Y-shaped allograft to permit immediate aortic reconstruction after surgical debridement. To our knowledge, this is the first time such a reconstruction has been reported in the literature.

KEYWORDS

Arterial infection – Vascular allograft – Cryopreservation

Accepted 24 April 2011; published online 20 December 2011

CORRESPONDENCE TO

John Davies, Education Fellow, York Hospital, Wigginton Road, York YO31 8HE, UK
E: mrjohn.davies@virgin.net

Case history

A 42-year-old man was admitted acutely to the medical admissions unit complaining of abdominal pain. He had a history of intravenous drug abuse, previous groin abscesses secondary to infected injection sites and bilateral lower limb deep vein thromboses (DVTs). He was pyrexial on admission and abdominal examination revealed a central non-tender pulsatile mass. There was no evidence of any groin sepsis but both legs were swollen. Blood results revealed normocytic normochromic anaemia (Hb 9.5g/l) and raised

inflammatory markers (WCC: $16.7 \times 10^9/l$, CRP: 161mg/l). Urgent computed tomography (CT) demonstrated an 8.5cm infrarenal aortic aneurysm with ill defined margins and a rim of abnormal soft tissue exterior to calcification within the wall of aneurysm, typical features of a mycotic aneurysm (Fig 1). The patient also underwent lower limb venous duplex studies that revealed bilateral common femoral DVTs and bilateral saphenofemoral/saphenopopliteal vein thrombosis. There was no clinical or radiological evidence of infective endocarditis.

In view of the high risk of rupture of a mycotic aneurysm this size and the limited surgical options, after discussion with the patient, we elected to attempt simultaneous surgical debridement and aortic arterial reconstruction using cryopreserved superficial femoral artery (SFA) allograft material obtained from the NHS tissue bank service based in Liverpool, UK. A whole day's operating list was set aside for the procedure, which was led by the two senior authors of this case report (both consultant vascular surgeons) operating simultaneously with assistants.

One team undertook the laparotomy and debridement, performed through a transverse incision. At laparotomy, the mycotic aneurysm, extensive retroperitoneal haematoma and a large abscess adjacent to the aorta pointing towards the sigmoid mesocolon were seen. There was no fistula seen between the aorta/abscess and the duodenum or small bowel. After clamping the vessels, the infected portions of the infrarenal aorta and bilateral common iliac arteries

Figure 1 Computed tomography of the mycotic abdominal aortic aneurysm

Figure 2 Bench preparation of Y-shaped graft from two superficial femoral artery allograft portions

Figure 3 In situ aortic reconstruction using the Y-shaped superficial femoral artery allograft

were resected and radical debridement of the tissues was performed followed by extensive washout using hydrogen peroxide and povidone-iodine. All resected tissue was sent for urgent Gram staining and culture.

The second operating team undertook the bench preparation of the SFA allografts. Two SFA allografts from the NHS tissue bank were defrosted and prepared in a straightforward manner as per the instructions from the tissue bank. The side branches were ligated with 2/0 polypropylene and the two SFA allografts were sutured together at each proximal end using 5/0 polypropylene, creating a Y-shaped graft (Fig 2). Immediate aortic reconstruction was performed with end-to-end anastomosis to the proximal aorta and bilateral common iliac artery bifurcations using the pre-constructed Y-shaped graft with 3/0 polypropylene (Fig 3). The senior authors reported that the SFA allograft material was not as pliant as normal artery or vein and somewhat more friable but did not feel this added any undue extra degree of difficulty in suturing. *Staphylococcus aureus* was isolated from the infected material sent for culture at laparotomy.

The patient made an excellent recovery postoperatively but remained in hospital for six weeks to receive high dose intravenous flucloxacillin via a tunnelled central venous catheter. He was anticoagulated postoperatively with therapeutic dose low molecular heparin that was continued for three months after discharge. At one year after surgery the patient remains clinically well with no signs of sepsis or lower limb ischaemia. There are no radiological signs of infection or anastomotic aneurysms on repeat CT or ultrasonography. He remains abstinent from intravenous drug abuse on a methadone programme. We have planned frequent clinical and radiological follow-up appointments to identify problems at an early stage. To our knowledge, this is the first time such an abdominal aortic reconstruction using two cryopreserved SFA allografts to create a Y-shaped graft has been reported in the literature.

Discussion

The term ‘mycotic aneurysm’ is broadly used to describe all infected aneurysms, regardless of the aetiology. Mycotic abdominal aortic aneurysms (MAAAs) account for only 1%

of all aortic aneurysms, with *Staphylococcus Aureus* being the most common infecting organism.¹ As our patient has no signs of infective endocarditis, it is likely he developed an MAAA secondary to staphylococcal bacterial seedling from intravenous drug abuse.

MAAA resection, debridement and extra-anatomic bypass of the infected aneurysmal segment has been described as the gold standard surgical treatment.² Other surgical approaches reported in the literature to restore arterial flow include the use of antibiotic impregnated surgical conduit grafts, the use of autologous superficial femoral vein grafts, endovascular stent grafting and the use of cadaveric arterial aortic allografts.³ In this case, we felt the large intra-abdominal septic burden and the patient’s relatively young age (42 years) were reasons to try and avoid extra-anatomic bypass grafting if at all possible. Furthermore, the presence of bilateral DVTs precluded an attempt at using superficial veins for aortic reconstruction. Although we undertake routine endovascular stent grafting for atherosclerotic aortic aneurysms in our unit, we were reluctant to consider this approach for fear of introducing foreign material into the aneurysm, particularly as endovascular stent grafting for MAAAs has been reported as only to be a potential bridge to open surgery.⁵

Cryopreserved arterial allografts have been adopted successfully as a treatment for MAAAs in mainland Europe and the US. Allografts are retrieved from deceased donors and assessed against rejection criteria before being stored frozen indefinitely. Complication rates of these allografts used for either MAAA or aortic graft infection have been reported favourably in large published series compared to extra-anatomic bypass and autologous vein grafting in terms of amputations, graft patency, re-infection and mortality.^{1,4,5}

Until recently, there was no UK provision of vascular allografts for intra-abdominal aortic and peripheral arterial surgery (as opposed to sections of aortic root and valves for cardiac surgery) but the NHS tissue bank started issuing SFA allografts in early 2009.⁵ Currently, SFA allografts are the only type of arterial allograft issued by the NHS tissue bank. Sections of infrarenal aorta are not available. We therefore elected to attempt aortic reconstruction using two SFA allografts sutured to create a Y-shaped graft. SFA allografts are

priced at £105 per centimetre, can be supplied on the same day as ordering and delivered direct to the operating theatre, allowing a degree of flexibility when planning difficult reconstruction procedures.

Conclusions

MAAAs remain a feared vascular condition. The novel use of two cryopreserved SFA allografts (available from the UK NHS tissue bank) to undertake aortic reconstruction is a further feasible treatment option, at least in the short term, in the management of this difficult group of patients. NHS tissue bank email, phone and postal contact details can be found at <http://www.nhsbt.nhs.uk/tissueservices/contact/address/>.

References

1. Müller BT, Wegener OR, Grabitz K *et al*. Mycotic aneurysms of the thoracic and abdominal aorta and iliac arteries: experience with anatomic and extra-anatomic repair in 33 cases. *J Vasc Surg* 2001; **33**: 106–113.
2. Lesèche G, Castier Y, Petit MD *et al*. Long-term results of cryopreserved arterial allograft reconstruction in infected prosthetic grafts and mycotic aneurysms of the abdominal aorta. *J Vasc Surg* 2001; **34**: 616–622.
3. Dodd PD. What tissue bankers should know about the use of allograft blood vessels. *Cell Tissue Bank* 2010; **11**: 3–11.
4. Zhou W, Lin PH, Bush RL *et al*. In situ reconstruction with cryopreserved arterial allografts for management of mycotic aneurysms or aortic prosthetic graft infections: a multi-institutional experience. *Tex Heart Inst J* 2006, **33**: 14–18.
5. Kieffer E, Gomes D, Chiche L *et al*. Allograft replacement for infrarenal aortic graft infection: early and late results in 179 patients. *J Vasc Surg* 2004; **39**: 1,009–1,017.