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Good Long Term Patency Rates Associated with an Alternative Technique in Vascular Access Surgery – The Adductor Loop Arteriovenous Graft

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Abstract *Introduction:* We have modified the arteriovenous groin loop procedure and present a technique associated with good patency rates and low infection rates.
Methods: We describe an alternative femoro-femoral arteriovenous loop technique which utilises the mid-thigh sub-sartorial Superficial Femoral Artery and Femoral Vein. We then performed a retrospective analysis of all such cases performed in our unit to date and analysed the patency and infection rates associated with the technique.
Results: 16 cases have been performed to date with a median follow-up of 18 months. The primary and secondary patency rates at one year were 70% and 90% respectively. The overall infection rate was only 12.5%.
Conclusions: Our technique is associated with good patency rates and low infection rates. In addition it preserves modesty whilst on dialysis and the groin vessels for further vascular access surgery if needed.

Introduction

Definitive vascular access for haemodialysis remains a key requisite for the treatment of patients with end-stage renal failure (ESRF). In the UK, 45,484 patients were on established renal replacement therapy (RRT) at the end of 2007,[1] a figure that will rise given that the current annual growth rate in the UK of RRT is around 5%.[1] The provision of permanent vascular access presents an ever-increasing challenge to the vascular access surgeon. This is in part due to the rapidly expanding dialysis dependant population,[1,2] an increase in the numbers of elderly and diabetic patients offered RRT and prolonged patient survival rates whilst on dialysis.[3] In addition the numbers of patients opting to commence RRT on peritoneal dialysis is contracting.[1]

Autologous vein arteriovenous fistulae (AVF) remain the vascular access of choice in patients who require long term haemodialysis. This is due to the association with superior long term primary patency rates and lower complication rates including infection.[4,5] There are, however, high primary failure rates ranging between 11 and 30%[6,7] and the

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time taken for maturation may vary from 6 weeks[8] to 4 months.[2] Prosthetic grafts, which have lower rates of primary failure and can be used more rapidly for haemodialysis,[9] are generally reserved for cases where there is an absence of suitable autologous vein. The upper extremities tend to be used first but if access is impossible it has been standard practice to then construct a femoro-femoral arteriovenous loop graft. Polytetrafluoroethylene (PTFE) has generally been used but, unfortunately, infection rates are high.[10] In addition, patency rates are poorer[11,12] and more frequent revision surgery is required.[11]

We have modified the groin loop procedure and present an alternative femoro-femoral arteriovenous loop graft technique. A similar modified technique was described by Bagul *et al*. in 2006[13] but our technique and the graft we use are different and in our experience, associated with low infection rates and good patency. We therefore present our current series of adductor loop grafts and report the time to needling, infection and patency rates.

The Adductor Loop Technique

Any patient in our unit requiring vascular access for haemodialysis, in whom all upper limb options had been exhausted or were not possible, were considered for the adductor loop technique. Our unit has no experience of thoracic grafts and the femoral vein transposition technique was not favoured due to problems with venous hypertension and low success rates in the very small numbers attempted. All patients who were considered for an adductor loop graft underwent pre-operative venous and arterial duplex imaging. We don't routinely perform an Ankle Brachial Pressure Index (ABPI) measurement, especially in diabetics, as the result is generally misleading due to the lack of compressibility of calcified ankle vessels. The arterial system is imaged to ensure that there is biphasic waveform flow to the ankle, signifying healthy vessels capable of delivering good inflow to the graft whilst maintaining distal perfusion so as to avoid ischaemia or a steal syndrome postoperatively. The venous system of the leg is imaged to ensure compressibility and patency with no underlying venous thrombosis that would affect the outflow of the graft. The graft is always placed on the side of any previous transplant to spare the contra-lateral side for future transplantation. This ensures that the venous pressure is normal on the side of future transplantation and minimises the risk of arteriovenous graft thrombosis when clamping the iliac vessels to implant a kidney.

To date, all of our cases have been performed under general anaesthetic. Patients are given a 300 mg loading dose of Aspirin pre-operatively if not already on it. Prophylactic antibiotics (1.2 g Co-amoxiclav and 1 g Vancomycin intravenously) are given at induction. The patient is positioned supine with the operative leg flexed at the knee and in abduction (frog-legged) so as to access the medial side of the thigh. An 8—10 cm incision is placed on the medial aspect of the mid-thigh over the anterior border of Sartorius muscle and dissection between Sartorius and the medial edge of Vastus Medialis is performed to expose the sub-sartorial mid-thigh femoral vein and superficial femoral artery (SFA) (Fig. 1). The vessels are mobilised and controlled. As the vein lies deep to the artery, additional arterial mobilisation is often required in both a caudal and a cephalad direction to enable adequate exposure of the vein. A vertical incision 2—3 cm in length, in a caudal-cranial direction is then made as laterally as possible (Fig. 2 — labelled 'counter incision') down to fascia lata to enable creation of the subcutaneous tunnel. A non-sheathed vascular tunnelling device is used in a two staged technique utilising both incisions. This involves bringing the arterial end of the graft from the medial incision out to the lateral 'counter incision' and then bringing the graft from the lateral incision back to the medial incision so as to ensure a nice curve on the graft. A 6 mm diameter, 40 cm long Bard PTFE Venaflo™ graft is placed in a transverse loop position (Fig. 2) in the superficial fat just beneath the skin. There is approximately 25 cm of the graft forming the loop that is easily accessible for needling for subsequent haemodialysis. The venous outflow end of the graft lies distally. This ensures that the venous hood of the graft is in a position to ensure in line flow from the graft into the native femoral vein in an attempt to maximise smooth laminar flow. This hopefully reduces the development of local myointimal hyperplasia and subsequent venous stenoses. The arterial and venous anastomoses are performed using 6.0 polypropylene. The venotomy is made as long as possible to utilise the entire length of the flared end of the Bard PTFE Venaflo™ graft. The facial layer is closed with 2.0 polyglactin 910 and the skin is closed with interrupted 3.0 polypropylene horizontal mattress sutures. Post-operative stay is one to two days. The commonest complication is localised swelling at the site of tunnelling. This has usually settled by two weeks. Patients are discharged on 75 mg Aspirin daily, if not already on it, to continue indefinitely. Follow-up is by the vascular access nurse specialist at 2 weeks. Haemodialysis is avoided until all wounds are healed and the swelling has settled, but not before 2 weeks.

Results

Since introducing the adductor loop technique in early 2006, we have performed 16 cases over 4 years. All patients were on established haemodialysis prior to procedure. 11 of the grafts

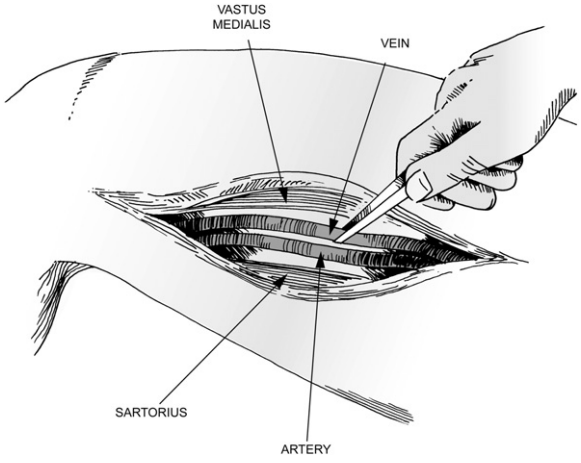

Figure 1 Artist impression of surgical dissection demonstrating mid-thigh sub-sartorial Superficial femoral artery (SFA) and superficial femoral vein (SFV).