CASE REPORT

Common femoral artery aneurysm repair using bifurcated graft

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SUMMARY

Common femoral artery aneurysms are rare, and surgical repair is indicated if they are significantly large, or if they are symptomatic (thrombosis causing limb ischaemia and compression of surrounding structures). Synthetic grafts are preferred, especially in cases involving large aneurysms, or the bifurcation of the common femoral artery. We present a case of bilateral common femoral artery aneurysms extending into the bifurcation repaired using a synthetic graft which is traditionally used for an axillobifemoral bypass. This technique was employed due to the specific anatomical relationship between the profunda femoris and the superficial femoral artery in our patient. We will also review the current literature on the operative approaches to repair of common femoral artery aneurysms.

BACKGROUND

True aneurysms of the femoral artery are rare. Risk factors include being male, heavy smoking, hyperlipidaemia and atherosclerosis.^{1,2} They present with a pulsatile groin mass, rupture, aneurysmal thrombosis causing acute limb ischaemia, femoral vein compression or distal embolisation. Approximately 25% of cases are an incidental finding of an unrelated distinctive pathology.²

The mainstay in the treatment of femoral artery aneurysms (FAA) >25 mm in diameter is surgical repair with or without use of a synthetic graft.^{1,2} An inlay bifurcated graft can be used for the repair of large aneurysms involving the bifurcation of the common femoral artery. However, the anatomy at the bifurcation can be unsuitable. The profunda may be too medial, and at a more acute angle than a conventional bifurcated graft would allow without kinking of the prosthesis and subsequent impairment of blood flow.

A novel technique for overcoming this anatomical situation is the use of a bifurcated graft traditionally used for axillobifemoral bypass, which more closely mimics this unique configuration at the bifurcation, and leads to a more satisfactory operative result. We describe the use of this technique in a patient with bilateral common FAAs.

CASE PRESENTATION

Our patient is a 74-year-old man with a history of chronic obstructive pulmonary disease, transient ischaemic attacks, hypercholesterolaemia and hypertension. He had remained a heavy smoker for

42 years. He had no history of intravenous drug use and had undergone no procedures on the groin. He had been referred to our service due to an incidental finding of bilateral common FAA on a CT chest, abdomen and pelvis done to investigate a possible bowel malignancy.

On physical examination, he was found to have bilateral pulsatile groin swellings consistent with FAAs. The left-sided aneurysm measured 42 mm, the right 32 mm in maximum diameter ([figure 1](#)). As part of the assessment of his lower limb vasculature, he was found to have bilateral small popliteal artery aneurysms, which were under the limit for intervention. The decision was made to manage these with 6-monthly surveillance scans. His distal pulses were unremarkable. Due to the size of both femoral aneurysms, and their associated risk of complications, the patient was offered operative repair, starting with the larger left-sided aneurysm.

TREATMENT

In the preoperative planning phase, the proposed approach was excision of the aneurysms and a repair using an inlay straight tube Dacron graft. However, during the left-sided repair, the aneurysm was found to extend to the bifurcation of the common femoral artery, necessitating a more extensive excision than was anticipated. Due to the anatomical position of the profunda femoris, it was found that a conventional bifurcated graft was unsuitable ([figure 2](#)). Thus an inlay Dacron bifurcated graft traditionally used for an axillobifemoral bypass, which more closely mimicked the patient's native anatomy, was employed. The proximal end of the graft was anastomosed to the common femoral artery beyond the aneurysm, and the distal limbs to the superficial femoral and profunda femoris.

OUTCOME AND FOLLOW-UP

The postoperative period was uneventful, and the patient was discharged after 4 days. The right aneurysm was repaired 5 months after the left repair. As the intraoperative findings were similar to the previous procedure, a similar technique was employed. Both grafts remained patent at the ongoing follow-up.

DISCUSSION

True FAA are caused by weakening of the arterial wall, most often secondary to atherosclerosis. Traumatic aneurysmal change can occur either through

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Figure 1 CT of pelvis showing bilateral Cutler-Darling type two common femoral artery aneurysms (labelled), the left (CFA component) measuring 42 mm, the right (profunda component) 32 mm.

direct trauma, iatrogenesis (angioplasty, groin surgery) or intravenous drug abuse.^{3 4} However, false FAAs are more common in these situations. Isolated true FAAs are rare, approximately 10 times less prevalent than abdominal aortic aneurysms.¹ One-third of FAAs are bilateral. As in this case, FAAs are most commonly found in elderly, male smokers.^{1 2 4}

Although FAAs can be asymptomatic, they present with significant complication in 50%–65% of cases: thrombosis (18%), distal emboli (12%), or rupture (10%–35%).^{3 4} The annual rupture rate of FAAs >50 mm is 16%.¹ Surgical excision is recommended in symptomatic FAAs or at diameters >25 mm.²

Associated aneurysms (usually popliteal) occur in 50%–66% of individuals with FAAs; screening with duplex ultrasound, CT or angiography is recommended.^{2 3 5} In our case, our patient was found to have bilateral popliteal artery aneurysms, which are currently under surveillance using duplex ultrasonography.

Open and endovascular techniques of FAA repair have been described in the literature, with open techniques being the preferred method for treating large aneurysms (diameter >5 cm).¹ Fagg describes the early surgical management of a common femoral artery aneurysm (CFAA) in 1908.⁶ A 26-year old man developed a CFAA following blunt trauma to the groin, which was treated by excision and end-to-end re-anastomosis or ligation of the remaining vessels. The general consensus is that excision and interposition grafting of the aneurysm or extra-anatomical bypass are favoured over the technique described in this case.

Interposition grafts can either be harvested veins, or synthetic material. Venous grafts (such as a reversed great saphenous vein) are usually employed in the treatment of infected or mycotic aneurysms.¹ Polytetrafluoroethylene (PTFE) is the most commonly used synthetic graft, although Dacron may also be used. Rigdon and Monajjem describe an open FAA repair using PTFE.⁴ A 93-year-old man with metastatic prostate cancer presented with rupture of a 120 mm true, isolated aneurysm of the right superficial femoral artery. The aneurysmal segment was replaced with an 8 mm PTFE graft. The patient made a complete recovery with patent graft at 12-month follow-up. In a similar case, Belhaj *et al* describe a ruptured, distal SFAA in 85-year-old man who had previously survived a ruptured AAA.⁷ The SFAA was excised and repaired with a 10 mm PTFE interposition graft. An exacerbation of COPD marred an otherwise uneventful recovery. An

Figure 2 (A) Diagrammatic representation of common femoral artery aneurysm involving bifurcation. Profunda femoris (PF) and superficial femoral (SF) arteries labelled. (B) Comparison between the two choices of Dacron bifurcated graft: standard trouser (ST) graft and axillobifemoral (ABF) grafts. (C) Repair using ST graft causes kinking at the PF anastomosis. (D) Repair using ABF graft more compatible with patient's anatomy.

unusual case described by Choi *et al* involved a 34-year-old man with angiosarcoma of the CFA, causing an aneurysm. This was also successfully repaired with an 8-mm PTFE inlay graft.⁸

One of the earliest classifications of FAAs was developed by Cutler and Darling in 1973. They describe a type 1 aneurysm as one involving only the CFA and terminating before the bifurcation, and type 2 involving the origin of the profunda femoris and beyond.⁹ Type 2 aneurysms are unsurprisingly associated with higher complication rates, and are technically more challenging to repair.⁹ This is due to the anatomical challenges associated with the reconstruction of the bifurcation of the common femoral artery. Our technique simplifies the repair by using a bifurcated graft that closely mimics the patient's anatomy and is easily reproducible (as evidenced by successful fixation on the contralateral side).

Endovascular repair under local anaesthesia can be useful in high-risk patients, and can be used in aneurysms up to 5 cm in diameter. A hybrid endovascular/open technique limits the amount of groin dissection performed, giving a shorter operating time and reducing complication rates.¹⁰ Rancic *et al* describe a case series of six males, mean age 72 years, with FAAs (four true,

two false, four had associated external iliac artery aneurysms) treated using such an approach.¹⁰ A sheath and endograft were inserted into the FAA via a puncture in the anterior wall. The graft was deployed in a proximal part of the vessel with normal diameter, and anastomosed distally beyond the aneurysmal segment. This technique avoids extensive circumferential arterial dissection and cross-clamping as well as the need for retroperitoneal or transperitoneal exposure if there is an associated external iliac aneurysm.¹⁰ Following the procedure, 30-day patency rate was 100%, with no evidence of migration.

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Contributors SAH wrote the case presentation, parts of the discussion and the article summary. CHNJ and NK wrote parts of the discussion. VB acted as the supervising consultant and was involved in the editing process and approval of the final manuscript for submission. All parties were involved in the patient's care, with VB being the patient's responsible consultant.

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Patient's perspective

I'm just glad my operations have gone so well. I was shocked to be told by the surgeon that I had big swellings in the arteries in my leg. I was even more shocked that they could have caused complications. It's sorted out now, and I can't complain about the care I have had.

Learning points

- Femoral artery aneurysms (FAAs) are rare and can present with a pulsatile mass, thrombosis, rupture, femoral venous compression, distal embolisation or incidentally.
- Aneurysms over 25 mm warrant surgical repair; options include autologous vein graft, synthetic graft and hybrid endovascular/open techniques.
- Use of a Dacron bifurcated graft used traditionally for axillobifemoral bypass is a novel, easily reproducible technique for repair of FAAs involving the bifurcation of the CFA.
- Screening for associated aneurysms (especially popliteal aneurysms) should be considered.

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