Percutaneous Closure of Iatrogenic Femoral Arteriovenous Fistula Using Endovascular Covered Stent

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Abstract
Local complications after femoral arterial catheterization, such as hematomas, pseudoaneurysms, arteriovenous fistulas (AV fistulas), and arterial occlusions, are becoming more common, with the growing number of complex invasive procedures being undertaken, especially in older and sicker patients. Newer percutaneous techniques are being developed to treat these. Covered stents are an effective, safe, and less invasive way to deal with pseudoaneurysms and AV fistulas. This case report highlights the application of this technique to treat an iatrogenic femoral AV fistula in a 69 years male.

INTRODUCTION
Covered stent grafts are being increasingly used to treat aneurysms, arteriovenous fistulas and coronary artery perforations. They provide an easy, reliable and highly efficacious percutaneous technique of dealing with these complications, for which previously only surgical options were available. Nevertheless using meticulous technique a vast majority of these complications can be avoided.

CASE REPORT
A 69 years male known hypertensive was admitted in 1996 for chest pain. His coronary angiogram (CAG) then revealed left anterior descending artery (LAD) proximal 75% stenosis, 1st diagonal 90% and left circumflex (LCX) 90% stenosis. He declined revascularisation and was discharged on optimal medical treatment. Subsequently he suffered Inferior wall myocardial infarction in 1999 after which he underwent PTCA and stenting to LCX. Six weeks post procedure on regular follow up the patient’s diastolic blood pressure was detected to be 50 mm Hg along with a pulsatile swelling in right groin (the side from where intervention was done). There was an audible bruit over the swelling, which was confirmed to be an arteriovenous fistula (on color Doppler study) between the common femoral artery and common femoral vein. He was advised surgical closure of the same but declined. In 2004 he was readmitted with fresh coronary symptoms, underwent CAG followed by PTCA and stenting to right coronary artery and LCX via the left groin approach. Peripheral angiogram revealed a large fistulous communication between right common femoral artery and vein (Fig. 1). Patient was given the option of percutaneous closure of the AV fistula for which he agreed. A left sided approach was not technically possible due to severe acute bend at the aortic bifurcation, across which negotiating the long covered stent was not feasible. The right femoral artery was cannulated using bony landmarks below the site of the fistulous communication by a puncture which was made in the thigh. A 0.035 inches J tipped guide-wire

Fig. 1: Fistula seen between right common femoral artery and femoral vein
was placed in the right common iliac artery and descending aorta. This was followed by deployment of a 48 mm, 6-9 mm JoMed covered stent graft mounted on a 6x40 mm balloon. Check angiogram revealed obliteration of the fistulous communication but another tract became evident feeding the right femoral vein (Fig. 2). In lieu of this a second 38 mm, 6-9 mm, covered stent graft was deployed mounted over a 6x40 mm balloon (Fig. 3). Check angiogram revealed complete obliteration of the arteriovenous communication and femoral vein did not fill from the femoral artery (Fig. 4).

**DISCUSSION**

During vascular access, the Seldinger needle puncturing the femoral artery and overlying femoral vein, creating an AV fistula after sheath withdrawal is a well known complication described in literature. The risk of developing AV fistula increases if multiple attempts are made to obtain femoral access, puncture is high (involving the common femoral artery and lateral femoral circumflex vein), or low (after common femoral has divided into the superficial femoral artery and profunda femoris artery, the profunda overlies the femoral vein) and impaired clotting.\(^1\) Hence meticulous care is needed while obtaining vascular access often taking the help of bony landmarks under fluoroscopy if necessary.

The incidence of AV fistula formation following diagnostic and therapeutic cardiac catheterization is 0.1-1.5%.\(^2\)

Clinically the patients may have a local bruit, distal arterial insufficiency (steal phenomenon), a swollen and tender extremity due to venous dilatation. Diagnosis can be confirmed at color Doppler examination.

Management—Small AV fistulas may close spontaneously.\(^3\) Ultrasound guided compression may be attempted for small fistulae but experience is limited.\(^4\) For large or symptomatic AV fistulae surgical or percutaneous closure is recommended to prevent
accelerated atherosclerosis, high output failure and progressive swelling and tenderness. Surgical repair involves division or excision of the fistula or synthetic grafting of the vessel in unusual cases. Endovascular stent grafts are now being increasingly used to close such AV fistulae. The stent graft is made up of two 316L high grade surgical steel stents between which Polytetrafluoroethylene (PTFE) is sandwiched. PTFE is expandable, nonporous, has no additional thrombogenicity and is about 150 microns in thickness. Autologus venous and arterial covered stent grafts (using radial artery) have also been used in coronary arteries. Endothelial and neointimal cells gradually cover the device until an intact cellular coating has been formed after a few weeks. Burger et al did not report any evidence of intimal hyperplasia, occlusion or stent graft migration at seven months follow up while Thalhammer et al reported stent thrombosis rates of 17% in a larger series of 26 patients on one year followup. Apart from this application stent grafts can also be used to seal off coronary artery perforations and treat aneurysms.

REFERENCES