SHORT CASES IN CARDIOLOGY

Successful treatment of false aneurysm of a saphenous vein bypass graft with fistula to the anterior chest wall using "covered" intracoronary stents

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A 63 year old woman presented to her local hospital with a painful anterior chest wall swelling. Two years previously she had undergone uncomplicated aortic valve replacement (mechanical prosthesis) and coronary artery bypass grafting. She had remained well following her surgery until three months before presentation when she had first noticed chest wall discomfort. The swelling had progressively enlarged until the time of presentation.

Examination revealed a 12 × 8 cm pulsatile swelling over the left parasternal region with a palpable thrill. She was otherwise well with normal prosthetic valve sounds. Subsequent transthoracic and transoesophageal echocardiography, computed tomography, magnetic resonance imaging, and aortography demonstrated a large fluid filled cavity anterior to the right ventricle, compressing the right ventricle and outflow tract, and containing an epicardial pacing lead. No communication with the aorta or cardiac chambers could be identified.

After preparation for femoral bypass the median sternotomy was reopened and a large presternal haematoma was identified in association with necrotic costal cartilage. The haematoma was evacuated but again no communication could be identified; following evacuation of the haematoma there appeared to be good haemostasis. It was hypothesised that the palpable pulsation had been transmitted from the pulmonary artery.

Initial progress was satisfactory, but the patient's subsequent clinical course was complicated by recurrence of the swelling and several episodes of recurrent bloody discharge from a sinus on the chest wall requiring further hospital admission, culminating in a profuse, self limiting haemorrhage causing haemodynamic collapse. At this time coronary angiography demonstrated a false aneurysm of the body of the left anterior descending (LAD) vein graft (fig 1), but no track to the chest wall was identified. Although modestly stenosed, the graft was widely patent with good distal run off into the LAD artery. The native vessel was occluded and left ventricular contraction

(as assessed by echocardiography) remained normal. The remaining vein grafts were patent.

An initial attempt at endovascular occlusion of the false aneurysm comprised placement of a Wallstent (Schneider, Staines, Middlesex, UK) across the neck of the aneurysm with a view to subsequent delivery of coils into the aneurysm sac through a Tracker-18 catheter (Target Therapeutics, St Albans, Herts, UK). Although an in vitro model suggested that the Tracker delivery catheter would readily pass through the cells of the Wallstent when deployed, in vivo it proved impossible to enter the aneurysm sac with the catheter despite successful placement of a guidewire. A further attempt using a smaller delivery catheter was planned, but prior imaging demonstrated a considerable increase in the size of the false aneurysm (fig 1), and in the interim the advent of covered stents offered an alternative solution.

A 19 mm Jostent coronary stent graft (JoMed International AB, Helsingborg, Sweden) was deployed across the aneurysm neck and postdilated using a 5.5 mm balloon (Bypass Speedy, Schneider) to a maximum pressure of 18 atm. Although much reducing flow into the false aneurysm a small jet of contrast persisted, therefore, a second similar stent was deployed overlapping the first. Again a small jet of contrast could be seen entering the aneurysm neck, and a third covered stent (12 mm) was deployed. Despite final dilatation to 20 atm with a 6 mm balloon, a jet of contrast still entered the aneurysm (fig 1). We decided to accept this result and manage the patient without anticoagulant or antiplatelet treatment. Over the ensuing weeks the discharging sinus dried and healed, and repeat angiography eight weeks later showed no communication from the LAD vein graft. There was moderate intimal stenosis, but in the absence of anginal symptoms no further intervention was planned. Anticoagulation was restarted.

Discussion

False aneurysms of saphenous vein grafts are a rare complication of coronary artery bypass surgery. Although sporadic case reports have

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Figure 1 (Top left) Right anterior oblique (RAO) view of the vein graft to the LAD artery at diagnosis showing a false aneurysm of the body of the graft with a wide aneurysm neck. (Top right) RAO view of the vein graft to the LAD artery before intervention—the aneurysm cavity has considerably increased in size. (Bottom left) RAO view of the vein graft to the LAD artery following implantation of a Wallstent, and at a subsequent procedure three overlapping Jostent coronary stent grafts (19 mm, 19 mm, and 12 mm). A narrow jet of contrast (arrow) enters the aneurysm through the overlapping stents. (Bottom right) RAO view of the vein graft to the LAD artery eight weeks after placement of the covered stents demonstrating no residual flow into the aneurysm. Restenosis is seen within the stents but the graft remained patent with good run off.

described a variety of presentations, false aneurysms have typically occurred at an anastomosis and have not arisen from the body of the graft, as in our case.¹ Presentation is usually early after surgery, and a complicated perioperative course often associated with mediastinal infection have been typical antecedents. Our patient is unusual in having had an uneventful in-hospital course with her initial surgery and having been asymptomatic until presentation two years later.

False aneurysms of coronary grafts reported in the literature have been associated with high morbidity and mortality. The traditional approach has been surgical ligation of the graft, with placement of a new conduit. In our case, however, both initial imaging and subsequent surgical exploration failed to identify the source of bleeding, and when the origin of the

false aneurysm was identified a third surgical procedure represented an unattractive option. Although endovascular procedures to seal false aneurysms in peripheral vessels are not uncommon, there are few reported cases of this approach to the coronary circulation. Percutaneous coil embolisation has been successfully used to treat pseudoaneurysms, including those with a fistulous connection to the anterior chest wall.^{2–4} This strategy has previously involved sacrifice of the vein graft, which was felt undesirable in our case. Because of the wide neck of the aneurysm we tried to demarcate the aneurysm from the graft lumen by stent placement before coil embolisation. Owing to the size of the aneurysm constraints were placed on the size of the coil delivery catheter that could reasonably be used. Additionally, because of the large lumen of the graft

the only stent available to cover the neck of the aneurysm was the Wallstent, which has a relatively close mesh when deployed. Unfortunately this stent did not allow in vivo passage of the coil delivery system. The desire to preserve the graft made the alternative strategy of sclerosant treatment (for example, with heated contrast⁵) inappropriate.

The advent of covered stents designed for intracoronary use permitted a new approach to closing the aneurysm and allowing the fistula to heal. The Jostent coronary stent graft is a composite stent with a layer of PTFE sandwiched between two stainless steel stents, similar in design to the stents currently in use for endovascular repair of abdominal aortic aneurysms. Unlike previous coronary stents that have an open metallic meshwork when deployed, such a covered stent is ideally suited to excluding aneurysms, with the PTFE having a pore size of only 5 µm.

Although ultimately effective, the covered stents initially appeared not to have completely sealed the neck of the aneurysm. The maximum nominal size of the stent used is 5.0 mm and to get an optimal luminal result the stent had to be expanded to larger size. Whether this reduced the efficacy of the covered stent is unclear. Cessation of anticoagulation and antiplatelet treatment may have contributed to

the delayed closure but this in isolation is unlikely to have been effective, as previous cessation of warfarin failed to result in aneurysm resolution. Deployment of multiple stents within one another may have contributed to the instant restenosis at the site of stent implantation. The residual stenotic lesion has not produced ischaemic symptoms and has therefore been managed conservatively. However, the principal objective of stent placement on this occasion was not to address luminal flow but to exclude the false aneurysm, and this was satisfactorily achieved. The covered intracoronary stent provides a promising new approach to this uncommon but difficult problem.

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