A saphenous vein graft aneurysm with fistula development to the right atrium: Surgical management of a rare bypass graft complication

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A patient presented late following coronary artery bypass surgery with recurrent angina. Investigations revealed a saphenous vein graft aneurysm, which subsequently formed a fistula with the right atrium. This was managed by surgical excision and repair followed by regraft of the run-off territory. Intraoperatively, the left internal mammary artery, a patent graft to the left anterior descending artery, was isolated from the circulation during aortic cross-clamping by preoperative placement of a percutaneous balloon catheter within this graft. Surgery was successful and the patient was discharged symptom-free one week later.

Key Words: Aneurysm; Coronary artery bypass surgery; Fistula

Aneurysmal dilation of saphenous vein grafts (SVGs) is a rare complication of coronary artery bypass surgery. Such aneurysms tend to expand and may thromboembolize or rupture. Rupture may occur locally into any structure, but fistulization into a cardiac chamber is extremely rare. We report the case of an SVG aneurysm that formed a fistula with the right atrium. The patient was successfully managed by surgical excision and repair of the fistula.

CASE PRESENTATION

A 72-year-old man presented with recurrent angina eight years following coronary artery bypass surgery. He had previously received an autologous long saphenous vein for two aortocoronary grafts to the intermediate and distal right coronary arteries (RCAs) and the left internal mammary artery (LIMA) to revascularize the left anterior descending coronary artery. A chest radiograph demonstrated an abnormal opacity at the right heart border and the patient was referred to the Wessex Cardiothoracic Centre (Southampton, United Kingdom) for further evaluation. A computed tomography (CT) scan of the chest and coronary angiography revealed an aneurysm of the SVG to the distal RCA with patent run-off. The aneurysm had a maximum diameter of 5 cm and was surrounded by mural thrombus (Figure 1A). The two remaining grafts were functional. In view of minimal symptomatology, the patient declined surgical intervention.

Further routine evaluation by chest CT scan six months later demonstrated an increase in aneurysmal dilation to 6 cm. Although the

Un anévrisme d'une greffe de la veine saphène avec apparition de fistule à l'oreillette droite : La prise en charge d'une rare complication d'un pontage par greffe

Un patient a consulté plusieurs années après un pontage aortocoronarien à cause d'une angine récurrente. Les explorations ont révélé un anévrisme de la greffe de la veine saphène, qui a ensuite formé une fistule avec l'oreillette droite. On a traité le problème par excision chirurgicale, suivie d'une réparation par une nouvelle greffe du territoire d'écoulement. Pendant la période intra-opératoire, on a isolé de la circulation l'artère thoracique interne gauche, une greffe libre à l'artère descendante antérieure gauche, par installation préopératoire d'un cathéter par ballonnet percutané dans la greffe. L'opération a réussi, et le patient a quitté l'hôpital sans symptômes une semaine plus tard.

patient had remained minimally symptomatic, urgent surgical repair was planned on this occasion. Unfortunately, in the intervening period, the patient suffered a myocardial infarction complicated by renal failure and pulmonary edema, requiring inotropic support and diuretic infusions. Re-evaluation by transesophageal echocardiography, CT scan (Figure 1B) and coronary angiography revealed fistulization of the aneurysm to the right atrium.

Urgent surgery was performed to excise the aneurysm, repair the fistula and revascularize the RCA. In view of the retrosternal position of the SVG aneurysm, hypothermic (32°C) cardiopulmonary bypass was instituted between the right common femoral artery and vein before resternotomy. Myocardial protection was achieved using antegrade cold blood cardioplegic solution instilled intermittently into the aortic root during aortic cross-clamping. During the period of aortic cross-clamping, the LIMA was occluded by inflating a balloon inserted into the vessel during percutaneous catheterization immediately before surgery.

A large tennis ball-sized aneurysm of the SVG to the RCA was found to be compressing the right atrium. The proximal part of the SVG to the RCA was isolated, transected and oversewn. The aneurysmal sac was laid open to reveal extensive thrombus, which was removed and sent for bacteriology. A defect 2 cm in diameter was seen, through which the aneurysm was communicating with the right atrium. This was closed using several 3/0 polypropylene (Prolene; Ethicon Inc, USA) sutures reinforced with pericardial

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Figure 1) A Contrast is seen within the lumen (black L) of the saphenous vein graft aneurysm (diameter 6 cm). The aneurysm is clearly seen to compress the right atrium (RA). Contrast is seen passing from the aneurysm to the RA via a fistula (F). **B** In axial reconstruction, the saphenous vein graft is seen arising from the aorta (Ao), before becoming aneurysmal. MT Mural thrombus; RV Right ventricle; White L Left

buttress mattress sutures. The left radial artery was dissected and anastomosed to the posterior descending coronary artery distally and proximally to the ascending aorta.

The patient was weaned from cardiopulmonary bypass with minimal inotropic support and made an uncomplicated recovery. He was discharged from the hospital on the seventh postoperative day. No organisms were grown from the aneurysmal contents.

DISCUSSION

The aneurysmal dilation of saphenous vein grafts is a recognized, although rare, complication of coronary bypass surgery. In the literature,

uncomplicated aneurysms have manifested either as a mediastinal mass, by the recurrence of angina (1) or even superior vena cava syndrome. By contrast, acute presentation may reflect aneurysmal complication through either thromboembolization causing myocardial infarction or fistulization.

Fistulization of SVG aneurysms is extremely rare. This can occur into any neighbouring structure including the pleura and bronchus (2). Of nearly 50 such aneurysms reported since 1975, only four describe fistulization into a cardiac chamber – either the right atrium or right ventricle (1,3). The resulting left-to-right shunt generates pulmonary volume overload and, in addition, it has been suggested that a ‘steal’ phenomenon may contribute to myocardial ischemia.

A distinction has previously been made between pseudoaneurysms, which have been attributed to technical failure at suture lines and tend to present early, and true aneurysms, occurring late and reflecting the continuing atherosclerotic process (3). The original operation report in our case described difficulty in identifying a suitable conduit due to severe varicose disease. It is likely that the greater wall tension within varicosities predisposes to pseudoaneurysm formation.

The temporal natural history of SVG aneurysms is not clear although, intuitively, intervention is necessary to pre-empt inevitable enlargement and consequent complications. The incidental discovery of a quiescent aneurysm in our asymptomatic patient initially resulted in deferring high-risk reintervention. Our experience, however, leads us to instead advise an aggressive approach, especially to seize a more favourable operative window. One successful report describing percutaneous coil embolization of an SVG pseudoaneurysm does exist (4). This may become a more attractive management option in the future.

Resternotomy in the face of patent LIMA grafts conventionally requires hazardous dissection of the LIMA pedicle to arrest its flow. We chose to adopt a recently described technique whereby a balloon catheter is introduced percutaneously into the LIMA preoperatively (5). During aortic cross-clamping, this allows the left anterior descending coronary artery myocardial territory to be isolated by balloon inflation. We are now using this technique routinely in redo cases with patent LIMA grafts to avoid its dissection.

The present report describes a rare case of an SVG aneurysm forming a fistula with the right atrium. Surgical management included excision, fistula repair and regrafting the run-off territory. Treatment was successful and the patient was discharged free from symptoms.

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