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Aneurysm of Aortocoronary Saphenous Vein Graft: Case Report and Literature Review

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ABSTRACT

True aneurysms of aortocoronary saphenous vein bypass grafts are a relatively rare complication of bypass surgery, but because the complications of thrombosis, embolization, or rupture are potentially fatal, this condition requires immediate surgical intervention. We describe a 78-year-old man who had undergone coronary bypass 15 years previously and who presented with a saphenous vein graft that was severely degenerated and aneurysmally enlarged throughout its course, measuring as much as 5 to 6 cm in certain locations. Redo coronary artery bypass grafting using the right and left internal thoracic arteries and resection of the aneurysm were performed. We also present a review of the literature regarding diagnosis, management, and treatment of this condition.

INTRODUCTION

True aneurysms of aortocoronary saphenous vein bypass grafts remain a relatively rare complication of bypass surgery compared to the number of bypass procedures performed annually. Because the complications of thrombosis, embolization, or rupture are potentially fatal, this condition requires immediate surgical intervention. We report a case of a 78-year-old man who presented 15 years after coronary bypass with a saphenous vein graft (SVG) that was severely degenerated and aneurysmally enlarged throughout its course, measuring as much as 5 to 6 cm in certain locations. Redo coronary artery bypass grafting (CABG) using the right and left internal thoracic arteries and resection of the aneurysm were performed. A review of the literature regarding diagnosis, management, and treatment of this condition is discussed.

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CASE REPORT

A 78-year-old man presented to the emergency department (ED) with intermittent episodes of nonradiating chest pain and shortness of breath. There was no associated nausea, vomiting, or diaphoresis. The pain was relieved with nitroglycerine, oxygen, and heparin. The patient's past medical history was remarkable for hypertension, hypercholesterolemia, venous insufficiency, and stasis dermatitis with bilateral varicose veins of the lower extremities. The patient had a positive smoking history of 20 pack years, but had quit 30 years prior. The patient had undergone CABG 15 years prior to this admission. He was asymptomatic for approximately 6 years after the procedure, until he developed angina. A repeat coronary angiogram was performed and showed an occluded native left anterior descending artery (LAD), an occluded SVG to the LAD, high-grade stenosis of the native second obtuse marginal branch of the left circumflex coronary artery, and an occluded native right coronary artery. The catheterization also showed distal occlusion with proximal varicosities present in the sequential vein graft to the third obtuse marginal branch and right coronary artery. The patient opted for medical therapy at that time and did well for several years, experiencing stable exertional chest pain.

The patient was admitted to the hospital several years later with unstable angina. A chest roentgenogram was obtained and showed a 6- to 8-cm mediastinal mass (Figure 1). Coronary angiography showed a severely degenerated and aneurysmally enlarged SVG along the length of the vessel up to the obtuse marginal branch of the left circumflex. Left ventriculography showed apical akinesis with normal left ventricular chamber size and preserved to minimally reduced left ventricular function. The patient was advised to undergo redo CABG and SVG aneurysm resection.

A resection of the SVG aneurysm and a redo CABG × 3 were performed. The left internal thoracic artery was sequentially anastomosed to the second and third obtuse marginal branches of the circumflex artery. The right internal thoracic artery was anastomosed to the LAD. The aneurismal SVG was ligated and excised (Figure 2). There were numerous postoperative complications, including multiple episodes of ventricular tachycardia and ventricular fibrillation arrest.

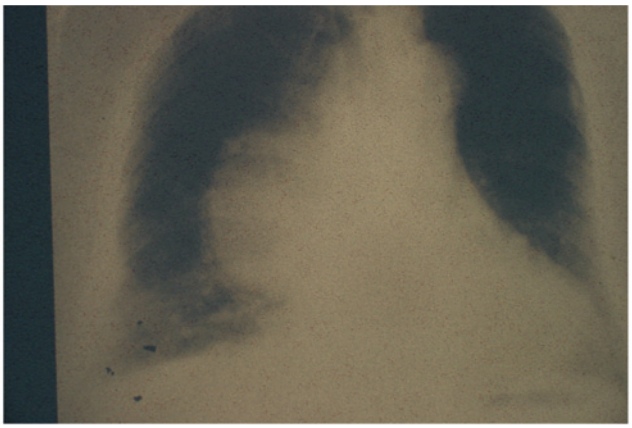

Figure 1. Plain chest radiograph.

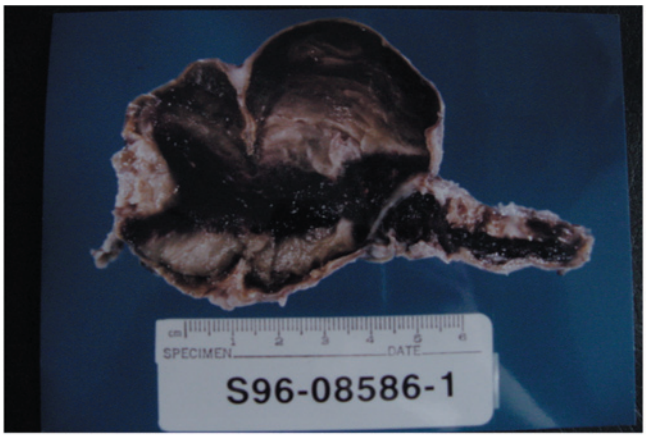

Figure 2. Pathologic specimen of saphenous vein graft aneurysm.

Electrical cardioversion/defibrillation and antiarrhythmic therapy with amiodarone were successful in restoring and maintaining normal sinus rhythm. The patient was discharged 3 weeks after surgery.

DISCUSSION

Aneurysms of SVGs are a relatively rare complication of CABG. In 1975, Riahi et al reported the first case of a true aneurysm of a saphenous vein used in CABG, occurring 2.5 years after bypass surgery [Riahi 1975]. Since that time, 45 cases of both true and false aneurysms have been reported. These reports have ranged from days to weeks following CABG [Douglas 1979] to as long as 21 years [Robiscek 1993]. The presentation of an SVG aneurysm from CABG may be subtle or striking, asymptomatic or symptomatic. Diagnostic methods include various radiologic modalities including plain roentgenography, echocardiography, computed tomographic (CT) scanning, and magnetic resonance imaging (MRI). An index of suspicion for an SVG aneurysm is necessary in order to avoid percutaneous needle biopsy of a mediastinal mass. Once the diagnosis is made, then the question of management arises.

Depending on the presentation, intervention may be considered elective, urgent, or emergent. In general intervention is necessary to avoid such serious complications as spontaneous late rupture with resultant pseudoaneurysm [Shapeero 1983, Murphy 1986, Yousem 1986], fistula development between the right ventricle and the SVG [Riahi 1984] or the right atrium and the SVG [Jukema 1992, Nathaniel 1996], hemothorax [Murphy 1986], or embolization of thrombotic material from a clot-filled aneurysm, causing myocardial infarction [Taliercio 1986], fatal dehiscence secondary to bacterial infection [Douglas 1979], superior vena cava obstruction [Rosin 1989], or acute myocardial infarction by mass effect [Sahouri 1995].

Management approaches for SVG aneurysms are variable, depending on the characteristics the aneurysm. One of the major factors used in characterizing an SVG aneurysm is whether it is a true or false (pseudo) aneurysm. These types appear to differ not only in their pathology but also in their location within the graft, time of presentation, and etiology. According to our review of the literature, true aneurysms tend to occur more commonly in the body of the graft, present more than 5 years after bypass, and are induced by vein graft necrosis, hypertension, trauma at harvest or implantation, or progressive atherosclerosis and thrombosis [Bramlet 1982]. Atherosclerosis has been shown to be an underlying factor in the formation of most true aneurysms, and SVGs appear to be as susceptible to similar sequelae of atherosclerosis as native coronaries [Pintar 1978, Teja 1987]. False aneurysms, on the other hand, tend to occur more often at proximal or distal anastomotic sites and are due more to suture defects, deficiency in preparation of the saphenous vein, or complications due to infection [Neilson 1988, Smith 1992]. Time of presentation tends to be less constant for pseudoaneurysms than for true aneurysms. Past reports have stated that false aneurysms tend to occur more often within 6 months following bypass. However, review of 17 reported cases found only 3 pseudoaneurysms presenting within 6 months following bypass [Dimitri 1992, Smith 1992, Mohara 1998]. Earlier studies of SVG aneurysms found that most vein graft aneurysms occurred at the anastomotic site and were therefore false [Shapeero 1983, Kallis 1993]. However, the literature cited in this paper reports 23 true and 18 false aneurysms. These findings may be due to reporting bias or may represent a true ratio.

Our patient presented with worsening unstable angina, which is a common presentation for patients with SVG aneurysms following CABG [Pintar 1978, Shapeero 1983, Liang 1988, Sherry 1989, Jukema 1992]. Patients may also present with pleuritic or diffuse chest pain, loss of consciousness, dyspnea, and/or hemoptysis, or they may be asymptomatic. In 1 patient a pulsatile mass was found on physical examination [Sahouri 1995]. Several diagnostic tools have been used in diagnosis of SVG aneurysms, each with its own unique feature. Chest roentgenography is the most widely used initial diagnostic tool. Several SVG aneurysms have ini-

tially presented as mediastinal masses on plain chest radiographs [Kim 1983, Shapeero 1983, Lopez-Velarde 1988, Karwande 1990, Forster 1991, Hughes 1991, Robiscek 1993, Wester 1993, Wyatt 1993]. MRI can be used to correctly identify and localize a radiographic abnormality as an aneurysm [Sherry 1989]. Transesophageal echocardiography provides serial assessment of size as well as intraluminal pathology and can be used to further delineate the anatomy of an aneurismal dilation seen on angiography [Dzavik 1989]. CT [Shapeero 1983, Yousem 1986] and CT with contrast [Dimitri 1992] can show the extent of the aneurysm and its relation to and impression on surrounding structures. Intravascular ultrasound with computerized 3-dimensional reconstruction provides detailed information on the structure and gives unique insight into morphology, pathogenesis, and management of SVG aneurysms [Ennis 1993]. Finally, angiography has been used most frequently as the final diagnostic criterion to demonstrate or confirm the vascular nature of SVG aneurysms.

One interesting feature that prompted the report of this case was the presence of varicose veins in our patient, a finding that raised the question of whether there is evidence for a relationship between SVG aneurysm formation and venous insufficiency and the propensity for varicosities. We found only one other report of a patient with a history of venous insufficiency and an SVG aneurysm [Ennis 1993]. We have found no evidence that development of graft aneurysms is more likely in SVGs performed in patients with a history of varicose veins. However, it would seem logical that the same weakness in a vein wall that would allow for varicosities would promote dilation due to the high arterial pressures of coronary circulation. This weakness in the wall of the vein is thought to occur between the valves of the saphenous veins, where the circular smooth muscle gives way to the longitudinal muscle [Benchimol 1975]. Regardless of the exact pathogenesis, it is surprising that this condition does not occur more often.

Riahi et al stated in 1984 that clear recommendations regarding the management of SVG aneurysms after coronary revascularization have not been proposed because the natural history of this entity had not been well enough established [Riahi 1984]. Based on the growing knowledge of this complication and the reports since that time, we have several recommendations for the management of patients with SVG aneurysms. First, for any patient with a history of CABG who presents with a mediastinal mass on chest roentgenography, SVG aneurysm should be included in the list of differential diagnoses. If an aneurysm is suspected, either CT or MRI is an adequate next step in diagnostic testing. Echocardiography has also been shown to be useful. However, any suspicious finding on any imaging study necessitates cardiac catheterization. Angiography remains the gold standard for diagnosis of SVG aneurysms and should be done if results of any previous tests are suspicious.

Based on the reported cases, our recommendation is that any symptomatic patient presenting with an SVG aneurysm should be treated surgically, regardless of the size of the aneurysm, because medical management of these patients has not been shown to have positive outcomes [Douglas 1979, Bramlet 1982, Yousem 1986, Wester 1993]. The most successful operative techniques are ligation of the proximal and distal ends of the graft with resection of the aneurysm, and performance of some method of revascularization. There have also been good results reported with coil embolism for aneurysmally dilated vessels. There were positive outcomes in several instances [Kim 1983, Shapeero 1983, Dimitri 1992] in which flow was blocked with embolization and the aneurysm was not resected. This result highlights the importance of patency of the vessel. Because of the likelihood of complications such as thrombosis, embolization, and fistula formation, a patent aneurismal vein graft should be considered for resection and replacement [Dzavik 1989]. A completely occluded graft appears less ominous and therefore can be followed with CT, MRI, or echocardiography. For asymptomatic patients, the size of the aneurysm was initially thought to be the most important factor in determining the management of SVG aneurysms, with larger aneurysms necessitating resection and the smaller ones less likely to require it. However, the cases reported demonstrate much variation in the size of the aneurysms and their outcomes [Riahi 1975, Yousem 1986, Lopez-Velarde 1988, Hughes 1991, Robiscek 1993, Chalasani 1997]. Therefore, we recommend that asymptomatic patients with SVG aneurysm be followed very closely for development of symptoms and undergo periodic imaging to assess growth of the aneurysm. Patients with either scenario (growth or symptoms) should undergo immediate surgery to resect the mass and avoid potential rupture.

CONCLUSION

SVG aneurysms are uncommon complications of CABG. These lesions present as mediastinal masses on plain radiography and may be mistaken for noncardiac, nonvascular lesions. Further imaging with CT, MRI, or echocardiography is needed to determine the diagnosis. Angiography is required to confirm the diagnosis and plan management. Intervention is necessary to prevent such complications as thrombosis, embolization, or rupture. Patent aneurysms should be ligated and the vessel they supply rebypassed. The management of thrombosed SVG aneurysms is debatable and may depend on location and size. Similarly, if proximal and distal ligation is performed, physical resection depends on location and size.

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