

Case Report on Saphenous Vein Graft Aneurysm with Fistula Development to The Right Atrium

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Received: 16 December 2021; **Accepted:** 21 December 2021

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ABSTRACT

Saphenous vein graft aneurysms (SVGA) are rare complications after coronary artery bypass graft (CABG) operation, which can develop fatal complications including cardiac ischemia, compression, rupture, and death. A 72-year-old male patient presented four years post-CABG with dyspnea. Investigations showed a saphenous vein graft aneurysm with fistulization to the right atrium. During the catheterization, the large coronary artery graft aneurysm was seen on the right measuring up to 6.0 x 4.7 x 6.7 centimeters. This was successfully operated by surgical excision and repaired. The patient was eventually discharged home. Commonly SVGAs are asymptomatic, but clinically significant ones are possible and should be diagnosed and treated appropriately.

Keywords: Saphenous Vein Graft Aneurysm, Fistula, Right Atrium, Coronary Artery Bypass Graft

Introduction

Aneurysms are organized into categories of true versus false and early versus late (Ramirez *et al.*, 2012). While mild saphenous vein graft aneurysms (SVGA) are common, clinically significant SVGAs are rare with complicated forms presenting as myocardial infarction and fistula formation to adjacent structures (Khan *et al.*, 2019; Gruberg *et al.*, 1999; Kim *et al.*, 1983; Memon *et al.*, 2003; Benchimol *et al.*, 1975). Diagnosis can be confirmed by coronary angiography or computed tomography coronary angiogram with contrast (Khan *et al.*, 2019; Memon *et al.*, 2003). The options for treatment of SVGAs include medical management, percutaneous interventions, and surgical repair (Ramirez *et al.*, 2012; Khan *et al.*, 2019).

Case Presentation

A 72-year-old male with a history of congestive heart failure, hypertension, hypercholesterolemia, and peripheral arterial disease presented with progressive dyspnea six years after coronary artery bypass graft (CABG) for severe left mainstem arterial stenosis. Cardiac examination found normal S1 and S2 heart sounds with no murmurs, gallops, or rubs. A chest radiograph showed dilated heart, mild pulmonary vascular congestion, and right-sided pleural effusion. Computed tomography (CT) scan of the chest revealed a 6.0 x 4.7 x 6.7-centimeter ball-like mass compressing the right atrium (Fig. 1) and fistulization to the right atrium (Fig. 2). An echocardiogram showed a moderately reduced systolic function with an ejection fraction of 30-35%. Catheterization from the aorta to the RCA redemonstrated the large SVGA that emptied into the right atrium and RCA.

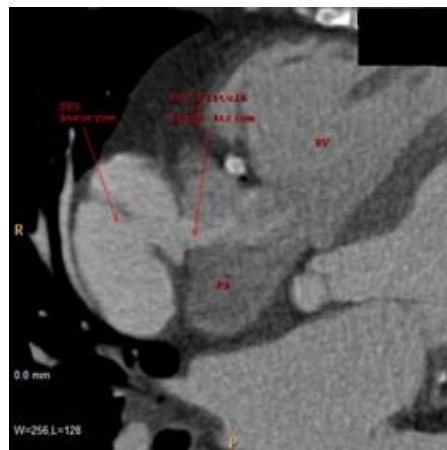


Figure 1: Computed tomography of coronary angiography showing saphenous vein graft aneurysm (6.0 x 4.7 x 6.7 cm) and fistula to the right atrium and right coronary artery.

Coronary angiography and urgent open-heart surgery were performed and redemonstrated fistulization of the SVGA to the right atrium (Fig. 2). Cardiopulmonary bypass was instituted between the left femoral artery and vein before re-sternotomy. Antegrade cold blood cardioplegic solution was instilled into the aortic root during aortic cross-clamping to provide myocardial protection. Cardiac surgery was performed to excise the aneurysm, repair the fistula with a bovine pericardial patch, and revascularize the RCA. The SVGA part of the RCA was transected and repaired with buttressed sutures. Thereafter, the patient was weaned from cardiopulmonary bypass without any complications. A CT coronary angiogram with contrast was performed two days later and confirmed occlusion of the aneurysm. A repeat echocardiogram showed a normal ejection fraction. The patient was discharged to his skilled nursing home. He came to a routine four-week follow-up appointment where he denied any acute symptoms, including recurrent or current chest pain, and no modifications were made to his medication regimen.

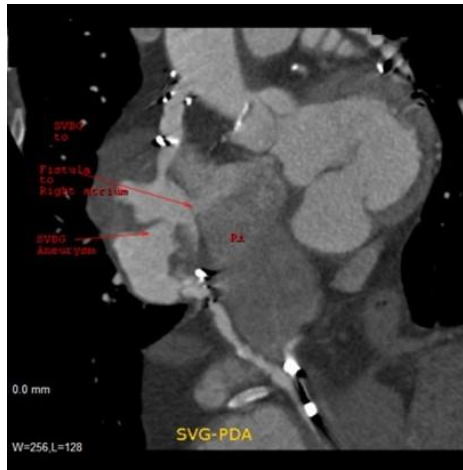


Figure 2: Computed tomography of coronary angiography showing fistulization of saphenous vein graft aneurysm to the right atrium.

Discussion

Aneurysms are defined as abnormal vessel dilation that is 1.5 times greater than the proximal reference value (Ramirez *et al.*, 2012). They can be classified into true and false, also known as pseudoaneurysms. True aneurysms are characterized by the expansion of all cell layers of the wall and are lined by endothelium. Pseudoaneurysms are the expansion of one or more cell layers (but not all), not lined by endothelium, and represent focal distension with a hematoma (Stedman, 1995). Based on their timing of development, they can also be categorized as early and late aneurysms. Early aneurysms present less than 12 months after surgery and are most likely pseudoaneurysms. Early aneurysms are typically caused by technical failures during conduit harvesting, preparation, and grafting (Kallis *et al.*, 1993; Werthman *et al.*, 1991). Other rare associations include infection of the implanted graft, intrinsic weakness of the graft vessel (such as from undetected varicosities), and anastomotic suture disruption (Douglas *et al.*, 1979; Ennis *et al.*, 1993; de Haan *et al.*, 1995). Late aneurysm forms after greater than five years from the initial CABG, are more often true aneurysm, and arise due to an ongoing atherosclerotic process (Ramirez *et al.*, 2012). Specific pathophysiological reasons for true SVGAs include hyperlipidemia, atherosclerosis, and graft wall weakness near the valve sites (Benchimol *et al.*, 1915; Liang *et al.*, 1988; Teja *et al.*, 1987; Neitzel *et al.*, 1986).

Six years after his surgery, our patient developed progressive symptoms and imaging findings were consistent with a true, late SVGA. A successful CABG was performed using a saphenous vein to revascularize the RCA and bypass the affected vessel. There was no history of varicosities or other vascular insufficiencies that would decrease the quality of the graft. Proximal and distal ends were sealed using continuous sutures of propylene monofilaments.

Although mild SVGAs are very common, with an incidence of approximately 14% within five to seven years after CABGs, clinically significant SVGAs are rare (Khan *et al.*, 2019; Gruberg *et al.*, 1999; Kim *et al.*, 1983). Pseudoaneurysms of a saphenous vein graft is more frequently symptomatic with recurrent chest pain a common presentation. They can also present with infection, hemopericardium, hemothorax, hemoptysis, and sudden cardiac death (Memon *et al.*, 2003). Cases have reported fistula development from an SVGA that involves adjacent structures such as the superior vena cava, atria, right ventricle, pulmonary artery, and even the chest wall. Benign progression is a feature associated with true SVGA (Memon *et al.*, 2003). Overall, the presentation of aneurysms is highly variable. Most of them are asymptomatic and are discovered incidentally as a mediastinal mass on chest x-ray or on CT scan that was performed for other reasons. Additionally, patients with uncomplicated symptomatic SVGAs can present for anginal symptoms or superior vena cava syndrome. On the other hand, complicated symptomatic SVGAs can be acutely present with myocardial infarction or fistula formation. Coronary angiography is the diagnostic modality to confirm aneurysmal dilation, but sometimes it cannot provide the dimensions of an aneurysm due to a thrombus formation at the site (Benchimol *et al.*, 1975). In these cases, CT coronary angiogram with contrast can be helpful. Therefore, the final treatment plan should be based on the findings of both the angiogram and CT scan (Benchimol *et al.*, 1975). Magnetic resonance angiography is another diagnostic modality that is useful in evaluating SVGAs (Benchimol *et al.*, 1975).

Treatment of SVGAs focuses on preventing complications and repairing the graft. The options include medical management with surveillance, percutaneous intervention, or surgical repair. Medical therapy is favored in patients with a low risk of rupture, aneurysm diameter less than one centimeter, or brisk flow through the graft. In poor surgical candidates, percutaneous interventions are considered and include covered stent grafting (Bhindi *et al.*, 2009; Rahim *et al.*, 2009), coil embolization (Maroo *et al.*, 2006), vascular plug insertion (Mylonas *et al.*, 2006), or alcohol injection into the graft (Mylonas *et al.*, 2006). Finally, surgical options include excision, fistula repair, and re-grafting (Sonnenberg *et al.*, 2010).

Although clinically significant SVGAs are rare, if they become complicated the patients can present with myocardial infarctions or fistualizations. Physicians should have a high clinical suspicion for these and consider coronary angiography to confirm the diagnosis. Moreover, CT coronary angiogram with contrast is the gold standard method of treatment.

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