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Mycotic Aortocoronary Saphenous Vein Graft Aneurysm Presenting With Unstable Angina Pectoris

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We report the case of a 60-year-old man with a history of coronary bypass surgery 20 years prior who had a fever, chest pain, and a mediastinal mass develop after a complicated postoperative course of abdominal aortic aneurysm resection. A mycotic aneurysm of the saphenous vein graft to his left anterior descending coronary artery was diagnosed based on blood culture results and visualization of the aneurysm before resection. A summary of the saphenous vein graft aneurysm and pseudoaneurysm cause, diagnosis, and management is detailed.

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Aneurysms and pseudoaneurysms of saphenous vein grafts (SVGs) to the coronary arteries are rare, and only four mycotic SVG aneurysms have been previously reported [1-4]. We present the case of a mycotic SVG aneurysm presenting as an unstable angina after resection of an abdominal aortic aneurysm with a complicated postoperative course. Recognition, evaluation, and management of this condition are discussed.

A 60-year-old man with a history of diabetes mellitus, hyperlipidemia, smoking, and four-vessel coronary artery bypass (CAB) 20 years previously underwent emergent repair of an abdominal aortic aneurysm at a referring institution. His postoperative course was complicated by multiple episodes of bacteremia with *Enterococcus faecalis* and *Staphylococcus aureus*, sepsis, and acute respiratory distress syndrome. In addition, the patient had hemorrhagic pancreatitis and ischemic colitis develop, which required a distal pancreatectomy, splenectomy, and partial bowel resection. He returned to the operating room for lysis of adhesions to relieve a postoperative small bowel obstruction. Two months after his initial abdominal aortic aneurysm repair, he was transferred to our hospital for further management. On arrival he remained ventilator dependent and critically ill with multiple abdominal abscesses and an entero-cutaneous fistula. Over the following month his condition slowly improved with antibiotics, percutaneous drainage of his

abdominal abscesses, and intense nutritional support. He was subsequently weaned from the ventilator. Despite more than 1 month of antibiotic therapy, the patient remained febrile with temperatures exceeding 38°C. Nevertheless he remained hemodynamically stable and was transferred out of the intensive care unit.

One day later, the patient had chest pain develop while moving from his bed to the chair. It was the first time he had experienced anginal symptoms since his CAB 20 years previously. Sublingual nitroglycerin was given to the patient, which resolved his pain and electrocardiographic changes. Serum cardiac enzyme levels were normal. Echocardiography revealed no regional wall motion abnormality, but a large anterior mediastinal mass compressing the right ventricle was present (Fig 1). To evaluate this mass, computed tomography of the thorax was performed that revealed a 6.0 × 3.0 cm calcified aneurysm of the SVG to the left anterior descending artery (LAD). Blood flow was maintained through a narrowed but patent graft lumen (Fig 2). Magnetic resonance imaging of the thorax revealed the presence of layered intraluminal thrombus within the aneurysm and a patent graft lumen (Fig 3).

The cardiac catheterization performed the previous year after a positive stress test was reviewed. It demonstrated an ectatic SVG to the LAD without evidence of aneurysm or stenosis. The other three vein grafts were 100% occluded, as were the patient's native LAD and right coronary arteries. The left circumflex remained largely disease free and appeared to provide much of the collateral blood flow to the right coronary artery. The setting of multiple episodes of bacteremia, persistent fevers, unstable angina, and the new SVG aneurysm was concern for a mycotic SVG aneurysm. In anticipation of surgical therapy, a repeat cardiac catheterization demonstrated no change from the one done previously, except for the aneurysmal SVG to the LAD (Fig 4). The aneurysm appeared to be filled with thrombus. Despite extensive coronary artery disease, good target vessels for bypass grafting were present in the distal regions of the LAD and right coronary artery.

The patient was subsequently taken to the operating room for resection of a presumed mycotic SVG aneurysm and repeat CAB. After a standard median sternotomy approach, a 6.0 × 4.0 cm aneurysm of the SVG graft to the LAD was noted to be compressing the right ventricle. The left internal mammary artery was damaged during the patient's first CAB and was unavailable for use; thus two SVGs were placed with one to the LAD and the other to the posterior descending artery. The aneurysmal SVG graft was ligated proximally and distally, and retrograde blood cardioplegia was performed to wash out any material remaining in the open artery. Upon incision of the aneurysmal SVG, intraluminal thrombus and approximately 100 mL of suppurative material were revealed. This SVG was then resected. Histopathologic examination revealed aneurysm with thrombosis and focal calcification. Gram stain, fungal stain, and cultures of the purulent material were all negative. Postoperatively, the patient was maintained on broad-spectrum antibiotic coverage, and he slowly recovered. Six months after his

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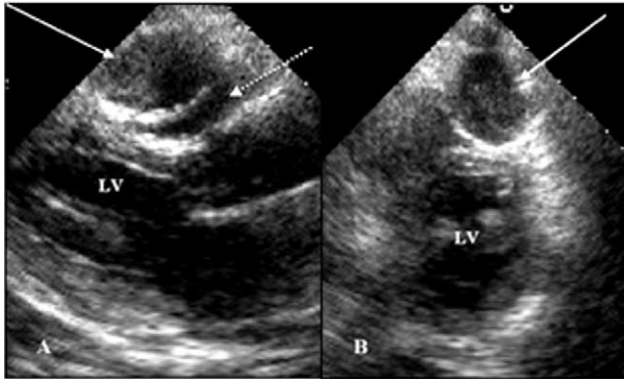


Fig 1. (A) Echocardiogram showing extrinsic compression of right ventricle (dashed arrow) by mass (solid arrow) on parasternal long axis view. (B) The arrow points to mass abutting the right ventricle and anterior wall of the left ventricle on short-axis view. (LV = left ventricle.)

original abdominal aortic aneurysm repair, the patient was discharged from the hospital.

Comment

Aneurysms and pseudoaneurysms of coronary artery SVGs are rare, having been reported in the literature less than 80 times in the past 30 years. Mycotic or infected coronary artery bypass graft aneurysms are only a small fraction of the reported cases, with only 4 patients who were previously documented [1-4]. In all of these patients, the mycotic aneurysms developed within the first postoperative year and in 2 of 4 patients, the aneurysms developed within the immediate postoperative period. Of these 4 patients, 3 had postoperative mediastinitis or sternal wound infection, or both. All of these patients underwent repeat sternotomies, and in 2 patients it was fatal.

Our case is unusual because the mycotic aneurysm developed many years after graft placement and because



Fig 2. Computed tomographic scan of the thorax reveals a dilated, calcified saphenous vein graft (arrow) in the anterior mediastinum.

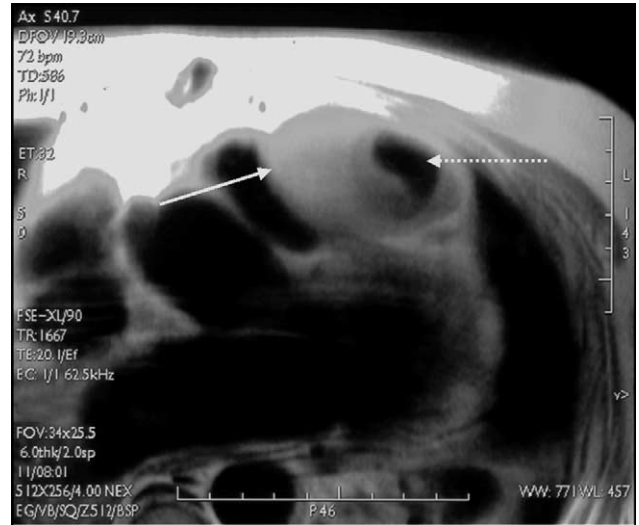


Fig 3. Magnetic resonance image of the thorax demonstrating aneurysmal saphenous vein graft with intraluminal layered thrombus (solid arrow) and a patent lumen (dashed arrow).

it occurred outside the setting of postoperative mediastinitis or sternal wound infection. The patient in the present case report had an aneurysm that likely developed after multiple bacteremic episodes that complicated the postoperative course of his abdominal aortic aneurysm resection. Despite the abundant amount of purulent fluid found intraoperatively, we were unable to identify a causative organism in this case, probably from

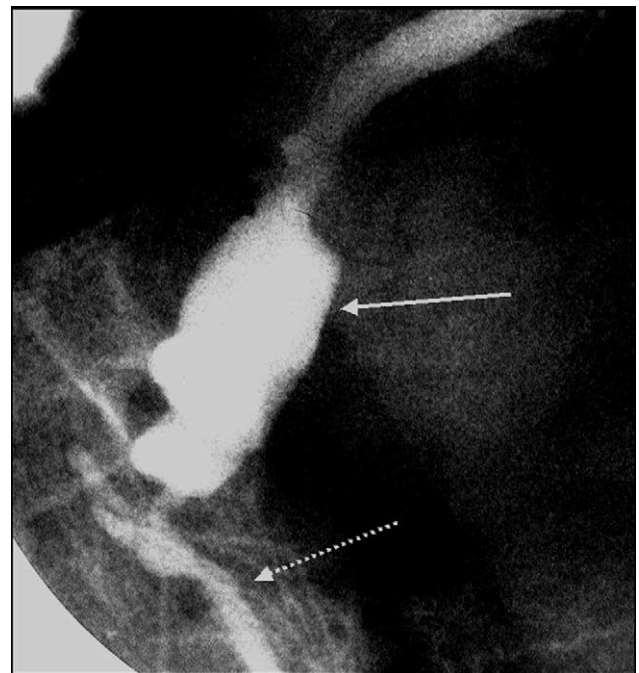


Fig 4. Coronary angiogram of the saphenous vein graft to the left anterior descending artery. The distal portion of the aneurysmal vein graft (solid arrow) with intraluminal thrombus inserts into the distal left anterior descending artery (dashed arrow).

sterilization of the aneurysm fluid by a prolonged course of broad-spectrum antibiotics. Of the 4 previously reported patients, 3 of the causative organisms were *Staphylococcus aureus* and *Aspergillus* was the isolated cause in the other patient [1-4].

Typically SVG aneurysms present with ischemic symptoms secondary to graft occlusion or distal embolization from intraluminal thrombus, or as asymptomatic chest masses detected during chest imaging. As described by Lupetin and colleagues [5], the triad of chest pain, mediastinal mass, and previous bypass surgery should raise concern of an SVG aneurysm. The most common graft involved is the SVG to the LAD. This is important because aneurysms of this graft are usually not seen on standard chest roentgenograms, whereas SVGs to the RCA or obtuse marginal branches may often be seen.

True aneurysms and pseudoaneurysms of SVGs occur with the same frequency, but they are pathologically different. True aneurysms typically are fusiform and involve the body of the graft and also commonly result from graft arteriosclerosis. Pseudoaneurysms, in contrast, are saccular, they usually present at the anastomotic site, and they are often related to technical issues [6].

In a review of 50 cases of SVG aneurysm by Kalimi and colleagues [6], the mean length of time post-CAB aneurysms were diagnosed was 10 years after surgery (range, 7 days to 21 years). As SVGs age, they become more susceptible to have aneurysms develop secondary to accelerated arteriosclerosis, and the inability of the thin venous wall to prevent dilatation. Our case, although extremely rare, illustrates that patients with previous CAB and bacteremia are at risk for mycotic aneurysm formation.

Once an SVG aneurysm is detected, computed tomography or magnetic resonance imaging of the chest should be performed to determine patency of the graft lumen, as well as the precise location of the graft within the mediastinum to guide the surgical approach. Before operation, a diagnostic cardiac catheterization should also be performed to evaluate potential distal targets for revascularization. In the review of 50 SVG aneurysms by Kalimi and colleagues [6], 31 patients underwent surgical ligation of the SVG aneurysm. Of these, 29 patients had simultaneous revascularizations of the affected vessel. The 2 patients who did not suffer large anterior wall myocardial infarctions postoperatively indicative of the importance of simultaneous revascularization in this setting. Embolization using coils placed percutaneously is another therapeutic option; however, no simultaneous revascularization occurs during this procedure. Kalimi and colleagues [6] suggest embolization should be reserved for patients deemed too high risk for repeat CAB.

This article describes a rare case of a mycotic SVG aneurysm that developed in a patient more than 20 years after CAB surgery in the setting of multiple episodes of bacteremia. Management of SVG aneurysms (mycotic or otherwise) depend on recognition of the disease, subsequent evaluation with computed tomography or magnetic resonance imaging of the chest to delineate the location of the aneurysm and patency of the graft lumen. This should be followed by cardiac catheterization to locate target areas

for revascularization. The appropriate timing of surgery in patients with an SVG aneurysm is not known. However, we would advocate urgent surgical revascularization of symptomatic or suspected mycotic aneurysms. A more conservative, observational approach for asymptomatic patients is reasonable for SVG aneurysms less than 1 cm in diameter and with brisk graft flow. The observational strategy could be performed noninvasively by using either magnetic resonance imaging, computed tomography or angiography. For those patients with SVG aneurysms greater than 1 cm in diameter or with diminished graft flow, prompt surgical revascularization would be recommended. Ligation or resection of SVG aneurysms with simultaneous revascularization appears to be the optimal therapy, but intravascular embolization of the graft with coils may be an option for high-risk patients.

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Selective Arterialization of the Coronary Venous System

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The idea of myocardial revascularization by means of grafting the coronary venous system is more than a century old; in cases of diffuse coronary artery disease, this may represent a valid therapeutic option. We present a challenging case in which a patient with an aberrant left coronary system and unstable angina underwent this type of procedure with good clinical results.

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