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CASE REPORT

BEGINNER

CLINICAL CASE

Successful Conservative Treatment of a Large Infected Saphenous Graft Aneurysm

Usefulness of PET/CT

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ABSTRACT

We report a case of a 75-year-old man with a medical history of coronary artery bypass graft surgery and a recent graft angioplasty, who presented to our emergency department with fever. An 18F-fluorodeoxyglucose positron emission tomography demonstrated a saphenous graft infected aneurysm, which was successfully treated conservatively with antibiotic therapy. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2020;2:764–8) © 2020 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

A 75-year-old man presented to our emergency department with fatigue and tarry stools. He had persistent fever during hospitalization and phlebitis was suspected to be the cause.

MEDICAL HISTORY

The patient had a history of coronary artery bypass graft surgery performed 30 years ago (left internal mammary artery to the left anterior descending artery and a saphenous vein graft [SVG] to the obtuse marginal artery). Six years ago, he had a myocardial infarction and 2 stents were implanted: one to the left anterior descending artery (the left internal mammary artery was occluded) and the other to the proximal segment of the SVG where a severe stenosis was detected. Two weeks before the current episode, he was admitted to another hospital with a non-ST-segment elevation myocardial infarction, and a critical stenosis at the distal segment of the saphenous graft was documented. A complex venous graft angioplasty was performed and a drug-eluting stent was implanted.

LEARNING OBJECTIVES

- To use PET/CT as a diagnosis and follow-up technique in an infected aneurysm.
- To consider conservative treatment in patients with infected graft aneurysm and high surgical risk.

DIFFERENTIAL DIAGNOSIS

Initially, the most frequent causes of fever in hospitalized patients, such as urinary or respiratory

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infections, were considered. Subsequently, because of the persistence of fever despite antibiotic treatment, other causes of fever of unknown origin were considered: rheumatic polymyalgia with or without temporal arteritis, cytomegalovirus infection, tuberculosis, Q fever, antiphospholipid syndrome, infective endocarditis, and neoplastic diseases such as lymphoma. The differential diagnosis was directed according to the frequency of diseases in our population.

INVESTIGATIONS

Peripheral venous line was removed and blood cultures were drawn. One culture grew methicillin-resistant *Staphylococcus aureus* and antibiotics were started according to antibiogram. The patient continued to have fever. Yet, there were no clear signs of infection on physical examination, nor were there symptoms of respiratory or urinary infection or gastroenteritis. Chest radiography and urinalysis were normal. A transesophageal echocardiogram (TEE) did not document signs of infectious endocarditis. Finally, an 18F-FDG PET/CT revealed an anterior mediastinal mass of 6x4 cm involving the saphenous graft (**Figures 1A and 1B**).

To assess patency of the graft and the condition of the coronary arteries, a thoracic contrast CT scan was performed (**Figure 2**). No clear leakage point was observed, and the saphenous graft lumen could not be properly assessed. The patient therefore underwent a coronary angiography demonstrating that the saphenous graft was occluded.

MANAGEMENT

An infected saphenous graft aneurysm was suspected and antibiotic treatment was switched to rifampin and daptomycin. The fever subsided with the new antibiotic therapy; left ventricular ejection fraction was normal and the patient was asymptomatic. Following discussion with the multidisciplinary heart team, because the aneurysm was excluded from the systemic circulation and given the complexity of the surgical intervention, a medical approach was preferred over surgery.

The patient continued with antibiotics and acute phase reactants (C-reactive protein and erythrocyte sedimentation rate) and leukocytosis progressively decreased. An 18F-FDG PET/CT was repeated after 2 weeks of antibiotics and a mild reduction of 18F-FDG uptake was observed. It was decided to continue with intravenous rifampin and daptomycin for a total of 6 weeks followed by 3 months of oral antibiotic treatment with rifampin and linezolid. After this long antibiotic cycle, a new 18F-FDG PET/CT showed resolution of the infection (**Figures 1C and 1D**) and antibiotics were discontinued.

DISCUSSION

SVG aneurysms are a rare complication after coronary artery bypass graft surgery. Only a few case reports and small case series have been published (1–3). Operative complications and need for re-exploration after surgery have been identified as predictors of this complication (1).

The pathophysiology of these lesions is poorly understood. Conduit injury, anastomotic suture disruption, and infection of the graft may be involved in the genesis of SVG aneurysms (2). Postoperative sternal wound infection or mediastinitis contributed to most of the infected SVG aneurysms (1,3). In the case presented here, we hypothesize that conduit injury during complex angioplasty and graft stenting plus the use of triple antithrombotic therapy might cause the formation of the SVG aneurysm. Subsequently, angioplasty- or catheter-related (phlebitis) bacteremia would cause aneurysm infection. Frequently, SVG aneurysms present with ischemic symptoms secondary to graft thrombosis or distal aneurysmal embolization, or as an asymptomatic mass during chest imaging (1). In infected aneurysms, in contrast, fever and infectious symptomatology prevail, making diagnosis more difficult.

S. aureus has been the most commonly involved microorganism in infected SVG aneurysms (3). The strong virulence of this microorganism may explain this association. *S. aureus* bacteremia is associated with high mortality, and TEE is indicated in most patients to rule out infected endocarditis. In our patient, after TEE was negative and the site of infection remained unknown, an 18F-FDG PET/CT successfully detected the focus of infection. The clinical value of this technique in *S. aureus* bacteremia has been recently shown (4,5).

Once an SVG aneurysm is detected, a chest CT should be performed to determine graft patency, as well as the exact location of the aneurysm within the mediastinum to guide the surgical approach. Cardiac catheterization should also be done to assess coronary anatomy and potential distal targets for revascularization.

There is no consensus on the optimal management of SVG aneurysms. Treatment options include surgical repair and percutaneous closure with Amplatzer devices, covered stents, and arterial coiling (1). In

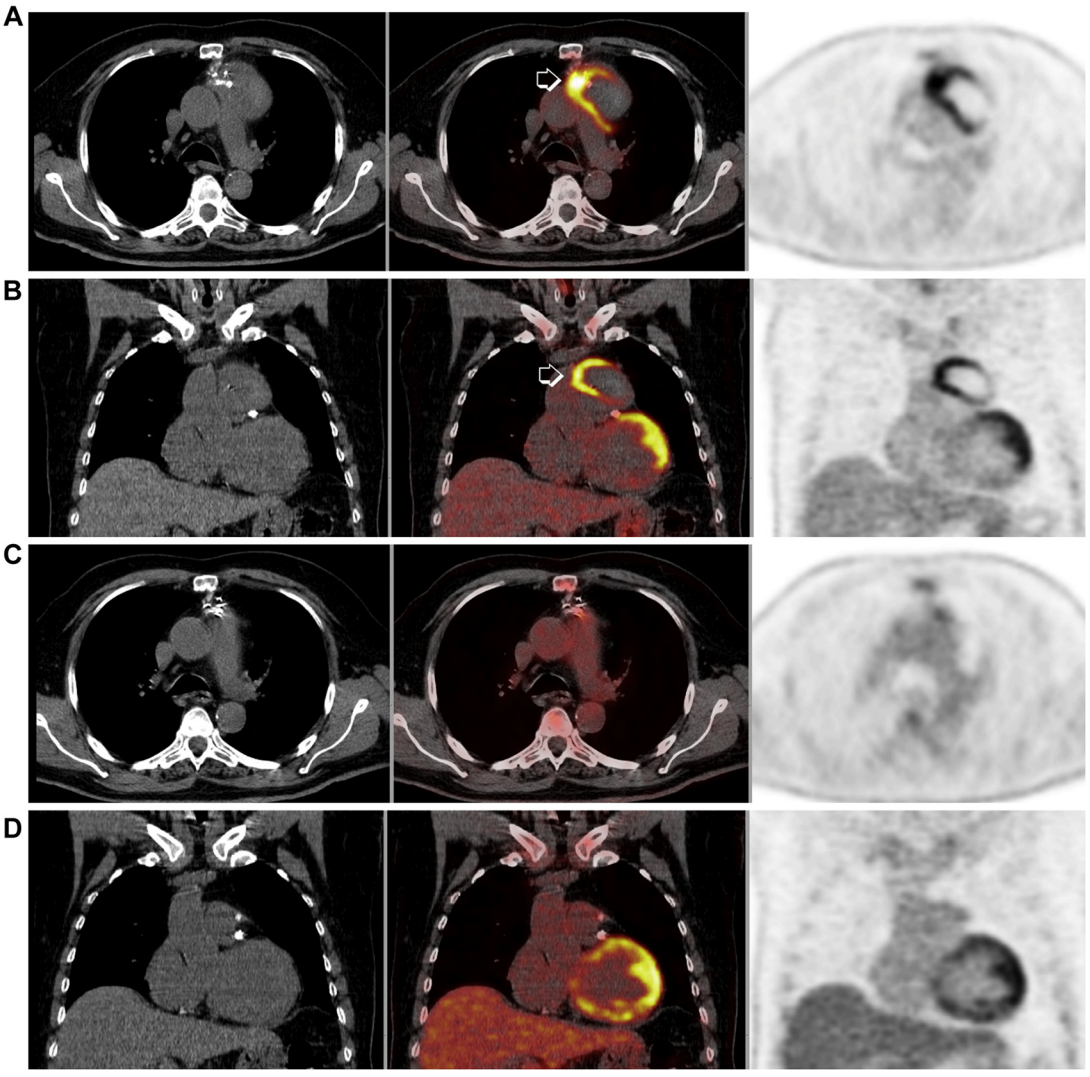
ABBREVIATIONS AND ACRONYMS

18F-FDG PET/CT = 18F-fluorodeoxyglucose positron emission tomography/computed tomography

SVG = saphenous vein graft

TEE = transesophageal echocardiogram

FIGURE 1 PET/CT Images Before and After Antibiotic Treatment

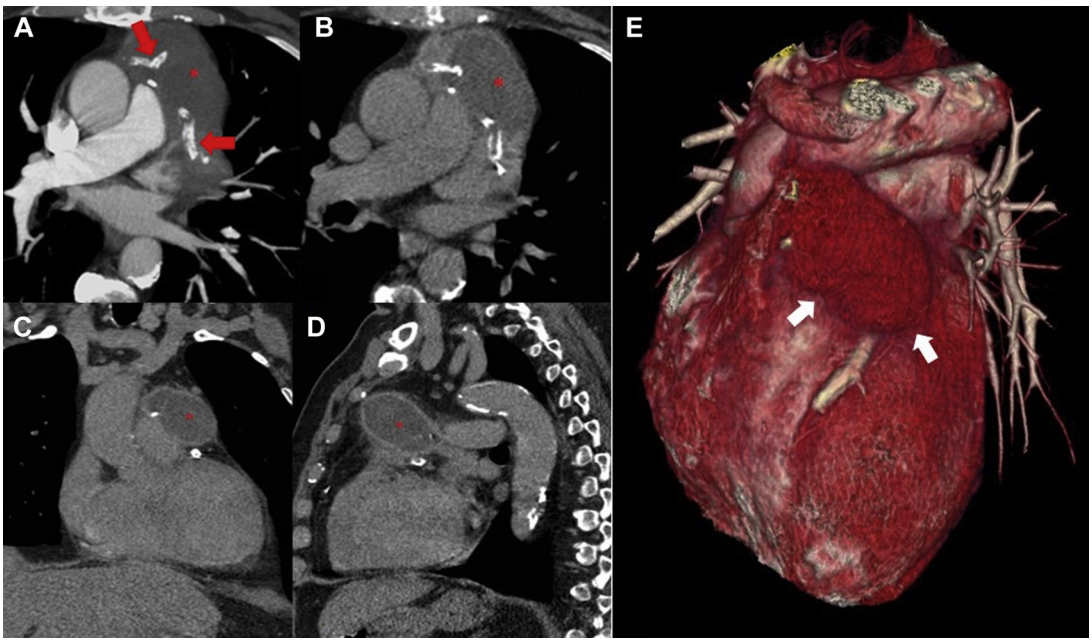


PET/CT images of 2 studies undertaken in **(A, B)** February and **(C, D)** July 2019. Axial and coronal images showing CT **(left)**, fusion **(middle)**, and PET **(right)**. **(A, B)** A huge mass surrounding the saphenous graft with intense 18F-FDG uptake (SUVmax 15.8) **(arrow)**. **(C, D)** Three months after oral antibiotherapy, a complete resolution of the infection with absence of FDG uptake can be seen. Note: a physiological uptake of the myocardium is seen in **B and D**. 18F-FDG = 18F-fluorodeoxyglucose; PET/CT = positron emission tomography/computed tomography; SUVmax = maximum standardized uptake value.

infected aneurysms, open surgical repair of the mycotic aneurysm and debridement with or without revascularization has been the most common management in previous cases (3). In our patient, a conservative management was decided according to 4 clinical reasons: 1) the patient was evolving well under antibiotics; 2) the saphenous graft was occluded and yet the patient had no signs of ischemia; 3) the infected aneurysm was already excluded from the systemic circulation; and 4) surgical risk was high.

In our center, daptomycin is the first-line therapy for methicillin-resistant *S. aureus* bacteremia (6). Rifampin is bactericidal against *S. aureus*, achieves

FIGURE 2 **CT Images Showing a Large Fluid Collection Surrounding the Saphenous Graft**



(A, B) Axial CT slices showing a large epicardial fluid collection **(*)** surrounding the saphenous bypass graft **(A)** in arterial and better delimited **(B)** at the delayed contrast phase. The fluid collection lies next to the main pulmonary artery trunk, the aortic root, and the left atrial appendage. Both proximal and distal stents located in the graft are seen on **A (arrows) and B**. **(C)** Coronal and **(D)** sagittal CT reconstructions showing the anatomical relations between the fluid collection **(*)**, the aortic root, and the pulmonary artery at the delayed phase images. **(E)** CT volume rendering showing a large fluid collection **(arrows)** surrounding the saphenous graft. CT = computed tomography.

high intracellular levels, is one of the few antimicrobial agents that can penetrate biofilms, and it has been commonly used adjunctively to treat *S. aureus* infections (7). Thus, we first used parenteral antibiotic therapy with daptomycin; thereafter, we used prolonged oral antibiotic combination of linezolid plus rifampin (6). It is pertinent to emphasize that in our case PET/CT was useful both in the location of the infectious focus and to monitor the therapeutic response. The possibility of using 18F-FDG PET/CT as a tool to monitor the response to the antibiotic treatment in patients with graft infections has already been suggested (8).

FOLLOW-UP

After 6 months of follow-up, the patient is doing well, without fever or any type of infectious or ischemic symptoms.

CONCLUSIONS

In selected cases, infection of SVG aneurysms can be treated conservatively with prolonged antibiotic therapy. 18F-FDG PET/CT is a useful technique in the diagnosis of this complication and in monitoring the response to antibiotic therapy.

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