CASE REPORT

Saphenous vein graft aneurysm and fistula with compression mimicking mitral stenosis

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SUMMARY

We present the case of a patient who presented with acute coronary syndrome and was found to have a mass compressing the left atrium. An angiogram revealed a large saphenous vein graft aneurysm with a fistula into a cardiac chamber, presumed to be the left ventricle. The patient also developed a functional mitral stenosis secondary to this mass causing left atrial compression. The patient passed away prior to receiving surgery. We describe a rare case of venous graft aneurysm with compression and fistula to a chamber other than the right atrium, that to our knowledge has yet to be reported.

BACKGROUND

Saphenous vein graft aneurysms have been reported with increasing frequency in the literature. Currently, there are no specific guidelines or recommendations to its diagnosis and treatment. The majority of the literature today reports fistula formation to the right atrium. Aneurysms with compression and fistula have rarely been reported. Clinicians must be aware of this rare yet potentially lethal diagnosis.

CASE PRESENTATION

We describe the case of a 74-year-old man with a history of coronary artery bypass grafting (CABG) approximately 15 years prior to admission, who presented with the chief complaint of typical angina. During his admission, his troponin I peaked at a value of 3.73 ng/mL and was given a diagnosis

of non-ST elevation myocardial infarction. The patient was initially stabilized and was asymptomatic. A CT of the chest with intravenous contrast revealed a 52×73×86 mm structure compressing the left atrium (figures 1 and 2). There was also another mass measuring 49×65×40 mm in size, located inferior and posterior to the right atrium (figure 3). Neither of these masses displayed contrast enhancement.

INVESTIGATIONS

A transthoracic echocardiogram revealed a large mass alongside the left atrium. This mass caused structural impingement and compression (figures 4 and 5). Spectral Doppler interrogation of the mitral valve revealed a significantly elevated transmitral gradient, consistent with severe mitral stenosis (figure 6). Early the next morning, the patient decompensated and became tachycardic and dyspnoeic with severe orthopnoea. A follow-up bedside echocardiogram demonstrated further elevation in his mean transmitral gradient to 14 mm Hg. He was given a dose of intravenous metoprolol, which improved his symptoms. Later that day, he underwent diagnostic left and right heart catheterisation. Angiography of his bypass grafts revealed a large aneurysm of the distal saphenous vein graft to the right coronary artery with a fistula to his left ventricle, and a smaller aneurysmal segment more proximally (figure 7). The right heart catheterisation demonstrated elevated right atrial and right ventricular pressures and an elevated pulmonary capillary wedge pressure, consistent with right-sided pressure overload due to left heart failure. His cardiac index was decreased with values of 1.3 by the Fick method and 1.0 by thermodilution. There was also a gradient of 11 mm Hg between the wedge pressure and left ventricular end diastolic pressure, again consistent with mitral stenosis or obstruction. The pulmonary artery saturations were low at 51.7% making it less likely to have a left to right shunt occur.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis includes a cardiac tumour, pericardial cyst and graft aneurysm. All might be detected by incidental imaging, however, MRI may clearly delineate cardiac tumours by detecting a blood supply. A pericardial cyst may display cystic fluid on MRI and CT, but may also be detected on chest X-ray or echocardiogram. A graft aneurysm

Figure 1 Chest CT with intravenous contrast, revealing a large mass compressing the left atrium.

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Figure 2 Chest CT with intravenous contrast, demonstrating 8.61 cm mass posterior to the left atrium.

may be suspected by these modalities but is best diagnosed on angiography or contrast CT.

TREATMENT

No specific treatments have been recommended for saphenous vein graft aneurysm but when complicated by aneurysm or compression, urgent surgery has been suggested. With regard to aneurysmal compression causing a functional mitral stenosis, medical management with decrease of heart rate showed improvement of his symptoms.

OUTCOME AND FOLLOW-UP

The patient was transferred to an outlying facility to receive further surgical treatment. While being medically stabilised to be suitable for surgery, the patient surmised due to his condition.

DISCUSSION

A large proportion of patients with coronary artery disease are still treated by means of CABG. Recently, patients and their bypass grafts have noted an increased longevity. Saphenous vein grafts aneurysms are rare, with reported incidence of 0.07% in

Figure 4 Parasternal long axis view of mass compressing the left atrium. Legend: Interventricular Septum (IVS), Left Ventricle (LV), Aorta (AO), Left Atrium (LA).

one study.¹ There appears to be an increasing incidence of saphenous vein graft aneurysms as seen by the influx of recent case reports in the literature.

A less likely complication of CABG includes vein graft aneurysm with actual rupture and fistula formation. Compression of vascular structures is another known complication and may be an indication for surgical repair. The mechanism of aneurysm formation is poorly understood. Some proposed mechanisms include progressive atherosclerosis and the change in shear stress on a vein graft after implantation.^{1,2} Previous retrospective data reveal that saphenous vein graft aneurysms are more common in men who have had grafts for over 10 years' duration.³ The patients often were haemodynamically stable at the time of presentation, with an average aneurysm size of 60.4 ± 31.7 mm. Fistula formation was rare, occurring in 7.7% of all patients with aneurysms, and the most common mechanical complication was right atrial compression (11.1%).^{3,4}

Diagnosis of vein graft aneurysms is difficult due to wide range of presentations. The most common presentations include angina, incidental finding on imaging and dyspnoea, listed in order of frequency. There is no single imaging modality that is uniformly recommended, and discovery of aneurysms often

Figure 3 Chest CT with intravenous contrast, showing a 4.04 cm mass near the right atrium.

Figure 5 Apical four-chamber view of mass compressing the left atrium. Legend: Left Ventricle (LV), Right Ventricle (RV), Right Atrium (RA), Left Atrium (LA).

Figure 6 Mitral valve spectral doppler showing gradient consistent with severe mitral stenosis BPM, beats per minute; HR, heart rate; MV, mit; MV Vmax, Maximum Velocity across the mitral valve; MV Vmean, Mean Velocity across the mitral valve; MV Max PG, Maximum pressure gradient, MV Mean PG, Mean pressure gradient across mitral valve; VTI, Velocity Time Integral

occurs during workup of unrelated complaints. Aneurysms can become quite large before causing symptoms, secondary to compression or haemodynamic compromise.³ A large proportion of previously reported cases were discovered during angiography. Transthoracic echocardiography can also be useful to detect any structural compression. A multimodality approach has been recommended to diagnose and predict the impact of a saphenous vein graft aneurysm. Fistula formation most commonly occurs between the aneurysmal graft and the right atrium. There is a high morbidity and mortality associated with this diagnosis and it often requires surgical treatment.^{3,4}

The treatment modality of choice has not been fully determined, but several treatment approaches have been suggested.

Figure 7 Coronary bypass graft angiogram revealing proximal and distal aneurysm of vein graft to right coronary artery with fistula to likely the left ventricle.

Several cases of surgical repair of aneurysms with associated fistulas have been treated by surgery, either electively or urgently.⁵ Part of the challenge with a surgical approach, however, is that these patients have already undergone at least one prior sternotomy procedure, making the operation more technically challenging. A percutaneous approach has been described with some success, with options including placement of covered stents, Amplatzer devices or embolisation coils. One case described the use of large stents designed for the peripheral vasculature to perform a successful repair. Coil embolisation has also been described with the use of CT to guide therapy.^{5,6}

Although compression of cardiac chambers by vein graft aneurysms has been previously described in the literature, most cases have been limited to right-sided structures.³ Our patient's scenario of functional mitral stenosis was a unique presentation, and represented a difficult diagnostic and therapeutic challenge. Moreover, fistulae to structures other than the right atrium have also rarely been described. Clinicians should be aware of this rare entity as it has high morbidity and mortality, and is often not appreciated until late in the clinical course. Diagnostic and treatment recommendations are varied, but should include a multimodality imaging approach. Several treatment options are available, ranging from percutaneous intervention to repeat surgery, depending on the patient's presentation, stability and anatomical considerations.

Learning points

- ▶ Saphenous vein graft aneurysms have been increasing in the literature, however, there are no guidelines for diagnosis or treatment.
- ▶ The most appropriate use of surgical intervention is still controversial.
- ▶ Functional mitral stenosis caused by left atrial external compression can be treated medically as true mitral stenosis.
- ▶ Saphenous vein graft aneurysms to the left ventricle and causing compression of the left atrium have rarely been described.

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