CASE REPORT

Early vein graft failure leading to acute myocardial infarction, dehiscence and haemopericardium treated by percutaneous coil embolisation and balloon tamponade

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SUMMARY

Early vein graft failure is a well-described early complication of coronary artery bypass grafting. Revascularisation with emergency percutaneous coronary intervention (PCI) may limit the extent of myocardial damage and is associated with lower procedural complications compared than with emergency redo bypass surgery. We describe a case of an early saphenous vein graft (SVG) thrombosis presenting as an inferior ST-elevation to our non-surgical PCI site, complicated by SVG graft dehiscence leading to cardiac tamponade, which we treated with coil embolisation and balloon tamponade during the patient's transfer to a surgical facility for emergent haemopericardium evacuation.

BACKGROUND

Vein grafts are one of the most commonly used conduits for coronary artery bypass grafting (CABG). Vein graft failure (VGF) has been defined as complete occlusion or severe narrowing with greater than 70% lumen loss on angiography.^{1,2} VGF occurring within 30 days is defined as early. The risk factors for early VGF include female sex, smoking and hypercoagulability.³ In the Veterans Affairs Cooperative Study, target vessel diameter >2 mm was found to be a strong and independent predictor of graft patency. Aspirin use, lower serum cholesterol and good functional class were also associated with good long-term patency.⁴ Aspirin resistance is known to occur immediately post-CABG and is associated with increased early VGF.^{5,6} Endothelial cell injury during the surgery is postulated to be the mechanism.⁷

Percutaneous coronary intervention (PCI) with target vessel revascularisation is the standard treatment of acute myocardial infarction. However, it is associated with higher incidence of complications in the perioperative period.⁸

We describe the case of a patient with acute ST segment elevation myocardial infarction (STEMI) 1 week after CABG surgery. The patient was taken to cardiac catheterisation. During PCI of the culprit lesion in the vein graft, the patient developed dehiscence leading to haemopericardium. We resorted to off-label use of percutaneous embolisation coils and coronary balloon, and successfully stabilised the patient.

CASE PRESENTATION

A 64-year-old woman with a history of hypertension and hyperlipidaemia presented to the emergency department with chest pain and shortness of breath for 2 weeks duration. She was a non-smoker and had no history of diabetes, atherosclerotic heart disease or family history of premature coronary disease. She was found to have a non-STEMI. Coronary angiography showed three-vessel disease. She underwent four vessel CABG with pedicled left internal mammary artery (LIMA) to left anterior descending (LAD), three reversed saphenous vein grafts to the obtuse marginal (OM), posterior descending (PDA) and posterolateral branches (PLB), respectively.

One week post-CABG, she presented to the emergency department (EM) again with acute chest discomfort which was worse this time.

INVESTIGATIONS

ECG showed ST segment elevation in leads II, III and aVF with reciprocal ST depression in leads I and aVL (figure 1). None of these changes were noted during the prior hospitalisation.

DIFFERENTIAL DIAGNOSIS

The patient was diagnosed with acute myocardial infarction. The differential diagnosis at this point included acute graft failure or acute occlusion of the right coronary artery (RCA). The former was more likely since the patient had two vein grafts to the RCA territory.

TREATMENT

In the ED, the patient received 600 mg of clopidogrel orally and an intravenous bolus of heparin. Emergent cardiac catheterisation and angiography demonstrated an occlusive thrombus in the saphenous vein graft (SVG) to the PLB with a meniscus sign (figure 2). The LIMA to LAD was patent, as was the SVG to PDA. The SVG to OM appeared subacutely occluded. The native RCA did not provide flow into the grafted PLB. The culprit SVG was engaged with a 6 Fr Multipurpose guide catheter (MPA-1, Medtronic, Santa Rosa, California, USA) and a 0.014-inch runthrough coronary guidewire (Terumo Interventional Systems, Somerset, New Jersey, USA) was passed through the lesion. Angioplasty was performed at the point of acute occlusion with a Mini-Trek 2.0×12 mm balloon

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Figure 1 ECG at presentation showing inferior wall ST elevation myocardial infarction. ST elevation in leads II, III and aVF along with reciprocal changes in I and aVL.

(Abbott Vascular, Santa Clara, California, USA) at a maximum of 8 atm for 10 min. This showed heavy thrombus burden and poor visualisation of the distal segment of the graft. A Guideliner V2 catheter (Vascular Solutions Inc, Minneapolis, Minnesota, USA) was then passed into the mid-portion of the graft to allow for improved angiographic visualisation (figure 3). Aspiration thrombectomy with a 6 Fr Export catheter (Medtronic Inc, Santa Rosa, California, USA) gave minimal thrombus yield and the SVG began to reocclude again. During manipulation of the SVG, partial separation of the SVG to PLB anastomosis at the distal aspect was noted with grade III extravasation into the pericardial space (figure 4). A 4.0×15 mm Sprinter Legend Rx balloon (Medtronic Inc, Santa Rosa, California, USA) was left inflated at 7 atm for 15 min and intravenous protamine was used to reverse the anticoagulation. Despite prolonged balloon inflation, there was persistent pericardial staining. Aggressive intravenous fluid resuscitation with normal saline, packed red blood cells and intravenous dopamine infusion were started to maintain systemic blood pressure. Owing to the small size of the distal target vessel, a covered stent could not be deployed. Three arterial embolisation coils (Complex Helical Pushable Fibered Platinum Coils, Boston Scientific, Natick, Massachusetts, USA) were deployed into the distal portion of the SVG in order to occlude it with associated prolonged repeat balloon inflation (figure 5). In spite of this, she continued to bleed from the SVG dehiscence with associated enlargement of the pericardial shadow on fluoroscopy during balloon deflation. An attempt was made to perform

echocardiographically guided pericardiocentesis, but she had a minimal anterior effusion space secondary to the recent pericardiotomy for her bypass, and we were unable to place a drain.

Cardiothoracic surgery was contacted and the operating room was prepped in the receiving hospital. She was successfully stabilised again on the table with an inflated balloon and a decision was made to transfer her emergently with the balloon in place. It was left inflated at 7 atm and the guide, Touhy valve and the balloon were secured externally to her leg (figure 6). She was transferred with an accompanying interventional cardiologist directly to the OR. Repeat sternotomy was performed and 200 mL of fresh blood in the mediastinum and thrombus was evacuated. The SVG to PLB and OM were found to be thrombosed. The distal targets were found to be small and hence repeat bypass was not attempted. No further bleeding was seen and the pericardium was copiously washed out with warm antibiotic impregnated saline.

OUTCOME AND FOLLOW-UP

The patient made an excellent recovery and was seen post-discharge in follow-up with no symptoms. Subsequent testing showed poor platelet reactivity to aspirin. Her antiplatelet therapy was then switched to clopidogrel.

DISCUSSION

This case demonstrates the complexity of managing early VGF and the potential complications associated with interventional

Figure 2 Bypass graft angiogram showing acute occlusion of the vein graft to posterolateral branches (arrow) with a meniscus sign.

Figure 3 Angiogram after reperfusion of the occluded vein graft to posterolateral branches (PLB). Wire is seen within the lumen of the PLB.

Figure 4 Angiogram showing extravasation of contrast into the pericardium (arrow).

procedures immediately post-CABG. Our patient was found to have poor platelet reactivity to aspirin, which may have predisposed her to very early graft thrombosis.

The role of PCI in perioperative myocardial infarction or ischaemia is controversial due to high incidence of complications. A prospective study with 118 patients with acute perioperative ischaemia or infarction showed improved ejection fraction and trend towards improved in hospital and 1 year mortality rate with PCI.² However, PCI in vein grafts is extremely challenging. Presence of large thrombus burden and diffuse atheromatous disease lead to significant distal embolisation and no reflow. Where possible, treatment of the native coronaries is recommended.⁸ Our case was complicated due to small size of the distal target and acute occlusion of the VG. The risk of vein graft perforation due to PCI is estimated at 0.1%.⁹ Embolisation coils have been used off-label for managing coronary aneurysms and perforations with variable success.^{10 11} In our patient, this technique was not completely successful. Hence we had to leave a coronary balloon inflated to stem the enlarging haemopericardium and transfer the patient to another institution for definitive therapy.

Figure 5 Embolisation coils (arrow) being deployed into the posterolateral branches.

Figure 6 Fluoroscopic image of the end result with the angioplasty balloon and wire at the proximal end of the vein graft and embolisation coils at the distal end. Note the opacified cardiac silhouette with contrast in the pericardial space.

Learning points

- Early graft failure after coronary artery bypass surgery is an uncommon but life-threatening complication.
- Percutaneous coronary intervention in perioperative myocardial infarction has high complications but better outcomes.
- Vein graft dehiscence with haemopericardium is a rare complication of percutaneous coronary intervention.
- In this case, we illustrate successful temporising management of haemopericardium at a non-surgical site with the help of embolisation coils and an intracoronary balloon.

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Competing interests None.

Patient consent None.

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