Giant aneurysm of an aortocoronary venous bypass graft compressing the right ventricle

R.M.A. van de Wal, J.W. van Werkum, M-C. le Cocq d' Armandville, H.W.T. Plokker, W.J. Morshuis

A 69-year-old man with a history of coronary artery bypass grafting and a recent inferoposterior myocardial infarction presented to the hospital for diagnostic coronary angiography. Physical examination, laboratory analyses, coronary angiography, echocardiography, and CT scan were performed. A giant aneurysm of the aortocoronary venous bypass graft, associated with compression of the right side of the heart, was revealed. After surgical resection and replacement of the venous graft the patient died due to right ventricular failure. (*Neth Heart J* 2007;15:252-4.)

Keywords: coronary artery bypass grafting, graft (venous), aneurysm (giant), ventricular failure (right)

A 69-year-old man was referred to our hospital because of a recent ST-elevation inferoposterior myocardial infarction, which was treated with thrombolysis. The patient's medical history revealed quadruple coronary artery bypass grafting (CABG) in 1979 using two venous jump grafts, and a redo CABG which was performed in 1990. During this last operation, one of the previous venous grafts was replaced by an aortocoronary venous jump graft to the posterior descending artery and the posterolateral branch. In addition, the right internal mammary artery was grafted to the obtuse marginal artery, while the left internal mammary artery was grafted to the left descending artery (LAD). The old venous graft that

was removed during surgery showed signs of severe atherosclerosis upon pathological examination.

Due to persistent chest discomfort, the patient was admitted for diagnostic coronary angiography. On admission, the patient had a heart rate of 80 beats/min and his systemic blood pressure was 112/80 mmHg. Physical examination revealed normal heart sounds with a loud pansystolic murmur, best heard at the high right sternal border. No other physical abnormalities were noted. The chest X-ray showed a large suspicious shadow arising from the right sternal border (figure 1A). Echocardiography revealed a slightly reduced left ventricular systolic function and a moderate to severe (grade III/IV) mitral valve insufficiency. An extra-cardiac, pulsating structure was visualised along the right atrioventricular groove. Diagnostic coronary angiography showed total occlusion of the native LAD and the left circumflex artery with both arterial bypass grafts being patent. The right coronary artery was occluded proximally, whereas contrast injection in the venous graft revealed a large, yet patent graft with an aneurysm with a diameter of up to 6 cm (figure 2). Aortography showed a normal ascending aorta with a wide ostium ($\varnothing$ 8 mm) to the venous graft.

Computed tomography (CT) identified two tandem giant aneurysmatic formations of the venous bypass graft, with one proximally with a diameter of 5 cm and one more distally of more than 10 cm (figure 1B). Due to the size of these aneurysms the right atrium and right ventricle were markedly compressed.

Subsequently, the patient was accepted for coronary artery surgery with mitral valve reconstruction using anterior sternotomy and cardiopulmonary bypass. After resection of the aneurysmatic venous graft, which was visually compressing the right side of the heart, a new venous jump graft was introduced. During surgery, mitral valve reconstruction was performed using a 28 mm Carpentier Edwards ring. Surgery was complicated by right ventricular insufficiency. Three hours after surgery the patient experienced ventricular fibrillation and consequent cardiac arrest. After emergency repeat thoracotomy, resuscitation and reinstitution of extracorporeal

R.M.A. van de Wal
J.W. van Werkum
M-C. le Cocq d' Armandville
H.W.T. Plokker
W.J. Morshuis

Department of Cardiology, St Antonius Hospital, Nieuwegein, the Netherlands

Correspondence to: J.W. van Werkum
Department of Cardiology, St Antonius Hospital,
PO Box 2500, 3435 CM Nieuwegein, the Netherlands
E-mail: w.van.werkum@antonius.net

Figure 1. (A) Chest X-ray of right-sided saphenous vein graft aneurysms and (B) computed tomographic scan demonstrating the distal aneurysm of the saphenous graft compressing the right ventricle. Note the large intraluminal aneurysm thrombus.

circulation an intramural right ventricular wall haematoma was identified with complete functional failure of the right ventricle. Despite pharmacological treatment and insertion of an intra-aortic balloon pump the patient died due to cardiac arrest. Histopathological examination confirmed the finding of two large true aneurysms of the saphenous vein graft partially filled with thrombus and with severe atherosclerotic changes in the graft wall. Inadvertently, autopsy revealed a metastasised renal cell tumour.

Discussion

Graft atherosclerosis, technical errors, and progression of native coronary artery disease have been shown to

be associated with saphenous vein aortocoronary bypass failure. However, aneurysmatic transformation of a venous coronary bypass graft is a rare, but potentially fatal complication of CABG.¹ In case of a true aneurysm, which usually occurs late after surgery, all layers of the graft wall are expanded, rather than one or more layers, which is the case in pseudo-aneurysm formation. Aneurysm formation usually affects the proximal anastomosis of the graft, although the distal suture line and the body of the graft can also be involved. Given the limited number of reports of true venous graft aneurysms, it remains largely unknown which factors are causally related to aneurysmatic transformation of the graft. Earlier reports suggest a causal relationship between true aneurysm formation and hypertension, weakness in the vein wall, and, more commonly, atherosclerotic degeneration of the vein.² The role of perioperative handling of the graft remains controversial. In our patient, aneurysm formation was probably the result of atherosclerotic degeneration of the saphenous vein graft. Stasis of blood and consequent thrombotic changes within the aneurysm resulted in myocardial infarction. Depending on the location of the venous graft, the aneurysm can induce severe complications which require surgery. The development of fistula and compression of the pulmonary artery have been reported before.^{3,4} In the present case we describe another complication: compression of the right atrium and ventricle. Recently, Kumar et al. described a fatal case of right ventricular failure due to a giant arterial aneurysm of the right

Figure 2. Coronary angiogram demonstrating both tandem aneurysms of the saphenous vein graft to the posterior descending artery (A) and the posterolateral branch (B).

coronary artery.⁵ In that particular case the patient presented with a superior vena cava syndrome. Our patient was already at high operative risk because of his age, his recent myocardial infarction, the re-redo operative status, his slightly reduced left ventricular function, and the concomitant replacement of the mitral valve. In addition, possibly due to ischaemia and what appears to be long-standing compression of the right-sided heart structures, the right ventricular function was significantly impaired. The intramural haematoma caused by the resuscitation procedure may have aggravated right ventricular dysfunction.

In summary, saphenous vein graft aneurysmatic formation of this unusual size is a rare complication of CABG. The present case stresses the importance of

weighing the benefits of surgery versus the risks when a saphenous vein graft aneurysm is severely affecting right ventricular function. ■

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