Case report - Coronary

Thrombosis of a large saphenous vein graft aneurysm leading to acute myocardial infarction 21 years after coronary artery bypass grafting: role of cardiac multi-slice computed tomography

Ludger Wilhelm Poll\textsuperscript{a+, b,} Birgitta Sadra\textsuperscript{b}, Sarah Rühlow\textsuperscript{a,b}, Rainer Wessely\textsuperscript{b}

\textsuperscript{a}Department of Radiology, Berufsgenossenschaftliche Unfallklinik Duisburg GmbH, Grossenbaumer Allee 250, D-47249 Duisburg, Germany
\textsuperscript{b}Department of Cardiology and Angiology, Evangelisches Bethesda-Johanniter-Klinikum, Academic Teaching Hospital of the University of Düsseldorf, Kreuzacker 1-7, D-47228 Duisburg, Germany

Received 30 August 2010; received in revised form 16 October 2010; accepted 20 October 2010

Abstract

We report a case of a 74-year-old male, who presented with an acute ST elevation posterior wall myocardial infarction (MI) 21 years following revascularization with three saphenous vein grafts (SVGs) to the left and right coronary arteries. In coronary angiography (CAG), the dilated SVG to the first marginal branch of the circumflex artery appeared only contrast enhanced in the proximal portion. The day after coronary angiography 128-slice cardiac computed tomography (CT) was performed. Cardiac CT showed a 5×3-cm incomplete thrombosed aneurysm of the proximal bypass with complete thrombotic occlusion of distal bypass grafting. With this diagnosis the patient was referred to a cardiothoracic unit for a second opinion. A surgical intervention was refused due to an increased intraoperative morbidity and occlusion of peripheral bypass portion. A follow-up CAG 10 days after infarction showed complete occlusion of the aneurysm. This case illustrates the utility of multi-slice CT to diagnose SVG aneurysm and influence clinical decisions for further treatment. This is the first report of a spontaneous SVG aneurysm thrombosis under a conservative treatment approach with recovery of the patient after MI. Clinical follow-up five months after infarction was unremarkable.

© 2011 Published by European Association for Cardio-Thoracic Surgery. All rights reserved.

Keywords: Coronary artery bypass graft; Saphenous vein graft aneurysm; Cardiac computed tomography

1. Introduction

A saphenous vein graft (SVG) aneurysm after coronary artery bypass grafting (CABG) is a rare but fatal complication \cite{1}. We describe a rare case of SVG aneurysm with thrombotic occlusion leading to myocardial infarction (MI) 21 years following CABG.

2. Case report

A 74-year-old male was admitted to the catheter laboratory with acute chest pain and dyspnea. He was found to have acute ST-segment elevation MI of the posterior myocardial wall. The patient underwent a triple CABG 21 years previously with SVGs to the left anterior descending artery (LAD), right coronary artery (RCA) and to the first marginal branch of the left circumflex artery (LCX). His physical examination was normal, blood pressure was 130 over 90 mmHg with regular pulse rate of 80/min. Initial laboratory values on presentation were as follows: white blood cell count 12.3 U/l; haemoglobin level, 11.4 g/dl; haematocrit, 34.6%; platelet count, 250,000/μl; Na\textsuperscript{+}, 144 mmol/l; K\textsuperscript{+}, 3.9 mmol/l; creatinine, 1.92 mg/dl; creatinine kinase (CK), 225 U/l (reference range 10–174), CK-MB, 84 IU/l (<25), cardiac troponin-I (CtnI), 0.47 ng/ml (reference range <0.04 ng/ml), international normalised ratio (INR), 1.31. Repeat laboratory values after 12 h: CK, 1609 U/l, CK-MB, 472 IU/l, ctnI, > 22.78 ng/ml, INR, 1.1. Left ventriculography showed depressed ejection fraction of 44%, a dilated left ventricle with akinesia of the anterolateral, inferior and posterolateral wall and severe mitral regurgitation.

Coronary angiography (CAG) at the time of admission showed a patent SVG to the LAD, a patent SVG to the RCA with a moderate stenosis of the distal portion. The SVG to the first marginal branch of the LCX was occluded in the proximal portion with a round-shaped contrast enhancement and no flow (Fig. 1). The presumptive diagnosis of an occluded SVG-aneurysm was made and no further intervention was performed due to the risk of perforation. On day 1 post-infarction a cardiac multi-slice computed tomography (MSCT) was performed using a 128-MSCT-scanner (SOMATOM AS+, Siemens Medical Solutions, Germany) to evaluate morphology and patency of SVGs. Routine preparation of the patient for coronary 128-MSCT included intravenous administration of 10 mg metoprolol and administration of a sublingual dose of nitroglycerin (0.6 mg) prior to scanning. The CT-angiography (CTA) was performed with a heart rate of 75 beats/min in sinus rhythm. Native scan shows hyperdense contrast material from the CAG the day
Fig. 1. Coronary angiography shows the occlusion of the dilated saphenous vein graft (SVG) to the first marginal branch of the left circumflex artery in the proximal portion with no flow.

Fig. 2. Three-dimensional volume-rendering-technique showing the 5×3 cm SVG aneurysm (white arrows). Only the proximal 1.9 cm of the SVG were patent (white arrowhead). The mid-portion and distal portion of the SVG to the first marginal branch of the LCX are occluded and not dilated. The SVGs to the LAD and the RCA are patent. SVG, saphenous vein graft; LCX, left circumflex artery; LAD, left anterior descending artery; RCA, right coronary artery.

cardiac ischemia or infarction due to graft thrombosis [4]. In the present case, chest pain and dyspnea were seen due to MI. Further complications of SVG aneurysms encounter fistula formation, bleeding, embolism, hematotherax or hemoptysis [5]. Rupture causes cardiac tamponade and could be rapidly fatal [6]. SVG aneurysms formation develops usually in the body of the vein graft as a result of chronic degeneration by vascular injury from hyperlipidemia and progression of atherosclerosis. Graft wall weakness occurs predominantly at valve insertion sites where smooth muscle in the media changes from circular to a weaker longitudinal orientation. Varicosity in the vein graft and vascular injuries from surgical trauma are other contributing factors. The aneurysms are typically located at the site of proximal anastomosis. They are thought to occur because of tension at site of anastomosis or from technical issues with suture placement [7].

The current report demonstrates the utility of cardiac MSCT in detecting SVG aneurysm following CAG in a patient with a cardiac frequency of 75 beats/min. Three-dimensional reconstructions allow the visualisation of SVG aneurysm morphology, size and topography to adjacent cardiac structures. CT-based diagnosis of an incomplete thrombosed SVG aneurysm was the basis for further interdisciplinary

3. Discussion

The first aneurysm of a SVG was described in 1975, but SVG aneurysms are rare and detection is usually incidental with an estimated rate of <1% [2]. It might be possible that only a minority of cases come to clinical attention. The development of SVG aneurysms seems predominantly to occur 10–20 years after CABG [3]. SVG aneurysms usually manifest as cardiac events like chest pain, dyspnea, myo-

before in a 5×3-cm aneurysm in the proximal portion of the SVG to the first marginal branch of the LCX (not shown). Coronary CTA shows a patent SVG to the LAD and a moderate stenosis of the distal SVG to the RCA (not shown). Only the proximal 1.9 cm of the SVG to the LCX were patent followed by a thrombosed aneurysm (Fig. 2). The SVG portion distal to the aneurysm was completely thrombosed. There were no signs of perforation. A cardiac intervention with a stent-graft was discussed but lastly not performed due to the risk of aneurysm perforation. The patient was admitted to a cardiothoracic unit for a second opinion. A surgical intervention was rejected due to the morbidity of the patient. A CAG 10 days after infarction revealed complete occlusion of the SVG-aneurysm. The patient recovered and was discharged on a conservative treatment regimen. Follow-up at the outpatient clinic five months after discharge was unremarkable and the patient presented in a stable condition.
treatment discussion and influenced clinical therapeutic decision in our case. One of the major advantages of MSCT as a cross-sectional imaging technique is to combine vessel wall imaging and luminography in contrast to CAG as a luminography. Although CAG is still the gold standard for SVG aneurysm, MSCT may be equivalent or better a diagnostic tool that allows more accurate delineation of the size and peculiar shape of an aneurysm [8]. CT and magnetic resonance imaging are useful to exclude other pathologies and to evaluate the size of the aneurysm [9].

The optimal management of SVG aneurysm remains controversial. Traditionally, repeat CABG and aneurysm resection or ligation has been advised in large aneurysm. Various percutaneous methods have been used in the treatment of SVG aneurysm, such as percutaneous coil embolization, covered stent implantation, and Amplatzer vascular plug occlusion [10].

To our knowledge, this is the first SVG aneurysm described in the literature treated with a conservative regimen with recovery of the patient after MI.

In conclusion, MSCT is considered as a useful technique for diagnosis, characterizing the nature and components of SVG aneurysm and seems to encounter reliable anatomical information for further treatment decisions.

References


eComment: Re: Thrombosis of a large saphenous vein graft aneurysm leading to acute myocardial infarction 21 years after coronary artery bypass grafting: role of cardiac multi-slice computed tomography

Authors: Leo Bockeria, Bakoulev Center for Cardiovascular Surgery, Roublevskoye Shosse 135, 121552 Moscow, Russia; Vladimir N. Makarenko, Inna E. Richina, Irina A. Goustova
doi:10.1510/icvts.2010.253021A

The authors describe a rare case of saphenous vein graft (SVG) aneurysm, with thrombotic occlusion leading to myocardial infarction, treated with a conservative regimen, with recovery of the patient after myocardial infarction [1]. It is well known that SVG aneurysms are rare, but the complication is often fatal caused by rupture of the SVG aneurysm leading to cardiac tamponade, and detection is usually incidental with an aneurysm rate of <1% [2].

With newer equipment 64-slice and more computed tomography (MSCT), the sensitivity in the diagnostics of coronary artery bypass grafting (CABG) is 100% and the evaluation of stenosis over 96%. We use MSCT angiography of CA and CABG in our practice, as one of the steps in the pre and postoperative diagnostic algorithm in the cardiovascular clinic. But we determined several limiting factors, such as arrhythmias and effects created by surgical clips. However, in most cases, very high-quality images are obtained and important therapeutic decisions based directly on these images can be made.

MSCT allows rapid scanning not only of the heart and coronary arteries, but also the thoracic aorta and entire lung. Thus, a single scan can rule out several causes of acute chest pain (ACP), so-called triple rule out (acute coronary syndrome (ACS), pulmonary embolism, aortic dissection), that potentially can be fatal. SVG complications usually manifest as different events, including ACP. Diagnostic assessment in the emergency room of ACP seems to be one of the best settings in which to use this diagnostic method for low and intermediate-risk patients, but it is not included in ACC/AHA guidelines for the assessment of patients with ACP. However, recent studies have indicated how multi-slice computed tomographic angiography could become part of emergency room protocols [3].

The main advantage of MSCT is not only the luminography (as opposed to a traditionally used invasive procedure, such as coronary angiography, which still remains the gold standard for SVG aneurysm detection, but which carries several risks), but the combination of vessel wall imaging and luminography with both qualitative and quantitative analysis of the lesion. Another advantage of MSCT is that it is a non-invasive diagnostic approach, preferable in patients with bypass grafts who are at high-risk for complications arising from invasive angiography. However, catheter angiography remains the gold standard for the detection of coronary artery stenosis and during ACS in patients at high-risk for cardiovascular disease. (ACC/AHA Current recommendations for coronary CT angiography, 2008.) Thus, with all its advantages, MSCT can be an equivalent or even better diagnostic tool allowing more accurate delineation of the size and the shape of an aneurysm for future therapeutic or surgical treatment.

We agree with the rational diagnostic and therapeutic strategies that have been chosen for patient management. The current report demonstrates the obvious utility of cardiac MSCT in the diagnosis of SVG aneurysms for this category of patient. Further investigation of SVG aneurysm management based on CT angiography data should be continued.

References