



## LETTER TO THE EDITOR

## Endovascular treatment of inadvertent left internal mammarian artery to great cardiac vein fistula



### KEYWORDS

Coronary artery bypass graft;  
Coil embolization;  
Arteriovenous fistula

**Abstract** Inadvertent left internal mammarian artery to coronary sinus anastomosis is a rare complication of coronary artery by-pass graft surgery. Management of this iatrogenic complication is controversial with conservative, surgical and endovascular options possible. Endovascular treatment offers a minimally invasive approach with a wide variety of embolic agents with different success rates. Herein we present a case of an iatrogenic left internal mammarian artery to coronary sinus anastomosis treated by detachable coil embolization. Use of detachable coil offers more precise deployment that is essential in the treatment of an iatrogenic left internal mammarian artery to coronary sinus anastomosis which can present challenges due to high flow rates and coil migration.

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### 1. Introduction

Internal mammarian artery (IMA) to great cardiac vein anastomosis is a rare complication of coronary artery bypass graft surgery (CABG). Management is controversial, with options including conservative management, surgery and endovascular treatment. Endovascular treatment modalities include a detachable balloon, a covered stent, a vascular plug device and different types of coils. Herein, we described the use of detachable coils in an iatrogenic IMA to cardiac vein fistula. To achieve precise deployment of coils and to avoid the risk of coil migration into the coronary sinus, detachable coils were used.

### 2. Case report

Two years ago, a 43-year-old female patient presented to an outside clinic with angina, dyspnoea and fatigue. A cardiac angiography was performed, and cardiac bypass surgery was performed for LAD stenosis. The patient remained symptom free for one and a half years. Two

months ago, the patient presented with recurrent onset of angina and fatigue. To exclude other possible vascular pathologies and to visualize vascular structures, cardiac computed tomography angiography (CTA) was performed. CTA revealed an inadvertent anastomosis of LIMA to the proximal great cardiac vein without any LAD stenosis (Fig. 1a, b, c). Based on the imaging findings and the recurrence of symptoms, the patient was referred to our interventional radiology clinic. Because no LAD stenosis was present, we proceeded with endovascular fistula embolization. Fistula occlusion was performed due to the presence of angina and to prevent new-onset cardiac failure. From a standard right femoral artery access and using a 4F Berenstein catheter (Cordis [Cashel, Ireland]), the LIMA was selectively engaged. Contrast injection revealed coronary sinus filling via LIMA, thus demonstrating the arteriovenous (AV) fistula (Fig. 2a). A 2.7 F microcatheter (ProGreat [Terumo, Somerset, NJ]) was advanced distally into the LIMA just proximal to the fistula. First, a larger-sized (8 mm × 25 cm) detachable microcoil (GDC [Boston Scientific, Natick, MA]) was deployed to create an initial scaffold for smaller coils to be deployed. Then, smaller-sized (6 mm × 15 cm and 4 mm × 6 cm) detachable microcoils (GDC [Boston Scientific, Natick, MA]) were deployed to occlude the fistula. After coil deployment, a final

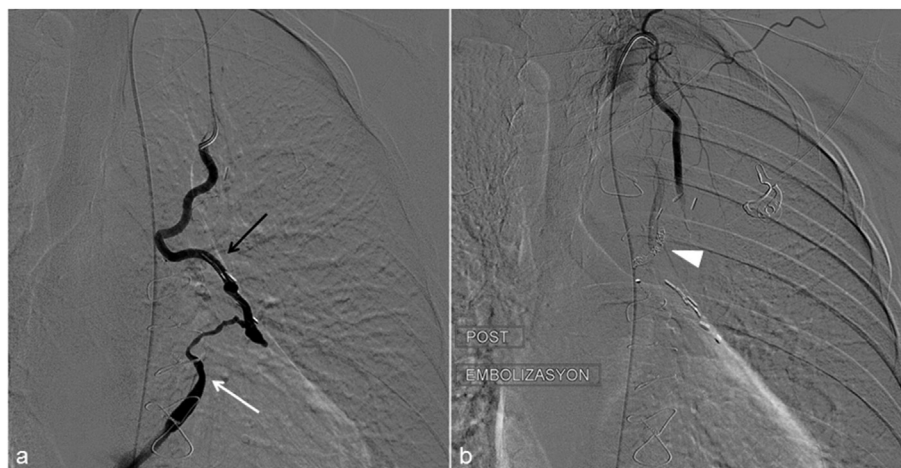
Peer review under responsibility of Hellenic Cardiological Society.

<http://dx.doi.org/10.1016/j.hjc.2016.03.008>

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**Figure 1** a) Pre-embolization CT (computed tomography) coronary angiogram image demonstrates the LIMA (left internal mammary artery) (arrow head) with minimal dilation. b–c) Pre-embolization CT (computed tomography) coronary angiogram reveals increased enhancement of the great cardiac vein (arrow).



**Figure 2** a) DSA (digital subtraction angiography) image before embolization demonstrates coronary sinus (white arrow) filling after contrast injection through the LIMA (black arrow). b) After embolization, the DSA image shows deployed coils (arrow head) and occlusion of the LIMA.

angiogram showed complete occlusion of the fistula (Fig. 2b). There were no complications, and the patient was asymptomatic upon discharge.

### 3. Discussion

Iatrogenic IMA to coronary sinus anastomosis is a rare complication of CABG surgery. IMA can be inadvertently anastomosed to a coronary vein secondary to distortion of the cardiac anatomy due to scarring and fibrosis related to previous myocardial infarctions, increased epicardial fat, and the intramyocardial course of LAD.<sup>1</sup> The main presenting symptoms for AV fistula secondary to CABG vary and include angina, dyspnoea, congestive heart failure, ventricular tachycardia, fatigue and new onset murmur. In our case, CABG and an initial cardiac angiography were carried out in an outside clinic, and we were not able to review the associated reports and images. The patient presented to our clinic with re-onset of symptoms and cardiac CT

angiography. Cardiac CT angiography showed the absence of LAD stenosis, and we considered the re-onset of symptoms related to an iatrogenic coronary AV fistula.

Management of iatrogenic coronary AV fistula is controversial, with reports of conservative, surgical and endovascular treatment present in the literature.<sup>2</sup> Although conservative management is an option in asymptomatic cases, there have been concerns about possible heart failure due to high-volume left-to-right shunt, coronary ischemia due to a non-functioning graft, bacterial endocarditis and fistula rupture.<sup>3,4</sup> In our case, we decided to close the fistula endovascularly for symptom relief and to avoid possible heart failure in the future. No LAD intervention was deemed necessary based on the cardiac CT angiography.

Aortocoronary fistula (ACF) can be occluded through the LIMA by using detachable balloons, vascular plug occlusion devices or coils. Maier reported a case with coil migration into the coronary venous system which were retrieved via a coronary sinus approach.<sup>5</sup> Migration can be due to

inappropriate coil size selection, an improper coil deployment site and underestimation of the AV-fistula size. Coil migration can cause lethal complications related to epicardial coronary artery occlusion.<sup>6</sup> In our case, detachable coils were used to avoid the risk of coil migration in a high flow system such as ACF. Initially, larger-sized coils were deployed to slow down the flow and create a nest for smaller-sized coils to be deployed. Another option is initial balloon occlusion of the fistula and deployment of detachable coils distally. Before detaching the coils, the balloon can be deflated to determine whether coil migration occurs. Larger-sized coils should be used because the diameter of the IMA after balloon occlusion may be misleading.

Our case illustrates the successful use of detachable coils in inadvertent IMA to the great cardiac vein. Detachable coils offer precise control of the occlusion site and decreased risk of coil migration.

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6 May 2014  
Available online 21 April 2016