

# Percutaneous treatment of the left main coronary artery ostial obstruction following aortic valve replacement

Angelo Placci, Marco Balducci\*, Roberto Casanova, Aleardo Maresta\*

Department of Cardiology, Ospedale per gli Infermi, Faenza (RA), \*Cardiac Catheterization Laboratory, Department of Cardiology, S. Maria delle Croci Hospital, Ravenna, Italy

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angioplasty.

Iatrogenic left main coronary artery ostial stenosis is a rare and late life-threatening complication of aortic valve replacement. The exact causes of this critical condition, despite being still nowadays elusive, are possibly related to the insertion of perfusion catheters into the left coronary system for cardioplegia delivery. We describe the case of a 69-year-old man, with normal coronary arteries documented by preoperative coronary angiography before surgery, who developed 1 year after aortic valve replacement worsening effort angina. A second coronary angiography revealed a severe left main ostial stem stenosis, which was successfully treated by sirolimus-eluting stent deployment.

This case demonstrates a new percutaneous approach of this poorly understood, yet potentially fatal complication following aortic valve replacement.

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## Address:

Dr. Angelo Placci

Via Galilei, 15  
48010 Fusignano (RA)  
E-mail:  
placci@hotmail.com

## Case report

A 69-year-old man, with a history of hypertension and hypercholesterolemia, was referred to our center for aortic valve replacement because of a severe symptomatic aortic stenosis.

At admission, the ECG showed sinus rhythm and left ventricular hypertrophy. Preoperative coronary angiography revealed normal coronary arteries. The echo-Doppler confirmed a maximum gradient of 70 mmHg and an aortic valve area of 0.7 cm<sup>2</sup> with normal left ventricular function.

The patient was scheduled for aortic valve replacement. One liter of cold cardioplegia solution was given through antegrade cannulation of both coronary ostia. A Carbomedics 21 mm prosthetic valve was placed.

The postoperative course was uneventful and the patient was discharged 8 days after surgery on beta-blocker and oral anticoagulation (INR 2.5-3.5).

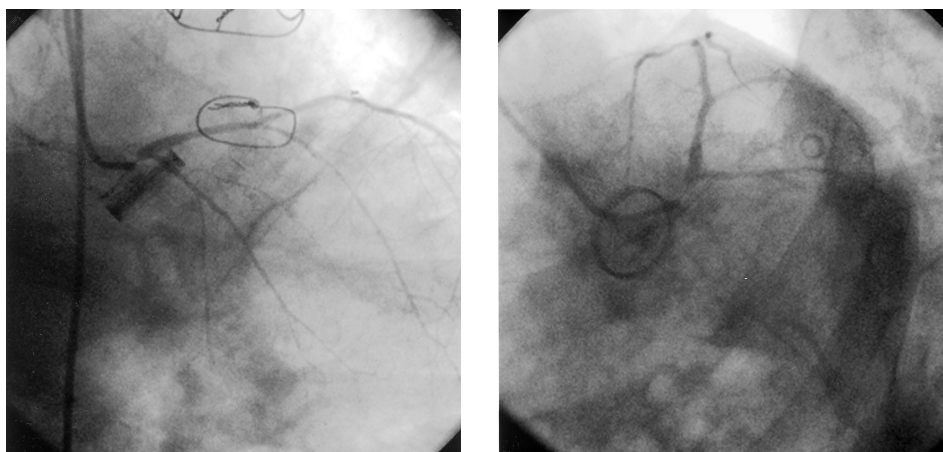
The patient felt well until 1 year later when he developed increasing severe chest pain on exertion and an ergometric test revealed ischemic signs in the lateral region after mild effort (2 METS). Physical examination showed normal prosthetic valve sounds, grade 2/6 systolic ejection murmur at the right second intercostal space by auscultation. There was no pedal edema and no rales on the base of the lungs.

Echocardiographic Doppler examination showed a normal function of the mechanical valve and of the left ventricle. Accurate diagnosis was confirmed by repeat coronary angiography that showed a tight main stem stenosis with otherwise normal coronary vessels (Fig. 1). He underwent successful percutaneous transluminal angioplasty and coronary stenting of proximal left main (Cypher drug-eluting stent 18-3.5 mm, Cordis) (Figs. 2 and 3). He was discharged in therapy with warfarin (INR 2.0-3.0) and low-dose aspirin (100 mg/day). Clopidogrel (75 mg/day) was associated for the first 3 months. At 4 months the patient was asymptomatic and control angiography did not reveal any restenosis.

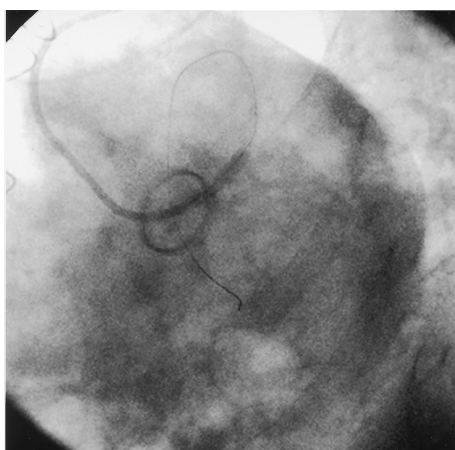
## Discussion

Coronary ostial stenosis after aortic valve replacement is a late-occurring complication first recognized in 1970<sup>1-3</sup>: its incidence may be as high as 3.5%<sup>1,3</sup>. Various pathogenetic causes have been considered to be potentially involved.

An endothelial coronary artery damage may occur during insertion of perfusion catheters and direct coronary antegrade perfusion of cardioplegia<sup>3-6</sup>: Hazan et al.<sup>4</sup> showed that this complication can be



**Figure 1.** Left coronary angiogram revealing subocclusion of the left main coronary artery.



**Figure 2.** Left main coronary angioplasty with drug-eluting stent implantation.

avoided by not cannulating the coronary ostia for antegrade cardioplegia, but instead using retrograde delivery as an alternative method for myocardial perfusion during open-heart surgery.

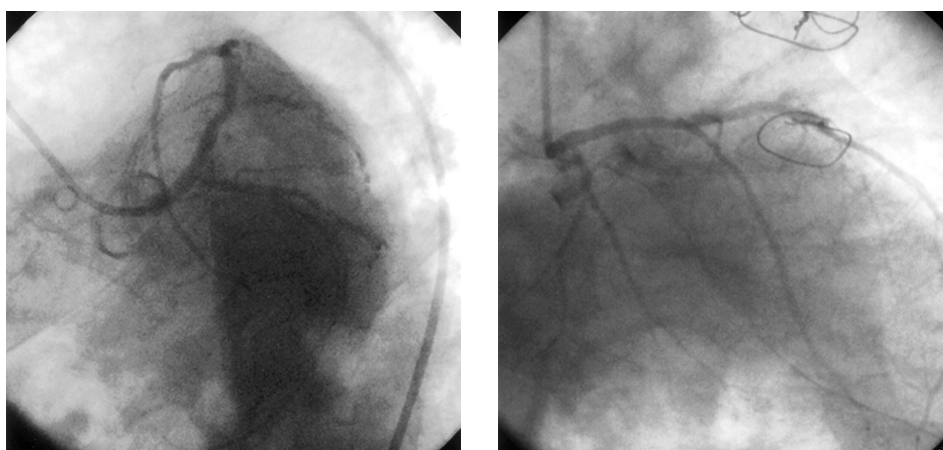
Also a turbulent flow around a prosthetic valve<sup>7-11</sup> seems to play a central role in endothelial injury causing fibrous reaction of coronary ostia and ascending aorta.

Optimal orientation of Carbomedics bileaflet prostheses, with subsequent reduction of turbulence decreases the risk of fibrous proliferation but does not seem to prevent it totally.

Anyway, whether coronary ostial narrowing is a complication of aortic valve replacement or a complication of coronary artery perfusion is still a controversial issue<sup>8</sup>. Moreover, the possibility that a specific gene polymorphism can also contribute to its genesis has recently been advocated.

Winkelmann et al.<sup>12</sup> reported that an epsilon 4 allele apolipoprotein E genotype was found in the majority of patients. This condition determines higher values of low-density-lipoprotein cholesterol. We found in this case an epsilon 3 allele apolipoprotein E that was not related to an increased risk of cardiovascular atherosclerosis.

Symptoms are chest pain or dyspnea during exercise or at rest, and/or acute pulmonary edema. Conventional



**Figure 3.** Postprocedure angiogram showing normal flow through the left main coronary artery.

treatment of left main ostial stenosis is conventional bypass surgery<sup>13</sup>, even if direct surgical angioplasty has been demonstrated to provide some advantages<sup>14-21</sup>.

The conventional treatment of iatrogenic isolated critical stenosis of the left main coronary artery was early bypass surgery with or without direct surgical angioplasty<sup>15,18-20</sup>.

This case shows a new non-surgical approach as a treatment of this rare, yet potentially fatal complication of aortic valve replacement.

In a review of the literature Chavanon et al.<sup>14</sup> underline that the risk of repeating surgery is relatively high for this condition, with a high operative mortality and morbidity rate and poor long-term outcome because of high risk of death, perioperative myocardial infarction and congestive heart failure at late follow-up.

Early coronary angiography seems warranted in the event of typical exertional angina, even after angiographic exclusion of relevant coronary artery stenosis before aortic valve replacement.

In this case, we discharged the patient in therapy with warfarin, aspirin and clopidogrel. In fact, there are not guidelines concerning medical treatment after this new approach. We used for the first 3 months an aggressive therapy with warfarin (INR 2.0-3.0), low-dose aspirin (100 mg/day) and clopidogrel (75 mg/day), because we considered the risk of stent thrombosis higher than that of bleeding<sup>22</sup>. Later, the restenosis probability is lower than the bleeding risk, so we prescribed a combination with warfarin and aspirin alone, as recommended in the American Heart Association/American College of Cardiology Foundation guide to warfarin therapy<sup>23</sup>. In this case no major bleeding occurred, and the patient remained asymptomatic.

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