

IATROGENIC LEFT MAIN CORONARY ARTERY STENOSIS AFTER AORTIC VALVE REPLACEMENT: A CASE REPORT

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Summary

Iatrogenic left main coronary artery stenosis after mitral and aortic valve replacement is an infrequent but potentially life-threatening complication.

A 56-year-old woman who had normal coronary arteries documented by preoperative coronary angiogram, and who developed severe stenosis of the left main coronary artery after aortic and mitral valve replacements is presented.

Coronary lesions were clinically manifested 6 months after the first operation. The diagnosis was confirmed by coronary angiography.

She underwent Coronary artery bypass grafting, mitral and aortic prostheses surgery. Unfortunately, she died 3 days after operation.

Keywords : Iatrogenic left main coronary artery stenosis; Aortic and mitral valve replacement; Coronary artery bypass grafting

INTRODUCTION

Iatrogenic left main coronary artery (LMCA) stenosis after aortic valve replacement (AVR) is an infrequent but life-threatening complication because of coronary perfusion related trauma to the vessel wall with cannulation of the coronary ostia [1-2] It was first described by Roberts and Morrow [3] in 1967.

We present a case of severe LMCA stenosis after aortic and mitral valve replacement; normal coronary arteries were documented by preoperative coronary angiogram.

CASE REPORT

A 56-year-old woman with a history of aortic and mitral valve surgical commissurotomy in 1989 was admitted because of increasing exertional dyspnea and palpitation 12 years after operation.

She had atrial fibrillation. Physical examination and cardiac catheterization revealed severe mitral valve stenosis (mitral valve area: 1.2 cm², maximal diastolic gradient: 27mmHg), grade II mitral valve regurgitation, severe calcific aortic valve stenosis (peak systolic gradient: 50mmHg aortic valve area: 0.83m²), and severe pulmonary hypertension (systolic pressure of 70mmHg). Preoperative coronary angiogram was normal.

In March 2001, she underwent mitral and aortic valve replacements with Saint-Jude mechanical prostheses (27 and 17 mm in size, respectively). She had undergone operation with antegrade delivery of cold blood cardioplegia and direct cannulation of both coronary ostia. An important mitral para prosthetic regurgitation associated with fever was treated as endocarditis 7 days after surgery despite the negativity of the hemoculture.

The patient had complete recovery. She was discharged by oral anticoagulant prescription. Seven months later, she was admitted to our hospital for severe acute coronary syndrome without ST elevation with a 1-month history of increasing severe chest pain and dyspnea on exertion. On admission, blood pressure was 150/80 mmHg and pulse rate was 91 beats/min and irregular.

Electrocardiogram showed ST depression of 2 mm in leads V5, V6, DI, aVL, II, III, and aVF. Physical examination revealed normal prosthetic valve sounds, rales on the base of the lungs, systolic ejection murmur at the right second intercostal space and a systolic murmur at the left fifth intercostal space by auscultation. There was no pedal edema.

An echocardiographic study showed dysfunction of the prosthetic valves: mitral para prosthetic regurgitation grade III, stenosis of aortic

prosthesis. Left ventricular ejection fraction was 65%. Her repeat coronary angiogram showed severe (90%) ostial stenosis of the left main coronary artery. (Fig.1)

The patient underwent emergency reoperation despite this morbid situation due to the difficulties of early reoperation. A redo median sternotomy was performed. She underwent aortocoronary bypass with two grafts to the anterior descending and circumflex branches and replacement of the prostheses. Unfortunately, the patient died 3 days after surgery because of cardiogenic shock and renal failure.

DISCUSSION

Iatrogenic coronary ostial stenosis (ICOS) after aortic valve replacement is a potentially life-threatening complication owing to its proximal location and rapid evolution. Prompt diagnosis and treatment are essential for the patient's survival. The usual clinical picture includes severe angina, ventricular arrhythmias, congestive heart failure and sudden death. It usually appears within the first six months but may occur up to thirty months after the procedure [4]. The incidence of this complication has been estimated to be less than 3% [3], but the real incidence is not known, considering that cases of undiagnosed sudden death following aortic valve replacement could be attributed to iatrogenic main coronary stenosis. In a published retrospective study, dating from 1987 to present [6], seven cases of iatrogenic left main coronary stenosis were observed at the Montreal Heart Institute, after 2158 AVR, representing 0.3% of all the cases. The interval between AVR and symptoms ranged from 4 to 11 months (mean: 7.3). The symptoms were usually severe unstable angina [5]. The LMCA was involved in all cases with the stenosis ranged from 55 to 75% and one occlusion and, the RCA in only two cases. It is believed that the occurrence of ostial stenosis is the result of a strong hyperplastic reaction of the vessel wall, in response to micro-injuries from the catheters used for cardioplegia administration. The micro-injuries are related to the infusion pressure of the cardioplegic fluid and overdistension of the vessel by the catheter tip [6]. Recently, Funada et al [7] concluded by using virtual histology that iatrogenic coronary ostial stenosis following AVR may be caused by fibrous tissue formation, and therefore be distinct from conventional atherosclerosis. The safest technique for morphological and functional preservation of the coronary artery endothelial and

muscular layers remains to be established, but the smallest soft catheters inserted gently with intermittent administration of cardioplegia at low pressure (100 mmHg) should be the preferred choice, if antegrade cardioplegia is necessary. However, left main ostial stenosis has been described after aortic valve replacement, without selective administration of cardioplegia via the coronary ostia, as the result of extension of fibrosis from the aortic annulus. It seems likely that certain individuals may have a predisposition to a strong hyperplastic reaction following injuries. It has been noted that the presence of apolipoprotein-E genotype 4 is much more common in patients who have left main ostial stenosis following aortic valve replacement [5].

Although the problem of left main ostial stenosis after aortic valve replacement was described in the 60s and 70s, it remains a problem even today, in spite of the developments in the manufacture of catheters for selective cardioplegia solution infusion and in techniques for myocardial preservation. Cardioplegia administration by other means, such as via the coronary sinus, reduces the need for manipulation of the coronary ostia and could perhaps provide a solution [8, 9].

In view of the location of the new stenosis in the left main coronary artery, the rapid progression of the hyperplastic lumen encroachment during the first months following surgery and the existence of hypertrophic myocardium with increased oxygen demand, treatment of this entity requires immediate reperfusion.

This case shows that LMCA stenosis following ostial cannulation at the time of AVR is a rare yet morbid complication. Reoperation for this condition is fraught with a high operative morbidity rate. Then Aortocoronarybypass is not without problems, considering the temporal proximity to the first operation and the difficulty of protecting the myocardium adequately, and it may result in a high incidence of perioperative infarction. Beating heart aortocoronary bypass surgery seems to offer some survival benefit to patients who have undergone previous cardiac surgery, but it is not certain whether it is superior to aortocoronary bypass surgery under extracorporeal circulation with an arrested heart in patients with left main coronary artery stenosis.

Balloon angioplasty, without stenting, has been reported in three patients with left main coronary artery stenosis following aortic valve replacement. All had a good outcome [10]. At long term follow-up (4, 6, 11 years, respectively) no clinical or

angiographic signs of restenosis were seen. Despite those good results the authors recommended that PCI only be considered in patients who would otherwise be deemed inoperable, or who refused re-operation but were willing to undergo PCI. In recent years PCI has been used more frequently as revascularization therapy for unprotected left main coronary artery stenosis. Although long-term follow-up may sometimes reveal angiographic restenosis, the need for repeat revascularization, or even cardiac death, in selected patients with normal LV function and large reference vessel diameter the long-term

prognosis has been reported to be favorable. In such carefully selected cases coronary stenting of unprotected LMT stenosis is a safe and effective alternative to bypass surgery. In addition, SES implantation for unprotected LMT stenosis may be even more effective in preventing restenosis because of the stent's immunosuppressive effects [14]. Among the case reports describing use of PCI for ICOS [11,10,12], several have reported good mid- and long-term outcomes. Recently, Funada et al [11] found that percutaneous coronary intervention is a possible alternative treatment in the absence of other options. They thought that this histopathological difference may be responsible at least in part for the good outcome. Further clinical studies of the long-term outcomes in more patients will be required to evaluate the role of PCI for ICOS in the

future. Our patient could be an ideal candidate for the PCI. Unfortunately she was operated with bad outcome. If she had had PCI, she would have survived?

CONCLUSION

Iatrogenic left main coronary ostial stenosis following aortic valve replacement should be avoided by limiting the manipulation of the ostia of coronary vessels as much as possible during the surgical procedure. This complication should be diagnosed and treated immediately, with either aortocoronary bypass or angioplasty. In view of the high incidence of complications associated with aortocoronary bypass under extracorporeal circulation with an arrested heart, beating heart surgery or angioplasty with stenting should be considered as possible alternatives.

Fig. 1. Coronary angiogram showing severe stenosis of the left main coronary artery.



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