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Surgical management of multiple in-stent restenosis with coronary endarterectomy and stentectomy

Abstract

In-stent restenosis remain the most important problem of coronary stent implantation. The number of patients with in-stent restenosis of coronary arteries is increasing in the practice of heart surgeons. We report a successful treatment of a patient with multiple in-stent restenosis of coronary arteries. LAD was treated with long arteriotomy of about 8 sm followed by open coronary endarterectomy and stentectomy. The arteriotomy was then reconstructed with a venous patch and distal anastomosis with the LIMA then performed. The patient's postoperative period was uncomplicated. At a 6-month follow- up examination, the patient is doing well and is asymptomatic. Combined open endarterectomy and stentectomy appears to be an effective alternative surgical treatment of FMJ-LAD and multiple intra-stent restenoses and gives a chance of full revascularization for such patients..

Keywords: Surgical management, coronary endarterectomy, stentectomy, arteriotomy, patient, FMJ-LAD

INTRODUCTION

Today, there are numerous circumstances in which stents are implanted, including the placement of multiple stents in diffuse vessels, bifurcation lesions and distal stenosis. Consequently, the number of patients having coronaries fully covered by stents, known as full metal jackets (FMJs), or using multiple stents, is increasingly taking place. These types of patients require surgery as an alternative to classical coronary artery bypass surgery..

CASE REPORT

A 57-year-old female patient was admitted to the hospital, experiencing typical chest pain and shortness of breath. The patient had a history of diabetes, arterial hypertension and hyperlipidemia. The patient had previously twice received percutaneous transluminal coronary angioplasty (PTCA) and stent implantation, with two stents in the left anterior descending artery (LAD) and one in the right coronary artery (RCA). A coronary angiography was performed, due to progressive angina. The examination revealed multiple restenosis of two stents implanted in the proximal-mid segments and diffuse stenosis of the LAD artery up to the apical segment (Figure 1). Examination

also revealed multiple stenosis of different segments of the RCA and critical stenosis of the patent ductus arteriosus (PDA) and the circumflex artery (Cx) system.

The patient was referred to our clinic for surgery, where echocardiography revealed systolic dysfunction of the heart (ejection fraction is 45%), together with hypokinesia of the anterior wall of the left ventricle and of the interventricular septum. Laboratory findings and cardiac enzymes were normal. The surgery undertaken was standard midline sternotomy with the use of cardiopulmonary bypass, with antegrade and intermittent retrograde cardioplegia. After saphenous venous grafts were anastomosed to the PDA and circumflex artery obtuse marginal (CxOM) vessels, the LAD was inspected. The diffuse calcification of the vessel and presence of two stents revealed the inability to perform arteriotomy and subsequent classical left internal mammary artery to the left anterior descending artery (LIMA-LAD) anastomosis. A long arteriotomy of about 8cm was performed, starting at the distal end of the second stent, followed by an open coronary endarterectomy and stentectomy. Both stents were removed with the atherosclerotic skeleton (Figure 2). The resulting defect was then reconstructed with a venous patch

and distal anastomosis with the LIMA performed thereafter. The operation was completed in a standard way. The postoperative period was uneventful, and the patient was discharged on the seventh postoperative day, in adequate condition with dual antiplatelet therapy. A six-month follow-up examination showed that the patient was doing well and remained asymptomatic.

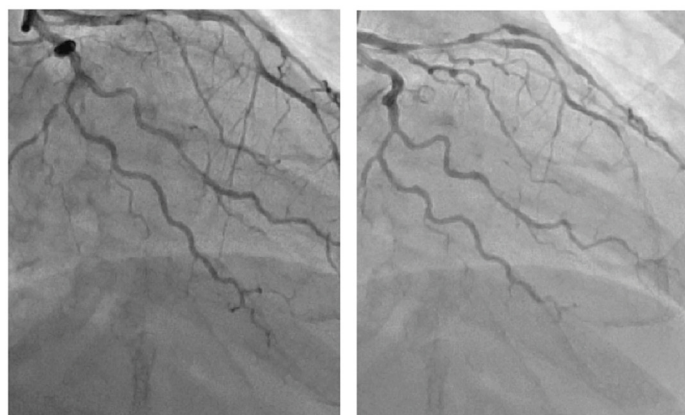


Figure 1: Angiography images of the multiple in-stent restenosis and diffuse stenoses of the LAD artery



Figure 2: Atherosclerotic skeleton with two stents removed during open endarterectomy and stentectomy

DISCUSSION

LAD is the most important revascularisation site in coronary surgery and incomplete revascularisation of this vessel has been proven to be a predictor of short- and long- term mortality in the postoperative period (1). The widespread use of percutaneous interventions in recent years, the expansion of indications for stent implantations and use of repeated percutaneous transluminal coronary angioplasty in restenoses, together with the implantation of multiple stents into diffuse diseased vessels and distal stenoses have led to FMJ-LAD or LAD vessels featuring multiple intra-stent restenosis. Such patients are candidates for alternative approaches as they are unsuitable for classical coronary artery bypass grafting. The most common of these is the coronary endarterectomy approach.

Endarterectomies can be performed with open or closed approaches. During the endarterectomy process, the atheroma rupture and residual stenosis may be observed, due to traction in the opposite direction of different diagonal and septal branches of the LAD (2). Incomplete endarterectomy is also correlated with severe outcomes in the short-term (3). As an endarterectomy is technically laborious and risky, open endarterectomy is preferred.

Particularly for patients with FMJ or multiple intra-stent restenosis, open endarterectomy facilitates the simultaneous removal of the atherosclerotic skeleton together with the stents attached to the intima. This technique also helps keep the lateral branches open. Thus, the cause of early occlusion of the graft (thrombosis) can be eliminated. The cause of long-term occlusion of the graft is a continuous, active atherosclerosis process. (3)

Another important situation is the reconstruction of a long vascular defect. In this regard, surgeons are divided into two fronts – reconstruction with a venous patch or using an arterial patch – whereby a long segment of LIMA is opened. Compliance of the venous wall is not the same as that for the other two components (LIMA and native coronary artery), and is thus considered to have a greater effect on energy loss and blood flow parameters, turbulent flow, and early thrombosis (4,5). Hence arterial reconstruction is supported by some surgeons (3,5,6). However, some studies claim that the reconstruction method does not affect the short- and long-term results (7). Despite this, suboptimal outcomes after endarterectomy are associated with activation of coagulation cascades, due to the lack of endothelial layer in short-term and myofibrointimal proliferation in the long-term (3).

CONCLUSION

Some authors suggest that patients receiving FMC-LAD or multiple in-stent restenosis surgery could receive arteriotomy and standard LIMA-LAD anastomosis without performing the endarterectomy and stentectomy (8). Surgery using this approach could also be performed on a beating heart. In my opinion, it was inappropriate to use this approach for all patients in this group. In many instances, it can be very challenging to find a small segment with a lumen for arteriotomy and anastomosis. Therefore, in terms of effective and adequate revascularisation, it is more appropriate to combine both open endarterectomy and stentectomy procedures (1,6,9,10).

Consequently, for patients receiving FMJ-LAD or multiple in-stent restenoses, open endarterectomy, stentectomy, and venous patch reconstruction of the vascular defect using subsequent LIMA-LAD anastomosis can technically be easily performed. This approach also ensures adequate revascularisation of the LAD territory.

Thus, combined open endarterectomy and stentectomy can be considered as a possible and effective alternative surgical treatment for FMJ-LAD and multiple in-stent restenoses. Our experience indicates that such patients thereafter have a chance to fully revascularise.

Conflict of Interests: The authors declare that they have no competing interest.

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Informed Consent: Written consent was obtained from the patient and his parents.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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