Left main coronary artery thrombectomy and stenting using a paclitaxel-eluting stent in the setting of acute myocardial infarction

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A 41-year-old man was referred to the Montreal Heart Institute, Montreal, Quebec, for primary angioplasty of an acute anterolateral wall myocardial infarction. Coronary angiography revealed the culprit lesion to be a subtotal left main coronary artery with Thrombolysis In Myocardial Infarction (TIMI) trial grade 1 flow associated with a filling defect compatible with an aggressive thrombotic process. The use of rheolytic thrombectomy and a drug-eluting stent for this distal left main target lesion are described.

Key Words: Angioplasty; Left main coronary artery; Myocardial infarction; Restenosis; Stents; Thrombus

In patients with acute myocardial infarction (AMI) and angiographic evidence of thrombus, percutaneous coronary intervention (PCI) remains a therapeutic challenge for interventional cardiologists. Thrombectomy with the AngioJet catheter (Possis Medical, USA) may be performed safely and effectively, allowing a profound reduction of thrombus burden and restoration of flow in the target vessel (1,2).

Current techniques of stent deployment using a high-pressure balloon combined with platelet ADP receptor antagonists and acetylsalicylic acid have been associated with a significant reduction in the risk of subacute stent thrombosis (less than 1%). Several studies that used coronary stenting for unprotected left main coronary artery (LMCA) lesions reported encouraging clinical results. In addition, drug-eluting stents (DES) have been reported to reduce intimal hyperplasia in the treatment of de novo coronary lesions, with improvement of target lesion revascularization and event-free survival (3,4). The present report describes a patient with an unprotected LMCA acute occlusion who was treated with the AngioJet catheter and stenting with a paclitaxel-eluting stent.

CASE PRESENTATION

A 41-year-old man with a significant medical history of hypertension, hyperlipidemia and tobacco abuse, but no previously known coronary artery disease, was referred to the Montreal Heart Institute, Montreal, Quebec, for primary angioplasty of an acute anterolateral wall MI. Two hours after the onset of symptoms, the patient presented with persistent, severe chest pain. He was pale and presented with cold, clammy extremities.

Une thrombectomie et l'endoprothèse de la principale artère coronaire gauche au moyen d'une endoprothèse à élution de paclitaxel en cas d'infarctus aigu du myocarde

Un homme de 41 ans a été aiguillé vers l'Institut de cardiologie de Montréal, au Québec, pour subir l'angioplastie primaire d'un infarctus aigu de la paroi antérolatérale du myocarde. La coronarographie a révélé que la lésion responsable était située sur la principale artère coronaire gauche subtotale avec thrombose dans le débit de l'infarctus du myocarde de grade 1 (TIMI) associé à une anomalie de remplissage compatible avec un processus thrombotique agressif. Le recours à une thrombectomie rhéolytique et à une endoprothèse à élution de médicament est décrit pour cette lésion distale.

The patient's systolic blood pressure reached 90 mmHg with inotropic support. An electrocardiogram showed a 2 mm ST segment elevation in leads of positions V1 to V6 and aVL with runs of nonsustained ventricular tachycardia.

Coronary angiography revealed that the culprit lesion was a subtotal LMCA occlusion, with Thrombolysis In Myocardial Infarction (TIMI) trial grade 1 flow associated with a filling defect compatible with an aggressive thrombotic process (TIMI thrombus scale classification 3) (Figures 1 and 2). An intra-aortic balloon pump was placed via the left femoral artery. Surgical revascularization was not possible because an operating room was not available. A decision was made to perform PCI on this highly thrombotic, unprotected LMCA lesion. The patient was pretreated with abciximab and unfractionated heparin to achieve an activated clotting time of 250 s. The LMCA was cannulated using a 7 Fr JL4 guiding catheter (Cordis Corporation, USA). Two 0.014 in (0.0356 cm) Balance Middleweight coronary guidewires 190 cm long (Guidant Corporation, USA) were used to cross the lesion; one was placed in the left anterior descending coronary artery (LAD) and the other in the circumflex coronary artery. Due to angiographic evidence of an extensive thrombus, rheolytic thrombectomy with an AngioJet X-MI catheter was performed in the LMCA and LAD (Figure 3). The AngioJet catheter was passed twice across the lesion, resulting in improvement of coronary flow (TIMI grade 3 flow) and complete thrombus disappearance (Figure 4). Subsequently, a 3.5 mm × 16 mm paclitaxel stent was deployed in the LMCA and the proximal LAD (10 atm for 15 s of inflation) without predilation (Figure 5).

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Figure 1) Right anterior oblique/caudal view – preprocedure. Arrow shows critical left main coronary artery and ostial left anterior descending artery stenosis associated with a fresh thrombus

Figure 2) Left lateral view – preprocedure. Arrow shows critical left main coronary artery and ostial left anterior descending artery stenosis associated with a fresh thrombus

Finally, after guidewire repositioning, two 20 mm Maverick balloons (Boston Scientific, USA) (one, 2.5 mm, positioned in the LMCA-circumflex coronary artery, and another, 3.5 mm, in the LMCA-LAD) were simultaneously inflated using a 'kissing' balloon technique for 30 s (Figures 6 to 8). The patient tolerated these stent inflations well, without experiencing arrhythmia or hypotension.

The intra-aortic balloon pump was removed the next day. The same day, an echocardiogram showed anterolateral wall moderate hypokinesia and a left ventricular ejection fraction of 35%. The intra-hospital course remained uneventful. The patient was discharged four days postprocedure and was maintained on acetylsalicylic acid, clopidogrel, atorvastatin, metoprolol and ramipril. He remained asymptomatic at the nine-month clinical follow-up visit.

DISCUSSION

In the setting of AMI, embolization of plaque and thrombus debris during primary angioplasty may lead to the obstruction of distal coronary arterioles, limiting the efficacy and the extent of myocardial reperfusion (5). By reducing distal embolization, patients who underwent successful thrombectomy showed enhanced myocardial reperfusion, as documented by

Figure 3) AngioJet X-MI (Possis Medical, USA) catheter across the lesion. Arrows show the AngioJet X-MI catheter markers.

Figure 4) Complete thrombus disappearance after mechanical thrombectomy. Arrow shows the residual noncritical stenosis

improved myocardial blush and ST segment resolution compared with patients who were treated by percutaneous transluminal coronary angioplasty alone (6). Among the most effective thrombectomy devices, the AngioJet rheolytic system uses high-velocity saline jets to create a Bernoulli effect to dissolve and evacuate a thrombus. Previous reports (1,2,7) demonstrated that the AngioJet may be used safely and effectively in patients with AMI, recent MI and MI that is complicated by cardiogenic shock. However, a randomized trial (8) that compared thrombectomy with the AngioJet (234 patients) with conventional PCI (235 patients) for treatment of ST segment elevation MI failed to demonstrate a significant reduction in MI size with the routine use of the AngioJet. The benefit of thrombectomy in highly thrombotic lesions could not specifically be assessed.

LMCA disease has a poor prognosis with medical treatment. Randomized trials and large registries have demonstrated that coronary artery bypass graft surgery leads to striking survival benefits and improved symptomatic status in patients with significant LMCA stenosis and stable coronary artery disease (greater than 50%). Compared with medical therapy, surgical revascularization has therefore become the standard therapy for patients with significant LMCA disease (9,10).

Figure 5) Stent deployment (3.5 mm x 16 mm taxus)

Figure 7) Right anterior oblique/caudal view – postprocedure

Figure 6) Simultaneous 2.5 mm and 3.5 mm balloon inflation. The final angiographic results after successful stent deployment

Figure 8) Left lateral view – postprocedure

An in-hospital mortality rate of 2.3% after elective bypass surgery for LMCA disease has been reported in experienced centres with an overall three-year mortality rate of 15.6% (11). DES, with their potential to reduce in-stent restenosis, may provide an alternative to surgery for LMCA disease. In a single-centre series (12) of 16 patients treated electively for LMCA disease with sirolimus-eluting stents, the authors observed only one in-hospital non-Q wave MI and one patient with in-stent restenosis at one year. Moreover, two recent reports showed the improved safety and efficacy of DES in unprotected LMCA angiography compared with bare metal stents (BMS). In the first report (13), 102 consecutive patients without left ventricular dysfunction treated with sirolimus-eluting stents for unprotected LMCA disease were compared with 121 patients treated with BMS during the preceding two years. There were no major adverse cardiac events during hospitalization. At 12 months, the rate of freedom from death, MI and revascularization was $98.0 \pm 1.4\%$ in the DES group compared with $81.4 \pm 3.7\%$ in the BMS cohort. Chieffo et al (14) also compared 85 patients treated with DES for unprotected LMCA disease with a historical control cohort treated with BMS. Patients treated with DES were more often diabetic, had a lower left ventricular ejection fraction and smaller vessels, and the treated lesions more frequently involved distal LMCA bifurcation (81.2% versus 57.8%). Despite these poor

patient and lesion characteristics, the incidence of major adverse events at six months was lower with DES than with BMS (20% versus 35.9%, respectively), and the mortality rate was lower in patients treated with DES than with BMS (3.5% versus 9.3%, respectively) (14).

We consider primary angioplasty with the concurrent use of abciximab and rheolytic thrombectomy as a potential treatment option for patients with an extreme thrombus burden in the setting of an AMI involving the LMCA. Furthermore, the paclitaxel-eluting stent adds to the benefit of acute revascularization by reducing the possibility of in-stent restenosis, regardless of the complexity of this target vessel anatomy.

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