

Bail-Out Stenting for Left Main Coronary Artery Dissection during Catheter-Based Procedure: Acute and Long-Term Results

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Summary

Background: The optimal treatment of patients with left main coronary artery (LMCA) dissection during catheter-based procedure remains uncertain.

Hypothesis: In cases with significant LMCA dissection occurring during catheter-based procedure, prompt stent implantation may be safe and associated with favorable clinical outcome.

Methods: We evaluated the acute and long-term results of bail-out stenting for LMCA dissection occurring during a catheter-based procedure in 10 patients.

Results: Initially, there was no significant stenosis of LMCA segments in these patients. Catheter-induced dissection occurred in eight patients (during diagnostic angiography in three patients and during guiding catheter manipulation in five patients). Two patients suffered dissection in the setting of stent deployment in other vessels. Therefore, bail-out stenting for LMCA dissection was performed in a total of 10 patients. In four patients, hypotension developed and an intra-aortic balloon pump was placed during the procedure. Stents were successfully deployed in all patients; there was no in-hospital mortality. Six-month angiographic follow-up was performed

in eight patients. No angiographic restenosis (diameter stenosis $\geq 50\%$) was observed in any patient at follow-up study. During a mean follow-up of 31 ± 25 months after hospital discharge, there was no major adverse cardiac event (death, myocardial infarction, and target lesion revascularization).

Conclusions: Bail-out LMCA stenting is technically feasible and showed good acute and long-term results in a small series of patients.

Key words: left main coronary artery, dissection, stent

Introduction

Left main coronary artery (LMCA) dissection is a rare complication during a catheter-based procedure. It is usually the result of injury related to manipulation of the catheter and coronary intervention for treatment of lesions in other vessels. A previous report described an incidence of LMCA dissection of $< 0.1\%$.¹ If prompt action is not taken before development of hemodynamic deterioration, LMCA dissection may have fatal results. In this circumstance, stent implantation could be the fastest technique in achieving vessel patency and stabilizing hemodynamic status.^{2–5} We therefore assumed that prompt stent implantation for LMCA dissection is safe and associated with favorable clinical outcome. To test this hypothesis, we retrospectively evaluated the acute and long-term results of bail-out stenting for LMCA dissection occurring during a catheter-based procedure.

Methods

From November 1989 to December 2002, 34,190 patients underwent coronary angiography and intervention at our institution. Among these, 10 patients (0.03%) had a complication due to angiographically documented significant LMCA dissection (types C–F by National Heart, Lung and Blood Institute [NHLBI] criteria⁶). Stents were deployed in the LMCA

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using standard techniques.⁷ Aspirin (200 mg/day) and ticlopidine (500 mg/day) were given to all patients. After the procedure, ticlopidine was given for 1 month and aspirin indefinitely. In-hospital and follow-up data were obtained by medical chart review and telephone interview. In-hospital and follow-up cardiac events (death, myocardial infarction, and target lesion revascularization) were recorded. Angiographic success was defined as <30% residual diameter in LMCA with Thrombolysis In Myocardial Infarction (TIMI) flow 3. Deaths were classified as either cardiac or noncardiac; those that could not be classified were considered cardiac. The diagnosis of myocardial infarction was based on creatine kinase (CK)-MB elevation ≥ 3 times normal values or the appearance of new electrocardiographic (ECG) or echocardiographic changes. Six-month angiographic restenosis was defined as a diameter stenosis of $\geq 50\%$.

Results

Clinical and Angiographic Characteristics of Study Patients

The mean age of the study patients was 67 ± 9 years. No patient had undergone previous coronary artery bypass graft (CABG). Coronary risk factors included hypertension in three patients, diabetes mellitus in one patient, current smoking in three patients, and hypercholesterolemia (≥ 240 mg/dl) in four patients. Initially, there was no significant stenosis of LMCA segment in any patient (angiographically minimal or no plaque in nine patients and 40% diameter stenosis in one patient).

Procedural and in-Hospital Outcomes

Three of the 10 patients who underwent bail-out left main stenting had dissection secondary to diagnostic angiography. Five patients suffered LMCA dissection because of manipulation of the guiding catheter. In the remaining two patients, dissection of LMCA occurred in the setting of stent deployment in the ostial left anterior descending artery and proximal ramus intermedius artery stenosis. Bail-out LMCA stenting was performed in the ostium in two patients, in the body of the artery in six patients, and in the distal bifurcation in two patients. Hypotension related to LMCA dissection occurred in four patients, and an intra-aortic balloon pump (IABP) was placed. Ten patients were successfully managed with intracoronary stenting without the requirement for CABG. Stenting of lesions in other vessels was performed in nine patients.

Postprocedural mild elevation of cardiac enzymes (CK-MB ≥ 3 times normal) was seen in three patients. No other major cardiac events occurred during hospitalization.

Angiographic Restenosis and Long-Term Clinical Outcomes

Six-month follow-up angiography was performed in 8 of the 10 patients. There was no case of angiographic restenosis of LMCA at follow-up study. The remaining two patients were octogenarians and had normal perfusion on 6-month fol-

low-up thallium single-photon emission computed tomographic image (SPECT). Two patients had in-stent restenosis in other vessels at follow-up study. Therefore, one of two patients underwent intracoronary brachytherapy for treatment of in-stent restenosis in other vessels. The remaining patient was asymptomatic and continued on medical treatment. There were no other major adverse cardiac events (death, myocardial infarction, and target lesion revascularization) after discharge during a mean follow-up of 31 ± 25 months.

Discussion

The major finding of our report was that LMCA dissection during coronary angiography or angioplasty could be successfully treated with prompt stent deployment in 10 patients; this resulted in good angiographic and long-term clinical outcomes.

Left main coronary artery dissection secondary to catheter manipulation or angioplasty is a rare complication that impairs coronary flow and consequently leads to death. The major risk factors of this life-threatening complication remain to be identified. Reported risk factors include the presence of atherosclerotic obstructive disease in LMCA disease and an unusual location or anatomy of the LMCA that necessitates extensive manipulation of catheter for entry.^{5,8} Intravascular ultrasound (IVUS) examination has shown that there can be a discrepancy between angiographic and IVUS findings since normal-looking coronary artery segments are often seen to be diffusely diseased by IVUS;^{9,10} this could, at least in part, explain the development of dissection in 9 of 10 patients in this group with angiographically minimal or no plaque at LMCA. Therefore, angiographically normal-looking LMCAs as well as atherosclerotic obstructive LMCAs both may develop dissection during the procedure. Therefore, special care should be taken in the selection and manipulation of catheters at all times during percutaneous coronary intervention.

Intracoronary stent placement has been demonstrated to be effective in repairing major epicardial coronary artery dissection complicating catheter-based procedures.^{2-5,11} In the present study, all patients with LMCA dissection were successfully treated with stent deployment. Treatment options for this complication include intracoronary stenting and emergency CABG. Although CABG can be successfully performed, prolonged periods of ischemia often culminate in severe left ventricular dysfunction and death.¹² Therefore, we suggest that prompt stent deployment may be a valuable procedure in patients with LMCA dissection and may result in a reduction of mortality.

Previous studies of patients undergoing elective stenting for significant LMCA stenosis have shown that some patients inevitably developed angiographic restenosis;^{7,13,14} this was not the case in this present study. This discrepancy may be explained by angiographically minimal plaque at the LMCA in this group of patients, a finding supported in a previous study¹⁵ showing that neointima proliferation in stented coronary artery lesions correlated positively with preintervention plaque burden.

Conclusion

Prompt recognition of this potentially catastrophic complication and treatment with immediate stent deployment will result in good early and late outcomes. Therefore, in this unexpected situation, the interventional cardiologist should not hesitate to deploy a stent in the LMCA.

This study has several limitations. First, this is a retrospective analysis, and we could not evaluate whether CABG would have comparable results. Second, the number of study patients is small; however, the rare incidence of this complication makes a larger study difficult.

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