Rotational Atherectomy and Mechanical Support to Treat Left Main

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ABSTRACT

We describe a complex percutaneous coronary intervention using rotational atherectomy (Rotablator, Boston Scientific, Marlborough, Massachusetts) and mechanical circulatory support (Impella, Abiomed, Danvers, Massachusetts) in a patient with multiple comorbidities scheduled to undergo a left main coronary percutaneous coronary intervention using a 2-stent technique based on angiography. However, intracoronary optical coherence tomography changed our strategy to a successful single-stent procedure. (Level of Difficulty: Advanced.) (J Am Coll Cardiol Case Rep 2019;1:811–4)

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A 85-year-old woman was admitted for fractured right radius and her hospitalization was complicated by non-ST-segment elevation myocardial infarction. The cardiac physical exam was normal except for systolic murmurs attributed to moderate valvular aortic stenosis and moderate mitral regurgitation.

PAST MEDICAL HISTORY

The patient had a history of hypertension, dyslipidemia, severe osteoarthritis, coronary artery disease, and previous percutaneous coronary intervention (PCI) to the first obtuse marginal artery.

DIFFERENTIAL DIAGNOSIS

The patient also had a left ventricular ejection fraction of 50%, moderate aortic stenosis, and moderate mitral regurgitation.

INVESTIGATIONS

An angiogram showed multivessel disease, including a severe lesion on the proximal right coronary artery (RCA) and a severe heavily calcified lesion in left...
main coronary artery (LM) bifurcation, apparently involving the ostium of both left circumflex artery (LCx) and left anterior descending artery (LAD), Medina classification 1,1,1, and SYNTAX score 40 (Figure 1A). Surgery was not recommended by the Heart Team owing to frailty and anticipated difficult rehabilitation (multiple falls, arthritis), so she was referred for PCI of the LM bifurcation lesion with circulatory device support, and staged treatment of the RCA disease.

The initial planned strategy was a 2-stent bifurcation technique using rotational atherectomy system (Rotablator, Boston Scientific, Marlborough, Massachusetts) of the unprotected LM supported by the Impella CP mechanical circulatory support system (Abiomed, Danvers, Massachusetts) guided by optical coherence tomography (OCT). A 14-F sheath was used for the Impella side in the right common femoral artery and a 7-F sheath for the PCI site in the left common femoral artery. Rotational atherectomy with 1.5- and 2-mm burrs (160,000 rpm) were performed to the LM and LCx. OCTs to LM and LCx and LAD showed a severe lesion in the ostium LCx (Figure 2A) but only moderate atherosclerotic disease with minimum lumen area of the proximal LAD of >4 mm², which was interpreted as likely to be nonischemic (Figure 3, Video 1). On that basis, we decided to change our plan to a provisional single-stent strategy.
Stenting went from the LM into the proximal LCx, which was performed by pre-dilation with a non-compliant (NC) balloon (3.5 × 12 mm) at 12 atm, stented with a drug-eluting stent (3.5 × 23 mm) at 12 atm, and post-dilated with 2 NC balloons (3.5 × 12 mm and 4.5 × 8 mm) at 24 atm (Figure 1B). Post-stenting OCT pullback showed excellent stent expansion (minimum expansion index 85%) without compromising the ostium of the LAD (Figure 2B). The patient remained hemodynamically stable during the entire procedure. At the end of the procedure, the Impella CP was successfully weaned off and removed.

DISCUSSION

In this clinical case, our initial plan was a 2-stent treatment strategy based on angiography, but OCT imaging was especially important because it changed our treatment to a single-stent strategy (1,2). OCT provided proper identification of plaque characteristics and lesion anatomy, showing a stenotic calcified lesion involving only the ostial LCx and the LM, without involvement of the ostial LAD. Thus, OCT guided appropriate treatment of the LCx and LM with a single stent. This prevented the stenting of the ostial LAD, which would have required a 2-stent bifurcation technique, with inherent risks and higher rates of stent restenosis and adverse outcomes in the long-term follow-up (3-5). Intravascular ultrasound would also show calcification, but its characteristic acoustic shadow could prejudice the appropriate evaluation of the calcification pattern, so in this particular case, OCT was the best option for a calcified anatomy evaluation (6).
This case also highlights the importance of detailed pre-procedural planning. We anticipated possible fatal complications, such as acute LM occlusion and severe hypotension, and implanted a mechanical circulatory support before the intervention, which provided hemodynamic stability during the procedure (7,8).

Last, rotational atherectomy is an adjuvant therapy to PCI for the treatment of complex lesions requiring plaque modification and debulking of heavy calcification. In this case, it was especially important to increase lumen diameter and acute lumen gain with lower risk of long-term in-stent restenosis (9,10).

FOLLOW UP. The patient was discharged home the following day without complications.

CONCLUSIONS
The Impella CP provided hemodynamic support during a high-risk PCI procedure allowing time for adequate lesion preparation, intracoronary imaging, and stent optimization. Intravascular imaging changed the initially planned treatment strategy. The immediate outcome was good and the patient was discharged uneventfully the next day.

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KEY WORDS coronary bifurcation lesion, mechanical circulatory support, OCT, optical coherence tomography, percutaneous coronary intervention, PCI, rotational atherectomy, stent expansion

APPENDIX For a supplemental video, please see the online version of this paper.