CASE REPORT

Conquering the obstacles during the intervention of a proximal chronic total occlusion of right coronary artery with a concurrent significant ostial stenosis: a case report

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Abstract

Percutaneous coronary intervention (PCI) on a proximal chronic total occlusion (CTO) of the right coronary artery (RCA) with concurrent ostial stenosis can be challenging because of the significant difficulty in properly engaging the catheter and providing stable support during the procedure. We report the case of a 57-year-old man with chronic coronary syndrome who underwent an elective PCI at the Dr. Soetomo General Hospital in Surabaya, on April 13th, 2022. At the beginning of the procedure, there was difficulty in intubating the RCA, which required the guide catheter replacement. The angiography revealed a significant lesion at the ostium, a CTO at proximal to mid-RCA with bridging collaterals, and a significant distal lesion. Several strategies to improve guiding catheter support during PCI are using large and supportive shape guide catheters, deep guide catheter intubation, extra support wire, microcatheter and guide catheter extension.

The risk of pressure dampening and ischaemia upon engagement should always be kept under consideration.

Keywords: Percutaneous, Coronary Intervention, Catheters, Vascular Diseases, Ischemia, Angiography, Intubation, Intratracheal

DOI: https://doi.org/10.47391/JPMA.S6-ACSA-19

Introduction

Chronic total occlusion (CTO) of the coronary arteries constitutes a complex lesion. It is defined as a completely occluded coronary artery with Thrombolysis In Myocardial Infarction (TIMI) 0 flow with an estimated duration of at least three months.[1] Recanalization of CTO by Percutaneous Coronary Intervention (PCI) can be challenging.[2] The difficulty of the procedure will increase with the presence of a coinciding ostial lesion. An ostial lesion is also a subset of complex lesion, defined as a lesion located within 3-5mm of the vessel origin.[3] Among the problems that we may encounter in this particular case are: difficulty in engaging the guide catheter in a coaxial manner, increased risk of pressure dampening[2] and poor backup support that provide stability during the procedure.[2]We report a case describing a PCI procedure for proximal CTO of the right coronary artery (RCA), which concurred with an ostial lesion.

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Case Report

A 57-year-old man with chronic coronary syndrome presented to our catheterization laboratory for an elective PCI at Dr. Soetomo General Hospital in Surabaya on April 13th, 2022. His chief complaint was frequent angina, assessed as Canadian Cardiovascular Score (CCS) III, for the last five months. The symptoms seemed not fully responsive to medical therapy. The past medical history was an acute myocardial infarction followed by a primary percutaneous coronary intervention (PPCI) for the left anterior descending (LAD) artery two years earlier. Other cardiovascular risk factors included hypertension and cigarette smoking. When presented in the catheterization laboratory, he was stable, and his vital signs were normal. The electrocardiogram (ECG) showed normal sinus rhythm without any typical ischaemic pattern. The chest x-ray also showed no abnormality. Echocardiography detected a mildly reduced left ventricular ejection fraction (45%) and a slight dilatation of the left ventricular cavity. Hypokinetic inferior and inferoseptal segments exhibited regional wall motion abnormalities.

Catheterization was performed through femoral access. Angiography displayed a normal left main coronary artery. There was a patent old stent at the proximal LAD, which was installed in the previous PPCI. There was a significant 80% stenosis at the distal LAD. The left circumflex artery (LCX) was normal and it provided collaterals for the right posterolateral branch.

Multiple attempts to intubate the RCA using a 6F Judkins Right (JR) 3.5 (Merit, Maquiladora, Mexico) were unsuccessful. Non-selective ascending aortography

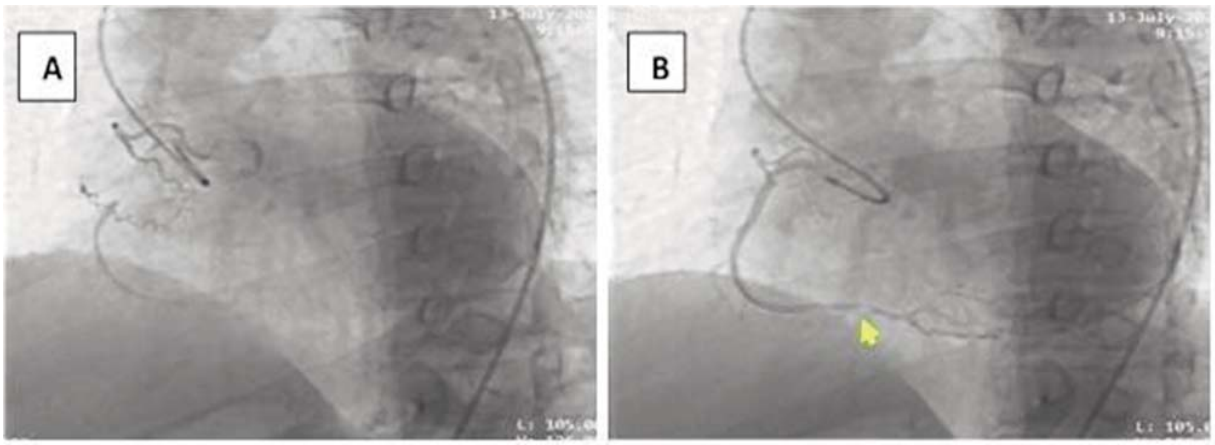

Figure-1: (A) The selective angiography displayed an 80% stenosis at the ostium, a CTO at proximal to mid RCA with a few bridging collaterals, and contrast underfilling at distal RCA (B) Angiography evaluation following the two stents placement revealed a significant 80% stenosis at distal RCA (yellow arrow)

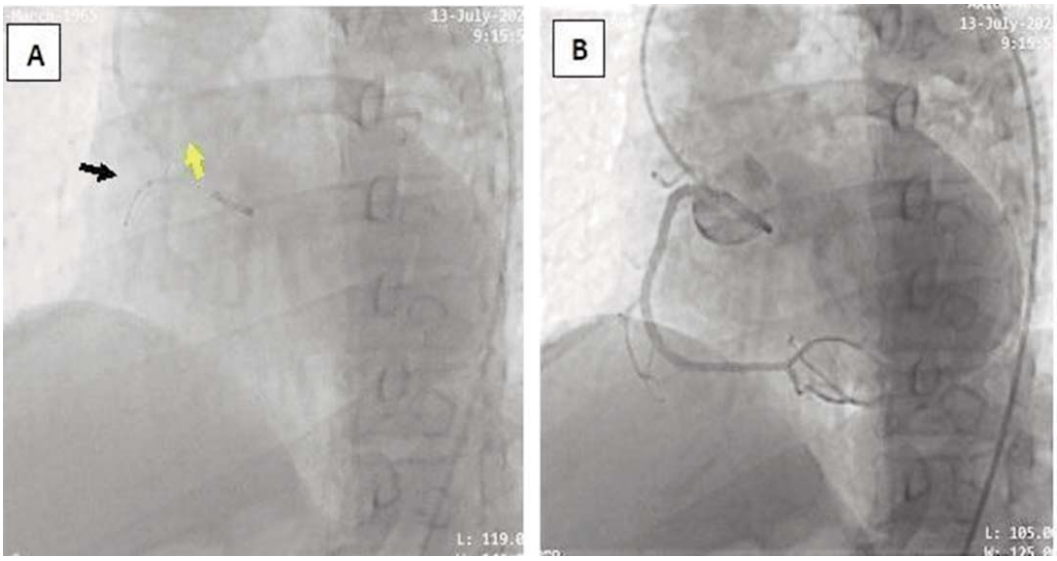

Figure-2: (A) Guide extension catheter (yellow arrow) was used for backup support and facilitating smooth device delivery (black arrow) (B) Post Procedure Angiography of RCA.

revealed significant stenosis at the ostium of RCA. The guiding catheter, JR 3.5, was then replaced with a 7F Amplatz Left (AL) 0.75 (Terumo corp., Shizuoka, Japan). The selective angiography displayed an 80% stenosis at the ostium, a 22mm CTO at proximal to mid RCA with a few bridging collaterals, and contrast underfilling at distal RCA (Fig. 1A). J-CTO score point was 1, which predicted an intermediate likelihood of successful wire crossing.[4] Based on the angiographic evaluation, we decided to perform PCI upon the RCA's lesions with the antegrade wire escalation strategy.

Initial crossing attempts through the CTO using a guidewire (GW) Runthrough NS Hypercoat (Terumo corp., Tokyo, Japan) failed, even with handling support from a 2F microcatheter Teleport (OrbusNeich, Hong Kong, China). Therefore, the guidewire was replaced with GW Miracle 3.0 (Asahi Intecc, Thailand) which eventually crossed through the lesion. Following the successful wire crossing, balloon angioplasty was performed with a 1.0mmx5mm Balloon Saphire II Pro (OrbusNeich, Hong Kong, China) to modify the lesion entry point. Then, a GW Runthrough NS Hypercoat was passed distally as a buddy wire. The purposes of the buddy wire were for backup support and facilitating the subsequent focused-force angioplasty. A 1.5mmx15mm Balloon Saphire II Pro (OrbusNeich, Hong Kong, China) was inflated to achieve optimal lesion expansion and to facilitate further stent delivery. The balloon was inflated to 18 atmospheres (atm) several times along the lesions from mid RCA to the ostium of RCA.

Drug-eluting stent (DES) CRE8 Amphilimus 2.75mmx25mm (CID S.p.A, Saluggia, Italy) was deployed over the proximal to mid lesion. The second stent was BuMa 3.0mmx25mm, a biodegradable drug-coating stent. It was deployed over the ostial lesion. Angiography evaluation following the two stents placement revealed a significant 80% stenosis at distal RCA (Fig. 1B). The third stenting was planned to treat the distal RCA lesion.

A 6F Guidezilla II guide extension catheter (Boston Scientific, Marlborough, USA) was advanced to mid RCA to facilitate smooth device delivery to distal RCA over the two recently deployed stents (Fig. 2A). The third stent, DES CRE8 Amphilimus 2.75mmx25mm (CID S.p.A, Saluggia, Italy) was expanded over the distal RCA lesion. The procedure was concluded by sequential post-dilatation using a non-compliant Balloon Mozec NC 3.5mmx14mm (Meril Life Science Pvt. Ltd., Gujarat, India) over the deployed stents located at the proximal to mid RCA and the ostium of RCA to prevent incomplete stent apposition.

The result of the PCI was excellent as we can see Fig. 2B. There was no serious complication during the procedure. A loading dose of 600mg clopidogrel was prescribed before the procedure. The procedure time was 2 hours with 300 ml of contrast used. After the procedure dual antiplatelet was prescribed. There was no recurrent angina after the procedure and no adverse cardiac event during hospital stay.

Discussion

Previous study showed that CTO lesions are most common in the RCA.[5] Ostial lesions account for about 7% of all coronary stenoses, and more than two-thirds of the ostial lesions involve the RCA[6]. In comparison to the ostial lesion of LMCA, the ostial lesion of RCA, in particular, represent a greater challenge for percutaneous interventions.[7]

Pressure dampening that may lead to ischaemia is a common challenge associated with the ostial lesion. A small, less aggressive guide catheter (such as JR) and avoiding deep guide engagement may prevent pressure dampening. However, these measures may not support more diffuse disease, CTO or tortuous vessels. In case of pressure dampening, we can use a small guide catheter extension to engage the ostium and back out the guide wire.[2]

Some techniques to increase guide catheter support include deep guide catheter intubation, large and supportive guide catheters, one or more buddy wires, microcatheters and guide catheter extension.[2] In the presence of an ostial lesion, the implementation of deep guide catheter intubation or a large guide catheter is limited due to the potential risk of dampening. In our case, sufficient collaterals from the LCX diminished the risk of myocardial ischaemia induced by pressure dampening. For this reason, we were confident in using the larger and more supportive guide catheter, i.e. 7F AL 0.75.

Guidewires with stiffer shafts are necessary for extra support.[8] A buddy wire helps supplement inadequate guide catheter backup, reduces balloon slippage, aids distal stent delivery in a significant tortuous vessel and helps to cross a proximal stent or calcified segment.[9] Buddy wires may use to perform focused-forced balloon angioplasty. During balloon inflation, the wires can modify the balloon forces exerted on the vessel wall leading to plaque modification and expansion.[8]

The use of microcatheter is one of the principles for CTO PCI. It is essential for guidewire manipulation and exchanges. A microcatheter provides better support and increases wire tip stiffness, thus enhancing its penetration. It also protects the proximal part of the vessel from guidewire-induced injuries.[1] Guide catheter extension increases backup support of the guide by providing coaxial alignment, deep intubation, and facilitation of stent delivery. It is beneficial in cases of severe calcification and tortuosity.

Conclusion

PCI for CTO of the RCA with concurrent ostial stenosis can be challenging as showed in our case, and should be aware of the risk of dampening when engaging the catheter.

Using a rigid catheter is risky for dampening, but a more rigid catheter is more stable in being able to penetrate CTO lesions. In our case, we used a more rigid AL catheter because the collateral distal to the lesion was quite good.

Acknowledgment: The authors acknowledge the role of the catheterization laboratory team of Dr Soetomo Integrated Cardiac Care Centre for support during the interventions. The authors appreciate the patient who has kindly given his consent for publication of his case report.

Disclaimer: None.

Conflict of Interest: None.

Funding disclosure: None.

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