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CASE REPORT

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Successful rotational atherectomies for calcified left main stenosis with distal aneurysms in the elderly

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Abstract

In complex calcified LM lesions, RA is an effective and safe alternative for resolving stenosis. As a plaque modifier, RA can allow an optimal stent deployment. Nevertheless, in limited availability of intravascular imaging, well-preparedness against incidental angiography findings is mandatory. Distal aneurysm is not a contraindication provided that the team has the necessary experience.

KEYWORDS

aneurysm, atherectomy, complex lesion, left main disease, percutaneous coronary intervention

1 | INTRODUCTION

Cardiac surgery has been long thought to be gold standard for left main (LM) coronary lesions. Nevertheless, recent advancements in coronary intervention have made nonsurgical approach in such lesions possible. Taking into account the advantages of lower burden on procedure and patients' preference, especially for high-risk surgical patients, for example, elderly patients, many patients, including ours, have favored the percutaneous coronary intervention (PCI) method most as it offers minimal invasive options.

Yet, in complex LM lesions, particularly calcified lesions and or lesions complicated by aneurysms, this method proves to be very challenging for the PCI team. The limited availability of specific PCI resources such as rotational atherectomy (RA) and intravascular imaging to ease the technique also play a significant role in surgical referrals of complex LM lesions. Currently, there are only few centers or teams in our country that are willingly to do PCI in such lesions, even when PCI is more preferable than surgical means.

We will be describing our experience in doing rotational atherectomies without intravascular imaging for complex LM lesions with distal aneurysm in elderly patients refusing surgery, from specific patient selection to intraprocedural approach, in expectation to add recommendation to RA procedure in such lesions.

Left main coronary artery disease (LMCAD) foretells higher mortality risk due to large myocardial area to be involved. Besides having more intense symptoms, LMCAD patients often have obscure and complex lesions, such as distal LM aneurysm, which will also contribute to the revascularization prognosis. Coronary artery bypass graft (CABG) surgery is the gold standard for treatment of LMCAD, but recent advancements in percutaneous coronary intervention (PCI) technique and equipment have given comparable outcome in LMCAD revascularization. Rotational atherectomy (RA) is one of such modalities. Using burr or drill principles, RA can cut and ablate heavily calcified plaques that make balloon or stent deploying difficult. However, it is still not widely available in our practice, especially for lesions complicated by distal aneurysms. In addition, intravascular ultrasound (IVUS) or other intravascular imagings are very limited in our setting, and thus, this procedure relies heavily on the PCI team's preparation and resourcefulness.

We are presenting two calcified LMCAD cases with distal aneurysms that were successfully treated with RA. We hope that it can shed a light in patient selection and procedural approach in our setting.

2 | CASE ILLUSTRATIONS

2.1 | Case 1

Our first patient was a 75-year-old woman with stable yet severe recurring dyspnea and angina of Canadian Cardiovascular Society (CCS) III. She had suffered from those symptoms for 5 years, and those symptoms had been deteriorating in the last months. She had chronic uncontrolled hypertension, and both of her parents passed away from myocardial infarction. Before these symptoms became worse, she had managed good activities of daily living and valued outdoor activities like attending Sunday services. The echocardiography before she had progressive angina had shown that she preserved left ventricular ejection fraction (64%) and normal valves. Even then, those symptoms were not fully controlled with pharmacologic means.

We performed first coronary angiography that showed 90% calcified stenosis in distal LM, 90–95% calcified stenosis in mid left anterior descending (LAD) artery, 90% calcified stenosis in ostial left circumflex (LCX) artery, and 80% calcified stenosis in mid right coronary artery (RCA) (Figure 1A,B). Due to the nature of three-vessel disease with LM involvement and SYNTAX score of 22–33, we had a family meeting followed by Heart Team meeting. Despite the mortality rate after surgery was low (1.05%) according to Euroscore, the patient and her family had refused to undergo surgery; therefore, the physicians opted for elective PCI with RA procedure.

Applying the procedure, we inserted microcatheter followed by RA wire to distal LAD and prepare RA with 1.5 mm burr (Figure 2A). We utilized Fine Cross 130 cm with BMW wire. Calcified lesion was defined by intense radio-opaque area in fluoroscopy. The burr procedure itself was done five times with 150,000–170,000 rotation per minute from LM to distal LAD. After RA, we protected LCX and then performed ballooning (size: 2.0 × 20 mm, pressure: 18 atmosphere/15 s) in LM-proximal LCX to increase LCX flow, followed by deploying 4.0 × 12 mm everolimus-coated stent (pressure: 18 atmosphere/15 s) in LM-proximal LAD to maintain key flow in those vessels. We only performed PCI in LM to LAD (stent cross). Further angiography showed TIMI flow 3 in LM-distal LAD (Figure 2B,C).

2.2 | Case 2

Our next patient was a 61-year-old woman but with worse cardiovascular health. She had been experiencing worsening angina of CCS III, dyspnea on effort, orthopnea, and paroxysmal nocturnal dyspnea for 3 months and has been diagnosed with hypertension just recently, with her blood pressure readings ranging from 170 to 190/110 to 130 mmHg. Although she was still independent in her daily living, she had spent most of her time lying or sitting down due to progressive symptoms. Her periprocedural echocardiography showed that she had 60% left ventricular ejection fraction, normal valves, and left ventricular hypertrophy.

We performed coronary angiography, which showed 90% calcified stenosis in distal LM, 60–70% calcified stenosis with proximal aneurysm in LAD artery, 30% stenosis in LCX artery, and 80% osteal stenosis in posterior descending artery (PDA) (Figure 3A,B). The SYNTAX score was <22. According to Euroscore, her mortality risk was low (0.96%), but she preferred non-surgical method. Thus, we planned elective PCI to LAD, with adjuvant RA to expose LM flow and to deploy stent to LAD.

First, we inserted microcatheter followed by RA wire to distal LAD before we made certain of calcified lesion(s) in LM. We did RA with 1.5 mm burr—150,000–170,000 rotation per minute—thrice from LM to proximal LAD. After RA, we protected LCX, followed by performing ballooning (size: 3.0 × 15 mm, pressure: 12–14 atmosphere/10 s) in LM-proximal LAD and deployed 3.5 × 28 mm sirolimus-coated stent (pressure: 8 atmosphere/15 s) in proximal-mid LAD to further maintain TIMI 3 flow (Figure 4A,B). No perforation

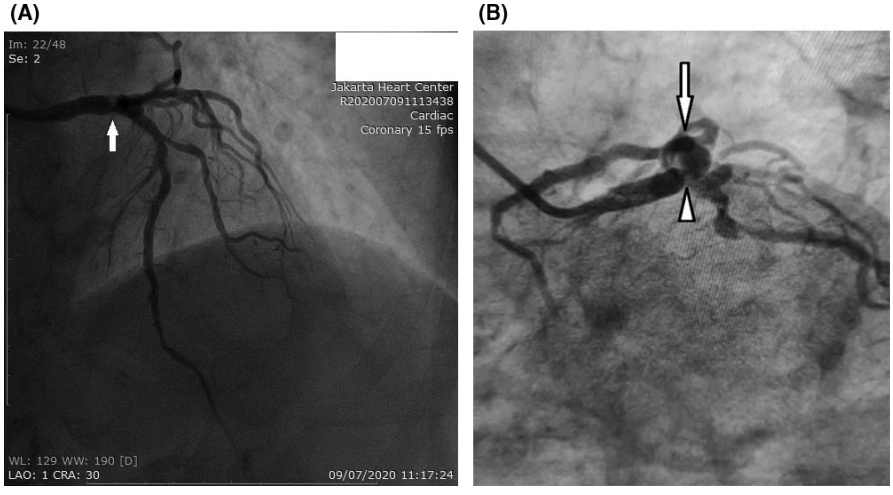


FIGURE 1 (A) Cranial view showed severe stenosis in LM (arrow). (B) Spider view exhibited severe stenosis in LM (arrowhead) complicated with distal aneurysm (arrow)

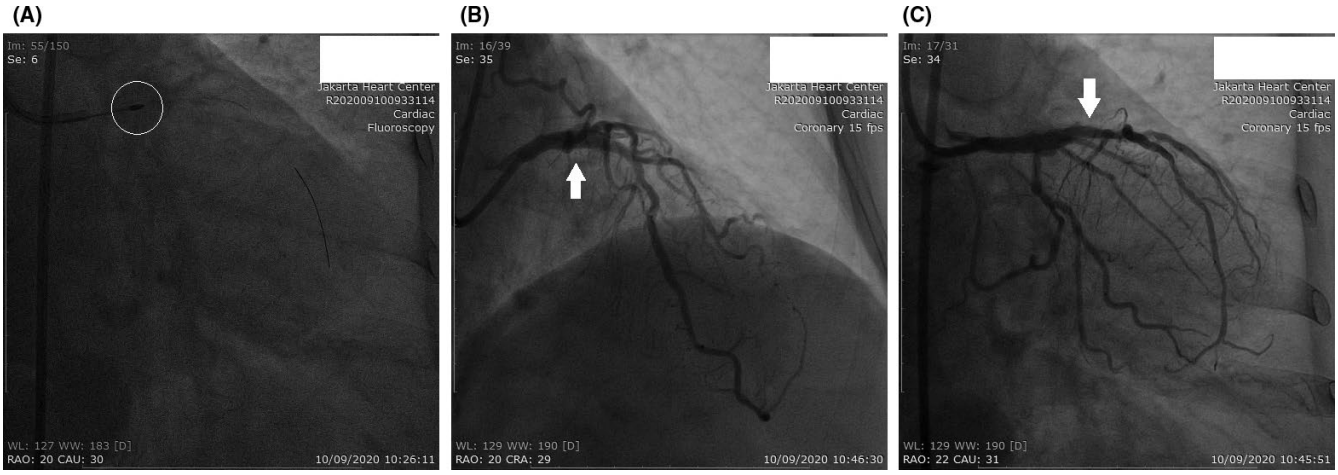


FIGURE 2 (A) Burr tip in LM (area in circle). (B) Cranial view showed stenosis resolution after RA and stent deployment in distal LM (arrow). The aneurysm was also disappeared. (C) Caudal view of the same area of importance (arrow). Note the disappearing aneurysm

FIGURE 3 (A) Caudal view showed severe stenosis in LM (arrowhead) with distal aneurysm near proximal LAD (arrow). (B) Spider view confirmed our finding: severe LM stenosis (arrowhead) and distal aneurysm (arrow)

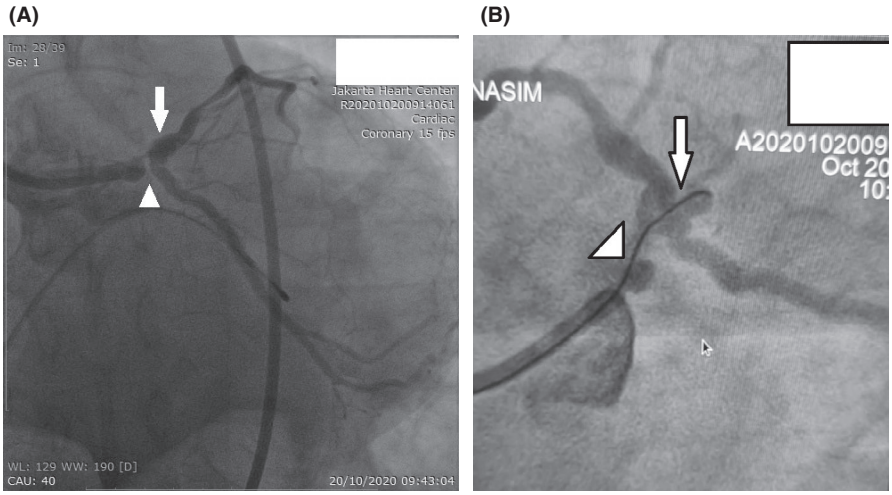
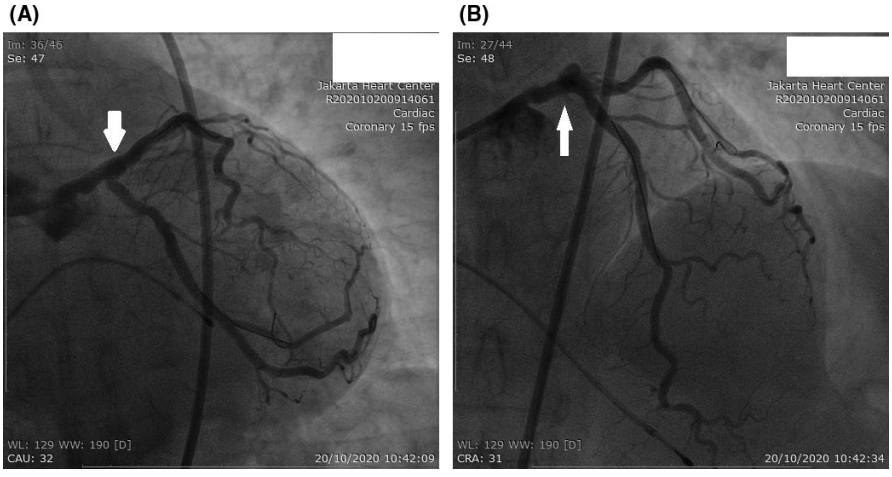


FIGURE 4 (A) Caudal view of optimal flow in LM (arrow). (B) Cranial view showed stenosis resolution after RA and stent deployment in distal LM (arrow). The aneurysm was improved significantly



or bleeding of the aneurysm in distal LM after cautious RA procedure is found in the area.

In both of the cases, the patients were safely discharged with dual antiplatelets, antihypertensives, and close monitoring for angina or other complications. Follow-ups in outpatient clinic showed good functional status in their activities of daily living, and a 6-month follow-up had shown no sign of angina in both patients.

3 | DISCUSSIONS

Involvement of left main usually contributes to a high mortality and morbidity rate of CAD patients. Diagnostic modalities in such cases usually vary, ranging from conventional angiography to more detailed on-site evaluations such as intravascular ultrasound (IVUS) or fractional flow reserve (FFR). Current guidelines from American College of Cardiology/American Heart Association and European Society of Cardiology recommend revascularization for all patients with ≥50% left main (LM) stenosis in spite of symptoms or ischemic burden. Yet, revascularization means in LMCAD are not black and white because of many considerations. After considering anatomic and complexity of lesion, surgical risk, left ventricular function, clinical presentation, and/or patients' preference, the physicians involved then can decide to continue with either PCI or CABG surgery.[1,2]

While CABG has been the gold standard for the treatment of LMCAD, advancements in PCI technology and technique have brought the latter to comparable outcomes to CABG.[3] It cannot be denied that PCI procedures in such lesions are still a formidable challenge for the operator; yet, for some patients who are not adequately fit to undergo CABG, or refusing surgery, vascular intervention is very desired.

Originally made for heavily calcified lesions that made balloon or stent deploying difficult, RA resurfaced as one of the atherectomy modalities that is essential for the revascularization of calcified, yet aging, patient population. Using diamond-tipped burr that spins concentrically on the wire, RA employs selective cutting and ablation in calcified plaque that does not stretch away from the tip. This procedure has long been successful in calcified difficult lesions such as ostial or bifurcating lesions, and recently in LM lesions, with success rate of >90%.[4,5] However, RA has not been widely used even in Europe and United States (only 1–3% of all PCIs performed),[3] let alone in Indonesia.

In our practice, the limitations of RA rise from its costs, its availability, and/or operators' unfamiliarity with the procedure. In addition, intravascular imaging modalities are not widely available and as a result, despite its being less sensitive in calcium detection, fluoroscopy is inevitable.[6]

The presence of aneurysms in the distal LM also gave grounds to more cautious approach when burring the atherosclerosis lesion(s). The LM aneurysms are usually rare, yet can lead to disastrous effects such as perforation, distal embolization, or myocardial infarction.[7] The procedures were chosen after consideration for patients' refusal to undergo CABG, their preference for symptom-free, and our team's familiarity with the procedure. Though highly risky, particularly without intravascular imaging, the procedures taken by our team managed to contain those risks. It should not be performed routinely, because team experience and preparedness are the main requirements of such high-risk PCI.

The successful procedures reflect that RA is an effective procedure for calcified complex LMCAD patients who are not fit for (or refusing) CABG. In turn, we also used RA as adjuvant before balloon angioplasty and stent deployment in such lesions. We expected the approaches would achieve and maintain optimal flow in the distal vessels. The approaches are in accordance with Rotational Atherectomy Prior to Taxus Stent Treatment for Complex Native Coronary Artery Disease (ROTAXUS) trial which indicated that RA before drug-eluting stent placement gave higher acute lumen gain than balloon angioplasty in calcified lesions.[8]

Still, RA requires cautious patient selection. ROTATE registry showed that 1-year major adverse cardiac events (MACE) risk was high in the unprotected LMCAD patients, owing to higher risk of in-stent thrombosis.[9] Therefore, in agreement with a review in United States,[7] we recommend that RA be used as follows: (1) adjunctive therapy for protected LMCAD, if possible, and (2) main therapy before stent deployment for selective, inoperable (or refusing surgery), and unprotected LMCAD patients, even in the presence of more complicated lesions such as distal aneurysms.

4 | CONCLUSIONS

Rotational atherectomy followed by stent deployment can be an efficient, safe, and optimal revascularization method for complex calcified LMCAD patients whom CABG gives higher complication risk or for those who refused surgery altogether. In intravascular imaging-limited setting, the key to successful revascularization with RA is team experience and well-preparedness against incidental angiography findings or intraprocedural complications.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

Todung D A Silalahi: Conceptualizing, Supervising, Writing - Review and Editing (equal). Christopher S Suwita: Writing - Original Draft Preparation, Writing - Review and Editing (equal).

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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