Rotational Atherectomy in a Patient with Acute ST-Elevation Myocardial Infarction and Cardiogenic Shock

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Abstract

Keywords

- angioplasty
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- PCI

Rotational atherectomy (rotablation) of coronary artery is relatively contraindicated in high thrombotic state such as acute ST-elevation myocardial infarction (STEMI) because of the risk of platelet activation by the rotablator. We present a case where rotablation was necessary to recanalize the right coronary artery in a patient presenting with acute STEMI complicated by cardiogenic shock, after unsuccessful attempts with balloon catheters. He improved remarkably after the procedure and was discharged after 4 days.

Case Report

A 70-year-old man was brought to our primary percutaneous coronary intervention service by the paramedic ambulance team for chest pain and inferior segment ST-elevation on his electrocardiogram (ECG). He was an ex-smoker and his medical history only included untreated hypertension. En route to our center, he required 5× direct current cardioversion for ventricular arrhythmia (ventricular fibrillation/ventricular tachycardia) by the paramedics and attained return of spontaneous circulation immediately. On arrival to our unit, he was alert, orientated, and breathing spontaneously. He was cold and clammy with a systolic blood pressure of 70 mm Hg. His ECG showed atrial fibrillation with ventricular rate of 50/min and 7 mm ST-elevation in inferior leads. He was loaded with oral aspirin 300 mg and clopidogrel 600 mg by the paramedics before arriving to our unit. Bivalirudin bolus and infusion was started in our unit.

An intra-aortic balloon pump (IABP) was inserted from the left femoral artery. His coronary angiogram was performed via right femoral access with 6 French (F) sheath and 6F catheters. This showed mild-to-moderate left-sided disease and complete occlusion of right coronary artery (RCA) at proximal segment with TIMI 0 flow, which appeared as an acute occlusion (►Fig. 1). An initial attempt via 6F Judkins right 4 (JR4) guiding catheter (GC) (Medtronic Corp, Minne-

apolis, MN) with BMW wire (Abbott Vascular, Chicago, IL) was unsuccessful to cross the RCA occlusion. Therefore, a PT Graphix wire (Boston Scientific Corp., MA) was used to cross the occlusion with slight difficulty. A thrombus aspiration catheter (Thrombuster, Kaneka Corp, Osaka, Japan) was then tried, but it was unable to cross the lesion. This was followed by a 2.5- × 12-mm semicompliant balloon, which also proved unsuccessful. Henceforth, a 1.1- × 15-mm ACROSS CTO (Acrostak, Geneva, Switzerland) balloon was used to cross the lesion and the lesion was predilated at 12 atm (►Fig. 2). This established a TIMI1 coronary flow, and the lesion at the mid-RCA was noted to have severe calcification. Further attempts with 2-mm and then 1.5-mm balloon proved unsuccessful. At this stage, there was reocclusion of RCA and the ST-elevation started to worsen. Therefore, we decided to use rotational atherectomy (rotablation) (Rotablator, Boston Scientific Corp., MA) to debulk the calcified lesion to establish flow in RCA.

The 6F sheath was upgraded to an 8F sheath in RFA and a temporary pacing wire was inserted into the right ventricular apex via right femoral vein. An Amplatzer right 2 GC catheter (Medtronic Corp., Minneapolis, MN) was used to intubate the RCA, and a PT Graphix wire with SuperCross (Vascular Solutions, Minneapolis, MN) microcatheter was used to cross the lesion. This was then exchanged to a Rotafloppy (Boston Scientific Corp., MA) wire and high-speed rotablation was

Fig. 1 Angiogram showing occlusion of right coronary artery in a left anterior oblique view.

performed initially with 1.25-mm burr at 160,000 rotations per minute (rpm) (→ **Fig. 3**). Because of heavy calcification, this proved difficult but managed to cross the lesion. Further rotablation was performed with 1.5-mm burr at 160k rpm. This established TIMI 2 flow in the RCA. Then a 2.5-mm balloon was used to predilate and a 3- × 18-mm drug eluting stent was deployed at mid-RCA (→ **Fig. 4**). A 3.5-mm noncompliant balloon was used to postdilate the stent, establishing TIMI 3 flow and excellent angiographic result (→ **Fig. 5**). The temporary wire was removed immediately after the procedure and the IABP was left until 24 hours postprocedure. There was no peri- or postprocedural complication. The ST-segments resolved and the patient was discharged after 4 days.

Discussion

Rotational atherectomy is relatively contraindicated in the setting of acute coronary thrombosis such as STEMI because of the risk of potential platelet activation by the rotator.

Fig. 2 Image showing 1.1-mm balloon inflation at the level of occlusion at 12 atm with Judkins right 4 guiding catheter in ostium of right coronary artery.

Fig. 3 Image showing Rota burr crossing the lesion with Rotafloppy wire in situ. An Amplatz right 2 guiding catheter was used. Temporary pacemaker wire can also be seen.

The manufacturer advises using rotablation at least 2 to 4 weeks after the use of thrombolytics in STEMI.¹ However, rotablation has previously been performed in acute STEMI²⁻⁴; but to the best of our knowledge, this is the first reported case of rotablation in STEMI in a patient with cardiogenic shock. The other option in our case would have been the use of cutting balloon at the level of the lesion. Considering the heavy calcification noted and the patient being unstable, we decided not to delay establishing coronary flow by trying different techniques that may or may not help. Retrospectively, after seeing the difficulty even with 1.25-mm burr, we believe rotablation was the appropriate technique in this case. The other options would have only delayed the coronary flow and might have led to problems with deployment of stent. We also recognize that the Rotafloppy wire was not in an ideal distal position. Considering that the patient was in cardiogenic shock because of poor coronary perfusion, we decided to run the burr carefully avoiding the radiopaque part of the wire to establish coronary flow at the earliest opportunity.

Fig. 4 Image showing successful deployment of stent in the lesion after rotational atherectomy.

Fig. 5 Final angiographic result at the end of procedure.

A recent single center retrospective observational study of rotablation from Japan showed that 156 of 250 (62%) rotablation procedures were performed for off-label indications in their center.⁵ Of the off-label indications, the use of rotablation in the culprit lesion of acute myocardial infarction (MI) was noted only in 4% of patients. The common off-label indications in the study were long lesions (≥ 25 mm) in 39% and angulated lesions (≥ 45 degrees) in 22% of patients. This study showed that occurrence of slow flow or periprocedural MI in the off-label group was higher than that in the on-label group (slow flow 30 vs. 18%, $p = 0.06$; MI: 8.8 vs. 2.1%,

$p = 0.04$), whereas severe complications such as burr entrapment, transection of the guidewire, or perforation were rare in both groups.⁵

We used rotablation in this case only after multiple attempts with balloon and because the patient was in cardiogenic shock. We do not recommend the routine use of rotablation in acute STEMI because of its inherent risk.

Funding Source

None.

References

- 1 Rotablator[®] Rotational Atherectomy System Natick, MA: Boston Scientific Corporation http://www.bostonscientific.com/templatedata/imports/collateral/Coronary/rota_checklist_01_us.pdf. Accessed May 3, 2013
- 2 Ho PC. Rotational coronary atherectomy in acute ST-segment elevation myocardial infarction. *J Interv Cardiol* 2005;18(4): 315–318
- 3 Mokabberi R, Blankenship JC. Rotational atherectomy to facilitate stent expansion after deployment in ST-segment-elevation myocardial infarction. *Am Heart Hosp J* 2010;8(1):66–69
- 4 Hussain F, Golian M. Desperate times, desperate measures: rotabating dissections in acute myocardial infarction. *J Invasive Cardiol* 2011;23(9):E226–E228
- 5 Sakakura K, Ako J, Wada H, et al. Comparison of frequency of complications with on-label versus off-label use of rotational atherectomy. *Am J Cardiol* 2012;110(4):498–501