# Rotational Atherectomy in STEMI

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## Introduction

ST elevation Myocardial Infarction(STEMI) is an emergency medical condition and the most severe form of Coronary Artery Disease in the Acute Coronary Syndrome spectrum. It is defined as transmural myocardial ischemia for complete coronary artery blockage, which if left untreated will lead to transmural myocardial infarction, or tissue death. Depending on the location of the occlusion, the amount of heart tissue can vary. The pathologic process in the disease is most often rupture of an atherosclerotic plaque which exposes its highly thrombogenic lipid core to the arterial lumen. This typically produces a soft appearing clot on angiography, which is most often treated with balloon dilation and stent deployment, with or without thrombectomy. Some of the less common causes of STEMI include coronary vasospasm, as well as spontaneous coronary artery dissection. Rotational atherectomy (RA) is a procedure utilized in chronic CAD with significantly calcified stenosis, but is contraindicated in situations with acute, soft thrombosis.

In our case, a 79 year old female presented to our facility with inferior wall STEMI, and was found to have severe chronic CAD with heavy calcification as well as acute clot causing complete vessel occlusion. In this specific case, due to the severe chronic calcification, standard balloons and stents could not cross the tight lesion. We will present a situation in which RA use may be necessitated in STEMI.

## CASE

A 79 year old female with a medical history of GERD, HTN, and tobacco abuse presented to our Emergency Department via EMS with the chief complaint of severe chest pain. Reportedly she had been seen at another ER earlier in the day and was sent home with the diagnoses of GERD. On route to our facility, EKG showed ST elevations in the inferior leads II, III, aVF, and high lateral lead V6 with reciprocal ST depressions in leads I, aVL, V1, V2. She was also bradycardic and hypotensive initially in EMS but responded to IV fluid boluses and was normotensive on arrival to the ED with systolic BP of 130, up from 70's in EMS. She was still complaining of 10/10 chest pain with persistent EKG changes consistent with STEMI as listed above. Further physical exam showed patient to be in Stage C Cardiogenic shock with cold and clammy extremities.

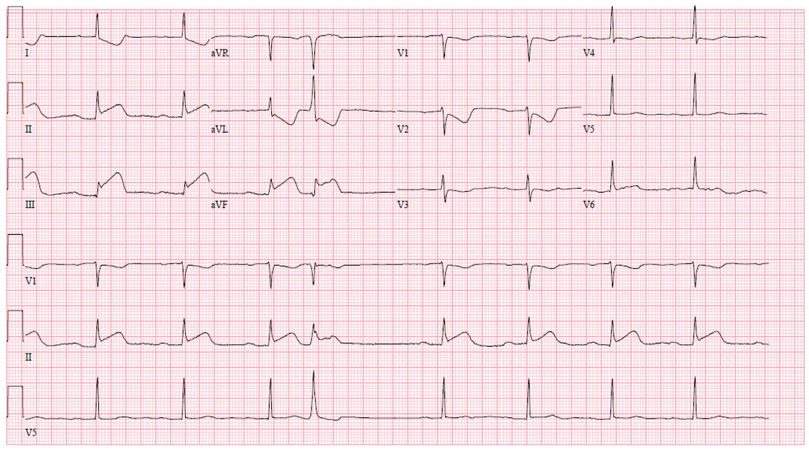


Figure 1: EKG results showing ST elevations in the inferior leads II, III, aVF, and high lateral lead V6 with reciprocal ST depressions in leads I, aVL, V1, V2.

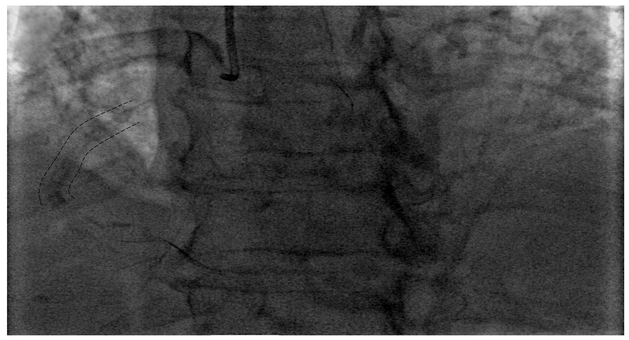

Figure 2: Photo highlighting heavy calcification (dashed outline) of the RCA prior to injection of contrast.

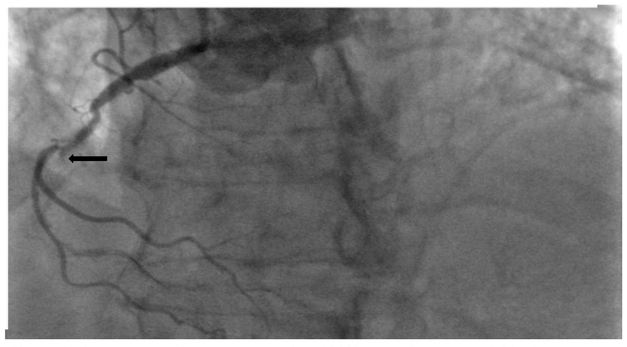

Figure 3: Coronary angiography showing 100% occlusion of the RCA. Note the lack of contrast in mid and distal RCA and the small stump at the site of occlusion (arrow).

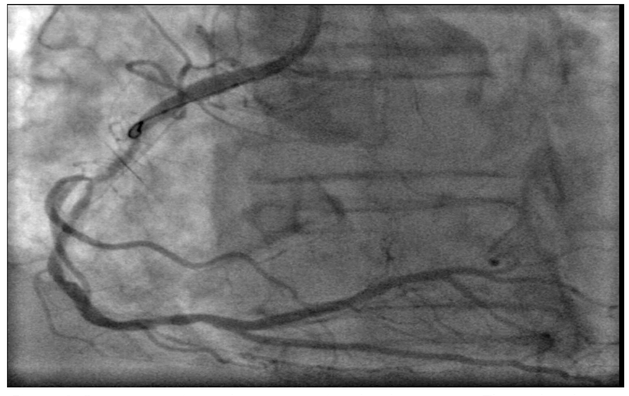

Figure 4: Coronary angiography post rotational artherectomy. The mid and distal RCA can now be visualized however there is still significant stenosis at the site of occlusion.

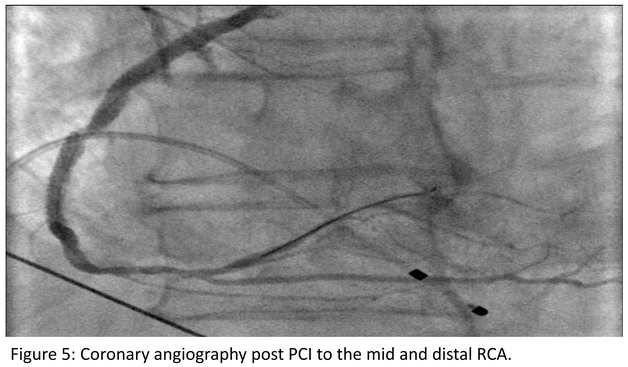

Figure 5: Coronary angiography post PCI to the mid and distal RCA.

## Hospital Course

The patient was loaded with Aspirin 325 mg and Ticagrelor 180 mg in the ER and subsequently taken to the catheterization lab. Diagnostic angiography showed completely occluded RCA in its mid segment with heavy calcification, which was deemed the culprit lesion. A 1.25mm balloon could not cross the lesion easily. She became hypotensive and bradycardic in the middle of procedure. Atropine was given, and she was started on dopamine and phenylephrine followed by temporary pacemaker placement. RA was performed with a 1.25mm burr. Balloon angioplasty was performed with multiple sizes of balloon with multiple attempts. Drug-eluting stents were placed successfully. The patient's SBP was 120 – 130s by the end of PCI with dopamine and phenylephrine infusing. Final angiographic images showed TIMI 3 flow in distal RCA.

Bivalirudin was used for anticoagulation. She was observed in HIACU and was able to wean down on pressors. Post procedural echocardiogram showed hyperdynamic LV and akinetic RV with no pericardial effusion. She was transferred to the ICU and required more vasopressor titration, essentially maxing out on these medications. The patient suffered an episode of PEA arrest but was resuscitated. As such, in persistent cardiogenic shock, Veno-Arterial ECMO was anticipated, however significant peripheral arterial disease prohibited this from being accomplished. She was planned to transfer to tertiary center for right ventricle support device initiation. The patient's BP declined progressively and she subsequently suffered PEA arrest multiple times. Next of kin decided to make her DNI/DNR. Comfort care measure was placed and she expired.


Figure 6: Example of a rotational atherectomy system. Rotapro™ by Boston Scientific.

## Discussion

Coronary stenoses with significant calcification frequently can't be dilated with the use of conventional balloon angioplasty. Even if the lesion can be dilated with balloon angioplasty, heavily calcified lesions can often decrease the effectiveness of drug eluted stents in preventing restenosis. In the setting of severe calcification, RA can be utilized to debulk severely calcified coronary lesions. RA removes calcified plaque with microscopic diamond chips embedded on the surface of a rapidly rotating olive-shaped burr. Recent studies reported RA's high procedural success rates, low risk of major complications, and its efficacy on restenosis. However, the use of RA in a high thrombotic state such as STEMI is relatively contraindicated due to the potential for further induction of platelet activation and aggregation by the rotating burr. To date, there are only a handful of case reports on the use of RA in STEMI in the literature. Our case demonstrates the efficacy of utilizing RA when conventional angioplasty was unsuccessful. We also demonstrate the successful use of RA to revascularize the severely calcified culprit lesion in a patient with STEMI complicated by cardiogenic shock.

**References:**

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