



## Case Report

### A challenging case of heavily calcified unprotected left main coronary artery (LMCA) distal critical stenosis treated with rotational atherectomy and drug eluting stent (DES) placement

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#### Abstract

We report a case of a 50 year old widowed mother with Canadian Cardiovascular Society (CCS) class IV symptoms, and ST Elevation in lead AVR due to unprotected calcified distal left main critical stenosis. It was decided to proceed with coronary angiogram and stent placement with rotational atherectomy and we achieved successful outcome with no associated complications. Interventional approach in unprotected left main stenosis carries a high procedural risk, particularly in complex distal left main stenosis. Combined rotational atherectomy with placement of DES may enhance procedural success and clinical outcome as in this case.

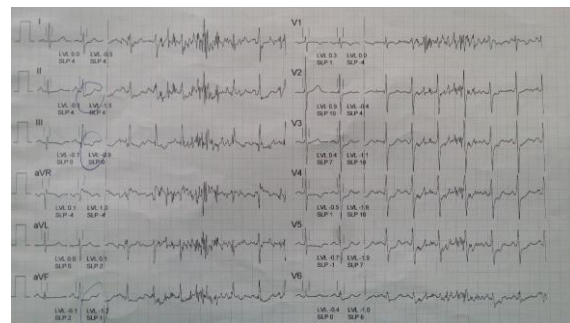
### Introduction

LMCA disease accounts for 5-10% of angiographic results and unprotected LMCA disease treated medically has a 3 year mortality rate of 50%. Coronary artery bypass grafting (CABG) is considered the gold standard therapy for LMCA disease. The development of coronary stents, particularly drug eluting stents, with their dramatic patency improvement powered by antiplatelet regimens warrants reconsideration of Percutaneous coronary intervention (PCI) as a successful treatment option for LMCA disease. Out of all LMCA stenting procedures, stenting of the distal LMCA lesion is a true technical challenge and presence of calcium makes an added difficulty. In this report we present a case of heavily calcified distal LMCA critical stenosis with CCS class IV symptoms treated with PCI and optimum medical management in a PCI capable center with onsite cardiac surgery back up but with limited availability.

### Case report

A 50 year old widowed mother with past medical history of hypertension and dyslipidemia presented with jaw pain and chest tightness on mild exertion with CCS class II angina over the past 3 months. Her cardiovascular examination was normal. She had normal resting ECG, normal left ventricular ejection fraction of 60%. Her Exercise ECG was positive subjectively and objectively at low work load. (Figure 1)

Diagnostic coronary angiography via right radial artery access demonstrated complex, heavily calcified left main coronary artery and



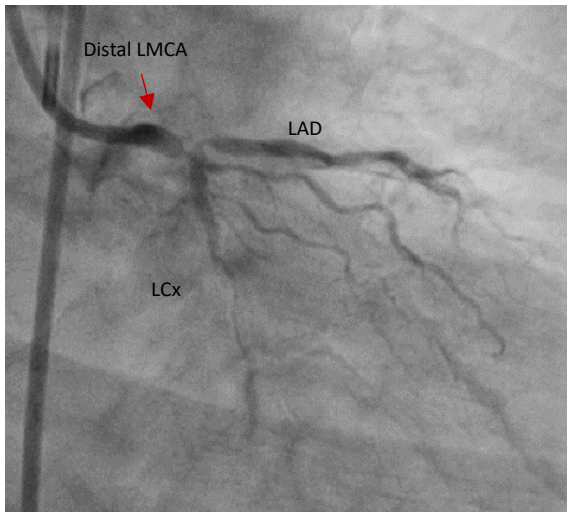
**Figure 1-** AVR ST elevation and diffuse ST segment depression in other leads in the ECG.

calcification extending to left anterior descending artery (LAD) and left circumflex artery (LCX) with 99% tight stenosis in distal left main stem (medina 1,1,1).

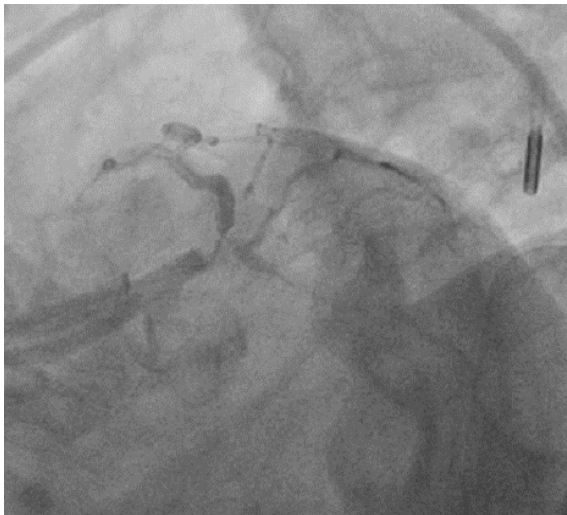
LAD had ostial tight stenosis with Thrombolysis in Myocardial Infarction (TIMI) 1 flow while the left circumflex (LCX, non-dominant) also had ostial tight stenosis with TIMI 1 flow [Figure 2,3]. The anatomically dominant right coronary artery (RCA) had mild to moderate disease. The diagnosis of double vessel coronary artery disease with critical distal left main stem stenosis was made. Examination of syntax score revealed a syntax 1 score of 34 and syntax II score of 31.8 with 4 year mortality for CABG of 1.75% whilst for PCI, syntax II score of 12.9 with 4 year mortality of 7.9%. It was a clear demonstration of revascularization favouring CABG as the first choice. Therefore the patient was offered the benefit of revascularization by surgery and was referred for CABG.[1]



However, urgent CABG could not be arranged as expected due to lack of facilities and patient was kept in-ward awaiting CABG.



**Figure 2-** RAO Caudal view showing critical distal LMCA and ostial LAD & ostial LCx lesions



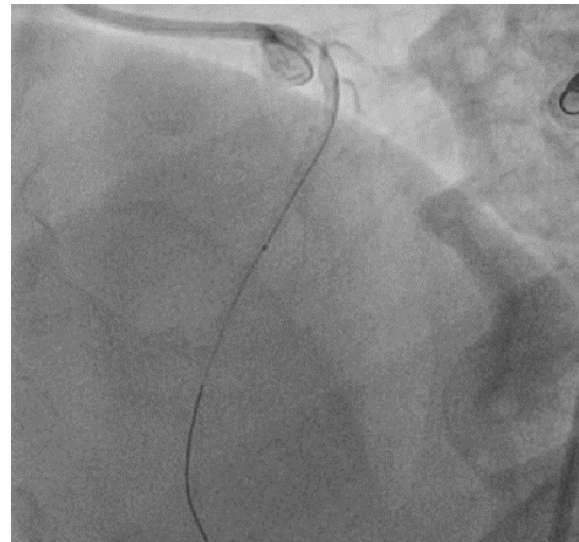
**Figure 3-** Spider view demonstrating the lesions

While awaiting CABG, the patient became clinically unstable complaining of chest pain at rest requiring urgent intervention. The condition of the patient was discussed with the family and other concerned parties including surgical colleagues and with the consensus opinion it was decided to proceed with revascularization by PCI.

On the analysis of patient's coronary anatomy, due to heavy calcification, it was decided to modify the plaque with rotational atherectomy combined with balloon angioplasty prior to deployment of the stent.

It was also decided to proceed with support of the intra-aortic balloon pump (IABP) and temporary pacing in order to obtain optimal haemodynamics until the procedure was over and the patient was stable. Intravascular ultrasonography (IVUS) examination of coronaries was kept as an option for pre and post procedure.

In preparation of PCI, a 34 cc intra-aortic balloon pump (IABP) catheter was inserted through left femoral access, using 8F sheath and temporary pacing done via right femoral vein. Left main coronary stem was cannulated with XB3 7F guiding catheter through right femoral approach. Several attempts to cross left main to LAD failed with Choice floppy guide wire through the visible ante grade path. Miracle 6 guide wire with the support of LAXA 1x5 mm balloon was used to cross the LAD lesion.[Figure 4].



**Figure 4-** Following rotational atherectomy rota wire is being exchanged for the workhorse wire.

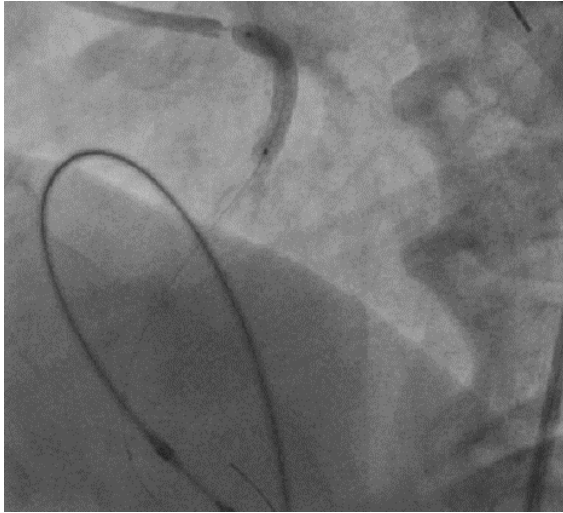
Pre dilatation was done with same balloon at 12-14 Atmospheres(ATMs) and micro catheter was advanced over the wire. Miracle guide wire was exchanged with 0.009" Rota extra support wire.

Rotablation of distal LMCA and proximal LAD was done using 1.25 mm Rota Link plus Burr at 180-200 k RPM. Rotablation of distal LAD calcified lesion was attempted but abandoned due to hypotension and bradycardia. Hypotension due to a pericardial effusion was excluded by transthoracic echocardiogram.



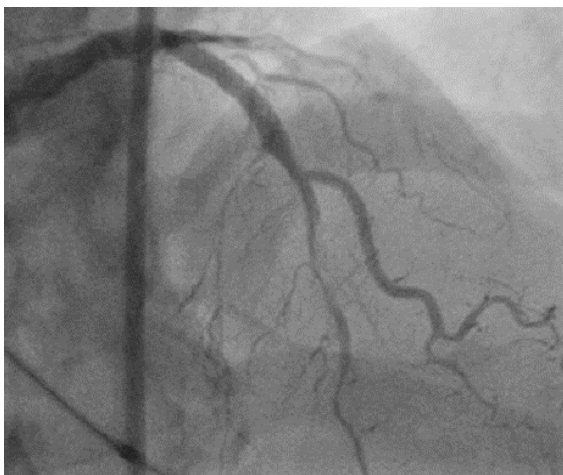
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Since the patient became unstable it was decided to stent the LMCA to LAD and attend to other lesions later as staged procedure. Pre dilatation of distal LMCA and LAD was done with TREK 2.5x15 balloon at 12-16 ATMs. Xience Prime 3.5x28mm DES was placed from mid LMCA to proximal LAD and deployed at 14 ATMs.[Figure5]



**Figure 5-** Stent deployment from LMCA to LAD

Post dilatation of mid and proximal stent done with MOZEC 4x8 Balloon at 12-18 ATMs (Final diameter 4.2 mm).



**Figure 6-** RAO cranial view shows TIMI III LAD and its branches following stenting .

Post procedure coronary angiogram revealed excellent results with TIMI III flow in LMCA and LAD and its branches .[Figure 6] Patient's haemodynamics improved immediately after the procedure.

Distal LAD and LCx lesions were planned to be done as staged procedures. Intravascular ultrasonography (IVUS) was not performed as patient was unstable during procedure. 400 ml of contrast was used with no impact on renal function. Total fluoro time was 40 minutes.

Patient was observed in the Coronary care unit(CCU) and temporary pacemaker (TPM) and the IABP were removed after 24 hours as patient was haemodynamically stable throughout. She was transferred to the ward on 3rd day and discharged from hospital on day 5 with per oral medications (asprin 75 mg nocte, clopidogrel 75 mg nocte, atorvastatin 40 mg nocte, enalapril 5 mg mane, bisoprolol 5 mg mane). She did not develop any complications of bleeding, arrhythmias and remained free of angina while in ward. She was reviewed at 2 weeks and 1 month follow up visits and found to be free of angina with normal haemodynamics. She reported that she had improved exercise tolerance at 2 months follow up while on same medication.

## Discussion

CABG is considered the gold standard therapy for all LMCA obstructive lesions and multi vessel obstructive coronary artery disease. [2] The first case of balloon angioplasty of coronary artery disease was performed by A.Gruntzing in 1979. [3] Since the initial results were poor due to acute and sub-acute thrombosis as a result of vessel dissection due to balloon angioplasty and unavailability of good antiplatelet medication, angioplasty was discouraged initially.

However due to advancement in development of coronary devices (balloons and stents subsequently), PCI became more popular and considered equal to CABG in selected patients. After the results of the SYNTAX trial and the development of SYNTAX score, the decision between CABG and PCI for patients with obstructive coronary artery disease was better understood with each method, and SYNTAX score of 32 and above favours CABG and score of less than 22 favours PCI. LE MANS and PRECOMBAT studies revealed that PCI with optimum medical therapy is not inferior to CABG in carefully selected subgroup of patients with unprotected LMCA stenosis. Hence, PCI to LMCA is an emerging treatment option in guidelines related to LMCA revascularization.



PCI option of LMCA is considered as a Class 11a indication in patients with SYNTAX score of 23-32 and Class 1 indication in less than 22 in recent revascularization guidelines. [4]

Rotational atherectomy (Rotablation) is used as a lesion preparation tool in severely calcified coronary arteries for better delivery and implantation of coronary stents. Debulking or plaque modification can reduce the risk of dissection, facilitate the stent passage and optimize the initial diameter gain with higher procedural success rate. However, there is no significant difference in clinical outcomes of non rotablated cases. [5] It was noted that aggressive rotational atherectomy strategy over nonaggressive rotational atherectomy offers no advantage. No reflow phenomena is more frequent with debulking procedure, bigger burr use, very high revolution burr rates and in vessels with calcified long segment of disease. [6]

Rotational atherectomy is therefore recommended as a reserved tool for heavily calcified lesions that may not be crossed by a balloon catheter and should not be used as a routine procedure.

## Conclusion

Non-surgical intervention of LMCA coronary artery disease is not routinely recommended and CABG should always be contemplated before attempting high risk maneuvers. However non-surgical revascularization of calcified complex left main stem obstructive lesions with the use of rotational atherectomy can be considered as a successful alternative treatment option for CABG in a selected patient population which could be a lifesaving procedure as illustrated in this case.

## References

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