



Case Report

A case report: successful percutaneous coronary intervention (PCI) in unprotected left main and three-vessel coronary artery disease

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ABSTRACT

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Background: Left Main Coronary Artery (LMCA) Disease is the highest-risk lesion of coronary artery disease and is related to cardiovascular morbidity and mortality compared to other types of obstructive Coronary Arterial Disease (CAD). Previously, coronary artery bypass grafting (CABG) was the preferred method for revascularization in significant LMCA lesions; however, results from several trials comparing percutaneous coronary intervention (PCI) with drug-eluting stents (DES) to CABG showed PCI was non-inferior to CABG in highly selected LMCA patients. This report was to describe the contemporary evidence for PCI to CABG in LMCA Disease.

Case Presentation: A diabetic and hypertensive 59-year-old man with stable angina pectoris and Canadian Cardiovascular Society (CCS) Score III was referred to Saiful Anwar Hospital for elective PCI consideration. The patient was diagnosed with left main and three-vessel coronary artery disease from CCTA in 2009 and angiography in 2023, then suggested to CABG for revascularization. However, the patient refused CABG surgery and decided to perform PCI with high-risk criteria after an adequate consultation. Considering the high-risk category and reduced ejection fraction, an elective PCI was performed with intra-aortic balloon pump (IABP) support. Then it implanted 2 DES at distal-LM until distal-LCx. In the following procedure, the patient also implanted 1 DES at mid-distal RCA and was discharged with significant improvement in his quality of life.

Conclusion: In selected left main and three-vessel coronary artery disease, PCI is successfully improves the patient's quality of life.

1. Introduction

The Left Main Coronary Artery (LMCA) disease was the primary cause in 4-6% of all PCIs.¹ There was no significant difference between PCI and CABG in patients with low or moderate morphological complexity LMCA disease, which has an endpoint of mortality, stroke, or myocardial infarction in 5 years.² In this left main and coronary artery disease, treatment options were limited depending on each center. Saiful Anwar Hospital was a referred hospital with a high volume of PCI. In this report, we present an interesting case of revascularization with high-risk PCI to patients who refuse CABG in LM with Three Vessel Coronary Artery Disease. This report describes the contemporary evidence for PCI to CABG as a revascularization option in LMCA disease.

2. Case Report

A man, 59 years old, complained about chest discomfort and shortness of breath when doing activities like walking 100-200 meters but was relieved with a rest. This symptom first occurred in 2009 when diagnosed with ST-elevation myocardial infarction (STEMI) and hospitalized for five days. The patient suggested primary PCI but refused. After conservative treatment, the patient performed CCTA, and the result was three-vessel coronary artery disease. They then

suggested stent implantation, but he also refused and continued his conservative treatment with Po. Aspilet 0-0-80 mg, Po. Clopidogrel 75-0-0 mg, Po. Atorvastatin 0-0-40 mg, Po. Bisoprolol 2.5 mg, Po. Ramipril 0-0-2.5 mg, and Po. Isosorbide dinitrate 3x5 mg routinely. In January 2023, his symptoms increased from CCS II to CCS III. During this period, the patient was first diagnosed with diabetes mellitus and got insulin basal 0-0-12IU. In February 2023, a patient with uncontrolled diabetes mellitus was diagnosed with unstable angina pectoris and agreed to PCI, which resulted in three-vessel coronary artery disease with Chronic Total Occlusion (CTO) in Mid LAD, RPLB Branch, and critical stenosis (95%) in distal LCx with SYNTAX Score >33. The patient has suggested a CABG procedure. The patient decided not to perform the CABG procedure, then took a second opinion from a cardiologist at Saiful Anwar Hospital and planned to have adequate consultation again.

At RSSA, the patient's physical examination was an unremarkable finding. Limits: His CXR is also within normal limits, as shown in Figure 1. ECG was found with sinus rhythm HR75bpm, with T-inversion at II, III, aVF, and LV-strain at V3-V6, as shown in Figure-2 creatinine. The laboratory result showed increasing creatinine level (Cr 1.23) and urea level (Ur 58.2), with eGFR being 63.8570; others were within the normal limit (Figure 2). From echocardiography found LVH eccentric (LVIDd 6.3 cm; LVMI 119.82 g/m²; RWT 0.253), decreased LV

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function (EF31% biplane), diastolic LV dysfunction gr I without increased LA pressure (E/A1.4), and MR moderate (MR-VC 0.3 cm; MR-ERO 0.3 cm²; MR-RV 36 cm). In June 2023, the patient underwent elective PCI, which performed IABP insertion before because of ULMCAD, which also reduced EF. From angiography, it shows left main and three-vessel coronary artery disease, as in Figures 3 and 4. Due to a not-pass thought calcified CTO lesion at LAD, the operator performs PTCA on that vessel. Then, it decided on LMCA as the next target vessel because of its dominant and main vessel. The operator then implanted 1 DES at distal LM-distal LCx and 1 DES at distal LCx. The patient had stable hemodynamics; no complications occurred during and after the procedure. IABP was released in several hours and continued observation at the cardiac intensive care unit for two days. After that, the patient moved to the ward for two days, was discharged from the hospital, and was scheduled to stage PCI for his CTO at LAD and his stenosis (90%) at RCA.

In September 2023, he underwent staging PCI again. Because of the high calcified lesion, the operator decided to use a rotator and also OCT at RCA, then implanted 1 DES at mid-distal RCA. The TIMI flow was III, and residual stenosis was 0% after stenting RCA. It was well-apposed, well expanded, and also had no medial dissection from OCT evaluation. From clinical symptoms, there was significant improvement between before and after stenting. He was in an IT division at a contractor company, where his office was on the 2nd floor. He can climb stairs several times without any complaint after stenting, which he never felt before. He had a significant improvement in his quality of life after PCI.

3. Discussion

This diabetic and hypertensive 59-year-old patient with CCS Class III and failure symptoms successfully performed high-risk PCI with IABP support after refusing the CABG procedure in an unprotected Left Main and Three Vessel Coronary Artery Disease setting until improvement in his quality of life. Unprotected Left Main Coronary Artery Disease (ULMCAD) is defined as stenosis at LMCA, more than 50% without any history of CABG. If a CABG procedure had been performed, it was also described as the lack of any graft or acceptable collateral preservation for any of the distal arteries.^{3,4}

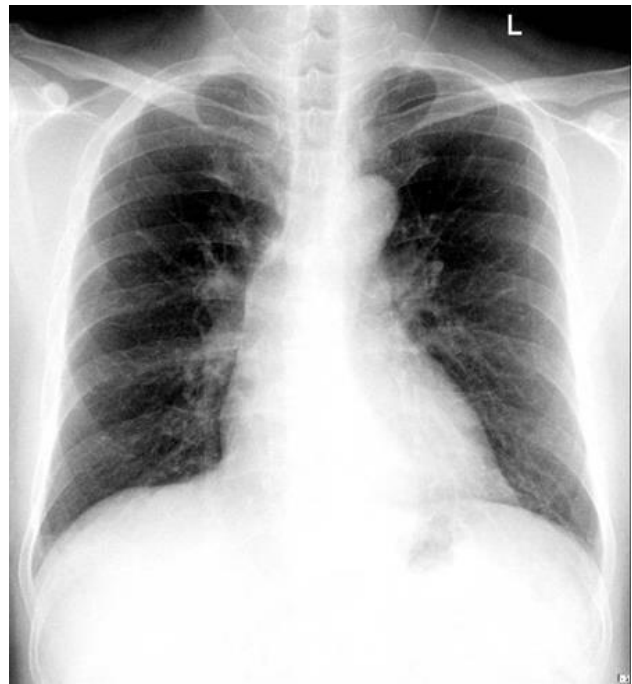


Figure 1. Chest X-ray showed aorta sclerosis, with CTR

CABG is the standard treatment for revascularization option in LMCAD.⁵ Shiomi et al. identified patients with ULMCAD from CREDO-Kyoto PCI/CABG registry cohort-2 and found that 1,004 patients with ULMCAD, 364 patients performed PCI and 640 patients performed CABG.⁶ Several studies showed patients have significant concerns about CABG, including fear of pain, age, and recovery durations, and 93% of patients who indicated both PCI and CABG, chose PCI as their revascularization procedure.⁷

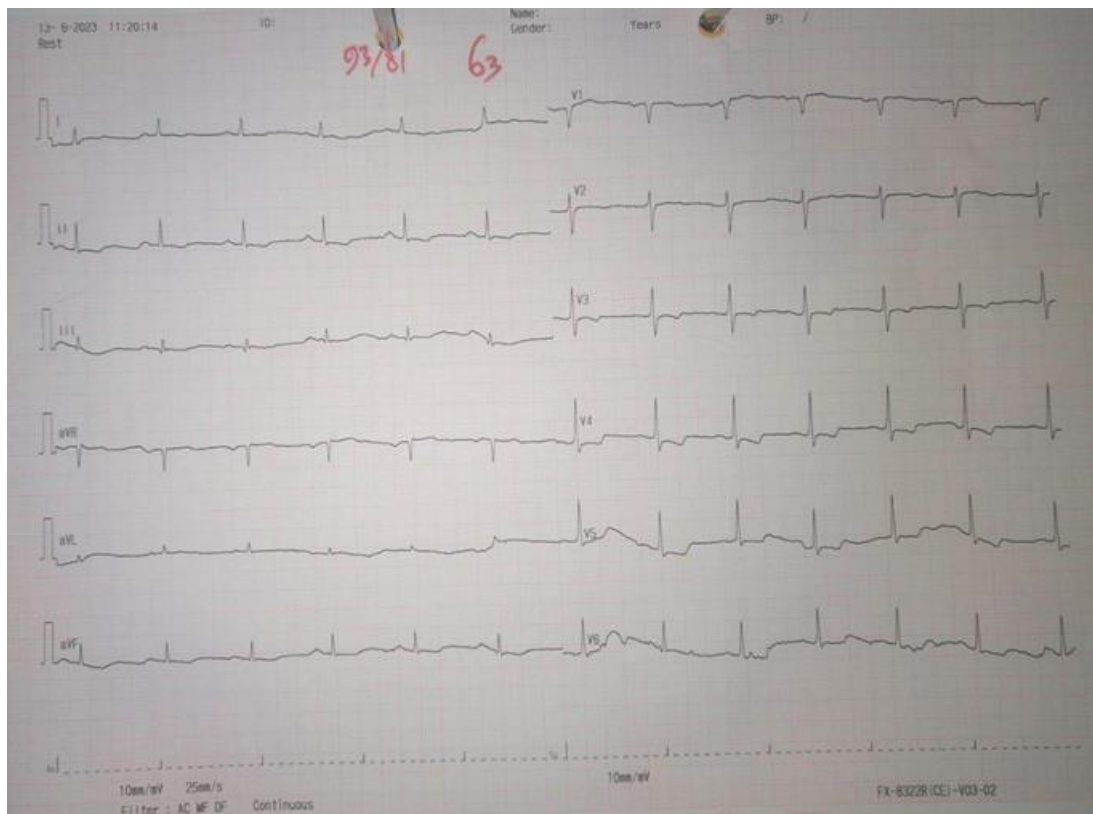


Figure 2. ECG shows normal sinus rhythm and T inversion at II, III, aVF, and LV strain di V3-6

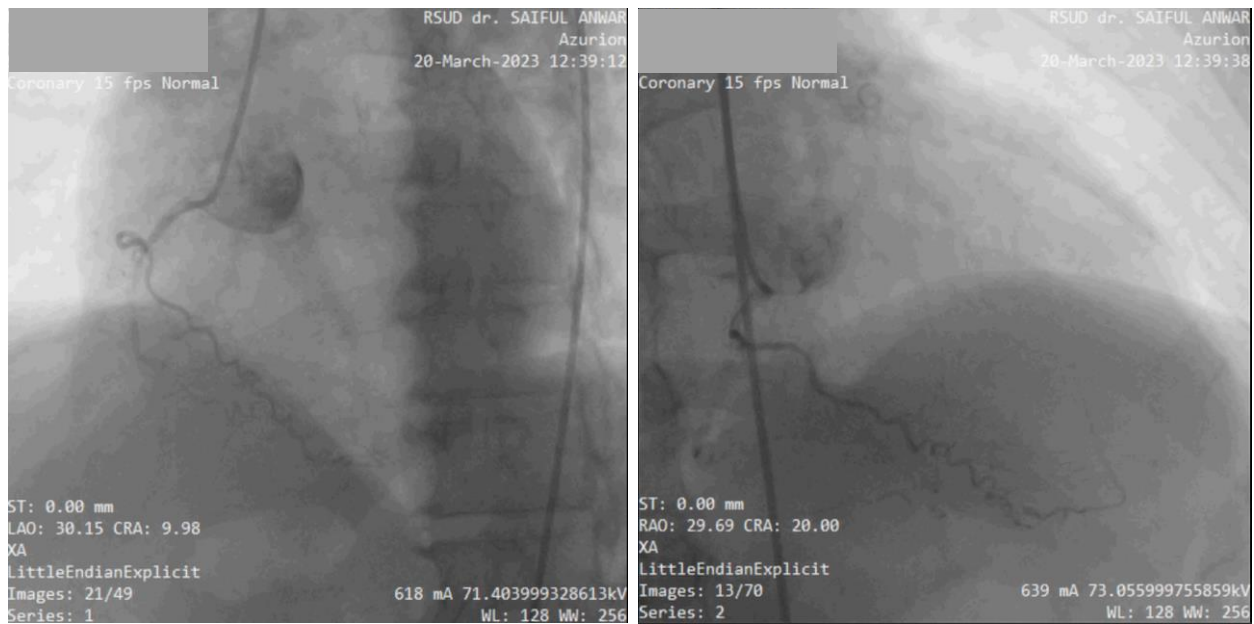


Figure 3. DCA at LAO-Cranial View and RAO-Cranial View shows highly calcified stenosis 90% at proximal RCA, CTO 100% at PLB and got collateral from ipsilateral, stenosis 70% at PDA, RV Branch gives collateral to LAD

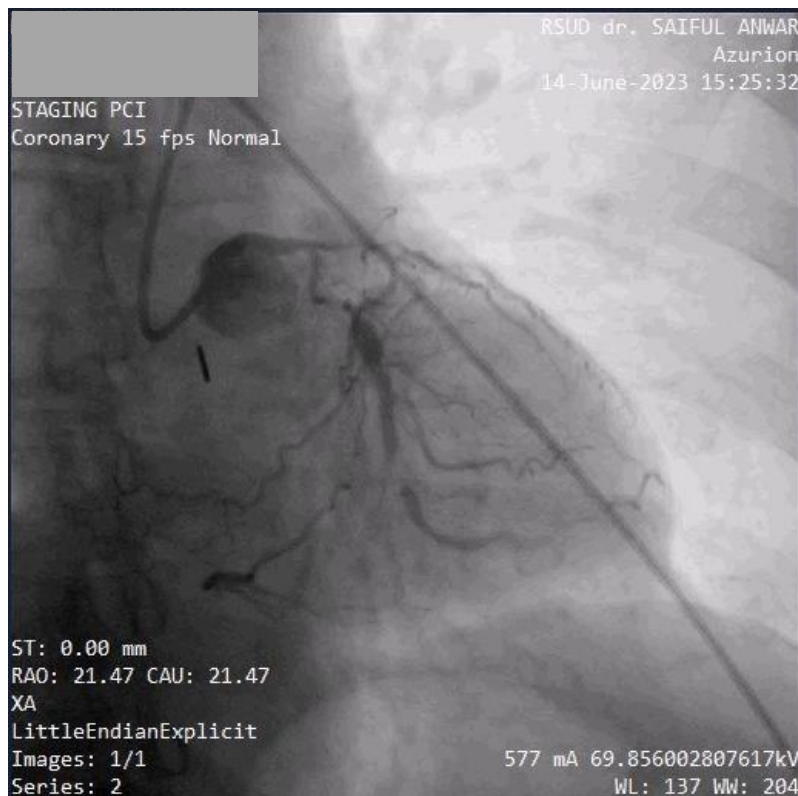


Figure 4. DCA at LAO-Cranial View shows Stenosis 50% at Distal LM. Diffuse highly calcified stenosis from ostial until mid-LAD, with maximal stenosis 90% at ostial, CTO 100% at mid-LAD, and collateral from OM4 also from RV branch. Diffuse highly calcified stenosis at proximal-distal LCx, with maximal stenosis 95% at proximal LCx, also CTO 100% at OM5, and collateral from the diagonal branch.

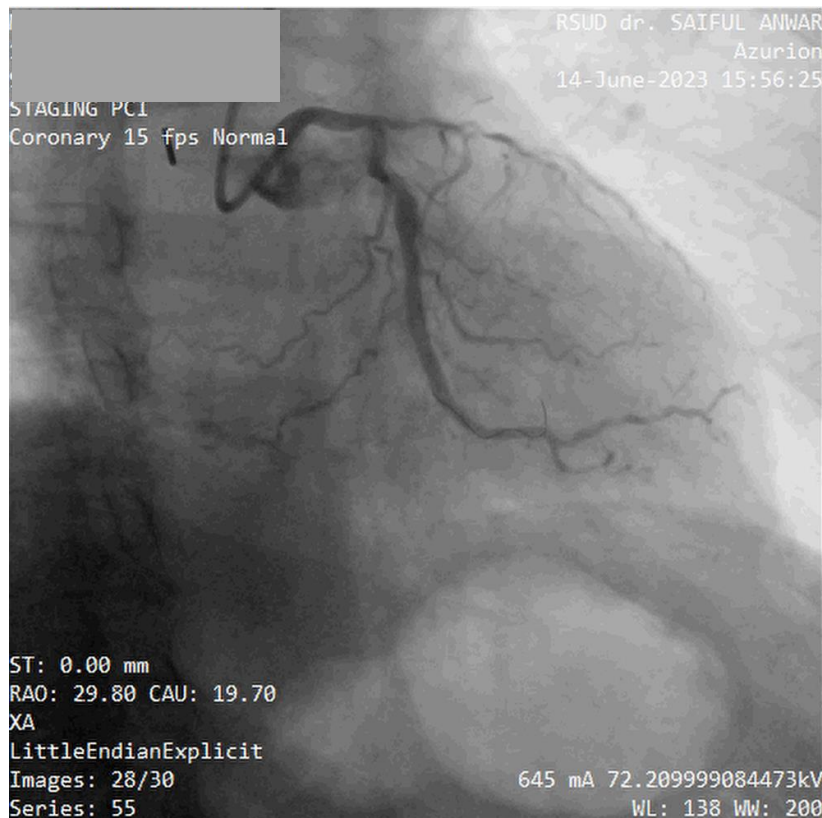


Figure 5. The last result, after stenting at distal LM to distal LCx, shows TIMI Flow 3 with no residual stenosis.

Several studies on PCI with DES in the early 2000s significantly reduced the complications following PCI by reducing the restenosis rate. An observational cohort study between January-2000 2000 and June 2006, which evaluated unprotected LMCA stenosis patients who received DES or BMS, showed that in a 10-year follow-up of 1102 patients (DES 784 patients and BMS 318 patients), the adjusted rate of the 10-year mortality rate was significantly lower in DES group than BMS group (20.6% vs 29.6%; HR0.65; 95%CI, 0.46-0.91; P=0.01) and also associated with a significant reduction in the rate of target-lesion revascularization (10.2% vs 21.8%; HR0.41; 95%CI, 0.27-0.61; P<0.001).⁵

According to the analysis of the SYNTAX⁸, PRECOMBAT⁹, and COMPARE¹⁰ studies, PCI can be an alternative option for revascularization in patients with low-and-intermediate anatomic complexity. There was evidence that outcomes for the primary clinical endpoint for PCI and CABG are similar in patients with a SYNTAX score of 22 (low-category), which received the same level of recommendation (IA). However, patients with a SYNTAX score of 23-32 (intermediate category) receive IA for CABG and IIaA for PCI. For patients with SYNTAX score ≥ 33 (complex category), only CABG is recommended (with IA recommendation), and PCI is not recommended (IIIB). Whereas, because of its complexity and risks and also because it is a more cost-effective revascularization method over a lifetime horizon for patients with severe LMCAD from EXCEL study¹¹, CABG has become the last option for revascularization for the patients. Furthermore, increasing experience, as well as a better understanding of physiological assessment and imaging techniques, have improved the outcomes of PCI in patients with LMCAD and made PCI a suitable alternative to CABG for revascularization of LMCAD in patients with low-to-intermediate anatomic complexity or when patients refuse CABG procedures despite adequate counseling by the heart team.¹²

Despite LMCA stenting becoming more common in the early 2000s, the use of IABP remains controversial. Prior research found that the use of elective IABP varies between 3%-to-50%.⁵ The Guideline for Coronary Artery Revascularization suggests that cardiopulmonary support, such as IABP, may be appropriate in high-risk PCI to prevent hemodynamic compromise^{14,15}. Briguori et al. also proposed elective use

of IABP support may be beneficial to 1) maintain flow and pressure in the arteries during LMCA obstruction, 2) maintain perfusion during LMCA manipulation and limit ischemic cycles, and 3) maintain hemodynamic stabilization to allow the operator to achieve greater focus during the procedure.¹⁴

Invasive coronary angiography is frequently used to evaluate and guide PCI. However, coronary angiography alone gives a 2-dimensional lumenogram, which limits recognition of arterial internal dimensions, plaque features, and vulnerability, as well as assessment of stent placement and stent extension of PCI. Intracoronary imaging (ICI), including intravascular ultrasound (IVUS) and optical coherence tomography (OCT), has given a detailed evaluation of PCI procedures and made ICI rise in use during the last two decades. Previous research has shown that ICI improves postprocedural clinical outcomes compared to angiography guidance for PCI alone. The American College of Cardiology/American Heart Association Joint Committee on Coronary Revascularization recently recommended the use of intravascular imaging to guide PCI.¹⁶

4. Conclusion

CABG has been the standard therapy option in the setting of LMCA disease. PCI can be considered a revascularization option in LMCA disease when the patient refuses the CABG procedure despite adequate counseling by the heart team and can be successfully improve quality of life. Cardiopulmonary support such as IABP may be appropriate for high-risk PCI to prevent hemodynamic compromise and contribute to a successful PCI procedure.

5. Declaration

5.1 Ethics Approval and Consent to participate

Patient has provided written informed consent prior to involvement in the study.

5.2. Consent for publication

Not applicable.

5.3 Availability of data and materials

Data used in our study were presented in the main text.

5.4 Competing interests

Not applicable.

5.5 Funding Source

Not applicable.

5.6 Authors contributions

Idea/concept: CK. Design: CK. Control/supervision: MSR. Data collection/processing: CK. Analysis/interpretation: CK, MSR. Literature review: CK. Writing the article: CK. Critical review: MSR. All authors have critically reviewed and approved the final draft and are possible for the content and similarity index of the manuscript.

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