

No Scalpel & No Stent - The Success of Optimal Medical Therapy in Diffuse Multivessel Coronary Artery Disease

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Keywords: Coronary revascularization, Multivessel coronary artery disease, optimal medical therapy, chronic total occlusion, Diffuse coronary disease. .

Received on: 25 July 2025

Accepted on: 12 August 2025

Published on: 17 August 2025

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Abstract

With challenging cases for PCI or CABG with respect to substantial diffuse coronary stenosis, one of the major clinical issue is multivessel coronary artery disease (MVD). In order to make optimal medical therapy (OMT), focus and integration of pharmacological control and life style changes could be very beneficial and successful. The current research exploration presented a case for a 65 years old male with severe anteriorolateral wall STEMI. With constrained resources towards deploying PCI at the current facility, patient was treated with intravenous thrombolysis using streptokinase. Later, coronary angiography showed acute diffuse disease which affected multiple coronary arteries of heart with inclusion of 100% occlusion of RCA

at large. With extensive entanglement with coronary arteries RCA, LAD, and LCX, patient was hence shifted to OMT instead of PCI or CABG. In order to proceed, with help of life style changes & using Beta-blockers, statins and dual antiplatelets were used in treatment. It was a success with 8th year follow-up showing being asymptomatic as well as no recurrent cardiac event or restraining normal life activities.

Hence OMT builds a strong case for selected strategy in patients facing acute diffuse MVD. In the current case, PCI & CABG may not always be a long term successful solution. OMT reduce the cardiovascular events with higher survivability in selected patients specially with complex coronary anatomy or higher risks for surgical procedures.

INTRODUCTION & BACKGROUND

With modern day life style, human life has been at risk of coronary heart disease because of lack of focus on health and more on allied matters related to socio-economic and financial burdens [1]. There is always a need to balance the life in the context of health vs social & dilemmas of the modern day life styles [2]. It has been observed to

impact the quality life in the later phase where managing these burdens along with stress directly impacts the heart and leads to coronary heart issues at large [3]. Life style patterns has thus been associated with coronary heart diseases, specially in developing countries where multifold stressors like socio-economic status, survivability, livability and work becomes a stress in themselves for the general public at large [4].

Coronary artery disease (CAD) is defined as the development of arterial plaque obstruction blocking the lumen of coronary vessels potentially leading to myocardial infarction (MI) [5]. If the atherosclerotic plaque causes more than 70 percent narrowing all the major coronary vessels, it is referred to multivessel disease (MVD) [6]. CAD is the third prevalent cause of mortality all around the world; moreover, CAD is responsible for 17.8 million deaths per year [7]. According to the study in 2019, the incidence of CAD in Pakistan was 918.18 per 100,000, while globally it was 684.33 per 100,000. The death rate in Pakistan due to CAD was 357.88 per 100,000, in comparison with the worldwide rate of 239.85 per 100,000 [8]. Risk factors for CAD include modifiable lifestyle factors such as smoking, dyslipidemia, obesity, sedentary lifestyle, diabetes, while non-modifiable determinants, for instance, are positive genetic history, age, and sex. Among the modifiable risk factors, arterial hypertension is a significant determinant of both ischemic heart disease and cerebrovascular diseases [9]. Latest therapeutic interventions for CAD stenting or surgical revascularization [10]. Although percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) are prevalent interventions for treating patients with CAD, a collective analysis of seven clinical trials, including 4,413 individuals with 13,163 grafts, reported overall graft failure rate of 16.6% [11]. Similarly, data show that the PCI procedures decreased by approximately 10% between 2010 and 2017, primarily due to a 34% reduction in elective PCI procedures, presumably reflecting concerns about potential complications [12].

Case Presentation:

A 67-year-old elderly male came to the emergency unit and reported vomiting and unbearable chest tightness for the past two hours. The chest pain had started suddenly approximately 24 hours prior to presentation and had persisted since then. The chest pain was gradual in onset and progressively increased in intensity over time. It was exacerbated by physical exertion, walking, and was not relieved by rest or medication. The pain was described as central, pressure-like, and non-radiating. In addition to chest discomfort, the patient experienced vomiting which was sudden in onset, non-projectile, and non-bilious. The vomiting episodes were sporadic, non-progressive, and unresponsive to antiemetic therapy. The patient did not report any associated abdominal pain, fever, or diarrhea. The patient had a 30-year history of smoking and hookah. He had also been diagnosed with hypertension for past 20 years but not been receiving any medical therapy. His family history was significant for the death of his father from tuberculosis (TB) and his mother due to myocardial infarction. He had no notable history of any previous surgical procedure. The patient's laboratory (lab) investigations revealed elevated triglyceride levels of 263 mg/dL (reference range: <150 mg/dL). Cardiac biomarkers showed markedly elevated troponin I levels of 63 ng/mL (reference range: <0.04 ng/mL), indicative of myocardial injury. A summary of initial lab results is shown in Table 1. An electrocardiogram (ECG) was obtained in the ED which confirmed the diagnosis of ST-elevation MI (STEMI), as demonstrated in figure 2.

Table 1**Detailed Laboratory Investigations**

Investigation	Result	Reference Range	Interpretation
CBC - Hemoglobin	14.4 g/dL	Male: 13.8-17.2 g/dL Female: 12.1-15.1 g/dL	Within normal limits
CBC - WBC count	5400 cells/ μ L	4,000-11,000 cells/ μ L	No leukocytosis or leukopenia
CBC - Platelets	360,000 / μ L	150,000-450,000 / μ L	Normal platelet count
RFTs - Serum Creatinine	1.1 mg/dL	Male: 0.74-1.35 mg/dL Female: 0.59-1.04 mg/dL	Normal kidney function
RFTs - BUN	10 mg/dL	7-20 mg/dL	Normal blood urea nitrogen
LFTs - ALT (SGPT)	30 U/L	7-56 U/L	Normal alanine transaminase level
LFTs - AST (SGOT)	35 U/L	10-40 U/L	Normal aspartate transaminase level
LFTs - Total Bilirubin	0.5 mg/dL	0.1-1.2 mg/dL	No evidence of hyperbilirubinemia
Triglycerides	263 mg/dL	<150 mg/dL	Elevated
Troponin I	63 ng/mL	<0.04 ng/mL	Markedly elevated - indicates myocardial injury

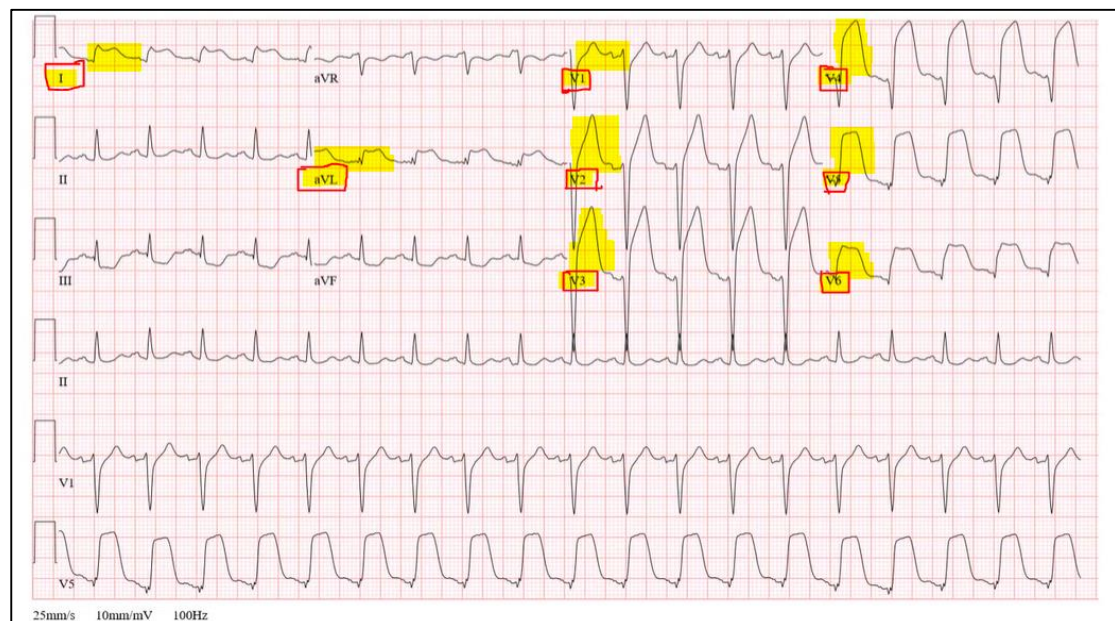
Figure 1

Figure 1 shows electrocardiogram (ECG) demonstrating an ST elevation pattern in leads I, aVL, and V1-V6, indicative of anterolateral wall myocardial infarction (MI). Prior to admission to the intensive care unit (ICU), the patient received the emergency medications listed in Table 2 as a part of the acute management protocol in cases of MI.

Table 2**Emergency Medications in Myocardial Infarction**

Medication	Class/Purpose	Typical Dose
Aspirin	Antiplatelet	160-325 mg chewed immediately
Nitroglycerin	Nitrate/Vasodilator	0.3-0.6 mg sublingual q5 min ×3 doses
Morphine	Analgesic/Vasodilator	2-4 mg IV q5-15 min PRN pain
Oxygen	Supportive therapy	If SpO2 < 90%, dyspnea, or HF
Beta-blockers	Rate/pressure control	Metoprolol 5 mg IV q5 min ×3 doses
Heparin (UFH/LMWH)	Anticoagulant	IV bolus followed by infusion
Clopidogrel / Ticagrelor	Antiplatelet (P2Y12 inhibitor)	Clopidogrel 300-600 mg PO loading dose
Atorvastatin	Statin	80 mg PO ASAP

The patient was shifted to the ICU for further surveillance and treatment. As to PCI was not available at the local hospital and door-to-balloon time exceeded 90 minutes, it was decided to start the patient on IV streptokinase infusion (1.5 million international units over one hour) as thrombolytic treatment. A follow-up ECG was obtained 12 hours later, demonstrating T wave inversions and the presence of pathological Q waves in leads, V1-V6; these changes indicate ischemic changes following a MI, as highlighted in figure 2.

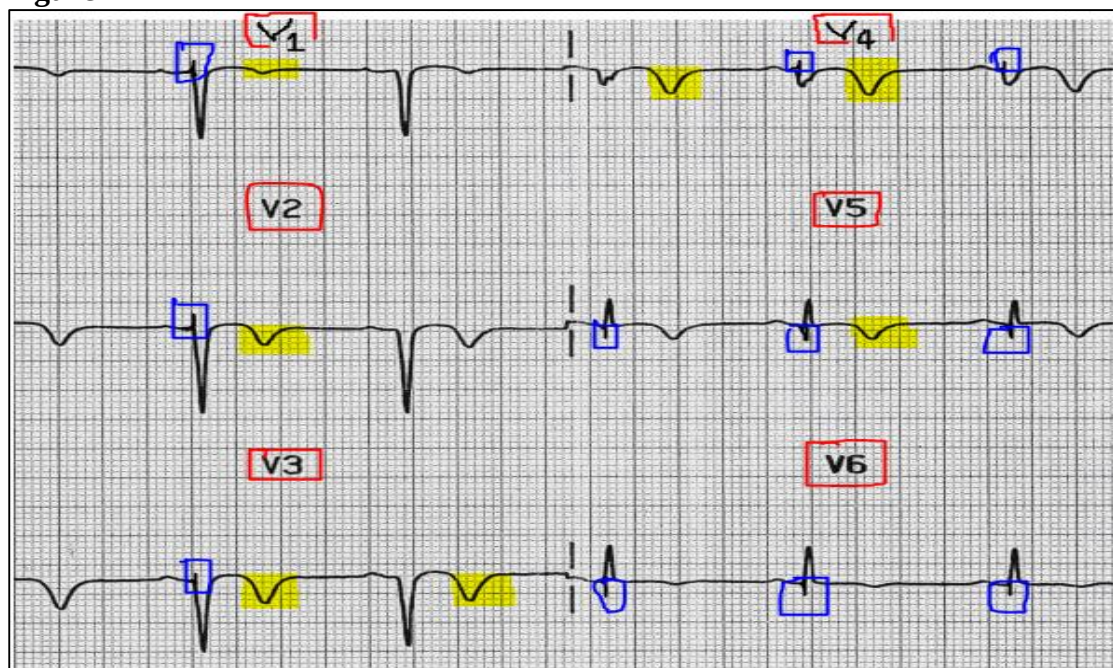
Figure 2

Figure 2 shows T wave inversions highlighted in yellow color and pathological Q wave highlighted in blue color.

On the third day following clinical stabilization, a transthoracic echocardiogram (TTE) was performed to assess intracardiac pressure gradients, evaluate overall cardiac function and examine valvular integrity. TTE revealed an ejection fraction (EF) of 45% (normal range: 55-75%) with Antero-apical wall hypokinesia, moderate systolic

dysfunction, and traces of mitral regurgitation (MR).The right ventricle (RV) was normal in dimensions and functional capacity, with no signs of intracardiac thrombus, pericardial effusion, or valve dysfunction. The findings are illustrated in Figure 3 and Figure 4.

Figure 3:

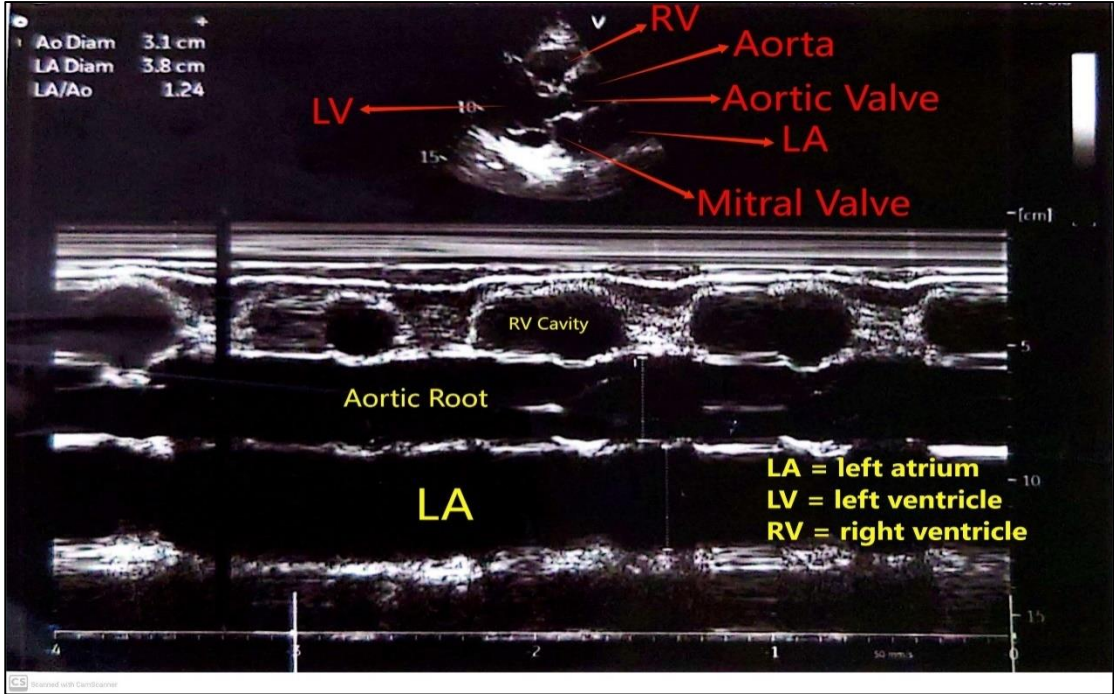
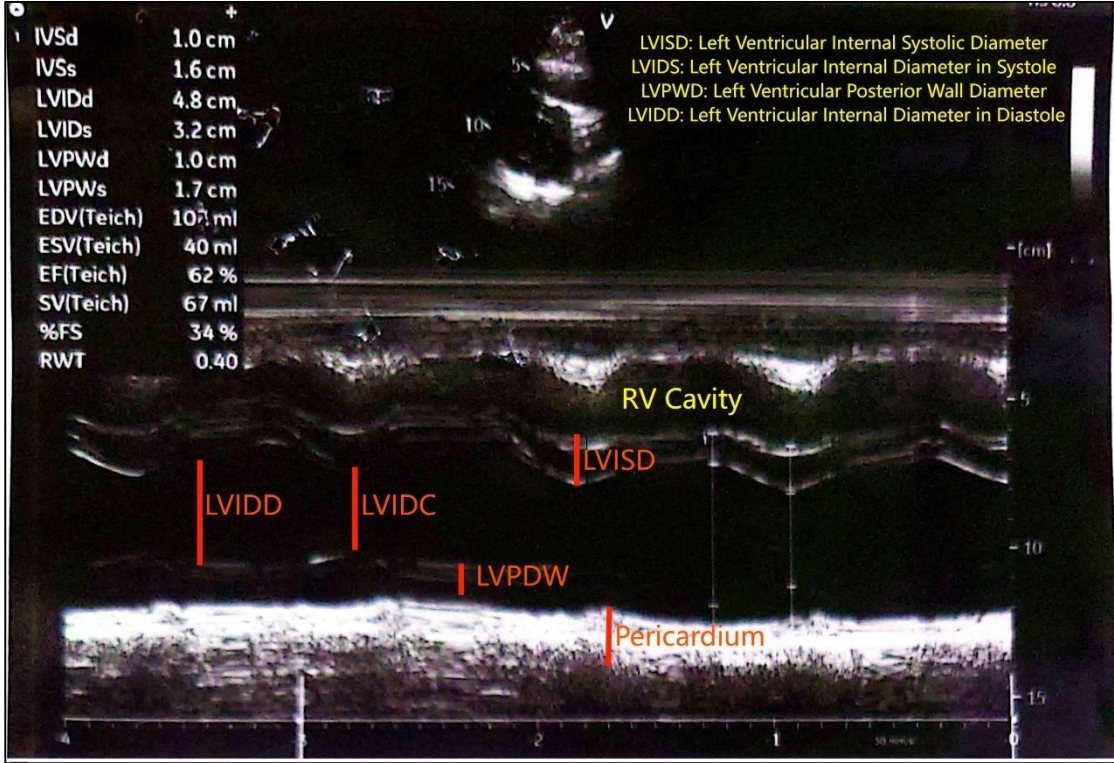


Figure 4:



Following stabilization with medical therapy, On Day 4, the patient was sent home with a post MI medical regimen. A summary of the prescribed medications is provided in Table 3.

Table 3

Prescribed Medications with Timing

Medication	Dose	Frequency	Time of Administration
Clopidogrel	75 mg	Once daily	Morning
Aspirin	75 mg	Once daily	Morning
Bisoprolol fumarate	2.5 mg	Once daily	Morning
Atorvastatin	10 mg	Once daily	Evening
Glyceryl trinitrate	2.6 mg	Twice daily	Morning + Evening

The patient was also strongly advised to strictly make significant behavioral changes, including quitting smoking, planned physical activity, and adherence to a low-fat diet. Three weeks post-discharge, the patient presented to a higher-level care facility for an elective coronary angiography, following clearance from the nephrologist after assessing the renal function. The procedure was conducted using the Seldinger technique via radial artery access. Both left and right coronary angiographies were performed using a 6F Judkins coronary catheter with contrast administration.

The patient was diagnosed with multivessel disease (MVD) with diffuse stenosis, particularly involving the terminal portions of the left anterior descending (LAD) and left circumflex (LCX) arteries. Ongoing previously prescribed pharmacological regimen was advised. Neither CABG nor PCI was deemed appropriate at this stage. Additionally, the patient's age was considered a limiting factor for CABG, making surgical intervention less favorable. Figures 5, 6, and 7 illustrate the findings of the coronary angiography, highlighting the severity and extent of the disease in each affected vessel. The extent of coronary artery involvement was assessed based on the degree of luminal narrowing observed during angiography. A summary of the interpretation according to the percentage stenosis is provided in Table 4.

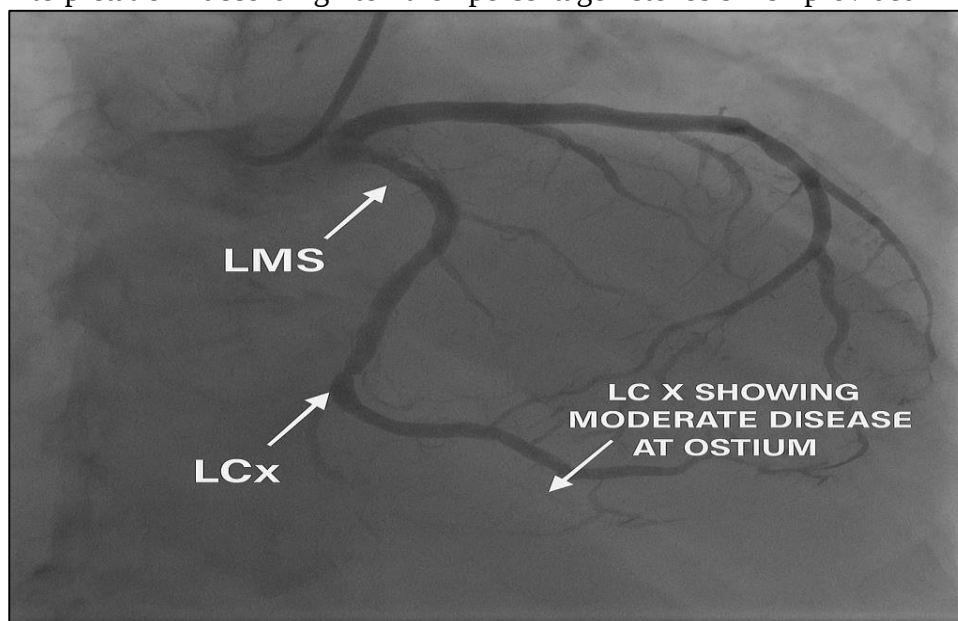


Figure 5. Coronary angiography demonstrating normal left main stem (LMS) with a moderately sized bifurcating vessel. The left circumflex artery (LCX) exhibits moderate stenotic disease at the ostium of the high obtuse marginal branch.

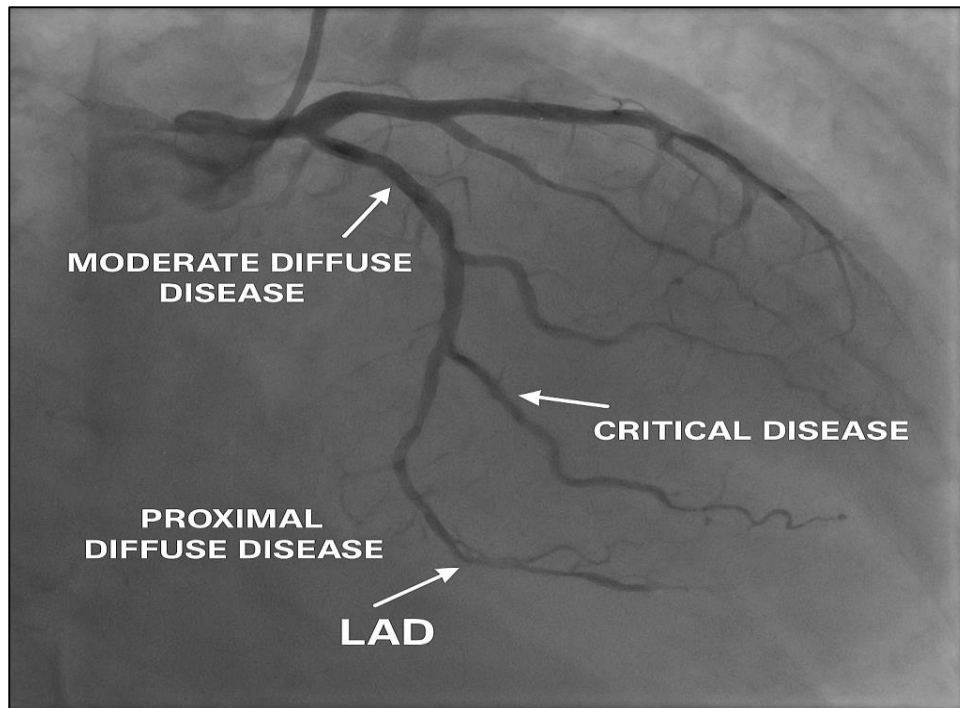


Figure 6. Coronary angiography revealing moderate diffuse disease in the initial segment of LAD. The mid and distal segments demonstrate critical stenosis. The vessel is of moderate to large caliber, with moderate proximal narrowing followed by severe narrowing in the mid-course.

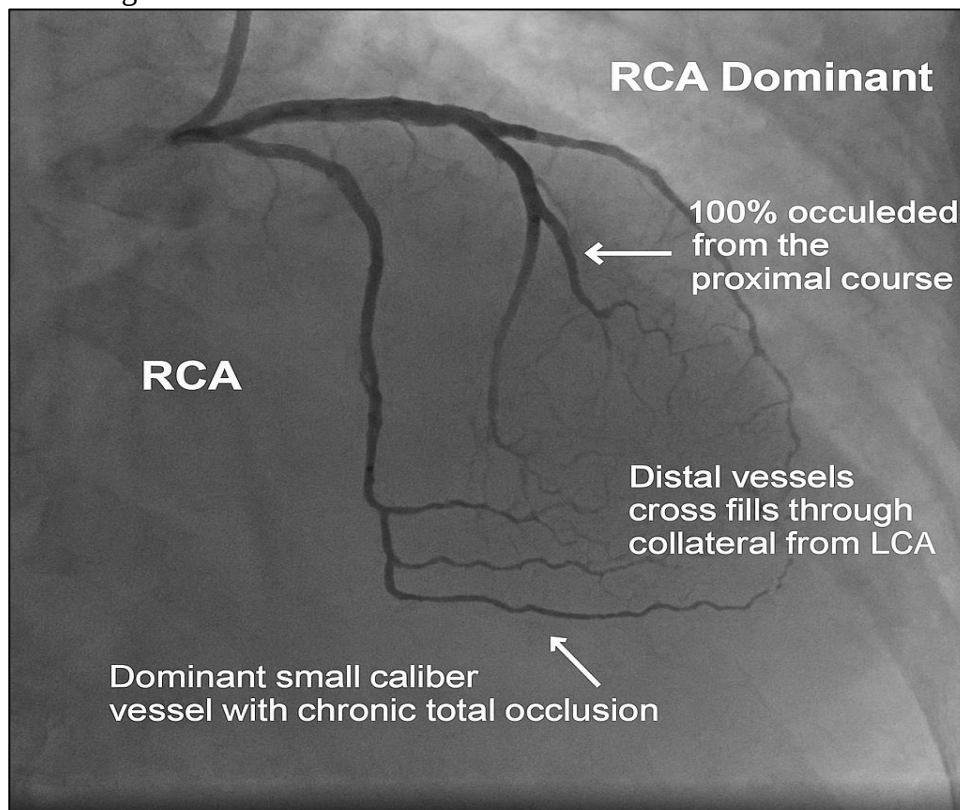


Figure 7. Angiographic findings indicating a dominant right coronary artery (RCA) with 100% occlusion in the proximal segment. The distal vessels are visualized via collateral circulation from the left circumflex artery (LCX). RCA dominant with chronic total occlusion.

Table 4 shows interpretation of coronary artery stenosis severity based on percentage of the luminal narrowing.

Vessel	Finding	Severity
Left Main Stem (LMS)	Normal appearance	–
	Moderately sized bifurcating vessel	–
Left Circumflex (LCX)	Moderate disease at ostium of high obtuse marginal branch	50–69%
	Collateral circulation to distal RCA	–
Left Anterior Descending (LAD)	Moderate diffuse disease in proximal segment	50–69%
	Severe stenosis in mid and distal segments	70–99%
	Vessel of moderate to large caliber	–
Right Coronary Artery (RCA)	100% occlusion in proximal segment (chronic total occlusion)	100%
	Small caliber vessel	–
	Distal vessels cross-filled via collaterals from LCX	–

Discussion

In this patient, coronary angiography revealed MVD, including severe narrowing in the middle segment to distal segment of the LAD and LCX arteries. Additionally, the RCA was identified as completely occluded (100%). According to both traditional & current guidelines PCI or CABG should be the primary intervention for such patients. CABG is the optimal revascularization approach over PCI for older patients with MVD[13], [14], [15]. Recent clinical trials have illustrated that in elderly patients, the overall benefits of PCI and CABG are comparable. However, CABG has been proven to be more effective in achieving full revascularization[13], [14], [15]. In contrast, PCI is often selected for individuals who are at greater risk of periprocedural complications and are unable to tolerate high-risk CABG procedures [13], [14], [15].

As per studies chronic total occlusion such as RCA occlusion in our patient significantly alters the management of patients. Recanalization of a completely occluded vessel through stenting is technically challenging and often associated with poor outcomes, mainly due to the risk of vessel perforation during the procedure. Furthermore, even when stenting is technically successful, the likelihood of restoring adequate of coronary flow remains below 10% [16]. Therefore, in this patient given the 100% occlusion of the RCA, PCI wasn't considered the optimal treatment option.

CABG was not pursued as secondary option due to patient's advanced age and the higher risk of graft failure rate observed in older patients. As per previous multiple studies, patients with MVD have a significantly higher internal mammary artery transplant failure rate than those with single vascular disease.[17]. Therefore, CABG was not the best option for this patient.

CABG and PCI were considered suboptimal due to significant risk of procedural failure and potential complications such as coronary artery perforation. Consequently, it was

concluded that optimal medical therapy (OMT) would be the most appropriate management strategy for this patient. Moreover, this case illustrates the importance of carefully weighing the advantages and disadvantages of revascularization techniques in older patients, guided by multidisciplinary team and aligned with patient's preferences. Throughout the 8-year follow-up period, the patient adhered to the prescribed medical therapy and remained asymptomatic. Regular monitoring was conducted including monthly assessments of LFTs, RFTs, lipid profile, coagulation profile, electrolyte levels, complete blood count (CBC), electrocardiograms (ECGs), and echocardiograms (ECHO). During this time the patient reported no chest pain, exertional dyspnea, orthopnea, or any symptoms indicative of acute or chronic heart failure. These findings suggest the possibility that the patient may have developed collateral circulation over time.

Conclusion

This case presentation reveals the potential of OMT as a preferred management strategy for patients with MVD, particularly when revascularization options such as PCI and CABG are not feasible due to extensive coronary involvement. In this case, the patient's multivessel disease and chronic total occlusion of the RCA were successfully managed through a combination of pharmacological therapy and lifestyle modifications. Over an eight-year follow-up period, the patient remained asymptomatic, with no recurrence of cardiac events or limitations in daily activities, underscoring the long-term effectiveness of OMT in managing complex coronary disease.

This case adds to the studies reinforce the role of OMT in select patients with severe diffuse CAD, particularly those unlikely to benefit from conservative medical management. It highlights an important gap in current cardiology practice, where revascularization is often prioritized over the potential benefits of OMT. The favorable clinical outcome in this patient suggests that OMT can provide sustained symptom relief and may serve as a viable alternative to invasive procedures, particularly in clinically vulnerable patients or those with complex coronary anatomy. Yet one of the major contribution of the research could be related to the human wellness through engagement of the environmental and life style interventions planning to prevent the current issues faced [18]. With proper life style follow and engagement with medical observation as well as follow up to keep track or monitoring, better results could be achieved [19].

Moreover, this case points toward important directions for future research, including the need to investigate the long-term therapeutic benefits of OMT in patients with advanced CAD. Extensive clinical trials are required to establish differences between the outcomes of OMT and revascularization across different patient subgroups, accounting for factors such as age, co morbidities, and coronary morphology. Further investigation into formation and role of secondary compensatory circulation in the success of medical therapy could also shed light on the underlying patho physiology of diffuse CAD and guide more effective treatment strategies. Ultimately, this case underscores the importance of individualized treatment approaches in managing MVD, challenging the conventional emphasis on invasive interventions and supporting an evidence-based strategy tailored to the patient's clinical profile.

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