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"Ostial Lesion of the Left Main Coronary Artery: PCI vs. CABG?"—A Case Report and Literature Review

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Abstract **Case Report**

For many years, coronary artery bypass grafting has been the primary method for revascularizing significant left main coronary artery disease. However, recent advancements in percutaneous coronary intervention with drug-eluting stents have proven to be a viable and effective alternative to coronary artery bypass grafting for treating this condition. In this report, we present a case of a patient with ischemic heart disease and severe left ventricular dysfunction. Coronary angiography revealed a lesion at the ostial left main coronary artery. Following successful primary angioplasty and the placement of a drug-eluting stent, the patient's left ventricular ejection fraction significantly improved from 26% to 59%, indicating a significant enhancement in cardiac function post-procedure.

Keywords: Left main coronary artery revascularization, improvement in cardiac function, percutaneous coronary intervention, coronary artery bypass grafting, lesion of the ostial left main coronary artery.

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INTRODUCTION

Left main coronary artery (LMCA) disease, which significantly impacts heart muscle function and heightens cardiovascular risks, necessitates revascularization when stenosis reaches 50% or more, as per guidelines [1, 2]. Traditionally, coronary artery bypass grafting (CABG) has been the preferred treatment [3]. However, recent advancements in percutaneous coronary intervention (PCI) provide a viable alternative, contingent on clinical and anatomical considerations [4, 5]. We present a case of a 70-year-old patient who underwent angioplasty at the ostium of the left main coronary artery, achieving a favorable clinical outcome.

CASE PRESENTATION

A 70-year-old male with a significant medical history, including poorly controlled type 2 diabetes mellitus (HbA1c 9.9%) and a history of smoking cessation 20 years ago, presented with worsening dyspnea at rest, progressing to NYHA class IV heart failure symptoms. He also reported orthopnea, paroxysmal nocturnal dyspnea, and epigastric pain. On initial examination, his blood pressure was 97/65 mmHg, heart rate 90 bpm, and oxygen saturation 95%. Lung auscultation revealed bilateral lower and mid-field crackles, indicating pulmonary congestion. An electrocardiogram (Figure 1) showed sinus rhythm with a mean heart rate of 90 bpm, normal axis, poor R-wave progression, negative T waves in the anteroseptal leads (V1, V2, V3), and flat T waves in D1 and aVL.

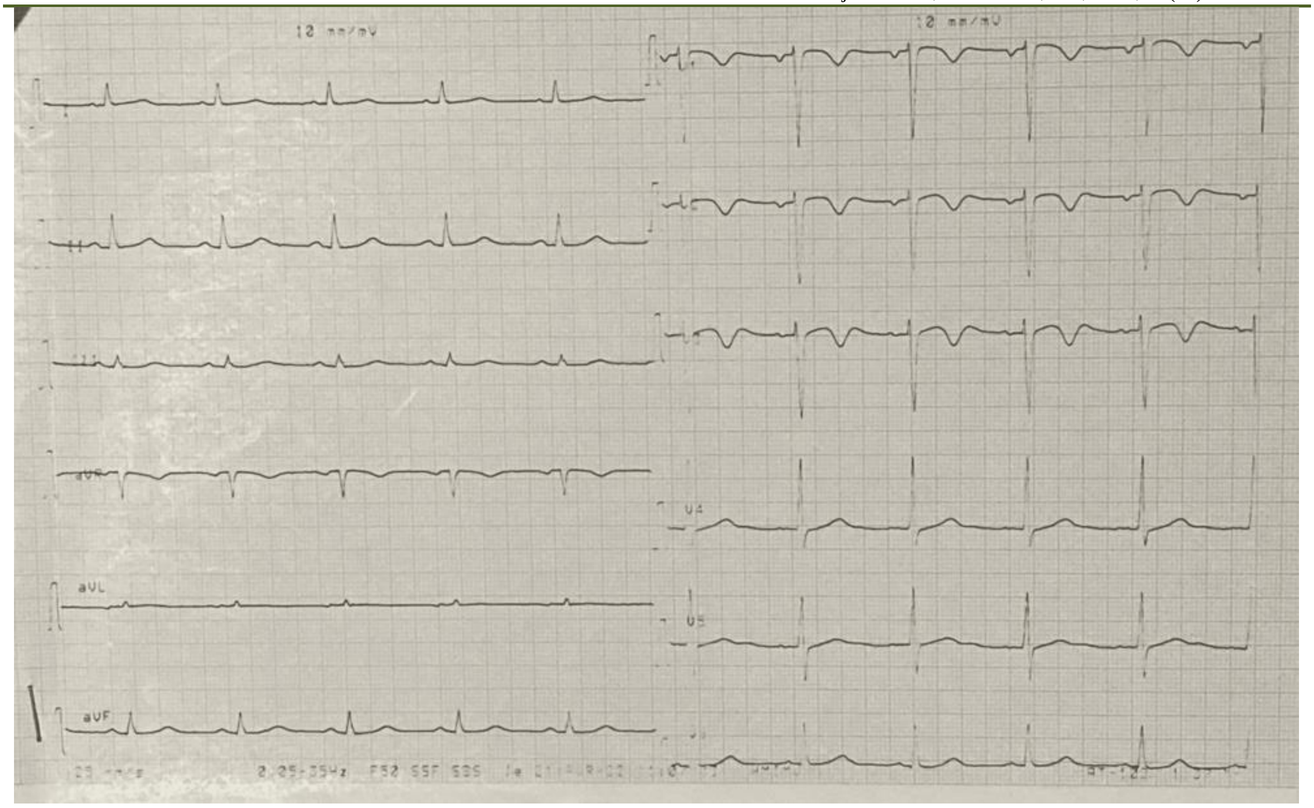

Figure 1: The EKG shows negative T waves in the anteroseptal leads, poor R-wave progression in the same territory, and flat T waves in D1 and aVl

The chest X-ray (Figure 2) revealed cardiomegaly, bilateral alveolar interstitial syndrome, and prominent Kerley B lines.

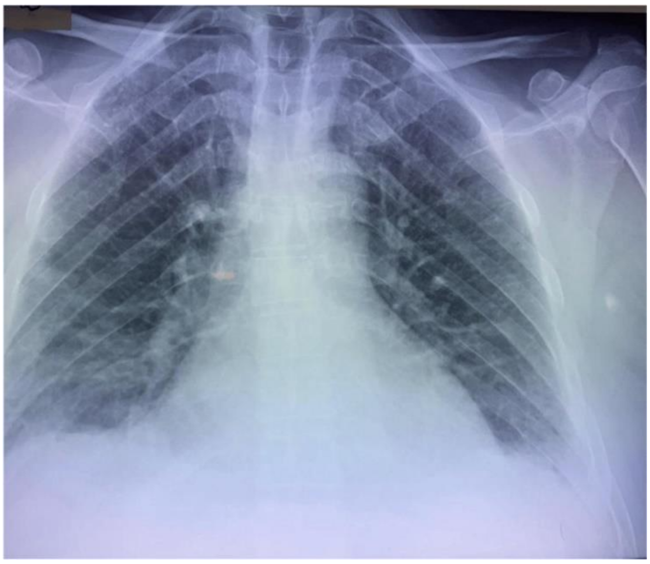

Figure 2: Chest X-ray illustrating bilateral alveolar-interstitial syndrome

Laboratory investigations revealed elevated troponin levels at 14 ng/ml, elevated HbA1c levels at 10%, indicating poorly controlled diabetes, and elevated LDL cholesterol at 1.01 g/l. Echocardiography (Figure 3) performed at admission in March 2023 showed a dilated left ventricle without hypertrophy. It also demonstrated segmental kinetic disorders, including akinesia of the inferoseptal, inferior, anterolateral, and anterior walls and hypokinesia of the other walls. Additionally, there was severe global systolic dysfunction, characterized by a left ventricular ejection fraction (LVEF) of 26%, a dilated left atrium, moderate secondary mitral insufficiency, elevated pulmonary artery pressure, and a dilated inferior vena cava.

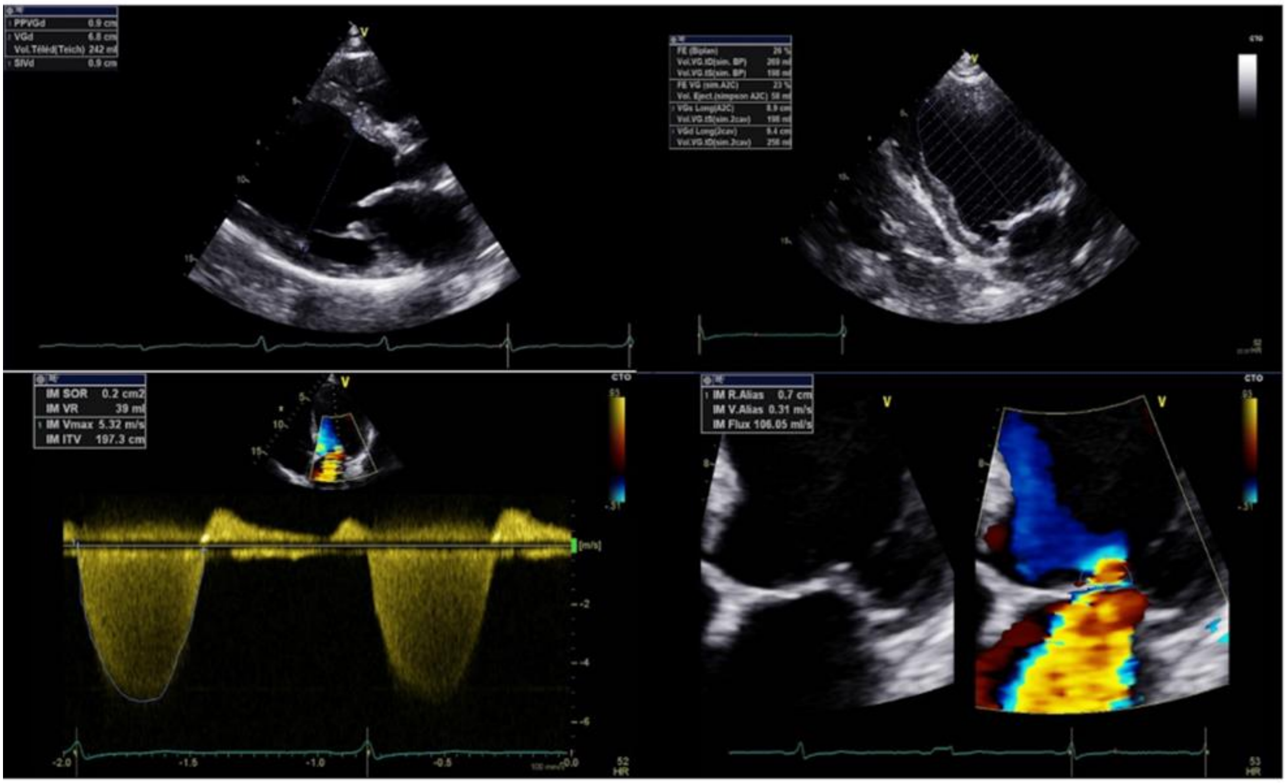

Figure 3: Echocardiography showing a dilated left ventricle with severe global systolic dysfunction (LVEF of 26%) and moderate secondary mitral insufficiency

Coronary angiography (Figure 4) performed after clinical improvement revealed severe stenosis (70%–90%) at the ostium of the left main coronary artery, necessitating urgent intervention. Successful percutaneous coronary intervention (PCI) with drug-eluting stent placement was conducted at the stenotic lesion, achieving optimal angiographic results and restoring coronary flow.

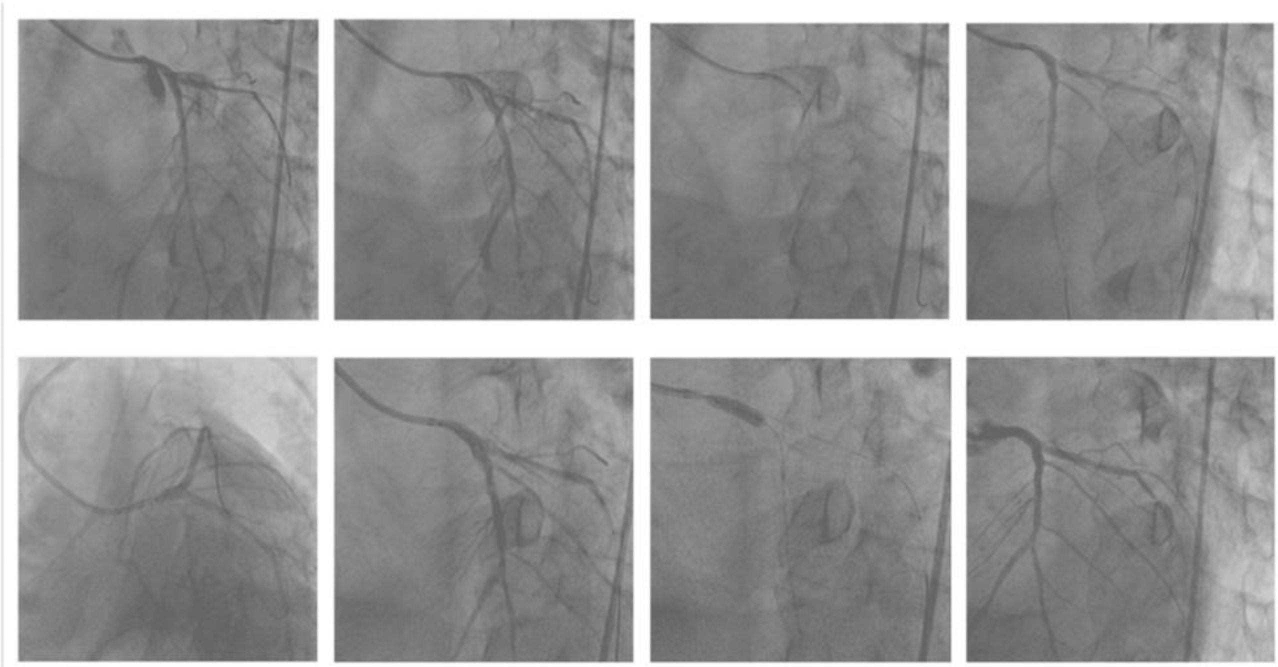

Figure 4: Steps of angioplasty for a lesion at the left main coronary artery ostium

The treatment plan included oxygen therapy, intravenous diuretics for volume management, vasodilators to reduce afterload, and dual antiplatelet therapy (DAPT) following PCI. Additionally, a highintensity statin was initiated to manage dyslipidemia. Upon discharge, the patient was prescribed heart failure therapy. They are now attending regular cardiology follow-ups every three months to monitor clinical progress, adjust medical therapy as needed, and assess cardiac function through repeat echocardiography. The most recent ultrasound (Figure 5) in April 2024 showed a notable improvement in the LVEF, which increased from 26% to 59%.

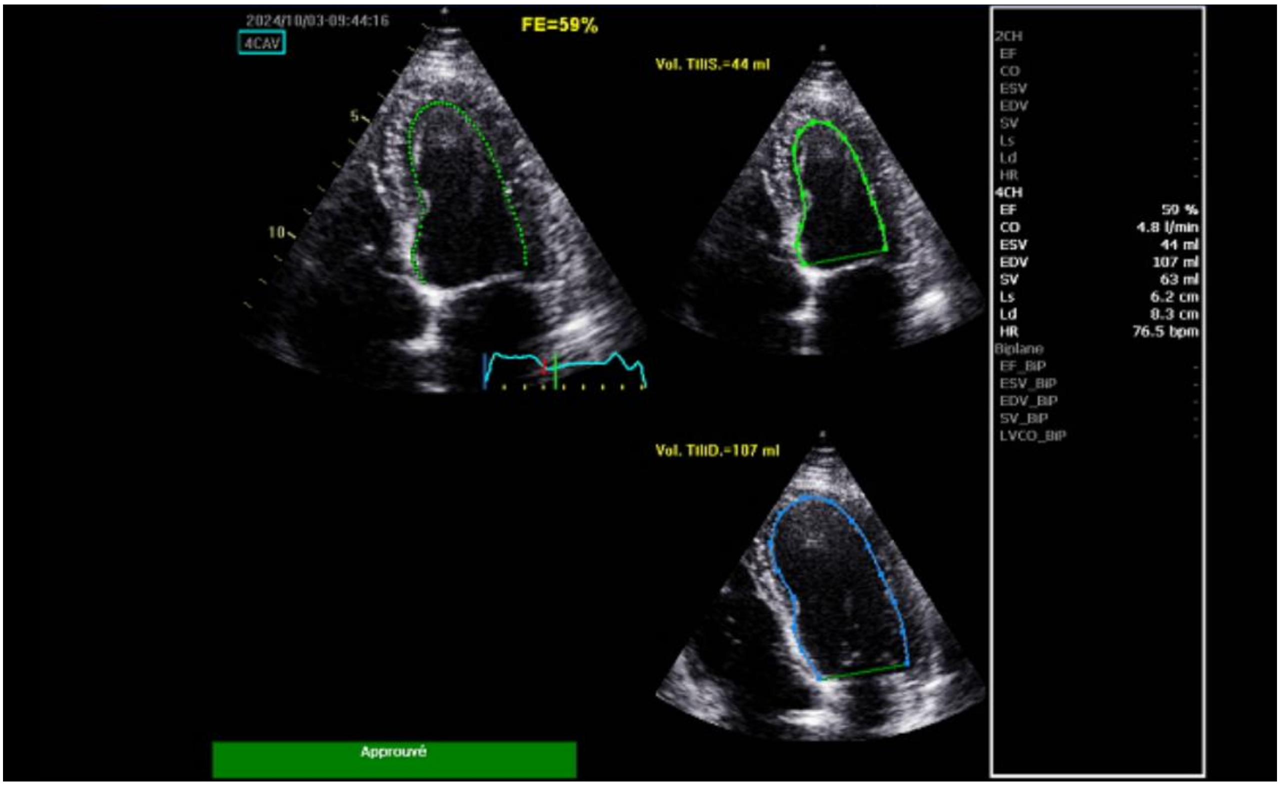

Figure 5: Recent echocardiography demonstrates an improvement in the left ventricular ejection fracture (LVEF), increasing from 26% to 59% following revascularization

DISCUSSION

LATEST EVIDENCE COMPARING PCI AND CABG FOR LMCA DISEASE [6]

Several randomized controlled trials (RCTs) have compared PCI using early-generation drug-eluting stents (DES) with CABG for treating LMCA disease, showing similar clinical outcomes between the two methods [6-8]. Notably, the EXCEL (Evaluation of Xience Everolimus Eluting Stent vs. Coronary Artery Bypass Surgery for Effectiveness of Left Main Revascularization) and NOBLE (Nordic-Baltic-British Left Main Revascularization) trials [9], were sufficiently powered to assess the efficacy of PCI with contemporary DES compared to standard CABG [6, 9-11]. However, these pivotal trials reported conflicting results: EXCEL concluded that PCI was as effective as CABG [10, 11], while NOBLE did not demonstrate non-inferiority for PCI compared to CABG [8, 12]. In clinical practice, there is a growing preference among patients and physicians for the less invasive PCI over CABG in LMCA disease [1, 13]. Despite the widespread adoption of PCI with contemporary DES for LMCA patients with varying clinical and anatomical complexities, translating trial findings into routine PCI practice without restrictions remains challenging [6].

CURRENT REVASCULARIZATION GUIDELINES [6]

Over the past decade, clinical practice guidelines have consistently recommended CABG surgery as a Class I treatment for myocardial revascularization [6]. However, recent RCTs and registry studies increasingly support PCI as a viable alternative for selected patients with less complex LMCA disease [6, 14]. Following the EXCEL and NOBLE trials, PCI has been recognized as a suitable substitute for CABG and major changes are summarized in (table 1) [6]. The 2018 European guidelines affirmed a Class I Level of Evidence: A recommendation for CABG in all LMCA disease patients, regardless of anatomical complexity [15, 16]. PCI is recommended as Class I, IIa, or III based on the SYNTAX score, which assesses CAD complexity [6]. The 2021 American College of Cardiology/American Heart Association/Society for Cardiovascular Angiography and Interventions guideline assigns a Class IIa indication (Level of Evidence: B nonrandomized) to PCI when comparable revascularization outcomes to CABG can be achieved without further categorization based on clinical and anatomical risk profiles [17, 18].

Table 1: Recent Updates to PCI Recommendation Guidelines for LMCA Disease [6]

Guidelines	Class of Recommendation	Level of Evidence
Pre-EXCEL and NOBLE		
2014 ESC/EACTS [6,19]	I: LMCA disease with a SYNTAX score of < or = 22.	B
	IIa: LMCA disease with a SYNTAX score of 23–32.	
	III: LMCA disease with a SYNTAX score of > or = 33.	
2014 ACC/AHA [6,20]	IIa: For SIHD patients when both of the following conditions are present: Anatomic conditions are associated with a low risk of PCI procedural complications and a high likelihood of good long-term outcomes (e.g., a low SYNTAX score of < or = 22, ostial or trunk LMCA stenosis). Clinical characteristics that predict a significantly increased risk of adverse surgical outcomes (e.g., STS-predicted risk of operative mortality >5%).	B
	IIb: For SIHD patients when both of the following conditions are present: Anatomic conditions associated with a low-to-intermediate risk of PCI procedural complications and an intermediate-to-high likelihood of good long-term outcome (e.g., low-intermediate SYNTAX score <33, distal bifurcation LMCA stenosis). Clinical characteristics that predict an increased risk of adverse surgical outcomes (e.g., moderate-to-severe chronic obstructive pulmonary disease, disability from previous stroke, or previous cardiac surgery; STS-predicted risk of operative mortality >2%).	
	III: For SIHD patients (vs performing CABG) with unfavorable anatomy for PCI who are good candidates for CABG.	
Post-EXCEL and NOBLE		
2018 ESC/EACTS [6,16]	I: LMCA disease with a SYNTAX score of < or = 22.	A
	IIa: LMCA disease with a SYNTAX score of 23–32.	
	III: LMCA disease with a SYNTAX score of > or = 33.	
2021 ACC/AHA [6,18]	IIa: For selected patients with SIHD and significant LMCA disease, where PCI can provide revascularization equivalent to CABG, PCI is a reasonable option to improve survival.	B

ACC = American College of Cardiology; AHA = American Heart Association; EACTS = European Association for Cardio-Thoracic Surgery; ESC = European Society of Cardiology; SIHD = stable ischemic heart disease; STS = Society of Thoracic Surgeons [6].

HEART TEAM APPROACH [6]

Current guidelines highlight the importance of a multidisciplinary heart team approach in managing complex coronary artery disease (CAD), including LMCA disease [6, 18, 21, 22]. As evidence supporting PCI for specific cases of LMCA disease grows, there has been a significant increase in left main PCI procedures [6]. This trend contrasts with a gradual decline in the use of CABG, as shown by contemporary multinational registries [1, 6].

CONCLUSIONS

Revascularization decisions for LMCA remain challenging in clinical practice. While CABG is often considered the standard therapy, PCI offers a valuable alternative with similar survival outcomes, especially for patients with less complex coronary anatomy. Instead of viewing PCI and CABG as competing options, they should be seen as complementary strategies. The heart team should consider factors such as coronary anatomy complexity, clinical characteristics, the expertise of the medical center and operators, and patient preferences when making treatment decisions.

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