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Complete Arterial Revascularization in Multivessel Coronary Artery Disease in AHI Disease: A Case of a 55-Year-Old Male

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Abstract

Background: Multivessel coronary artery disease (CAD) presents a significant challenge in surgical management, with graft choice playing a crucial role in long-term outcomes. Arterial grafts, particularly complete arterial revascularization, offer superior patency and survival benefits compared to venous grafts. This case highlights the successful use of complete arterial revascularization in a patient with acute ischemic heart disease and multivessel CAD.

Case Summary: A 55-year-old male with a two-year history of diabetes and hypertension presented to the emergency department with acute, stabbing chest pain radiating to the left shoulder and back, accompanied by sweating. His vital signs were stable on admission. Laboratory tests showed elevated troponin levels, indicating myocardial ischemia. Transthoracic echocardiography revealed hypokinesia of the anterior left ventricular wall and mild mitral regurgitation. Coronary angiography identified significant stenotic lesions in the left main coronary artery (LMCA), left anterior descending artery (LAD), and left circumflex artery (LCX), as well as diffuse atherosclerosis in the right coronary artery (RCA). Given the extent of the disease, the patient was scheduled for coronary artery bypass grafting (CABG). The surgical approach involved complete arterial revascularization using the left internal mammary artery (LIMA), right internal mammary artery (RIMA), and a radial artery graft. The procedure was performed without complications, and postoperative monitoring showed stable hemodynamics with no signs of graft occlusion or ischemia.

Conclusion: This case highlights the benefits of complete arterial revascularization in multivessel coronary artery disease, improving surgical outcomes and recovery. While promising, further research is needed to confirm long-term benefits and refine patient selection. Individualized surgical planning and risk management remain crucial. Given the increasing prevalence of similar presentations, further case evaluations are underway to explore patterns in clinical presentation, risk stratification, and surgical outcomes.

Introduction

Ischemic heart disease (IHD) remains one of the leading causes of morbidity and mortality worldwide [1]. Acute coronary syndrome (ACS) presents with varying clinical manifestations and requires a multidisciplinary approach for optimal management [2]. Patients with multivessel coronary artery disease, particularly those with left main involvement, are at a higher risk of adverse cardiovascular events, necessitating early intervention [3]. Coronary artery bypass grafting (CABG) remains the preferred treatment for severe multivessel disease, especially when percutaneous coronary intervention (PCI) is not feasible or carries a high risk of restenosis [4]. This case report describes the presentation, diagnostic workup, and surgical management of a patient with ACS and significant multivessel coronary artery disease, demonstrating the effectiveness of CABG in preventing further ischemic complications.

Case Presentation

A 55-year-old male from Thamar, with a two-year history of well-controlled hypertension presented to the emergency department with a chief complaint of acute, stabbing chest pain radiating to the left shoulder and back, accompanied by profuse sweating and nausea. The pain began prior to arrival. He denied any prior episodes of similar chest pain, shortness of breath, or palpitations. The patient had no prior history of myocardial infarction, heart failure, or other significant medical conditions. He reported no family history of premature coronary artery disease.

On arrival, his vital signs were initially stable: Laboratory investigations revealed elevated troponin levels confirming acute myocardial ischemia. Other initial laboratory results (from the Clinical Biochemistry Report) included a random blood sugar of 11.37 mmol/L (high), total bilirubin of 9.3 µmol/L (normal), direct bilirubin of 2.1 µmol/L (normal), GPT-ALT of 53.5 U/L (high), GOT-AST of 45.7 U/L (slightly elevated), albumin of 41.5 g/L (normal), urea of 4.0 mmol/L (normal), creatinine of 83 µmol/L (normal), sodium of 134 mmol/L (slightly low), and potassium of 4.36 mmol/L (normal).

Electrocardiography (ECG) performed on admission (Figure 1) demonstrated S T elevation.

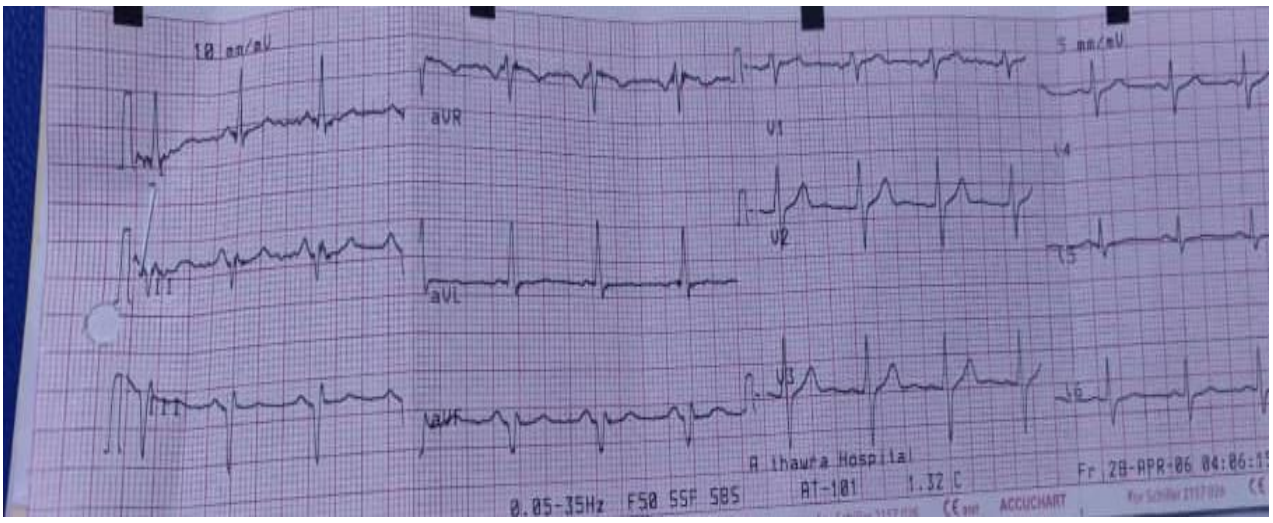

Figure 1: ECG results.

Transthoracic echocardiography (per the Echocardiography Report) performed revealed hypokinesia of the inferolateral and inferoseptal wall segments. Concentric left ventricular hypertrophy was noted. Mild secondary mitral regurgitation (Grade I/IV) was observed. The overall left ventricular systolic function was fair, with mildly impaired diastolic function. The right heart was normal, and no valvular disease (other than the mild MR), intramural thrombi, masses, pericardial effusion, or congestion was noted.

Coronary angiography (per the Cardiac Catheterization Report) demonstrated severe multivessel disease. The LM was normal. The LAD was diffusely diseased with multiple significant lesions extending from proximal to distal, causing >90% stenosis in some areas. The LCX had a mid-segment intermediate lesion with ~50% stenosis, and its OM2 branch showed long significant disease. The RCA was dominant, with a significant lesion in the mid-segment causing ~70-80% stenosis. A chronic total occlusion was noted in the far mid-segment of the RCA with well-established collaterals.

Lower limb Doppler study (per the Lower Limb Doppler Report) showed normal arterial flow and no evidence of DVT. A small, calcified plaque (10 x 2.5mm) was noted on the posterior wall of the left CFA, but it did not cause significant stenosis or occlusion. Upper limb Doppler study revealed diffuse carotid atherosclerotic changes bilaterally, manifested by increased intima-media thickness (IMT), but normal flow patterns. The vertebral arteries and jugular veins were also normal.

Pulmonary function test (PFT) (per the PFT Report) (Figure 2) indicated a moderate restrictive pattern. Specifically, the FVC was 3.04 L (67% of predicted), the FEV1 was 2.42 L (68% of predicted), and the FEV1/FVC ratio was 79.6%. The quality control grade was D.

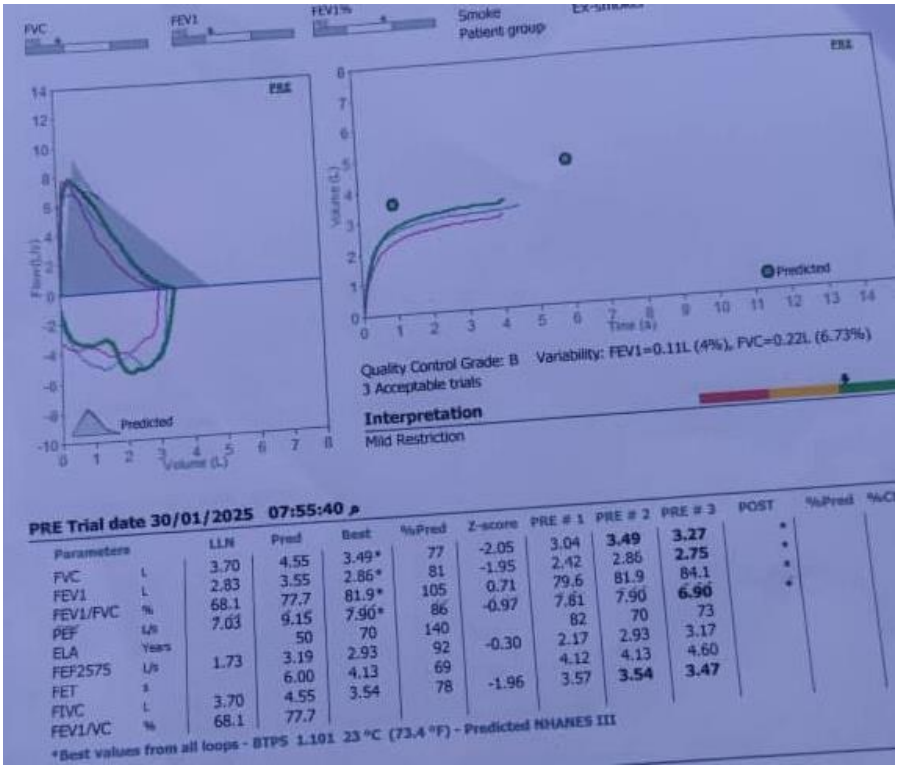

Figure 2: PFT results.

Glycemic control was evaluated, and the HbA1c level (per the HbA1c Report) was 7.8%, indicating diabetes. Hematology, coagulation, and serology tests (per the Lab Report) showed a normal CBC with slightly elevated eosinophils (3.9%), an elevated ESR of 38 mm/hour, normal coagulation studies, and a negative CRP.

In addition, the Chest X-ray (Figure 3) findings were Wide med sternum and Chest infection.

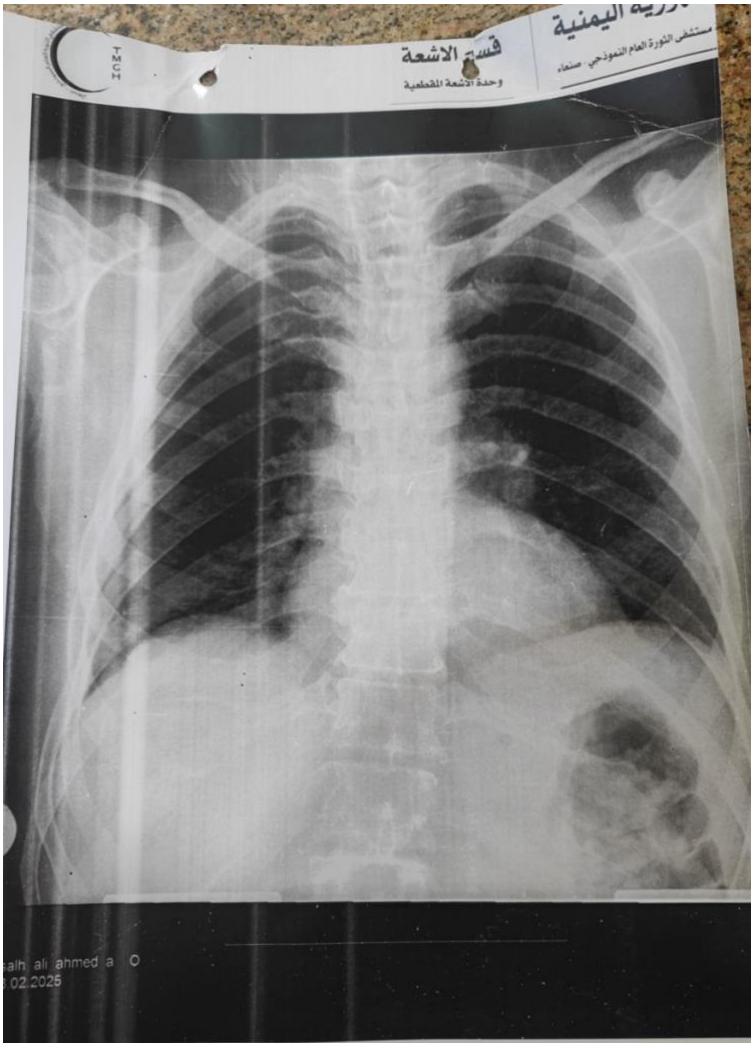

Figure 3: Chest Xray.

Given the extent of the disease, the cardiology team recommended surgical revascularization via CABG.

Management and Surgical Intervention

The patient underwent coronary artery bypass grafting (CABG) under general anesthesia. The surgical approach included grafting the LAD with the left internal mammary artery (LIMA), the RCA with the right Internal mammary artery (RIMA), and additional bypass using a radial artery graft. Cardioplegia was administered to ensure myocardial protection during the procedure. Intraoperative monitoring was conducted to maintain stable blood pressure and optimal arterial blood gas levels. Postoperatively, the patient was transferred to the cardiac Intensive care unit (CIU) for close monitoring. He received low-dose Dopamine for inotropic support.

Over the following days, his condition remained stable, With no signs of graft occlusion, ischemia, or arrhythmias. After three days in the ICU, he was transferred to the general ward for further observation and rehabilitation. The hospital stay was uneventful, with serial echocardiograms confirming good graft patency and stable cardiac function.

Discussion

This case highlights the complexities of managing acute ischemic heart disease (AIHD) in patients with multivessel coronary artery disease (CAD), emphasizing the ongoing debate between percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG). While PCI has advanced significantly, CABG remains the gold standard for extensive multivessel CAD, particularly in patients with diabetes or left main coronary artery involvement [5]. Clinical trials have demonstrated superior outcomes with CABG in these high-risk groups, primarily due to a reduction in major adverse cardiovascular events (MACE) [6]. Our case reinforces this, as the patient presented with both multivessel disease and poorly controlled diabetes, indicated by an elevated HbA1c.

The selection of arterial grafts, particularly the left internal mammary artery (LIMA) and right internal mammary artery (RIMA), is a key factor in CABG. Arterial grafts have superior long-term patency compared to saphenous vein grafts [7,8]. The ART trial compared bilateral internal mammary arteries (BIMA) with LIMA alone, suggesting potential survival benefits and reduced need for reintervention with BIMA [9,10]. This case aligns with current best practices by prioritizing LIMA and RIMA, reinforcing the importance of maximizing arterial grafting to ensure sustained myocardial perfusion and better long-term outcomes. Additionally, the presence of moderate restrictive lung disease necessitated preoperative pulmonary assessment, as respiratory complications are a major concern in cardiac surgery patients [11]. A multidisciplinary approach, including perioperative respiratory support, is critical in minimizing postoperative complications [12].

Finally, the elevated HbA1c underscores the importance of strict glycemic control in the perioperative period, as hyperglycemia is associated with increased postoperative complications, including infection, atrial fibrillation, and mortality [13]. Numerous studies highlight the benefits of intensive glucose management in cardiac surgery patients [14,15]. In summary, this case reinforces the established role of CABG in high-risk patients, the significance of arterial grafting, the necessity of preoperative pulmonary assessment in patients with restrictive lung disease, and the importance of strict glycemic control. Further research is needed to optimize revascularization strategies, including the comparative effectiveness of BIMA versus LIMA alone in diabetic patients and strategies to minimize pulmonary complications in those with pre-existing lung disease.

Conclusion

This case underscores the Importance of early diagnosis, thorough cardiovascular evaluation, and timely surgical intervention in patients with acute ischemic heart disease and multivessel coronary artery disease. A multidisciplinary approach involving cardiologists, cardiac surgeons, and intensivists was essential in optimizing patient outcomes. The use of multimodal imaging, including echocardiography and coronary angiography, played a crucial role in guiding clinical decisions. The patient's favorable postoperative course highlights the effectiveness of CABG in restoring coronary perfusion and preventing recurrent ischemic events. Long-term follow-up is necessary to ensure graft patency, optimize medical therapy, and reduce the risk of future cardiovascular complications. As additional 25 cases are evaluated underway, further insights may be gained into optimizing CABG strategies and long-term postoperative management in patients with complex coronary disease.

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