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Resurrecting the Heart: Complex Coronary Reconstruction on Central VA ECMO for Immediate Post-CABG STEMI

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Abstract

Background: Multivessel coronary artery disease (MV-CAD) often requires coronary artery bypass grafting (CABG), but postoperative complications such as graft failure and myocardial infarction can lead to life-threatening conditions like cardiac arrest, necessitating advanced interventions such as extracorporeal membrane oxygenation (ECMO) and multivessel percutaneous coronary intervention (PCI).

Case Presentation: A 71-year-old male with hypertension and ulcerative colitis underwent three-vessel CABG. Immediately postoperatively, he developed STEMI leading to cardiac arrest, requiring cardiopulmonary resuscitation (CPR) and placement on central VA ECMO. Repeat angiography revealed occlusion of two grafts and complete mid-left anterior descending artery (LAD) occlusion. Emergent PCI revascularized the native coronary vessels with multiple drug-eluting stents (DES) using DK crush technique.

Outcome: The patient was weaned off ECMO after four days and extubated after one week, and had tremendous recovery. Eighteen months later, a repeat angiography for NSTEMI showed patent stents. His left ventricular ejection fraction (LVEF) has improved to 50%.

Conclusion: This case demonstrates the successful management of CABG complications with emergent ECMO and PCI, highlighting the importance of early intervention and a multidisciplinary approach in high-risk patients.

Keywords: Multivessel coronary artery disease; Coronary artery bypass grafting; Extracorporeal membrane oxygenation; Cardiac arrest; Percutaneous coronary intervention; Drug-eluting stents; Postoperative complications

Introduction

Coronary artery disease (CAD) is a leading cause of morbidity and mortality globally. Multivessel CAD, involving significant stenosis in two or more coronary arteries, increases the risk of myocardial infarction (MI) and heart failure [1]. Coronary artery bypass grafting (CABG) is the standard of care for severe multivessel disease, particularly in patients with left main coronary artery (LMCA) involvement or impaired left ventricular function, offering superior survival and reduced ischemic events compared to percutaneous coronary intervention (PCI) or medical therapy [2]. CABG improves survival, reduces MI, and enhances quality of life, as shown by randomized trials and meta-analyses [3].

However, complications such as graft failure, perioperative MI, arrhythmias, and cardiac arrest, though rare, are associated with significant morbidity [4]. In cases of refractory cardiac arrest after CABG, venoarterial extracorporeal membrane oxygenation (VA ECMO) can provide vital circulatory support, allowing time for recovery or intervention [5]. Emergent multivessel PCI, particularly in the setting of graft failure and ongoing ischemia, often required to restore coronary perfusion, has favorable outcomes when performed by experienced operators [6]. This case highlights the successful management of a 71-year-old male who developed cardiac arrest due to ST-segment elevation myocardial infarction (STEMI) immediately following the CABG and required central VA ECMO support and multivessel PCI to manage the graft failure, emphasizing the importance of rapid intervention, timely revascularization, and a multidisciplinary approach in such high-risk patients.

Case Presentation

A 71-year-old male with a history of hypertension (HTN) and ulcerative colitis was initially seen in the gastroenterology clinic for frequent heartburn, raising concern for gastroesophageal reflux disease (GERD). He underwent an upper gastrointestinal (GI) endoscopy, which revealed mild gastritis but was otherwise unremarkable. Due to recurrent substernal pain, he was referred for cardiology evaluation to explore potential cardiac causes for his symptoms. The patient reported experiencing up to 20 daily episodes of sharp, substernal burning pain, worsened by exertion, suggestive of progressive angina. A review of his medical records revealed a negative nuclear stress test with myocardial perfusion imaging performed a year prior.

Given the recurrence of chest pain, coronary angiography was recommended, which revealed severe multivessel coronary artery disease (CAD), including 50% calcified distal left main coronary artery (LMCA) stenosis, 99% heavily calcified ostial left circumflex artery (LCX) stenosis, multi-segment stenosis of the left anterior descending artery (LAD), and 99% calcified ostial right coronary artery (RCA) stenosis (Figure 1). The patient was advised to undergo coronary artery bypass grafting (CABG). An echocardiogram showed preserved left ventricular ejection fraction (LVEF) of 55-60%.

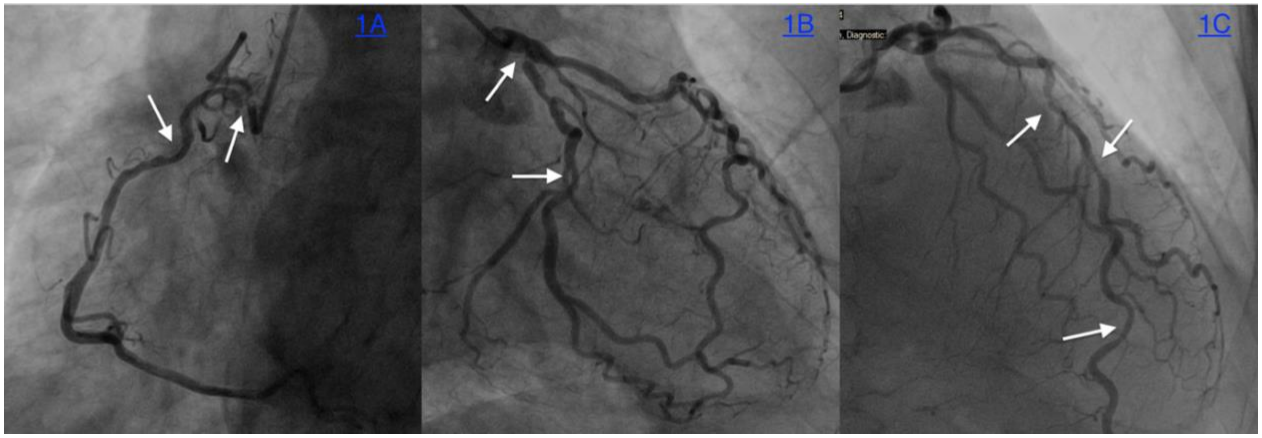

Figure 1: Coronary angiogram showing multivessel coronary artery disease. **(1A):** Ostial and proximal right coronary artery (RCA) stenosis; **(1B):** Ostial and proximal left circumflex artery (LCX) stenosis; **(1C):** Proximal, mid, and distal left anterior descending artery (LAD) stenosis.

The patient underwent a three-vessel CABG using the left internal mammary artery (LIMA) to the LAD, a saphenous vein graft (SVG) to the LCX, and an SVG to the RCA. Postoperatively, the patient remained intubated and developed hypotension, requiring vasopressor support. Immediately after coming out from the operating room (OR), an electrocardiogram (ECG) revealed ST-segment elevations in leads V2 and V3 (Figure 2). Shortly thereafter, the patient lost pulses and went into pulseless electrical activity (PEA) cardiac arrest, requiring cardiopulmonary resuscitation (CPR) according to advanced cardiac life support (ACLS) protocols. Return of spontaneous circulation (ROSC) was achieved after two rounds of CPR. Despite this, the patient remained severely hypotensive, requiring escalating doses of inotropes and vasopressors. He also became bradycardic and required pacing via epicardial pacer leads. A second episode of PEA occurred, requiring another two rounds of CPR per ACLS protocols before ROSC was achieved. A repeat echocardiogram showed a drop in LVEF to 35%.

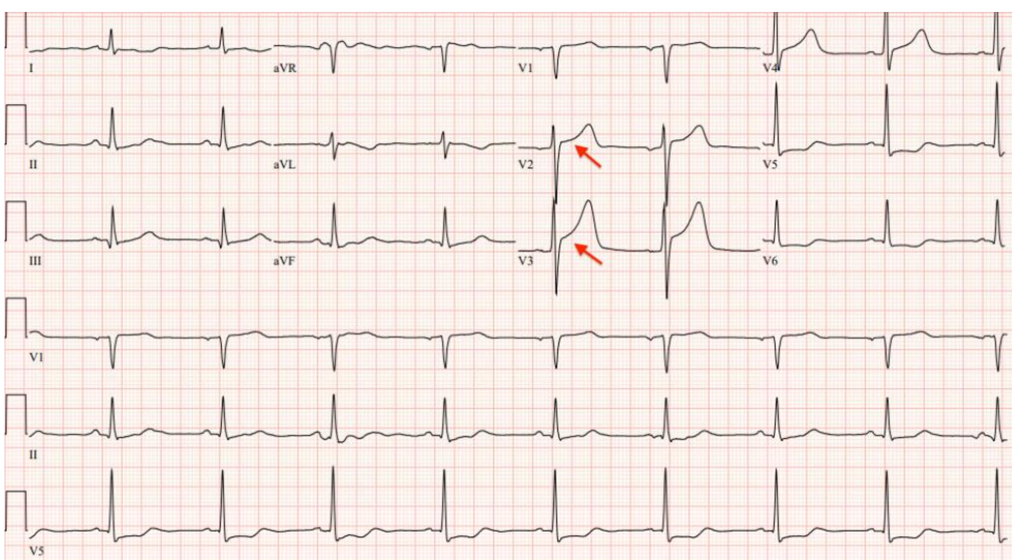

Figure 2: Postoperative ECG immediately following CABG showing ST-segment elevations in leads V2 and V3.

The patient was emergently taken back to the OR for cannulation and initiation of central veno-arterial (VA) extracorporeal membrane oxygenation (ECMO). A repeat cardiac catheterization revealed occlusion of two grafts (LIMA to LAD and SVG to LCX) (Figure 3), while the SVG to RCA remained patent. Native vessel angiography showed complete occlusion of the LAD in the mid-section (Figure 4A). A decision was made to proceed with percutaneous coronary intervention (PCI) to restore flow in the native vessels. Initial angioplasty with a 2 x 12 mm semicompliant balloon restored Thrombolysis in Myocardial Infarction (TIMI) III flow in the LAD (Figure 4B). Additional balloon inflations were performed in the proximal, mid, and distal LAD, followed by the deployment of four overlapping drug-eluting stents (DES) from distal to proximal LAD: 2.25 x 22 mm, 2.5 x 38 mm, 3 x 34 mm, and 3.5 x 26 mm (Figure 5A).

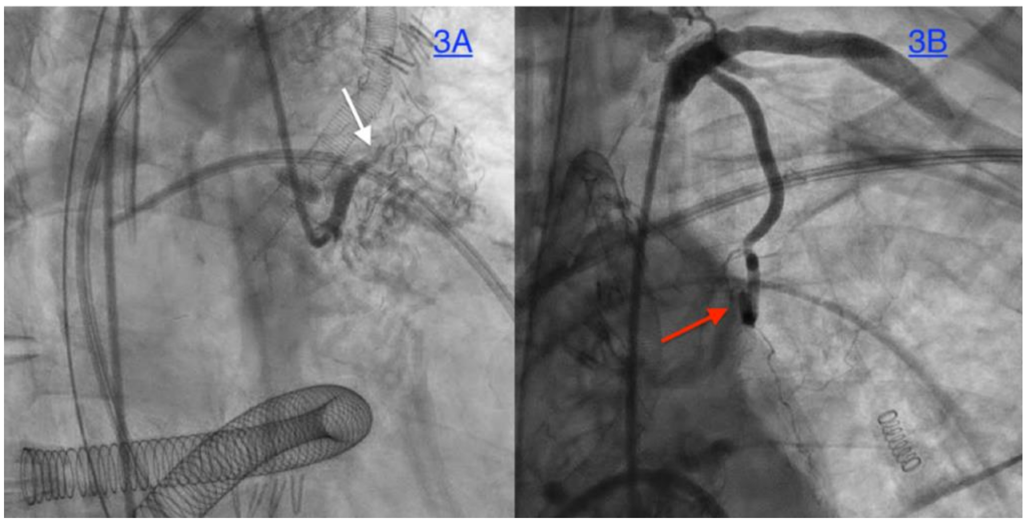

Figure 3: Graft angiography. **(3A):** Occlusion of the saphenous vein graft (SVG) to LCX; **(3B):** Occlusion of the left internal mammary artery (LIMA) to LAD.

Figure 4: Coronary angiography immediately post-CABG. **(4A):** Complete occlusion of the mid-LAD (white arrow); **(4B):** TIMI III flow restored to LAD after initial balloon angioplasty (red arrow).

Next, the LCX was revascularized. Multiple balloon inflations were performed using 2 mm and 3.5 mm semicompliant balloons to prepare the mid, proximal, and ostial LCX segments. Three overlapping DES were deployed: 2.75 x 22 mm in the mid LCX, 2.25 x 22 mm in the OM1, and 3 x 18 mm in the proximal LCX (Figure 5B). Next a decision was made to proceed with bifurcation stenting of the distal LMCA into the ostial LCX and LAD using the DK crush technique. A 3.5 x 26 mm DES was deployed from distal LM into the proximal LCX, while a 4 mm semicompliant balloon was simultaneously positioned in the LAD and inflated to crush the stent struts (Figure 6A). The first kissing balloon inflation was performed with 4 mm and 3.5 mm balloons in the ostial LAD and LCX (Figure 6B), followed by the deployment of a 4 x 18 mm DES in the distal LMCA extending into the proximal LAD (Figure 6C). A second kissing balloon inflation was performed with the same balloon sizes (Figure 6D). Proximal optimization technique (POT) was carried out with a 4.5 x 8 mm balloon in the LMCA (Figure 6E). At the conclusion of the procedure, an angiogram revealed a significant lesion at the distal edge of the distal LAD stent, requiring placement of another 2 x 12 mm stent distally (Figure 7). The final angiogram demonstrated excellent results with TIMI III flow in all arteries (Figure 8).

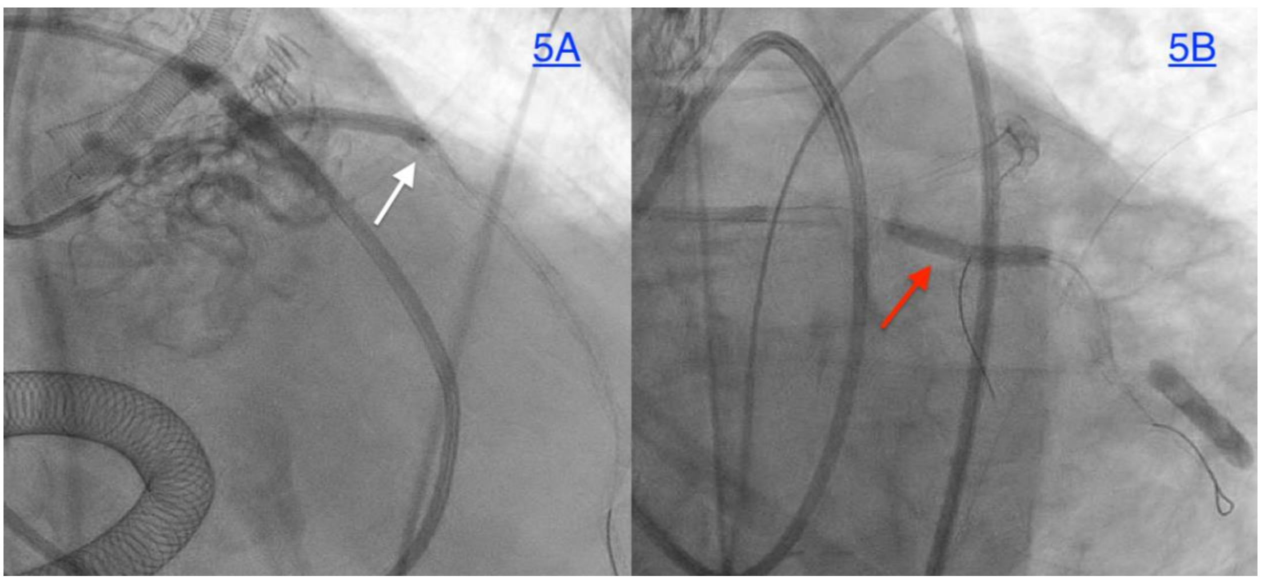

Figure 5: Coronary angiography showing stent deployment. **(5A):** Stent deployment in the proximal LAD, with stents in the mid and distal LAD visible on dry cine; **(5B):** Stent deployment in the proximal LCX, with stents in the mid LCX visible on dry cine.

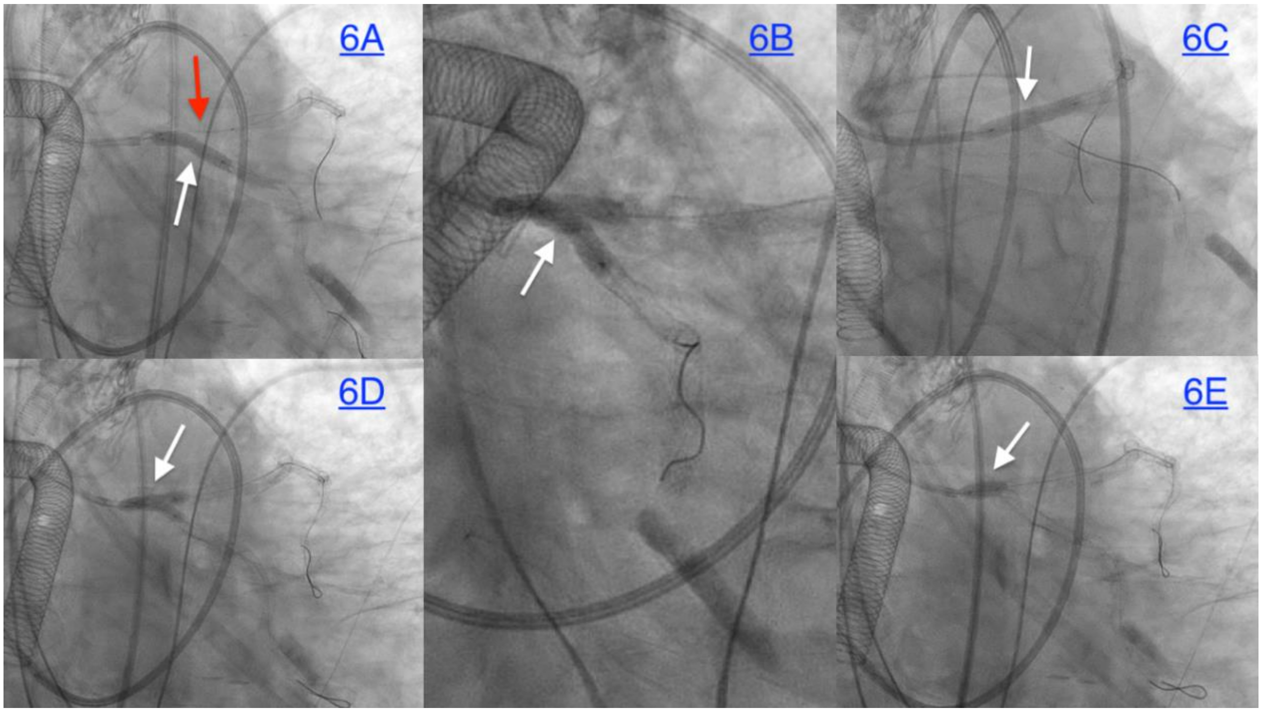

Figure 6: Double kissing (DK) crush technique for bifurcation stenting of the LMCA into the ostial LCX and LAD. **(6A):** Stent deployment from distal LMCA into proximal LCX (white arrow), with a semicompliant balloon positioned in the LAD (red arrow) to crush the stent struts; **(6B):** First kissing balloon inflation; **(6C):** Stent deployment from distal LMCA into proximal LAD; **(6D):** Final kissing balloon inflation; **(6E):** Proximal optimization technique with a balloon in the LMCA.

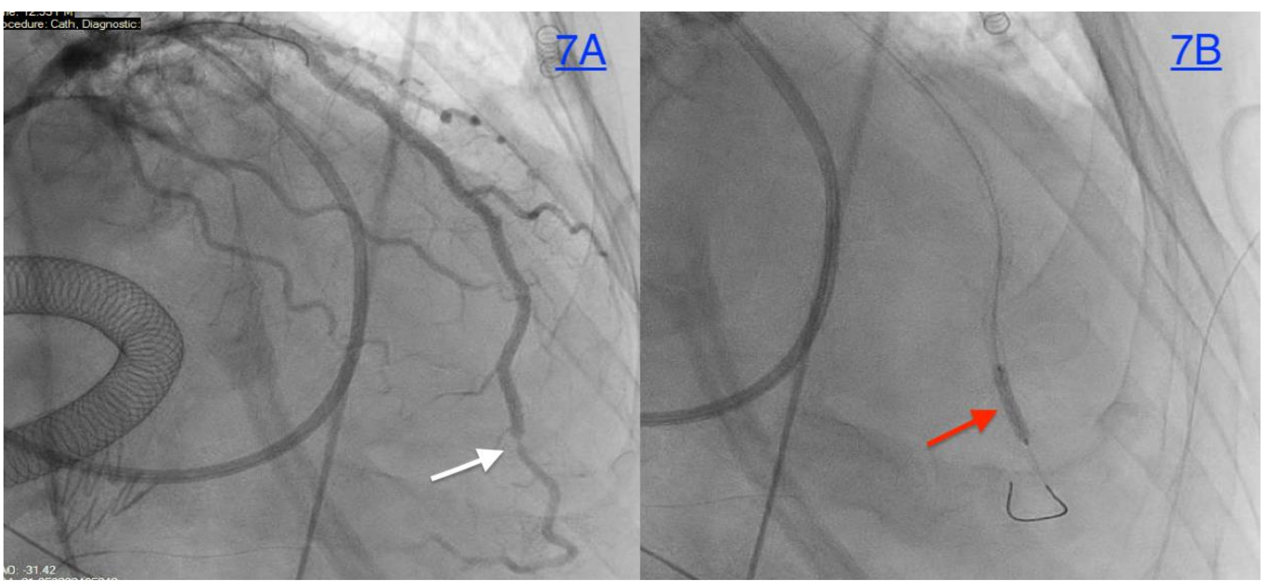

Figure 7: Angiogram at the anticipated end of the procedure. **(7A):** Significant stenosis at the distal edge of the distal LAD stent; **(7B):** Deployment of a stent to cover the distal LAD stent edge stenosis.

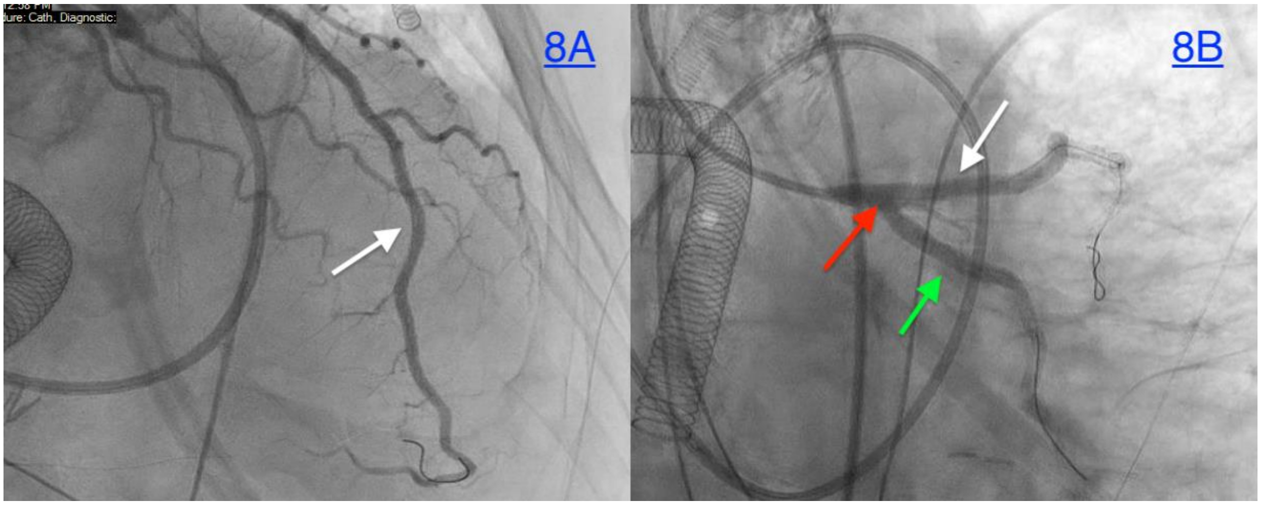

Figure 8: Final angiogram demonstrating excellent results with TIMI III flow in the LAD (white arrow), LMCA (red arrow), and LCX (green arrow).

Throughout the procedure, the patient remained on VA ECMO and mechanical ventilation and tolerated the procedure well. He was decannulated from VA ECMO after four days and extubated after one week. A repeat echocardiogram showed improvement in LVEF to 45%. The patient was discharged to a rehabilitation facility in stable condition.

At his four-week follow-up, the patient was recovering well from his extended hospital stay. His CABG scar had healed, and he reported no chest pain or signs of heart failure. He had completed cardiac rehabilitation and was compliant with his medications. Approximately 18 months later, the patient was admitted for a non-ST elevation myocardial infarction (NSTEMI) and underwent cardiac catheterization. The angiogram revealed that all stents were patent, and the SVG to RCA remained patent, requiring no intervention (Figure 9). His LVEF had improved to 50%.

Figure 9: Coronary angiography after 18 months showing patent stents.

Discussion

Coronary artery bypass grafting (CABG) remains the gold standard for patients with multivessel coronary artery disease (CAD) who are not suitable candidates for percutaneous coronary intervention (PCI) [2]. CABG has been shown to improve long-term outcomes, including reduced mortality, decreased recurrence of angina, and a lower need for revascularization. However, CABG can be complicated by issues such as graft failure, myocardial infarction, arrhythmias, and cardiac arrest, all of which contribute to adverse outcomes [3,4]. In this case, the patient developed STEMI and cardiac arrest immediately after CABG, a critical and life-threatening complication that required the use of VA ECMO for hemodynamic support followed by emergent PCI.

Prompt recognition and management of postcardiotomy STEMI and cardiac arrest are essential. The American College of Cardiology and American Heart Association recommend rapid evaluation for revascularization in such cases, with PCI as the preferred modality when feasible [7]. For patients in refractory cardiogenic shock or cardiac arrest, venoarterial extracorporeal membrane oxygenation (VA-ECMO) provides vital circulatory support, serving as a bridge to definitive therapy [8,9]. Central cannulation for VA-ECMO is commonly used in the postcardiotomy setting to optimize hemodynamic support and facilitate left ventricular decompression [10]. VA ECMO stabilizes patients by oxygenating blood and ensuring perfusion, allowing time for recovery or further intervention. It has been shown to improve survival in critically ill patients with severe hemodynamic instability, such as those experiencing cardiac arrest following CABG [11]. In this case, VA ECMO was crucial in stabilizing the patient, allowing timely PCI as a life-saving intervention.

Following stabilization, urgent coronary and graft angiography is required to identify the cause of ischemia. In this case, two grafts were occluded, and there was an acute LAD occlusion. Multivessel PCI, including the LAD, LCX, and left main, was performed using the double kissing (DK) crush technique. The DK crush technique is well-supported by randomized trials and meta-analyses as an effective strategy for treating complex bifurcation lesions, including left main disease, and has lower rates of major adverse cardiovascular events compared to other bifurcation techniques [12,13]. Recent registry data indicate that in patients with acute myocardial infarction and cardiogenic shock on VA-ECMO, immediate multivessel PCI is associated with improved short- and long-term outcomes compared to culprit-only PCI [14].

The overall prognosis in this setting remains guarded, with high rates of complications and mortality, particularly in the postcardiotomy population [15,16]. However, studies show that early intervention in patients with post-CABG complications leads to improved survival and long-term outcomes. Hence, early initiation of VA-ECMO and rapid revascularization are critical determinants of survival [17], as evidenced by the recovery in this case. The patient showed a remarkable recovery with improvement in LVEF and patent stents on angiography 18 months later.

Conclusion

This case report underscores the critical importance of early recognition and prompt management of complications following CABG in patients with multivessel coronary artery disease. The use of VA ECMO in patients with refractory cardiac arrest after CABG can be life-saving, providing vital support and enabling subsequent interventions like PCI to restore coronary flow. The successful outcome in this case highlights the value of a multidisciplinary approach involving cardiothoracic surgery, interventional cardiology, and advanced life support in managing complex postoperative complications. Clinicians must remain vigilant in identifying high-risk patients and be prepared to utilize advanced therapies such as ECMO and multivessel PCI to optimize patient outcomes.

REFERENCES

1. Writing Committee Members, Virani SS, Newby LK, et al. 2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients with Chronic Coronary Disease: A Report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. J Am Coll Cardiol. 2023; 82: 833-955.
2. Farkouh ME, Domanski M, Sleeper LA, et al. Strategies for multivessel revascularization in patients with diabetes. N Engl J Med. 2012; 367: 2375-2384.
3. Deb S, Wijeysundera HC, Ko DT, et al. Coronary artery bypass graft surgery vs percutaneous interventions in coronary revascularization: A systematic review. JAMA. 2013; 310: 2086-2095.
4. Taggart DP. PCI or CABG in coronary artery disease? Lancet. 2009; 373: 1150-1152.
5. Banning AS, Adriaenssens T, Berry C, et al. Veno-arterial extracorporeal membrane oxygenation (ECMO) in patients with cardiogenic shock: rationale and design of the randomised, multicentre, open-label EURO SHOCK trial. EuroIntervention. 2021; 16: e1227-e1236.
6. Widmer RJ, Hammonds K, Mixon T, et al. Acute Coronary Syndrome Revascularization Strategies with Multivessel Coronary Artery Disease. Am J Cardiol. 2024; 220: 33-38.
7. Rao SV, O'Donoghue ML, Ruel M, et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI Guideline for the Management of Patients with Acute Coronary Syndromes: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. J Am Coll Cardiol. 2025; 85: 2135-2237.
8. Conrad SA, Rycus PT. Extracorporeal membrane oxygenation for refractory cardiac arrest. Ann Card Anaesth. 2017; 20: S4-S10.
9. Guglin M, Zucker MJ, Bazan VM, et al. Venoarterial ECMO for Adults: JACC Scientific Expert Panel. J Am Coll Cardiol. 2019; 73: 698-716.
10. Van Diepen S, Katz JN, Albert NM, et al. Contemporary Management of Cardiogenic Shock: A Scientific Statement from the American Heart Association. Circulation. 2017; 136: e232-e268.
11. Shibasaki I, Masawa T, Abe S, et al. Benefit of veno-arterial extracorporeal membrane oxygenation combined with Impella (ECpella) therapy in acute coronary syndrome with cardiogenic shock. J Cardiol. 2022; 80: 116-124.
12. Di Gioia G, Sonck J, Ferenc M. Clinical Outcomes Following Coronary Bifurcation PCI Techniques: A Systematic Review and Network Meta-Analysis Comprising 5,711 Patients. JACC Cardiovasc Interv. 2020; 13: 1432-1444.
13. Güner A, Uzun F, Demirci G, et al. Cardiovascular Outcomes After Mini-Crush or Double Kissing Crush Stenting Techniques for Complex Bifurcation Lesions: The EVOLUTE-CRUSH Registry. Am J Cardiol. 2023; 206: 238-246.
14. Choi KH, Yang JH, Park TK, et al. Culprit-Only Versus Immediate Multivessel Percutaneous Coronary Intervention in Patients with Acute Myocardial Infarction Complicating Advanced Cardiogenic Shock Requiring Venoarterial-Extracorporeal Membrane Oxygenation. J Am Heart Assoc. 2023; 12: e029792.
15. Kang J, Cuartas M, Flo Forner A, et al. Mortality in patients with normal left ventricular function requiring emergency VA-ECMO for postcardiotomy cardiogenic shock due to coronary malperfusion. PLoS One. 2024; 19: e0300568.
16. Lüsebrink E, Binzenhöfer L, Hering D, et al. Scrutinizing the Role of Venoarterial Extracorporeal Membrane Oxygenation: Has Clinical Practice Outpaced the Evidence? Circulation. 2024; 149: 1033-1052.
17. Henry TD, Tomey MI, Tamis-Holland JE, et al. Invasive Management of Acute Myocardial Infarction Complicated by Cardiogenic Shock: A Scientific Statement from the American Heart Association. Circulation. 2021; 143: e815-e829.