**Off-pump Coronary Artery Bypass Grafting in a Patient with Severe Ischemic Cardiomyopathy: A Case Report**

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This case report does not contain identifiable patient information, and therefore informed consent was not required.

**ABSTRACT**

Ischemic cardiomyopathy is characterized by left ventricular dysfunction secondary to coronary artery disease. This case highlights a 68-years-old male with an ejection fraction. Of 15% and triple-vessel coronary artery disease. The patient underwent off-pump coronary artery bypass grafting to mitigate the risks associated with cardiopulmonary bypass. Despite persistent postoperative left ventricular dysfunction, the patient recovered uneventfully and was discharged five days later. This case underscores the feasibility of off-pump coronary artery bypass grafting in high-risk patients with severely reduced ejection fraction.

**INTRODUCTION**

Ischemic cardiomyopathy (ICM) is a condition characterized by an ischemic damage to the myocardium, leading to heart’s inability to pump blood effectively1. ICM is typically present with left ventricular dysfunction in the context of coronary artery disease (CAD), which is known to be the main cause of Heart failure (HF)2. Left ventricular dysfunction in ICM can be a consequence of large infarct size, myocardial stunning, changes in hemodynamics and neurohormonal activation or even inflammation3. Here, we present a case of a 68-year-old male patient with ejection fraction of 15%, diagnosed with ICM and referred to undergo off-pump coronary artery bypass grafting (OPCAB).

**CASE DESCRIPTION**

A 68-year-old male with a body mass index of 35.9 Kg/m2 presented with ICM and an EF of 15%. He had a history of COVID-19 and type 1 cardiorenal syndrome but was non-diabetic and abstinent from alcohol. Preoperative echocardiography revealed global hypokinesia, chamber dilation, mild valvular regurgitation, and diastolic dysfunction. He had a 40% surgical risk and a 30% likelihood of requiring renal replacement therapy.

A chest CT showed ground-glass opacities suggesting pneumonia, while abdominal ultrasound revealed gallstones and benign prostatic hyperplasia. Carotid duplex imaging identified a partially calcified plaque without stenosis. Preoperative labs indicated anemia, renal dysfunction, vitamin D deficiency, elevated inflammatory markers, and high D-dimer levels.

Preoperative optimization for this high-risk patient with ischemic cardiomyopathy (EF 15%) focused on stabilizing hemodynamics and reducing the risks of pulmonary congestion and ischemic complications. Continuous furosemide infusion was administered to alleviate volume overload and reduce central venous pressure (CVP), while isosorbide mononitrate was given orally to enhance myocardial perfusion and reduce preload through vasodilation.

The patient subsequently underwent a 3-hour and 45-minute OPCAB for triple-vessel disease. Anesthetic induction included the use of propofol and midazolam for sedation, ketamine for analgesia, and atracurium for muscle relaxation. Regional anesthesia with an epidural block using fentanyl was employed to minimize systemic opioid requirements and attenuate the stress response. Gastric protection was achieved with omeprazole, and dexamethasone was administered to reduce inflammation. Ceftriaxone and teicoplanin (Tragocid) were used as prophylactic antibiotics to prevent surgical site infections.

Noradrenaline was used to sustain systemic vascular resistance, while dobutamine served as the primary inotropic agent to enhance myocardial contractility and cardiac output. Milrinone was employed to provide additional inotropic support and reduce pulmonary vascular resistance. Adrenaline was administered during critical phases as a secondary inotropic agent, and vasopressin was used to counteract vasoplegia and maintain vascular tone. Systemic analgesia and stress control were ensured with a continuous infusion of remifentanil.

Following the insertion of an endotracheal tube (ETT), an intra-aortic ballon pump (IABP) was placed for mechanical circulatory support. A central venous line was established via the right internal jugular vein (IJV), and a radial arterial line was inserted for continuous invasive blood pressure monitoring.

Intraoperatively, after median sternotomy, the heart was noted to be significantly dilated, with severe displacement of the apex toward the left. Due to the increased risk associated with harvesting the left internal thoracic artery (LITA), the radial artery was selected for grafting to the Left anterior descending artery (LAD), while saphenous vein grafts (SVG) were used for the obtuse marginal artery (OMA) and the right coronary artery (RCA) crux. Proximal anastomoses were performed using a side clamp on the aorta.

Distal anastomoses were achieved with the aid of apical deep pericardial stay sutures, an apical suction device, and an octopus suction stabilizer. Proximal coronary snaring facilitated the exposure of target vessels. Complete revascularization was successfully performed without intraoperative complication.

Postoperatively, the patient remained in the intensive care unit (ICU) for 64 hours with continuous monitoring and inotropic support. Despite persistent left ventricular dysfunction, he was extubated without complications, maintained stable hemodynamics, and was discharges in good condition on postoperative day five.

**DISCUSSION**

This case highlights the successful management of a high-risk 68-year-old male with ICM (EF 15%) undergoing OPCAB for triple-vessel disease

Preoperative preparation focused on stabilizing hemodynamics and addressing comorbidities, including furosemide and isosorbide mononitrate utilization, which effectively reduced volume overload and optimized myocardial perfusion, critical steps in preparing the patient for surgery despite severe left ventricular dysfunction4.

the use of OPCAB avoided the systemic inflammatory response and hemodynamic compromise associated with cardiopulmonary bypass, critical for managing severe ventricular impairment5. Intraoperative strategies included mechanical support with an IABP to reduce myocardial workload and stabilize cardiac output, alongside precise hemodynamic monitoring via central venous and radial arterial lines. Surgical challenges, such as significant heart dilation and displacement, required adaptive techniques. The radial artery was used for the LAD graft due to the high risk of harvesting the LITA6, while SVG were utilized for the OMA and RCA. Apical stay sutures, suction stabilizers, and coronary snares facilitated successful distal anastomoses, ensuring complete revascularization despite intraoperative complexities.

Postoperatively, the patient was closely monitored in the ICU, where early extubating and stable hemodynamics reflected the efficacy of the integrated care strategy. Despite persistent left ventricular dysfunction, the patient was discharged in good condition on postoperative day five, underscoring the importance of personalized perioperative management in high-risk cardiac surgery.

limitations included the lack of exploration of sex- and gender-related factors, which may influence outcomes in high-risk cardiac surgery. In addition, the absence of detailed dosage information for the pharmacological agents used during the perioperative period, which may limit the ability to replicate the described management approach precisely.

**CONCLUSION**

OPCAB is a feasible approach for patients with severe ICM and low ejection fraction. Careful perioperative planning and management were critical to the successful outcome. This case underscores the potential of OPCAB in improving outcomes for high-risk cardiac surgery patients.

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**AUTHOR CONTRIBUTIONS**

Dr. Hemn A. Abdulla, Dr. Darya N. Saeed, Dr. Sherzad A. Ismael, Abdulla H. Flayeh, Blnd A. Ismael, and Marwan A. Hussein have made substantial contributions to the conception and design of the manuscript, as well as the acquisition, analysis, and interpretation of data. Dr. Sherzad A. Ismael, Abdulla H. Flayeh, Blnd A. Ismael, and Marwan A. Hussein have participated in drafting the manuscript, all authors provided critical revision to enhance its intellectual content. all authors have read and approved the final version of the manuscript for publication.

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**TABLES**

Table 1: Acronyms and Abbreviations

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| Acronyms and Abbreviations | Full form |
| ICM | Ischemic cardiomyopathy |
| EF | Ejection fraction |
| CAD | Coronary artery disease |
| HF | Heart failure |
| OPCAB | Off-pump coronary artery bypass grafting |
| CVP | Central venous pressure |
| ETT | Endotracheal tube |
| IABP | Intra-aortic ballon pump |
| IJV | Internal jugular vein |
| LITA | Left internal thoracic artery |
| LAD | Left anterior descending artery |
| SVG | Saphenous vein grafts |
| OMA | Obtuse marginal artery |
| RCA | Right coronary artery |
| ICU | Intensive care unit |