**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 included the use of continuous furosemide infusion at 3 mL/hour to alleviate volume overload, reduced central venous pressure (CVP), and optimize hemodynamics for surgery. Additionally, isosorbide mononitrate was administered orally at a dose of 10 mg twice daily to provide vasodilation, reduced preload and improve myocardial perfusion. These measures were critical in stabilizing the patient with an EF of 15% and mitigating the risk of pulmonary congestion and ischemic complications. The patient subsequently underwent a 3-hour and 45-minute OPCAB for triple-vessel disease. Intraoperative management was meticulously designed to ensure hemodynamic stability in this high-risk patient with ischemic cardiomyopathy and an ejection fraction of 15%. Regional anesthesia was achieved via an epidural block using fentanyl (100 μg), which provided effective analgesia, reduced systemic opioid requirements, and attenuated the stress response. This approach significantly contributed to stable intraoperative hemodynamics and enhanced postoperative recovery. Additionally, an intra-aortic ballon pump (IABP) was employed to provide mechanical circulatory support, reducing afterload, augmenting coronary perfusion and stabilizing cardiac output during the procedure. A targeted pharmacological regimen as carefully titrated based on continuous hemodynamic monitoring. Noradrenaline (10 mL/ hour) was used to maintain systemic vascular resistance and mean atrial pressure. Dobutamine (2mL/hour) served as the primary inotropic agent to enhance myocardial contractility and improve cardiac output, while milrinone (2mL/hour) provided additional inotropic support and reduced pulmonary vascular resistance with its vasodilatory effects. Adrenaline (2mL/hour) was administered as secondary inotropic agent to address potential hemodynamic instability, and vasopressin (2mL/hour) was used to counteract vasoplegia and maintain vascular tone. For systemic analgesia and stress control, remifentanil was administered at 2 mL/hour via continuous intravenous infusion. Due to anatomical challenges, the radial artery was used for grafting to the left anterior descending artery (LAD), with saphenous vein grafts employed for other vessels. The procedure was completed without intraoperative complications. Postoperatively, the patient spent 64 hours in intensive care with inotropic support, after which he was extubated without complications. Despite persistent preoperative left ventricular dysfunction with an EF of 15%, the patient remained hemodynamically stable and was discharged on postoperative day five.

**DISCUSSION**

The successful management of a high-risk 68-year-old with ischemic cardiomyopathy (EF of 15%) undergoing OPCAB highlights the importance of a multidisciplinary and individualized approach in patients with severe left ventricular dysfunction. Preoperative optimization played a pivotal role in stabilizing the patient’s hemodynamics and mitigating risks. Continuous furosemide infusion alleviated volume overload and reduced CVP, while isosorbide mononitrate improved myocardial perfusion and reduced preload. These measures, combined with a comprehensive diagnostic workup, including imaging and laboratory evaluation, addressed the patient’s type I cardiorenal syndrome and systemic inflammation, ensuring surgical readiness despite a 40% predicted surgical risk.

Meticulous management was essential to maintain hemodynamic stability and mitigate the challenges associated with severely impaired left ventricular function. An IABP was utilized to reduce myocardial workload, enhance coronary perfusion and stabilize cardiac output. Regional anesthesia via an epidural block with fentanyl minimized systemic opioid use, attenuated the stress response ad contributed to stable intraoperative hemodynamic monitoring. Noradrenaline and vasopressin sustained systemic vascular resistance and counteracted vasoplegia, while dobutamine and milrinone provided synergistic inotropic support to enhance myocardial contractility and reduce pulmonary vascular resistance. Adrenaline was employed as a secondary inotropic agent during critical phases, and remifentanil provided systemic analgesia without exacerbating hemodynamic instability. Additionally, surgical precision was evident in the choice of grafting vessels, with the radial artery used for the LAD and saphenous vein graft for other vessels, ensruing optimal outcomes in a complex coronary bypass procedure.

**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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