

Successful ECPR with Neurological Recovery in Fulminant Myocarditis: A Case Report

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Abstract: ***Background:** Fulminant myocarditis is a severe and life-threatening condition often resistant to conventional treatments. This report highlights a rare case of a 40-year-old female with refractory cardiogenic shock who experienced a witnessed in-hospital cardiac arrest. Advanced interventions, including extracorporeal cardiopulmonary resuscitation (ECPR) and veno-arterial extracorporeal membrane oxygenation (V-A ECMO), resulted in intact neurological recovery. This case underscores the potential of aggressive life-support strategies in achieving favorable outcomes for fulminant myocarditis. **Case Report:** In our case, a 40 year old female, who was provisionally diagnosed as acute fulminant viral myocarditis in refractory cardiogenic shock had suffered a witnessed in hospital cardiac arrest was managed with Extracorporeal Cardiopulmonary resuscitation(ECPR) and revived with intact neurological status. The patient had sustained pulseless Ventricular tachycardia and Advanced Cardiac Life Support (ACLS) protocol was initiated immediately. Due to refractory ventricular fibrillation, she was initiated on Veno-Arterial Extracorporeal Membrane Oxygenation (V-A ECMO). Return Of Spontaneous Circulation (ROSC) was achieved and post cardiac arrest care was continued and her neurological status was evaluated and found to be intact. She was managed on V-A ECMO and other supportive measures and was gradually weaned off from ECMO on day 12. Elective tracheostomy was performed and gradually weaned off from the ventilator. She had right hemothorax due to persistent active bleeding from right intercostal artery and underwent right intercostal artery embolization followed by Video Assisted Thoracoscopic Surgery (VATS). After a prolonged course of hospital stay she was discharged home with good clinical and functional status. Fulminant myocarditis is often fatal, but aggressive supportive measures with novel ECPR strategies have found to have mortality benefit with good recovery as it happened in this case. **Conclusion:** With a complete recovery of neurological function, this was one of the rare cases of successful ECPR for fulminant myocarditis and emphasized the potential role of VA-ECMO in treating fulminant myocarditis in cardiogenic shock. Further research should be done for our current understanding of the role of ECPR in cardiac arrest and to refine our approach to this complex endeavour.*

Keywords: ECPR, fulminant myocarditis, cardiogenic shock, V-A ECMO, neurological recovery

1. Introduction

Myocarditis has been reported in over two million cases annually worldwide, resulting in approximately 350,000 deaths [1-2]. The pathophysiology, epidemiology, and disease course in myocarditis have been well described in the literature. Initial management is largely supportive, while long-term management consists of standard guideline-directed medical therapy for ventricular dysfunction, if present [3-4].

Fulminant myocarditis is a life-threatening progressive condition, which has an unpredictable clinical course with a high risk of circulatory collapse and mortality ranging from 25% to 75% without immediate mechanical circulatory support [5]. Extracorporeal membrane oxygenation (ECMO) is an effective lifesaving strategy in patients with fulminant myocarditis in cardiogenic shock experienced cardiac arrest and for whom conventional cardiopulmonary resuscitation (CPR) has failed [6].

2. Case Report

A 41-year-old lady referred from outside hospital presented with history of fever and myalgia for 5 days. On arrival, she was tachycardic and tachypneic with cold clammy

extremities and decreased urine output. She was started on high-flow oxygen and vasopressor support after initial fluid resuscitation. Arterial blood gas analysis showed severe metabolic acidosis with high lactates with hypoxic respiratory failure. ECG showed tachycardia with frequent atrial premature complexes. 2D Echo showed global hypokinesia/severe left ventricular dysfunction and ejection Fraction (EF) of 20% [Figure 1]. She had elevated cardiac enzymes. Acute myocarditis probably viral in cardiogenic shock was diagnosed clinically. After a few hours, she had witnessed cardiac arrest with ventricular fibrillation. High-quality CPR was initiated and defibrillation was performed as per Advanced Cardiac Life Support (ACLS) guidelines. She was intubated and put on mechanical ventilation. Return of spontaneous circulation (ROSC) was achieved after 2 cycles of CPR. She became hemodynamically unstable requiring triple vasopressors and the decision to put her on Veno-Arterial ECMO (V-A ECMO) was made after discussion with the family. During the initiation of ECPR, she had pulseless ventricular tachycardia and high-quality CPR and immediate defibrillation were performed and continued until the placement of femoral arterial and venous cannulas and initiation of V-A ECMO. ROSC was achieved after 5 cycles of CPR. Targeted temperature management (TTM) was initiated and her neurological status was assessed after 48 hours and found intact. She was started on

continuous renal replacement therapy for acute kidney injury and hemodynamic instability. Over the next 3 days, her general condition improved with adequate urine output and vasopressors were gradually tapered and stopped and dialysis was discontinued. Serial 2D echo showed improvement in LV contractility with EF 50%. She was gradually weaned off and liberated from V-A ECMO on day 12 in the intensive care unit. She had a right hemothorax [Figure 2a] with active bleeding on day 15 of the hospital stay for which intercostal artery embolization was performed and a right intercostal drainage tube was inserted [Figure 3a,3b]. In view of the difficult weaning from the ventilator, tracheostomy was performed on day 18 of the ICU stay. She underwent video-assisted thoracoscopy (VATS) on ICU day 40 due to persistent right-sided pleural effusion and hemothorax [Figure 2b, 2c]. Redo right intercostal artery angiogram + embolization was done on the 45th day of hospital stay in view of persistent active bleeding. She had bilateral groin/thigh abscess/ collection which were managed appropriately with antibiotics. Aggressive physiotherapy and mobilization were carried out throughout the ICU and hospital stay. After a prolonged course of events, she was discharged from the hospital after 75 days of hospital admission. She was decannulated and discharged home

walking with stable hemodynamics with full neurological recovery and is under regular follow-up.

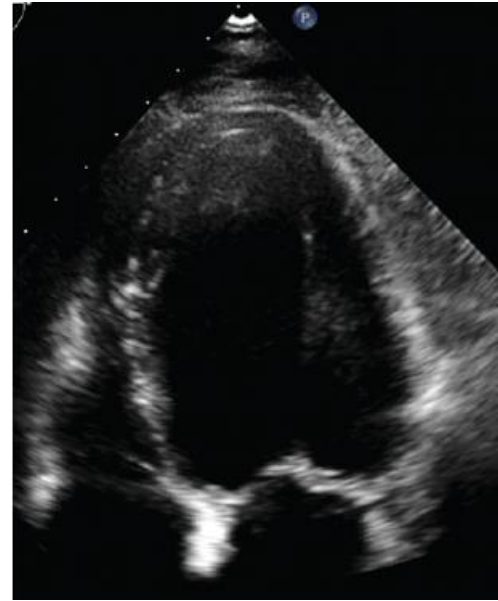


Figure 1: Showing severe left ventricular dysfunction

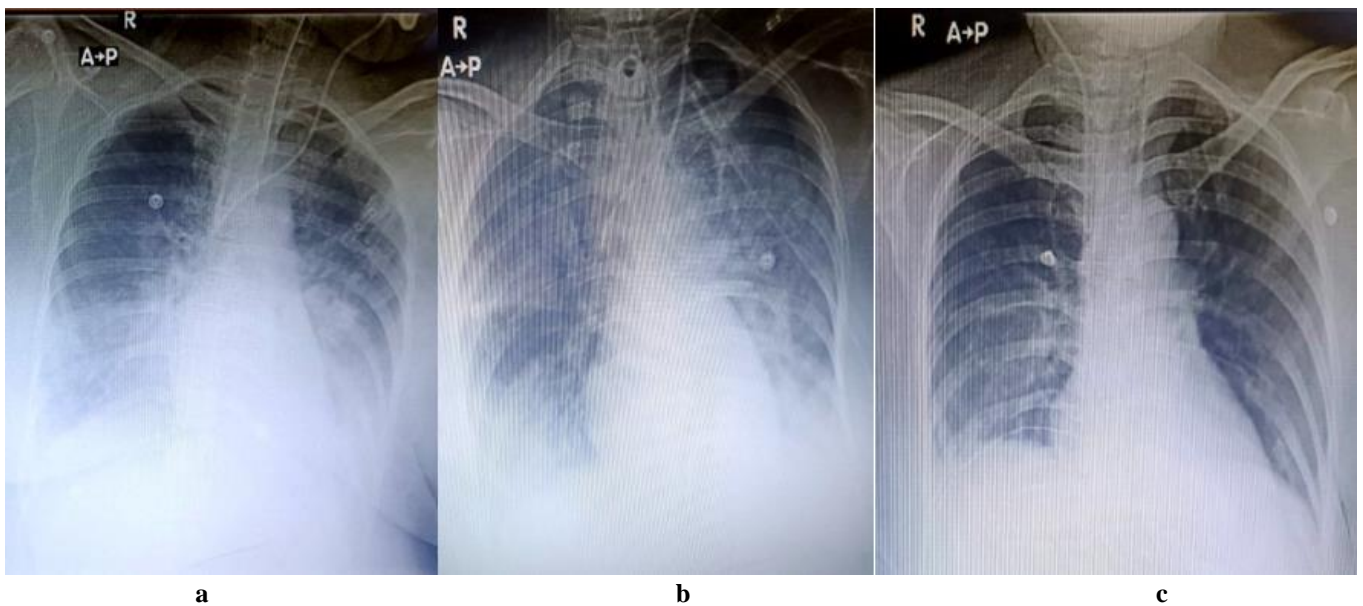


Figure 2: Chest x-ray showed

- Bilateral pleural effusion right > left with active bleed from right intercostal artery on day 15
- Bilateral pleural effusion/ hemothorax/collection on day 40
- Improvement after VATS/Embolization on day 50

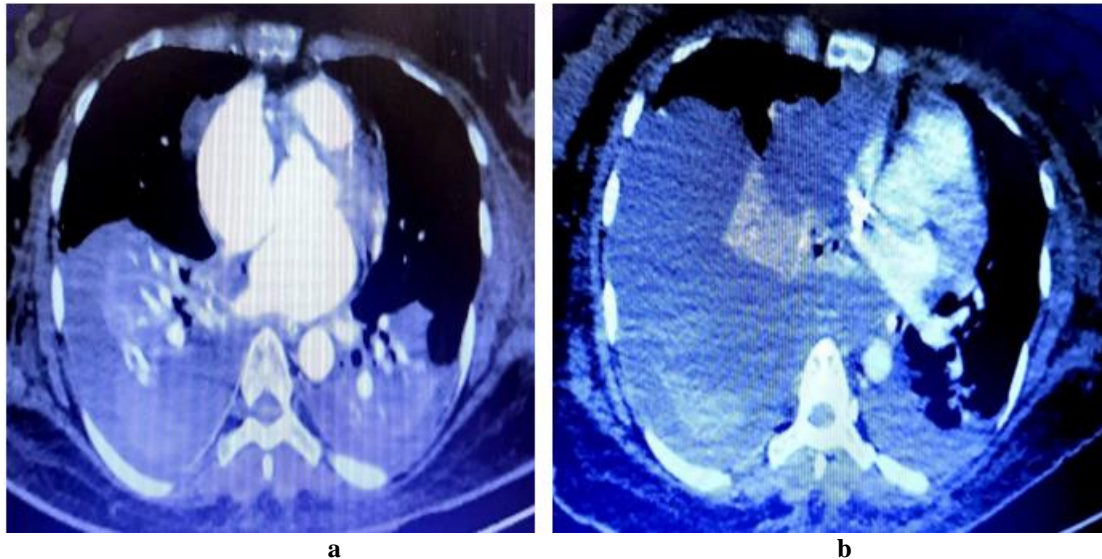


Figure 3: Contrast enhanced CT Thorax showing bilateral hemothorax

3. Discussion

VA-ECMO is an extracorporeal technique that provides both cardiac and respiratory support that sustains life [7]. Using VA-ECMO as an adjunct to CPR, blood flow is restored in patients with sustained cardiac arrest providing sufficient perfusion, importantly cerebral perfusion, to prevent fatal anoxic brain injury. E-CPR was found to have a favourable outcomes in those young patients with initial shockable rhythms, particularly when they have reversible conditions such as acute myocarditis [8]. A crucial component of an ECPR program is to provide effective chest compressions for adequate vital organ perfusion. Conventional CPR can provide up to 25 to 30% of cardiac output, but with ECPR, a very low-flow duration can be reduced with adequate end-organ perfusion. The longer the time between cardiac arrest and initiation of E-CPR, the worse the prognosis tends to be. It is reported that only approximately 15% of the patients survive when arrest to E-CPR interval exceeded 40 minutes [9]. Our case was a young lady who suffered a witnessed in-hospital cardiac arrest and high quality CPR was started immediately, therefore the “no flow time” was zero and good recovery of neurologic function was expected.

Out-of-hospital cardiac arrest has exceedingly high mortality in all patients, as well as in patients with fulminant myocarditis [10]. Long-term mortality outcomes in fulminant myocarditis are usually good if patients survive the initial hospitalization [11]. As most of the mortality due to fulminant myocarditis occurs during the acute phase of the disease, high levels of hemodynamic support at that time with an ECPR protocol is required [12-13]. The development of ECPR programs incorporating VA-ECMO as an adjunct to CPR has shown encouraging results in patients with out-of-hospital cardiac arrest also with good neurological recovery though studies are limited [14]

Prior studies of VA-ECMO in cardiogenic shock caused by myocarditis have shown promising results [15-17]. Our case is another example that V-A ECMO can be performed safely in patients with hemodynamic instability due to fulminant myocarditis. Implementation of an ECPR program in such

patients can be life-saving with good neurological and functional recovery.

4. Conclusion

Acute fulminant myocarditis with hemodynamic collapse remains a critical challenge with high mortality rates. This case highlights the pivotal role of VA-ECMO and ECPR in achieving complete neurological and clinical recovery. Further studies are essential to refine ECPR protocols and improve outcomes for such complex conditions.

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