ECRONICON OPEN ACCESS

EC CARDIOLOGY
Case Report

Role of Veno-Arterial Extracorporeal Membrane Oxygenation for Acute Myocardial Infarction-Associated with Early Cardiogenic Shock

Arturo Moreno Pérez*, Gregorio Ruiz Franco and Araceli Leal Alanis

Departamento de Cardiología, Instituto Nacional de Cardiología - Ignacio Chávez, Mexico City, Mexico

***Corresponding Author:** Arturo Moreno Pérez, Departamento de Cardiología, Instituto Nacional de Cardiología - Ignacio Chávez, Mexico City, Mexico.

Received: June 06, 2019; **Published:** June 28, 2019

Abstract

We report a case of a patient admitted with an acute ST elevation myocardial infarction (STEMI) followed by thrombolytic therapy complicated with cardiogenic shock. Emergency coronary angiography showed a unique lesion of 30% in proximal left anterior descending artery (LAD). The use of Extracorporeal Membrane Oxygenation (ECMO) was decided in an early manner, the patient had a good clinical evolution; withdrawal was achieved on 4th day after STEMI with improved hemodynamics and ventricular function.

Keywords: *ST Elevation Myocardial Infarction (STEMI); Left Anterior Descending Artery (LAD); Extracorporeal Membrane Oxygenation (ECMO)*

Background

The treatment of acute myocardial infarction (AMI) induced cardiogenic shock (CS) primarily consists of early revascularization and intensive care treatment with inotropes, vasopressors, sedation and mechanical ventilation [1]. The most severe cases of CS can be treated with mechanical circulatory support, as a bridge to recovery of cardiac function, or sometimes as a bridge to heart transplantation. According to Guidelines of the European Society of Cardiology [2], short-term mechanical circulatory support should be considered (as a 'bridge to recovery') in patients remaining severely hypoperfused despite inotropic therapy and with a potentially reversible cause (e.g. viral myocarditis) or a potentially surgically correctable cause (e.g. acute interventricular septal rupture) (class IIa/level C recommendation) and may be considered (as a 'bridge to decision') in patients deteriorating rapidly before a full diagnostic and clinical evaluation can be made (class IIb/level C recommendation) [3].

Among available devices, veno-arterial (VA)-Extracorporeal Membrane Oxygenation (ECMO) technique, also called Extracorporeal Life Support (ECLS), has been increasingly used [4] since it is easy to implant in referring centers and has an acceptable cost. In a recent meta-analysis including 20 studies and 1,866 patients, complications were frequent with lower extremity ischaemia (16.9%), compartment syndrome (10.3%), amputation (4.7%), stroke (5.9%), major bleeding (40.8%), and significant infection (30.4%) [5].

VA-ECMO was indicated for acute refractory cardiovascular failure defined as evidence of tissue hypoxia (e.g. extensive skin mottling or elevated blood lactate); left ventricular ejection fraction (< 25%); low cardiac index (< 2.2 L/min/m^2); and sustained hypotension despite infusion of very high-dose catecholamines (epinephrine > 1 µg/kg/min or dobutamine > 20 µg/kg/min and norepinephrine >1 µg/kg/min). VA-ECMO exclusion criteria were severe underlying condition with life expectancy < 1 year, prolonged cardiac arrest (> 60 minutes) pre-ECMO, and irreversible neurological pathology (e.g. massive intracranial bleeding or flat EEG) [6].

The utility of VA-ECMO in AMI remains unknown. Several limitations preclude the use of VA-ECMO in AMI including: 1) the possibility for LV distention and increased LV stroke work, 2) a potentially higher risk for bleeding complications due to the need for large bore cannulas in the setting of aggressive antithrombotic and antiplatelet therapy, and 3) the risk of other complications including vascular injury, limb ischemia and insufficient upper body oxygenation in cases of relatively preserved LV systolic function. A recent, single-center experience reported a 67% survival to discharge rate among 18 patients with acute coronary syndromes complicated by cardiogenic shock. Bleeding complications were observed in 94% (17 out of 18) patients in this study [7].

Case Report

A previously healthy 35 year old male with history of foreign body in elbow following a firearm assault 20 years ago, tobacco smoking for three years, sedentarism, and denial of cocaine consumption, presents to the emergency room with clinic of acute chest pain that started at rest on January 20th at 22:00 hr, admitted to the emergency room on January 21st at 04:00 hr with ST elevation on precordial leads V1-V6, diagnosis of STEMI was made and fibrinolytic therapy was given with Tenecteplase 45 mg. Chest pain goes on decreasing intensity until 12:00 hours, it was accepted at our center for pharmacoinvasive strategy.

Admitted on January 22nd at 08:00 hr, with persistent chest pain, complete AV block with escape at 50 bpm and congestive heart failure. Airway was secured with orotracheal tube. Temporary transvenous pacemaker was placed and coronary angiography showed TIMI 3 flow with a single LAD plaque with 30% stenosis. Intraaortic balloon pump (IABP) was placed and patient was admitted in the coronary unit for STEMI complicated with cardiogenic shock, with hemodynamic support based on IABP, norepinephrine and dobutamine infusions. Transthoracic echocardiogram (TTE) showed akinecia of the mid and apical anterior, anteroseptal and anterolateral walls with LVEF of 25%. Initial blood chemistry reported NT ProBNP 8382, K 6.25 Na 131 Troponin I > 80 Lactate 5.1.

Percutaneous ECMO circuit was placed on dual veno-arterial cannulation mode. Patient improved in clinical status, norepinephrine and dobutamine were weaned on January 23rd and ECMO and IABP were retired on January 24th. Patient continued medical treatment, on evolution patient acquired nosocomial pneumonia, receiving IV antibiotic course. Cardiac improvements were achieved with LVEF 35% and hemodynamic stability.

Discussion

We present the case of a patient attended in our institution in the context of acute myocardial infarction in cardiogenic shock. The important thing is to establish the use of ECMO in early manner, since we demonstrated an improvement of 28.57% of ventricular function with respect to discharge. ECMO has also been shown to be an effective method for supporting hemodynamics in patients with cardiogenic shock by myocardial infarction [8]. The impacts of ECMO use on mortality remains however controversial; survival rate in ECMO patients with cardiogenic shock postmyocardial infarction is reported in hospital discharge of 59.3% [9]. The guidelines for management of heart failure by The American College of Cardiology Foundation/American Heart Association also provide more detailed patient selection criteria for mechanical circulatory support such as ECMO. These criteria consist of "patients with LVEF < 25% and NYHA (New York Heart Association) class III-IV functional status despite guideline-directed medical therapy, including, when indicated, cardiac resynchronization therapy, with either high predicted 1- to 2-year mortality (e.g. as suggested by markedly reduced peak oxygen consumption and clinical prognostic scores) or dependence on continuous parenteral inotropic support" [10].

Conclusion

The increasing evidence for ECMO use in cardiogenic shock is showing promise; however its impact is not clear, especially with its associated increase in cost of care and resource utilization.

Bibliography

1. Persico N., *et al*. "Veno-arterial extracorporeal membrane oxygenation for acute myocardial infarction-associated cardiogenic shock: Can we predict survival before decision of implantation?" *Journal of Thoracic Disease* 8.9 (2016): 2331-2333.

2. McMurray JJ., *et al*. "ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC". *European Heart Journal* 33.14 (2012): 1787-1847.

3. Werdan K., *et al*. "Mechanical circulatory support in cardiogenic shock". *European Heart Journal* 35.3 (2014): 156-167.

4. Stretch R., *et al*. "National trends in the utilization of short-term mechanical circulatory support: incidence, outcomes, and cost analysis". *Journal of the American College of Cardiology* 64.14 (2014): 1407-1415.

5. Cheng R., *et al*. "Complications of Extracorporeal Membrane Oxygenation for Treatment of Cardiogenic Shock and Cardiac Arrest: A Meta-Analysis of 1,866 Adult Patients". *Annals of Thoracic Surgery* 97.2 (2014): 610-616.

6. Muller G., *et al*. "The ENCOURAGE mortality risk score and analysis of long-term outcomes after VA-ECMO for acute myocardial infarction with cardiogenic shock". *Intensive Care Medicine* 42.3 (2016): 370-378.

7. Esper SA., *et al*. "Extracorporeal membrane oxygenation support in acute coronary syndromes complicated by cardiogenic shock". *Catheterization and Cardiovascular Interventions* 86.1 (2015): S45-S50.

8. H Kim., *et al*. "Efficacy of veno-arterial extracorporeal membrane oxygenation in acute myocardial infarction with cardiogenic shock". *Resuscitation* 83.8 (2012): 971-975.

9. JW Diddle., *et al*. "Extracorporeal membrane oxygenation for the support of adults with acute myocarditis". *Critical Care Medicine* 43.5 (2015): 1016-1025.

10. CW Yancy., *et al*. "ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure". *Circulation* (2017).

Volume 6 Issue 7 July 2019