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First case of extracorporeal membrane oxygenation in cardiorespiratory arrest in an emergency room in Brasil: a possible reality?

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SUMMARY

The extracorporeal membrane oxygenation (ECMO) is a procedure that has been used for a long time in reference centers worldwide. Its fundamental precept is to serve as a bridge to a definitive treatment in patients with severe, but potentially reversible, clinical conditions. Despite this, its use in cardiopulmonary arrest (ECPR) is still a matter of debate, especially when indicated in the emergency department. There is not yet a sufficient level of evidence to support its routine use. In Brasil, the procedure stopped being considered an experimental technique by the Federal Council of Medicine only in 2017. The objective of the present case is to share the pioneering spirit of a Brazilian reference center with ECPR in the emergency room and to discuss the future challenges of the ECMO technique.

KEYWORDS: Extracorporeal Membrane Oxygenation. Death, sudden. Emergencies.

INTRODUCTION

Extracorporeal membrane oxygenation (ECMO) is a procedure that has been used for a long time in reference centers worldwide. Its fundamental precept is to serve as a bridge for definitive treatment in patients with severe, but potentially reversible, clinical conditions[1]. Despite this, its use in cardiorespiratory arrest (ECPR) is still a matter of debate, especially when indicated in the emergency department. There is no sufficient level of evidence to support its routine use yet[2]. In Brasil, the procedure became no longer considered an experimental technique by the Federal Council of Medicine only in 2017[3].

ECMO indications are basically restricted to four situations:

1. refractory hypoxemic respiratory failure;
2. refractory hypercapnic respiratory failure;
3. cardiogenic shock and;
4. cardiorespiratory arrest[3].

The latter, as it is the most urgent situation, is the one that needs well established protocols and a well trained team the most.

The main determinants of the success of cardiopulmonary bypass in cases of cardiopulmonary arrest are the technical quality and the time to start cardiopulmonary resuscitation maneuvers, which should not exceed five minutes. Outside of these conditions, so far, there is no data to prove the benefit of the technique[4].

The objective of the present text is to share the pioneering spirit of a Brazilian reference center with ECPR in the emergency room and to discuss the future challenges of this technique.

CASE REPORT

A 47 year old man was brought to the emergency unit by co-workers, reporting severe chest pain and tightness, radiated to his left arm for one hour. Upon admission, he was taken immediately

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to the emergency room. He was confused, agitated, his blood pressure was 70x40 mmHg, heart rate of 68 bpm, with thin pulses, poorly perfused, capillary filling time of 7 seconds, respiratory rate of 30 irpm and saturation of 78% in room air, with presence of pulmonary rales to the apex bilaterally. An electrocardiogram was performed, and it showed ST segment elevation of the extensive anterior wall (Figure 1). The patient progressed rapidly, with worsening of the breathing pattern and decreased level of consciousness, with orotracheal intubation and initiation of intravenous vasoactive drugs (dobutamine and norepinephrine) indicated. However, about 10 minutes later, he evolved to cardiorespiratory arrest in pulseless electrical activity. Cardiopulmonary resuscitation (CPR) was started immediately. After 15 minutes of resuscitation, with no return to spontaneous circulation, it was decided to indicate venoarterial ECMO. The surgical team was called and attended the emergency room. During chest compressions, antisepsis was performed and sterile fields were placed in the right femoral region, followed by incision in the inguinal region and exposure of the femoral vessels, heparinization, puncture under direct vision and progression of arterial and venous cannulas using the open Seldinger technique (Figure 2). Afterwards, the cannulas were fixed and connected to the circuit, and ECMO was started, with a total time of 50 minutes of CPR.

At that moment, chest compressions were interrupted and the patient was referred to hemodynamics for cardiac catheterization. Incoming laboratory tests showed arterial lactate of 212 mg/dL and troponin greater than 25000 mg/dL. Cineangiocoronariography did not identify obstructive lesions, showing only slowed flow in all arteries. Bedside echocardiogram showed significant ventricular dysfunction (ejection fraction of 30%), with diffuse hypokinesia, more pronounced in the apical region, in addition to moderate right ventricular dysfunction. Also in the hemodynamics room, an intra-aortic balloon was passed through the left femoral artery, maintained in 1:1 programming. In order to prevent lower limb ischemia, a perfusor was placed in the right posterior tibial artery (Figure 3) and, for the left ventricular decompression strategy, a pulmonary artery catheter was also implanted. The patient evolved with the need for increasing doses of vasoactive drugs, with adrenaline and methylene blue associated with refractory cardiogenic shock, evolving to death approximately 24 hours after admission.

AUTHORS' CONTRIBUTION

AS: Data Curation, Writing – Original Draft. **TL:** Data Curation. **LP:** Data Curation. **RL:** Data Curation. **PG:** Data Curation, Investigation. **TS:** Data Curation. **GB:** Conceptualization. **FP:** Investigation. **TP:** Data Curation. **TP:** Visualization. **AF:** Data Curation. **PS:** Data Curation. **DT:** Investigation. **CD:** Data Curation. **FG:** Investigation, Validation. **SS:** Supervision. **CC:** Supervision. **RKF:** Supervision. **PRS:** Writing – Original Draft.

Figure 1. Electrocardiogram of admission showing ST segment elevation in V2-V6.

Figure 2. (A) Medical team performing cardiopulmonary resuscitation during femoral dissection and cannulation of venoarterial extracorporeal membrane oxygenation under direct view inside the emergency room; (B) End of cannulation, interruption of chest compressions and cannula fixation; (C) Preparation of the patient in extracorporeal membrane oxygenation for transport to the hemodynamics sector; (D) Patient being effectively taken for cardiac catheterization using venoarterial extracorporeal membrane oxygenation.

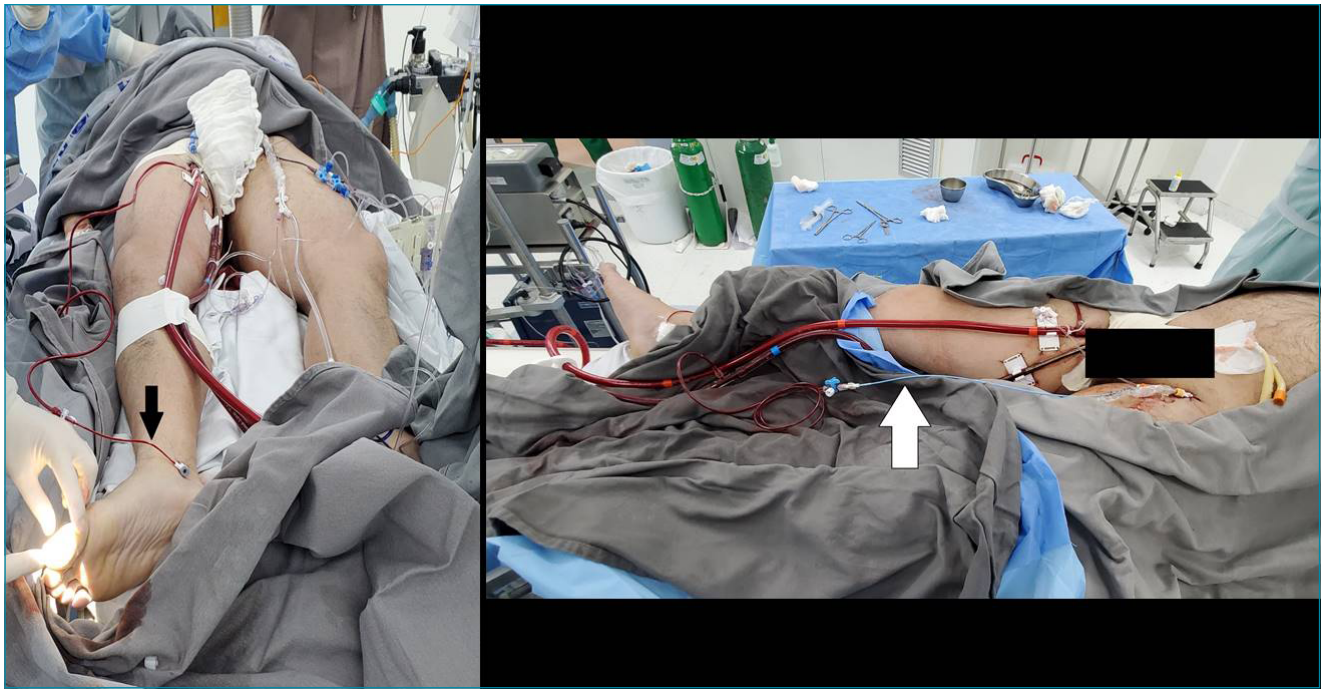

Figure 3. Perfusor (black arrow) connecting extracorporeal membrane oxygenation arterial cannula outlet to posterior tibial artery and pulmonary artery catheter (white arrow) connected to extracorporeal membrane oxygenation circuit.

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