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CASE PRESENTATION

Case report: Long-distance air and ground transport of a patient on VA ECMO, a bridging therapy to transplant.

Transporte aéreo y terrestre a larga distancia ciente en ECMO VA como terapia puente para el trasplante. Presentación de un caso.

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ABSTRACT

The use of ECMO V-A is becoming more and more frequent in large transplant centers, as it's ECMO transport. In long distances, the training and experience of the responsible team becomes paramount for the safety and success of the transport. The aim of this paper is to report a case of a 54-year-old male with end-stage heart failure, in which it was necessary to use ECMO V-A to perform aeromedical transport from a non-specialized center to a tertiary hospital, where the transplantation was performed. Therefore, it's possible to portray the importance of ECMO to stabilize hemodynamics, providing transport conditions, as well as the importance of assistance as a bridge to cardiac transplantation. In order for long distance ECMO transport to be performed safely, it's necessary to have a specialized team, trained and with good communication. This is the first case reported in the brazilian literature of ECMO V-A transport, at a distance greater than 2 500 km, followed by cardiac transplantation.

Key words: **ECMO, Air medical transport, heart failure, cardiac transplantation.**

RESUMEN

El uso de la ECMO VA es cada vez más frecuente en los grandes centros de trasplante, así como el transporte en ECMO. Durante el transporte de pacientes en largas distancias, la formación y la experiencia del equipo responsable se convierte en primordial para la seguridad y el éxito de este. El objetivo de nuestro trabajo es informar de un caso de un paciente masculino de 54 años, con insuficiencia cardíaca terminal, en el que fue necesario el uso de la ECMO VA para realizar el transporte aeromédico, desde un centro no especializado hacia un hospital terciario, donde se realizó el trasplante. Por lo tanto, es posible resaltar la importancia de la ECMO para estabilizar la hemodinamia, y ofrecer condiciones de transporte seguras, así como la importancia de la asistencia como puente para el trasplante cardíaco. Para que el transporte, a larga distancia, en ECMO pueda realizarse de forma segura, es necesario que haya un equipo especializado, entrenado y con buena comunicación. Este es el primer caso reportado en la literatura brasileña de transporte en ECMO VA, a una distancia mayor a 2 500 km, seguido de trasplante cardíaco.

Palabras clave: **ECMO, transporte aeromédico, insuficiencia cardiaca, trasplante cardíaco.**

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INTRODUCTION

Extracorporeal membrane oxygenation (ECMO) is part of Extracorporeal Life Support or Extracorporeal Life Support (ECLS), and works as temporary mechanical support for patients with significant cardiac and/or respiratory dysfunction. The most common forms of ECMO are venoarterial (VA) and venovenous (VV). In both modalities, blood is drained from the patient through a vein. However, in VV ECMO, oxygenated blood is returned to venous circulation while in VA ECMO, oxygenated blood is reinjected into an artery[1].

Over time, there has been an increase in the use of VA ECMO for patients experiencing cardiogenic shock due to decompensated heart failure. Therefore, VA ECMO has increasingly become a transitional treatment for heart transplantation, especially in the leading transplant facilities. ECMO can serve not only as a bridging therapy to transplantation but also to recovery, decision-making, or to another circulatory assist device[2]. This type of support has proven helpful in situations involving postoperative complications, poisonings, infections, and cardiopulmonary resuscitation. It has been utilized both within and outside hospital settings, resulting in significant experience[3]. Additionally, the COVID-19 pandemic caused a surge in patients with respiratory failure needing ECMO worldwide. This increase has also helped ECMO teams become more equipped to handle complicated cases[4].

This study aims to report a successful case of transporting a 54-year-old man by plane on ECMO to a different state for a heart transplant.

CASE PRESENTATION.

This is the case of a 54-year-old man with a past medical history of mitral valve replacement surgery 11 years ago. He was admitted to the intensive care unit of a city in Northern Brazil with cardiogenic shock due to myocarditis of probable viral etiology. At the time of examination, he was receiving high doses of inotropic and vasopressor medications alongside assistance with an intra-aortic balloon pump. It was decided to perform a VA ECMO implantation to achieve hemodynamic stabilization, followed by aeromedical transportation to São Paulo, Brazil, which is approximately 2700 kilometers away. The transportation process went smoothly, without any complications. On the second day of admission, the patient was removed from the ventilator and underwent necessary examinations to be listed as a priority candidate for a heart transplant. After fifteen days of having an ECMO implanted, a suitable and accepted heart for transplantation was finally found. The donor was a 35-year-old man who had suffered a subarachnoid hemorrhage and had a normal echocardiogram. The surgery was done after 90 minutes of extracorporeal circulation, and the graft ischemic time was 3 hours and 45 minutes. The femoral cannulas were taken out after the procedure without causing any harm to the vessels' distal flow. The patient underwent a transesophageal echocardiogram in the operating room which revealed that the graft had preserved biventricular function. Post-surgery, the patient experienced a positive progression and was extubated on the second day. Initially, he required continuous hemodialysis but after five days it was changed to intermittent. After thirty days, the patient was still undergoing intermittent dialysis, but his condition had improved and the echocardiogram showed preserved biventricular function.

DISCUSSION

Just a few decades ago, it was considered impossible to implant an ECMO device during an out-of-hospital cardiac arrest. But France has proved that it can be done, inspiring teams to train for similar situations5. Taking a cue from this, transportation of patients on ECMO via air started as a far-fetched idea, but it is now a feasible option for transferring critically ill patients to better-equipped centers, specialized hospitals, and locations with advanced treatment options.

Air transportation using fixed-wing aircraft, as observed in this study, is a sensitive process. This is because it involves the use of equipped ambulances for ground transportation between airports and hospitals in both the departure and arrival cities. As a result, there is increased movement of the patient and the ECMO circuit which exposes them to higher risks.

It is essential to emphasize that ambulances and transport aircraft require sufficient power supply for ECMO and access to oxygen throughout the journey. Additionally, climate control is necessary, and drugs must be easily reachable to ensure safety measures are met.

To ensure effective ECMO team structuring, it's important to have a strong, collaborative effort from various healthcare professionals with expertise in ECMO. The ELSO guidelines suggest the team should consist of doctors, perfusionists, nurses, and intensivists[6]. During our medical transport, the presence of each of these professionals was vital for a successful outcome.

CONCLUSIONS.

ECMO is a highly effective tool that can provide circulatory support to patients experiencing severe hemodynamic instability. It has been utilized in various contexts, such as enabling long-distance air transportation and serving as a bridging therapy to heart transplantation. Heart transplantation is currently the most effective treatment for advanced heart failure.

Transporting patients long distances on ECMO can be done safely, provided that the personnel involved are well-trained and the implantation indication is appropriate[6]. A recent case in Brazilian medical literature describes the successful transportation of a patient on VA ECMO over a distance of more than 2500 km, followed by a heart transplant.

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