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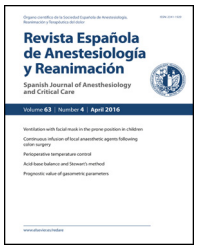

ORIGINAL ARTICLE

Experience in the management of ECMO therapy as a mortality risk factor☆

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KEYWORDS
Extracorporeal membrane oxygenation;
Cardiac and respiratory failure;
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Learning

Abstract
Introduction: The extracorporeal oxygenation membrane (ECMO) is a system that provides circulatory and respiratory assistance to patients in cardiac or respiratory failure refractory to conventional treatment. It is a therapy with numerous associated complications and high mortality. Multidisciplinary management and experienced teams increase survival.
Objective: Our purpose is to evaluate and analyse the effect of the learning curve on mortality.
Methods: Retrospective and observational study of 31 patients, from January 2012 to December 2015. Patients were separated into 2 periods. These periods were divided by the establishment of an ECMO protocol. We compared the quantitative variables by performing the Mann–Whitney *U* test. For the categorical qualitative variables we performed the Chi-square test or Fisher exact statistic as appropriate. The survival curve was computed using the Kaplan–Meier method, and the analysis of statistical significance using the Log-rank test. Data analysis was performed with the STATA programme 14.
Results: Survival curves show the tendency to lower mortality in the subsequent period ($p = 0.0601$). The overall mortality rate in the initial period was higher than in the subsequent period ($p = 0.042$). In another analysis, we compared the characteristics of the 2 groups and concluded that they were homogeneous.
Conclusion: The degree of experience is an independent factor for mortality. The application of a care protocol is fundamental to facilitate the management of ECMO therapy.

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PALABRAS CLAVE
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Mortalidad;
Aprendizaje

Experiencia en el manejo de terapia ECMO como factor de riesgo de mortalidad

Resumen
Introducción: La membrana de oxigenación extracorpórea (ECMO) es un sistema que proporciona asistencia circulatoria y respiratoria a pacientes en fallo cardiaco o respiratorio refractarios al tratamiento convencional. Es una terapia con numerosas complicaciones asociadas y alta mortalidad. El manejo por equipos multidisciplinares y con experiencia aumenta la probabilidad de supervivencia.
Objetivos: Evaluar y analizar el efecto de la curva de aprendizaje sobre la mortalidad.
Métodos: Estudio retrospectivo y observacional de 31 pacientes, realizado desde enero de 2012 hasta diciembre de 2015. Los pacientes se agruparon en 2 periodos que están divididos por la instauración de un protocolo ECMO. Comparamos las variables cuantitativas realizando la prueba U de Mann-Whitney; para las variables cualitativas categóricas empleamos la prueba Chi-cuadrado o el estadístico exacto de Fisher, según correspondiera. La curva de supervivencia se elaboró mediante el método de Kaplan-Meier y el análisis de la significación estadística mediante el test Log-rank. El análisis de los datos se realizó con el programa STATA 14.
Resultados: En las curvas de supervivencia se muestra la tendencia a menor mortalidad en los pacientes del periodo posterior (p = 0,0601). La tasa de mortalidad general en el periodo inicial fue mayor que en el periodo posterior (p = 0,042). En otro análisis comparamos características de los 2 grupos y concluimos que eran homogéneos.
Conclusión: El grado de experiencia es un factor independiente para la mortalidad. La aplicación de un protocolo asistencial es fundamental para facilitar el manejo de la terapia ECMO.

Introduction

Refractory cardiorespiratory failure is associated with a high mortality rate.[1] Extracorporeal membrane oxygenation (ECMO) can save lives in these cases.[2] ECMO was used successfully outside the operating room for the first time in 1972.[3] Considerable technological advances have been made since then, and the ECMO system is now simpler, less invasive, and more widely used. ECMO therapy, however, is associated with high mortality and numerous complications,[5] but in the hands of multidisciplinary, more experienced teams, both these risks can be reduced.[6,7] Therefore, clinicians need to receive adequate training in the management of this type of therapy,[8] and should ideally use it in 12–15 patients per year to guarantee competence.[5]

The aim of our study is to analyse the results of the ECMO programme at the Puerta de Hierro University Hospital and to evaluate the effect of the learning curve on mortality.

Material and methods

This is a retrospective, observational study in 31 patients recruited from January 2012 to December 2015, divided into 2 groups: Group 1–early period (2012–2014) and Group 2 – later period (2015), representing the period prior and subsequent, respectively, to implementation of a protocol based on the guidelines of the Extracorporeal Life Support Organisation (ELSO). The protocol includes the indications for ECMO therapy, the haemodynamic and respiratory therapeutic goals, a description of the most frequent complications and how they can be prevented or managed, and a protocol for weaning and decannulation. All patients admitted to the post-anaesthesia care unit (PACU) after placement of a peripheral or central venoarterial ECMO access were included.

To compare the baseline characteristics of study patients, we selected variables from the Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS)[9] and the Survival After Veno-arterial-ECMO (SAVE) scales.[10] Tissue hypoperfusion was evaluated on the basis of pH, lactic acid and bicarbonate levels prior to the start of therapy. Response to vasoactive support was evaluated on the basis of the need for more than 2 different vasoactive drugs (norepinephrine, adrenaline, dobutamine, isoproterenol and dopamine) and the use of an intraaortic balloon pump. Target organ damage was evaluated on the basis of creatinine and bilirubin levels prior to ECMO, peak creatinine levels during therapy, need for renal replacement therapy before ECMO, and indication for ECMO, meaning the underlying condition that precipitates the need for ECMO therapy, since we believe that this may affect the patient's baseline characteristics. The initial treatment strategy was also used as a variable, as this would reveal differences in the patient's pre-ECMO status. ECMO can be used in various clinical situations: as a bridge to transplant, as a bridge to long-term care strategies, as a bridge to recovery, or as an interim measure during clinical decision-making.

Management of ECMO was evaluated on the basis of complications associated with the therapy (lower limb ischaemia, arrhythmia, need for renal replacement therapy during ECMO), type of access (peripheral or central), mortality during therapy, overall mortality, length of stay in the PACU, duration of ECMO, length of stay in the PACU