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ORIGINAL ARTICLE

Experience with infections in the use of extracorporeal membrane oxygenation☆,☆☆

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KEYWORDS
Extracorporeal membrane oxygenation;
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Risk factors

Abstract
Objective: To identify risk factors associated with infectious complications acquired by paediatric patients during extracorporeal life support (ECLS).
Patients and methods: Patients under ECLS from January 2011 to December 2014 have been retrospectively reviewed and data on demographics, care and infectious complications were collected.
Results: There were 50 ECLS assistances in the study period, of which 20 patients had 23 infectious complications: 16 were bloodstream infections, with coagulase negative staphylococci being the predominant isolate (there were 2 cases of candidaemia). Age, site of cannulation procedure, cannulation site, severe coagulopathy, and surgical interventions during assistance were analysed as risk factors for infectious complications, but no significant differences were found. ECLS duration was significantly longer in patients with infectious complications (8.91 vs 5.91 days; $P = .039$). There were no significant differences as regards Paediatric Intensive Care Unit (PICU) stay, or in survival.
Conclusions: Infectious complications during ECLS are very common, and ECLS duration is significantly longer in patients with infections. Measures should be put in place to prevent infectious complications and reduce time on ECLS.

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PALABRAS CLAVE
Oxigenación por membrana extracorpórea;
Infección nosocomial;
Factores de riesgo

Infecciones durante oxigenación de membrana extracorpórea

Resumen
Objetivo: Identificar factores de riesgo asociados con el desarrollo de infecciones nosocomiales en pacientes pediátricos asistidos con oxigenación por membrana extracorpórea (ECMO).
Pacientes y métodos: Se han revisado de forma retrospectiva los pacientes que han recibido asistencia en ECMO de enero de 2011 a diciembre de 2014. Se han recogido datos demográficos, sobre la asistencia y sobre las infecciones que aparecen durante dicha asistencia.
Resultados: En este periodo hubo 50 asistencias en ECMO. Veinte pacientes tuvieron 23 episodios de infección, de los que 16 fueron bacteriemias, siendo el microorganismo más frecuente el estafilococo coagulasa negativo (habiendo 2 casos de candidemia). En cuanto a los grupos de edad, el lugar y el tipo de canulación, la presencia de coagulopatía grave y la realización de intervenciones quirúrgicas durante la asistencia, ninguno de estos factores resultó un factor de riesgo de infección estadísticamente significativo. La duración media de soporte en ECMO fue significativamente mayor en los pacientes que tuvieron alguna infección (8,91 vs. 5,96 días; p = 0,039). No hubo diferencias significativas en cuanto a la estancia en la Unidad de Cuidados Intensivos Pediátricos ni en cuanto a la supervivencia.
Conclusiones: La incidencia de infección durante ECMO es muy alta y los pacientes que tienen una infección están asistidos un tiempo significativamente mayor, por lo que se deben instaurar medidas para prevenir la aparición de estas infecciones e intentar minimizar el tiempo de asistencia en ECMO.

Introduction

Extracorporeal membrane oxygenation (ECMO) is a technique used in critical patients of any age with reversible cardiopulmonary failure.[1] The development of infectious complications in patients supported by ECMO is associated with poorer outcomes.[2,3] Patients under ECMO are particularly susceptible to nosocomial infections, since they not only are critically ill but also undergo numerous invasive procedures (placement of central venous and arterial catheters, urinary catheters, abdominal or chest drainage tubes, endotracheal intubation, etc.).[4,5] In addition, the ECMO circuit itself contains several potential points of entry for pathogenic microorganisms.

Several studies have described nosocomial infections in the context of ECMO.[3,6] The known risk factors for nosocomial infection include longer duration of ECMO,[6,7] greater disease severity at initiation of ECMO,[2,7] performance of invasive procedures during ECMO,[5] ECMO support with an open chest[5] and complications during ECMO.[6,8] A query of the Extracorporeal Life Support Organization (ELSO) Registry (1998–2008) found that infections developed in 11.7% of ECMO cases, which corresponds to a rate of 15.4 infections per 1000 ECMO days (30.6/1000 d in adult patients, 20.8/1000 in paediatric patients and 10.1/1000 d in neonatal patients); the proportion dropped to 6.1% in patients that required ECMO for 7 or fewer days and rose to 30.3% in patients that required it for more than 14 days.[3]

The aim of this study was to make a retrospective analysis of the patients that received ECMO support in the paediatric intensive care unit (PICU) of a tertiary care hospital to describe the associated infections, identify the risk factors for infectious complications and find opportunities for improvement.

Patients and methods

We performed a retrospective review of the health records of patients that received ECMO support between January 1, 2011 and December 31, 2014. We collected data on the demographic characteristics of patients, the care received (indication for ECMO, type of ECMO, type of cannulation, setting of insertion, procedures during ECMO, transfusion of blood products, ECMO duration), the infections developed during ECMO (type of infection, aetiological agent, time from ECMO initiation to onset of infection), length of stay in the PICU (in days) and survival.

The study included all patients aged 0–16 years that received ECMO support during this period. We excluded patients with infections with onset before to initiation of ECMO, that were the indication for ECMO, or that developed after ECMO was discontinued and may not be secondary to this support.

Each type of nosocomial infection was diagnosed based on the criteria established in the CDC guidelines.[9] In our hospital, cultures are performed routinely every 48 h.

During the period under study, antibiotic prophylaxis in patients that received ECMO consisted of a 48-h course of vancomycin and gentamycin.

We compared continuous variables by means of analysis of variance, and qualitative variables by means of the χ^2 test or the Fisher exact test. We expressed the results