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ORIGINAL ARTICLE

Relationship between previous severity of illness and outcome of in-hospital cardiac arrest☆

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Cardiac arrest;
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Creatinine;
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Abstract
Objectives: To analyse the relationship between previous severity of illness, lactic acid, creatinine and inotropic index with mortality of in-hospital cardiac arrest (CA) in children, and the value of a prognostic index designed for adults.
Methods: The study included a total of 44 children aged from 1 month to 18 years who suffered a cardiac arrest while in hospital. The relationship between previous severity of illness scores (PRIMS and PELOD), lactic acid, creatinine, treatment with vasoactive drugs, inotropic index with return of spontaneous circulation and survival at hospital discharge was analysed.
Results: The large majority (90.3%) of patients had a return of spontaneous circulation, and 59% survived at hospital discharge. More than two-thirds (68.2%) were treated with inotropic drugs at the time of the CA. The patients who died had higher lactic acid before the CA (3.4 mmol/L) than survivors (1.4 mmol/L), $p = .04$. There were no significant differences in PRIMS, PELOD, creatinine, inotropic drugs, and inotropic index before CA between patients who died and survivors.
Conclusion: A high lactic acid previous to cardiac arrest could be a prognostic factor of in-hospital cardiac arrest in children.

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PALABRAS CLAVE
Parada cardiaca;
Reanimación cardiopulmonar;
Índice inotrópico;
Fármacos inotrópicos;
Ácido láctico;
Creatinina;
Gravedad clínica

Relación entre el estado de gravedad previo y el pronóstico de la parada cardiaca intrahospitalaria

Resumen
Objetivos: Analizar si el estado de gravedad previo, el láctico, la creatinina y el índice inotrópico se relacionan con la mortalidad de la parada cardiaca (PC) intrahospitalaria en niños y si un índice de predicción pronóstica diseñado para adultos tiene utilidad en pediatría.
Métodos: Se estudió a 44 niños de edades entre un mes y 18 años de edad que presentaron una PC en el hospital durante un período de 2 años. Se analizaron la relación entre las puntuaciones de gravedad PRIMS y PELOD, el láctico, la creatinina, el tratamiento previo con fármacos vasoactivos, el índice inotrópico con la recuperación de la circulación espontánea (RCE) y la supervivencia.
Resultados: Un 90,3% de los pacientes recuperaron la circulación espontánea y un 59% sobrevivió al alta del hospital. Un 68,2% de los pacientes recibían inotrópicos previos a la PCR. Los pacientes fallecidos presentaban valores de lactato previos a la parada más elevados (3,4 mmol/L) que los supervivientes (1,4 mmol/L), $p = 0{,}04$. No existieron diferencias en las puntuaciones de PRISM, PELOD, los valores de creatinina, el tratamiento con inotrópicos, con adrenalina, el número de inotrópicos, o el índice inotrópico antes de la PCR entre fallecidos y supervivientes.
Conclusión: La elevación de ácido láctico previa a la parada cardiaca puede ser un indicador de mal pronóstico en la PC en los niños.

Introduction

Between 50 and 70% of in-hospital cardiac arrests (CA) take place in a paediatric intensive care unit (PICU).[1–4]

Various authors have analysed the characteristics of CAs and the factors associated with in-hospital CA prognosis in children,[1–9] but no studies have assessed whether severity of illness prior to CA is associated with return of spontaneous circulation (ROSC) and survival.

A scoring system for predicting the prognosis of out-of-hospital CA in adults has been developed and reported,[10] and its application to in-hospital CA has also been evaluated.[11]

The aim of this study was to analyse whether previous severity of illness, measured by paediatric severity scores, prognostic scores for adult CA, other markers such as lactic acid and creatinine, and the treatments given to patients such as mechanical ventilation and inotropic drugs, are associated with in-hospital CA mortality in children.

Patients and methods

We conducted an observational prospective study that included paediatric patients aged one month to 18 years who had in-PICU CA between December 2007 and December 2009. We collected the data following the Utstein style guidelines.[12,13] We excluded infants under one month of age and patients who only had respiratory arrest.

We included the following variables: age, sex, weight, cause and type of CA, assisted respiration, administration and dosage of inotropic drugs, inotropic index, blood pressure, heart rate, lactate, creatinine, paediatric prognostic scores, Paediatric Risk of Mortality (PRISM)[14] and Paediatric Logistic Organ Dysfunction (PELOD)[15] prior to CA, and CA prognostic score.[10] We recorded the values closest to CA, always within the previous 24 h.

We calculated the inotropic index by modifying the formula proposed by Gaies et al.,[16] substituting isoproterenol for vasopressin, which is not commercialised in Spain. Inotropic score (μg/kg/min): dopamine + dobutamine + (adrenaline × 100) + (noradrenaline × 100) + (isoproterenol × 100) + (milrinone × 15). The CA prognostic score includes the following variables (initial ECG rhythm, time elapsed to CPR initiation, CPR duration, and pre-arrest creatinine level).[10]

We defined CA as an abrupt, unexpected and potentially reversible interruption of spontaneuous circulation and respiration requiring cardiac massage and ventilation. We defined ROSC as the return and maintenance of a palpable central pulse for at least 20 min. We looked at survival to discharge from hospital.

We performed the statistical analysis with the SPSS software version 18 (SPSS Inc., Chicago, Illinois). The data are expressed as medians and interquartile ranges, P25–P75 [IQR]). We analysed the relationship of each of the parameters with ROSC and survival. We used the chi-squared test to compare percentages, and the Mann–Whitney non-parametric test to compare qualitative variables. We performed univariate logistic regression to analyse the relationship of each of the risk factors with mortality, and analysed the ROC curve to study the predictive ability of lactic acid in relation to mortality. We set the significance value at $p < 0.05$.