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ORIGINAL ARTICLE

Cardiac dysfunction and ferritin as early markers of severity in pediatric sepsis☆,☆☆

Cristian T. Tonial[a,b,*], Pedro Celiny R. Garcia[a,b,c], Louise Cardoso Schweitzer[d], Caroline A.D. Costa[b], Francisco Bruno[a], Humberto H. Fiori[b,e], Paulo R. Einloft[a], Ricardo Branco Garcia[f], Jefferson Pedro Piva[g,h]

[a] *Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Hospital São Lucas, Unidade de Terapia Intensiva, Porto Alegre, RS, Brazil*
[b] *Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Programa de Pós-Graduação em Pediatria e Saúde da Criança, Porto Alegre, RS, Brazil*
[c] *Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Bolsista de Produtividade em Pesquisa, Brazil*
[d] *Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Hospital São Lucas, Serviço de Cardiologia Pediátrica, Porto Alegre, RS, Brazil*
[e] *Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Hospital São Lucas, Unidade de Terapia Intensiva Neonatal, Porto Alegre, RS, Brazil*
[f] *Pediatric Intensive Care Unit, Cambridge University Hospitals NHS Trust, Cambridge, United Kingdom*
[g] *Hospital de Clínicas de Porto Alegre (HCPA), Unidade de Terapia Intensiva Pediátrica, Porto Alegre, RS, Brazil*
[h] *Universidade Federal do Rio Grande do Sul (UFRGS), Programa de Pós-Graduação em Saúde da Criança e Adolescente, Porto Alegre, RS, Brazil*

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KEYWORDS
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Septic shock;
Echocardiogram;
Outcome;
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Abstract
Objective: The aim of this study was to verify the association of echocardiogram, ferritin, C-reactive protein, and leukocyte count with unfavorable outcomes in pediatric sepsis.
Methods: A prospective cohort study was carried out from March to December 2014, with pediatric critical care patients aged between 28 days and 18 years. Inclusion criteria were diagnosis of sepsis, need for mechanical ventilation for more than 48 h, and vasoactive drugs. Serum levels of C-reactive protein, ferritin, and leukocyte count were collected on the first day (D0), 24 h (D1), and 72 h (D3) after recruitment. Patients underwent transthoracic echocardiography to determine the ejection fraction of the left ventricle on D1 and D3. The outcomes measured

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☆☆ Study carried out at Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Postgraduate Program in Pediatrics and Child Health, Porto Alegre, RS, Brazil.
* Corresponding author.
E-mail: cristiantonial@gmail.com (C.T. Tonial).

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were length of hospital stay and in the pediatric intensive care unit, mechanical ventilation duration, free hours of VM, duration of use of inotropic agents, maximum inotropic score, and mortality.
Results: Twenty patients completed the study. Patients with elevated ferritin levels on D0 had also fewer ventilator-free hours ($p = 0.046$) and higher maximum inotropic score ($p = 0.009$). Patients with cardiac dysfunction by echocardiogram on D1 had longer hospital stay ($p = 0.047$), pediatric intensive care unit stay ($p = 0.020$), duration of mechanical ventilation ($p = 0.011$), maximum inotropic score ($p = 0.001$), and fewer ventilator-free hours ($p = 0.020$).
Conclusion: Cardiac dysfunction by echocardiography and serum ferritin value was significantly associated with unfavorable outcomes in pediatric patients with sepsis.

PALAVRAS-CHAVE
Sepse;
Choque séptico;
Ecocardiograma;
Desfecho;
Unidade de Terapia Intensiva Pediátrica

Disfunção cardíaca e a ferritina como marcadores precoces de gravidade na sepse pediátrica

Resumo
Objetivo: Verificar a associação do ecocardiograma, da ferritina, da Proteína C Reativa (PCR) e da contagem de leucócitos com desfechos desfavoráveis na sepse pediátrica.
Métodos: Estudo de coorte prospectivo, no período de março a dezembro de 2014, com pacientes críticos pediátricos de idade entre 28 dias e 18 anos. Critérios de inclusão foram diagnóstico de sepse, necessidade de ventilação mecânica (VM) por mais de 48 horas e uso de drogas vasoativas. Avaliaram-se os níveis séricos PCR, ferritina, contagem de leucócitos, no recrutamento (D0), 24 horas (D1) e 72 horas (D3) após o recrutamento. No D1 e no D3 todos pacientes foram submetidos a ecocardiograma transtorácico para determinação da Fração de Ejeção (FE) do ventrículo esquerdo. Os desfechos avaliados foram tempo de internação hospitalar e na Unidade de Terapia Intensiva pediátrica (UTIP); duração da VM; horas livres de VM; duração do uso de inotrópicos; escore de inotrópicos máximo e mortalidade.
Resultados: Vinte pacientes completaram o estudo. Ferritina elevada no D0 associou-se com menor tempo livre de ventilação (p = 0,046) e maior escore de inotrópicos máximo (p = 0,009). A disfunção cardíaca pelo ecocardiograma no D1 relacionou-se com maior tempo de internação hospitalar (p = 0,047), de UTIP (p = 0,020), VM total (p = 0,011), escore de inotrópicos máximo (p = 0,001) e menor tempo livre de VM (p = 0,020).
Conclusão: A disfunção cardíaca pelo ecocardiograma e o valor de ferritina sérica associaram-se significativamente com desfechos desfavoráveis nos pacientes pediátricos com sepse.

Introduction

Sepsis remains an important cause of morbidity and mortality in the pediatric intensive care unit (PICU) environment. Finding tools that can anticipate or monitor unfavorable evolution in sepsis can contribute to the improvement of care in these critically-ill patients.[1,2]

Thus, several biological markers have recently been studied as tools to evaluate disease progression in bacterial infections, sepsis, and septic shock.[1–8] Among the biomarkers, the most often used in the authors' setting are leukocyte count, C-reactive protein (CRP), and ferritin levels, the last two having limited studies in pediatrics correlating serum levels with unfavorable outcomes.[1,4,6–8]

In pediatric sepsis, myocardial dysfunction is one of the main causes of clinical deterioration.[9] Myocardial dysfunction may be present in up to 50% of cases of severe sepsis or septic shock, causing systolic or diastolic ventricular dysfunction and contributing to shock and mortality.[10] The echocardiogram is already used in the management of patients with septic shock during volumetric resuscitation and to choose the best vasoactive drug.[11,12] It is speculated that evaluations obtained by echocardiographic assessment can be used as markers of sepsis evolution. Additionally, few studies have associated these measures with unfavorable outcomes in pediatric sepsis.[13]

The present observational study evaluated the evolution of left ventricular ejection fraction (EF) as measured by echocardiography, serum ferritin and CRP, as well as leukocyte count in critically ill patients with sepsis. Furthermore, measures of these markers were associated with unfavorable outcomes.