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ORIGINAL ARTICLE

Predictive factors of contamination in a blood culture with bacterial growth in an Emergency Department☆,☆☆

S. Hernández-Bou[a,*], V. Trenchs Sainz de la Maza[a], J.N. Esquivel Ojeda[a], A. Gené Giralt[b], C. Luaces Cubells[a]

[a] *Servicio de Urgencias, Hospital Sant Joan de Déu, Esplugues de Llobregat, Barcelona, Spain*
[b] *Servicio de Microbiología, Hospital Sant Joan de Déu, Esplugues de Llobregat, Barcelona, Spain*

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KEYWORDS
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Abstract
Introduction: The aim of this study is to identify predictive factors of bacterial contamination in positive blood cultures (BC) collected in an Emergency Department.
Patients and methods: A prospective, observational and analytical study was conducted on febrile children aged one to 36 months, who had no risk factors of bacterial infection, and had a BC collected in the Emergency Department between November 2011 and October 2013 in which bacterial growth was detected. The potential BC contamination predicting factors analysed were: maximum temperature, time to positivity, initial Gram stain result, white blood cell count, absolute neutrophil count, band count, and C-reactive protein (CRP).
Results: Bacteria grew in 169 BC. Thirty (17.8%) were finally considered true positives and 139 (82.2%) false positives. All potential BC contamination predicting factors analysed, except maximum temperature, showed significant differences between true positives and false positives. CRP value, time to positivity, and initial Gram stain result are the best predictors of false positives in BC. The positive predictive values of a CRP value $\leq$ 30 mg/L, BC time to positivity $\geq$ 16 h, and initial Gram stain suggestive of a contaminant in predicting a FP, are 95.1, 96.9 and 97.5%, respectively. When all three conditions are applied, their positive predictive value is 100%. Four (8.3%) patients with a false positive BC and discharged to home were revaluated in the Emergency Department.

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* Corresponding author.
E-mail address: shernandez@hsjdbcn.org (S. Hernández-Bou).

Conclusions: The majority of BC obtained in the Emergency Department that showed positive were finally considered false positives. Initial Gram stain, time to positivity, and CRP results are valuable diagnostic tests in distinguishing between true positives and false positives in BC. The early detection of false positives will allow minimising their negative consequences.

PALABRAS CLAVE
Hemocultivos;
Servicio de Urgencias;
Bacteriemia;
Contaminación

Factores predictores de contaminación ante un hemocultivo con crecimiento bacteriano en Urgencias

Resumen
Introducción: El objetivo del estudio es identificar factores predictores de contaminación ante un hemocultivo (HC) con crecimiento bacteriano realizado en un servicio de Urgencias.
Pacientes y métodos: Estudio prospectivo, observacional-analítico. Se incluyen los pacientes de uno a 36 meses, febriles, sin factores de riesgo para bacteriemia, con un HC realizado en el Servicio de Urgencias entre noviembre de 2011 y octubre de 2013 en el que se observa crecimiento bacteriano. Se analizan como posibles factores predictores de contaminación: temperatura máxima, tiempo de positividad, resultado inicial de la tinción de Gram, leucocitos totales, neutrófilos totales, neutrófilos inmaduros y proteína C reactiva (PCR).
Resultados: Se incluyen 169 casos. El crecimiento bacteriano del HC se considera significativo (positivo) en 30 (17,8%), y contaminado en 139 (82,2%). Todos los factores predictores analizados, a excepción de la temperatura, presentan diferencias estadísticamente significativas entre los 2 grupos. Los 3 mejores predictores de contaminación son la PCR, el tiempo de positividad y el resultado inicial de la tinción de Gram. El valour predictivo positivo de una PCR $\leq$ 30 mg/L, un tiempo de positividad $\geq$ 16 h y una tinción de Gram con morfología bacteriana considerada como probable contaminación es del 95,1, 96,9 y 97,5%, respectivamente; el valour predictivo positivo es del 100% para la combinación de los 3 factores. Se reevalúan el 8,3% de los pacientes con un HC contaminado dados de alta inicialmente a domicilio.
Conclusiones: La mayoría de HC con crecimiento bacteriano son finalmente considerados contaminados. El resultado inicial de la tinción de Gram, el tiempo de positividad y el valour de la PCR permiten identificarlos precozmente. Su pronta detección permitirá reducir las repercusiones negativas derivadas de los mismos.

Introduction

Infectious disease is the main reason for care seeking in paediatric Emergency Departments (EDs). At times, the evaluation of these patients requires microbiological studies, and blood culture (BC) is among the tests most frequently ordered.[1] Fever without a source in infants at risk of potentially severe bacterial infection is the main reason for requesting BCs, and they are also frequently performed in febrile patients with immunosuppressive conditions and in children with bacterial infections requiring hospital admission for parenteral antibiotic treatment before starting its administration.[2]

Following the introduction of routine vaccination with the seven-valent pneumococcal conjugate vaccine (PCV), the rate of occult bacteraemia (OB) has decreased drastically to values below 0.5–1%.[3–7] It is expected that the universal administration of the 13-valent PCV will lower this rate even further in reducing other forms of invasive pneumococcal disease. In this new scenario, most BCs performed in EDs that show bacterial growth turn out to have been contaminated.[3,5,7] Furthermore, the continuous-monitoring BC systems that are currently available can detect bacterial growth in the first 24 h in most instances, while in the past detection occurred considerably later.[8] This decrease in detection time has a significant impact on the therapeutic approach to these patients, as in this reduced timeframe most of them are still febrile when they return for reevaluation, which may lead to a more aggressive management. In this emerging reality, the early identification of these patients is essential to avoid the unnecessary use of healthcare resources that often ensues, especially in the case of patients discharged to their homes (return visits, additional diagnostic testing, hospital admission and/or initiation of antibiotic treatment, etc.),[3,9] thus minimising the anxiety caused to patients and their families. While different variables have been proposed as possible predictive factors for contamination in BCs with bacterial growth, such as time to positivity and Gram stain results,[3,9–11] we are not aware of any studies on the subject published after the changes discussed above that have occurred in recent years.