Bloodstream infections as a marker of community-acquired sepsis severity. Results from the Portuguese community-acquired sepsis study (SACiUCI study)

J. Gonçalves-Pereira[1,2], P. R. Povoa[1,2], C. Lobo[3] and A. H. Carneiro[4]

1) *Polyvalent Intensive Care Unit, Sao Francisco Xavier Hospital, CHLO, Lisbon, Portugal,* 2) *CEDOC, Faculty of Medical Sciences, New University of Lisbon, Lisbon, Portugal,* 3) *Faculty of Medicine, Department of Biostatistics and Medical Informatics, CINTESIS, University of Porto, Porto, Portugal and* 4) *Santo Antonio Hospital, Porto, Portugal*

Abstract

The impact of bloodstream infection (BSI) on admission to hospital on the outcome of patients with community-acquired sepsis (CAS) admitted to intensive-care units (ICU) is largely unknown. We selected 803 adult patients consecutively admitted with CAS to one of 17 Portuguese ICU, in whom blood cultures were collected before initiation of antibiotic therapy during a 12-month period. A BSI was identified on hospital admission in 160 (19.9%) patients. Those with and without BSI had similar mean Simplified Acute Physiology Score (SAPS) II and age. The presence of BSI was independently associated with mortality in ICU (adjusted odds ratio 1.86; 95% confidence interval 1.20–2.89; p 0.005). On the 4th day in ICU, patients with BSI were found to be significantly more dependent on vasopressor support (p 0.002) but not on ventilatory support. Cumulative ICU mortality was significantly higher in BSI patients from the 9th day onwards. A seasonal variation of BSI isolates was noted: gram-negative BSI were more common in the summer, whereas in the winter, gram-positive infections were more frequent (p 0.024), without mortality differences.

Clin Microbiol Infect

Corresponding author: J. Gonçalves-Pereira, Unidade de Cuidados Intensivos Polivalente, Hospital de Sao Francisco Xavier, Centro Hospitalar Lisboa Ocidental, Estrada do Forte do Alto do Duque, 1449-005 Lisboa, Portugal
E-mail: joaogpster@gmail.com

Introduction

Despite great advances in the understanding of its pathophysiology, severe sepsis remains associated with high mortality, morbidity and costs [1]. Microbiological documentation, particularly of bloodstream infections (BSI), occurs in only a fraction of patients with community-acquired sepsis (CAS) [2].

The Surviving Sepsis Campaign guidelines [3] reinforce the need for obtaining blood cultures before starting antibiotic therapy in patients with CAS and with a high risk of dying to identify the causative microorganism and target antibiotic therapy. Our group, the SACiUCI (*Sepsis Adquirida na Comunidade e internada em Unidade de Cuidados Intensivos*) study group, had already shown that performing blood cultures in patients with severe sepsis and septic shock was independently associated with improved survival [4].

Hospital-acquired BSI is associated with excess length of stay, extra costs and excess mortality in critically ill patients [5]. However, data on BSI in patients with CAS is scarce. Furthermore, it is not known if the presence of a BSI by itself, complicating an identifiable focus of CAS, e.g. pneumonia or peritonitis, increases the risk of death.

In this study, we evaluate the impact of BSI on the mortality of patients with severe CAS.

Methods

The SACiUCI study is a prospective, multi-centre, observational study designed to evaluate the epidemiology of CAS in

patients admitted to Portuguese intensive-care units (ICUs). A detailed description of the study has been previously published [4,6,7]. Briefly, all patients older than18 years, newly admitted to the 17 participating ICUs, were consecutively enrolled during a 12-month period and followed up until death or hospital discharge. The study design was approved by the local Hospital Ethics Committees. Informed consent was waived because of the study's observational nature.

Patients with CAS, defined as the onset of infection before hospital admission or not present at admission but that became evident in the first 48 h, were eligible for further analyses. Presence of sepsis, severe sepsis or septic shock was defined according to the American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference criteria [8]. The presence of healthcare-associated infection (HCAI) was defined at hospital admission according to the presence of the following criteria: home infusion therapy or wound care; chronic dialysis or chemotherapy within 30 days; hospitalization for 2 days or more in the preceding 90 days; residence in a nursing home or extended-care facility [9]. Episodes of CAS were divided according to the primary infection focus. All data were managed by the Department of Biostatistics and Medical Informatics at the University of Porto, where a dedicated database for SACiUCI had been created.

All patients consecutively admitted with CAS who had blood cultures collected before initiation of antibiotic therapy constituted our study population. Data collection included demographic data and co-morbid diseases, clinical and laboratory data from hospital admission to the 5th ICU day (including C-reactive protein and temperature). The Simplified Acute Physiology Score (SAPS) II was computed for all included patients [10]. The days of ICU and hospital discharge were recorded. Microbiological and clinical infectious data were reported, along with the antibiotics prescribed. The microorganism's sensitivity to the antibiotics prescribed on the day of hospital admission was available in 343 of the 364 patients with positive microbiological cultures. Blood culture collection on the day of hospital admission and its results were closely scrutinized. Blood cultures with isolated microorganisms considered most likely to be contaminants were considered negative for further analyses. Patients' ICU and hospital outcomes, either discharge or death, were our primary outcome measures. Comparison between survivors and non-survivors was performed.

Statistical analysis

A single investigator in each participating centre performed data entry. Consistency of data was assessed with a rechecking procedure of a 10% random sample of patients (see Acknowledgements). Data were screened in detail (see Acknowledgements) for missing information and for implausible and outlying values.

Continuous variables were expressed as median (interquartile range) or mean ± SD according to data distribution. Comparisons between groups were performed with two-tailed unpaired Student's *t* test or Mann–Whitney *U* test for continuous variables according to data distribution. Fisher's exact test and chi-squared test were used to test association between categorical variables as appropriate.

A multiple logistic regression was fitted to assess the impact of BSI on mortality in patients with CAS, adjusting for age, SAPS II, sepsis severity, the presence of HCAI, and primary infection focus. Adjusted odds ratios (AOR) with 95% CI were computed.

The Hosmer and Lemeshow test was used to check goodness-of-fit.

Cumulative mortality for each day in the ICU was calculated for CAS patients either with or without BSI.

Data were analysed using PASW STATISTICS v.18.0 FOR MAC (SPSS, Chicago, IL, USA). All statistics were two-tailed, and significance level was defined as p <0.05.

Results

General description and outcomes

A total of 897 patients with CAS were included. In 94 patients, blood cultures were not performed on the day of hospital admission, resulting in 803 patients for analysis (age 58.4 ± 17.8 years; 65.3% male). At ICU admission their mean score on SAPS II was high, 47.9 ± 17.9, and 51% of the patients were in septic shock (Table 1). The overall ICU and hospital mortalities were 29% and 37%, respectively.

In 160 patients with CAS (19.9%) blood cultures returned positive. Patients with and without BSI had similar mean age and SAPS II. Nevertheless, the rate of septic shock at ICU admission was higher in patients with BSI (Table 1), although not reaching statistical significance (58.8% versus 50.5%, p 0.086).

The main primary focus of infection in our patient population was the lung (60.6%); however, among the patients with BSI, only 36.9% had a lower respiratory tract primary infection focus. In contrast, despite the fact that the urinary tract was the primary infection focus in only 7.8% of CAS patients, it was present in 16.3% of the BSI episodes (p <0.001) (Table 1).

In the multivariable analysis, the presence of BSI at hospital admission was found to be independently associated with ICU mortality, 39.4% versus 26.4%, (AOR 1.86; 95% CI