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EXTENDED ABSTRACT

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Procalcitonin in burn patients: diagnosis of sepsis and prognosis of death in the first week

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Background

Despite the continuous advances in burn care and infection control over the last decades, mortality rate is still significantly high, and sepsis keeps being the main cause of death in burn patients. With large areas of the skin damaged, a subsequent state of systemic inflammation and compromised immune system develops, causing these patients to be greatly susceptible to infections and sepsis which, if not quickly treated, can lead to multiple organ dysfunction and death. Therefore, a fast diagnosis and prompt administration of antimicrobial therapy are of most importance to reduce morbidity and mortality associated with sepsis[1]. However, in burn patients, clinical diagnosis of sepsis is often difficult because there is an overlap of signs and symptoms between the systemic inflammatory response and true sepsis. Several biomarkers for the diagnosis of sepsis were researched in the last decades, but procalcitonin (PCT) has been reported multiple times as the most accurate diagnostic biomarker for sepsis when compared with conventional markers, that often lack specificity, and it is currently used in many hospitals. PCT levels were shown to be significantly higher in patients with sepsis and PCT elevation is correlated with severity and outcome. Moreover, increasing levels of PCT after admission to the burn units were demonstrated to be a good predictor of death and useful for the identification of patients with higher risk of adverse outcomes. The aim of this study was to assess PCT variation in the first week of hospitalization of burn patients and its potential contribution for the diagnosis of sepsis and prognosis of death[2].

Material and methods

One hundred and forty-two patients comprising 15% or more of total burn surface, admitted consecutively from January 2011 to December 2014 at Coimbra Burns Unit (CBU), Portugal, were included in the sample. Clinical diagnosis of sepsis of all patients was according to American Burn Association criteria[3]. Range and median values of PCT during the first seven days of hospitalization were used for the statistical analysis. The quantitative variables were analysed with Mann–Whitney U tests and qualitative variables were analysed with Pearson chi-square tests. Receiver operating characteristic (ROC) curves were performed to evaluate the discriminatory power for sepsis diagnosis and death prognosis. The most accurate cut-off value was calculated by the Youden Index[4]. Sensitivity, specificity, positive and negative predictive values were calculated for the cut-off values. Statistical analysis was performed with R version 3.6.1 2019-07-05 © 2019 The R Foundation for Statistical Computing and RStudio Version 1.2.1335 © 2009-2019 RStudio, Inc.

Results

The sepsis group (n=68) and the no sepsis group (n=74) showed homogeneity in age and gender, while the remaining variables, namely, burn severity index, burn degree, inhalation injury, mechanical ventilation, days of mechanical ventilation, length of stay and mortality showed significant differences between both groups. The survivors group (n=109) and the non survivors group (n=33) showed homogeneity in terms of gender and length of stay, while all other variables were significantly different. Both first week PCT range and median values were higher in the sepsis and non-survivor groups and were statistically significant for sepsis diagnosis and death prognosis. PCT median stood out with the greatest area under the curve (0.82), being significantly better than PCT range. For the diagnosis of sepsis, the cut-off of 0.3 ng/mL presented a sensitivity of 0.75 (median) and 0.78 (range) and a specificity of 0.66 and 0.65 (respectively).

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For the prognosis of death, PCT range cut-off of 0.6 ng/mL presented a high sensitivity (0.76) and lower specificity (0.64) whereas PCT median cut-off of 1.3 ng/mL was less sensitive (0.64) and the most specific (0.85).

Conclusion

PCT levels' variation in the first week of hospitalization of burn patients is significantly related with sepsis diagnosis and death prognosis. Monitoring the variation of PCT levels in the first week of hospitalization, together with other measures and rigorous clinical examination, may contribute to an early detection of sepsis, potentially reducing morbidity and mortality, and be useful for the prognosis of death and stratification of patients.

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