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Characterization of critically ill adult burn patients admitted to a Brazilian intensive care unit

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ABSTRACT

Introduction: To characterize the evolution of clinical and physiological variables in severe adult burn patients admitted to a Brazilian burn ICU, we hypothesized that characteristics of survivors are different from non-survivors after ICU admission.
Methods: A five-year observational study was carried out. The clinical characteristics, physiological variables, and outcomes were collected during this period.
Results: A total of 163 patients required ICU support and were analyzed. Median age was 34 [25,47] years. Total burn surface area (TBSA) was 29 [18,43]%, and hospital mortality rate was 42%. Lethal burn area at which fifty percent of patients died (LA50%) was 36.5%. Median SAPS3 was 41 [34,54]. Factors associated with hospital mortality were analyzed in three steps, the first incorporated ICU admission data, the second incorporated first day ICU data, and the third incorporated data from the first week of an ICU stay. We found a significant association between hospital mortality and SAPS3 [OR(95%CI) = 1.114(1.062–1.168)], TBSA [OR(95%CI) = 1.043(1.010–1.076)], suicide attempts [OR(95%CI) = 8.126(2.284–28.907)], and cumulative fluid balance per liter within the first week [OR(95%CI) = 1.090(1.030–1.154)]. Inhalation injury was present in 45% of patients, and it was not significantly associated with hospital mortality.
Conclusions: In this study of an ICU in a developing country, the mortality rate of critically ill burn patients was high and the TBSA was an independent risk factor for death. SAPS3 at admission and cumulative fluid balance in the first seven days, were also associated with unfavorable outcomes. The implementation of judicious fluid management after an acute resuscitation phase may help to improve outcomes in this scenario.

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Abbreviations: ICU, intensive care unit; TBSA, total burn surface area; LA50%, lethal burn area in which fifty percent of the patients died; APACHE, acute physiology and chronic health evaluation; SAPS, severity acute physiological score; ABSI, abbreviated burn severity index; SBE, Standard Base Excess; SvO_2, venous oxygen saturation; RRT, need for renal replacement therapy; SOFA, sequential organ failure assessment; ROC, receiver operating characteristic; VIF, variance inflation factor.

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1. Introduction

Burn is an important cause of morbidity and mortality. Severe cases carry a high risk of physical, emotional, cultural and economic sequelae, not only for the victims but also for society [1]. Burns are common and frequently involve small areas needing only ambulatory treatment. However, more complex patients require hospitalization and intensive care unit (ICU) support [2].

The characteristics of adult patients with burns admitted to the hospital are well described [1,3]. By contrast, data on adult burn patients who need ICU admission are scarce [4–6]. Moreover, very little data on the outcomes of critically ill adult burn patients from low-middle income countries are available. Only one study has explored these features from resource-constrained settings, and this analysis included predominantly very young, non-ventilated patients [6]. Some reasons related to the lack of ICU data on adult burn patients may include the rarity of great thermal injuries [7], burn prevention campaigns [8], the absence of dedicated reporting about burn patients from mixed ICUs, and an improvement in early specific care in burn units that avoids complications and precludes ICU admissions [9].

Knowledge regarding the clinical characteristics, risk factors for mortality, and outcomes of severe burn patients requiring intensive care in low-middle income countries is essential to assist in the decision-making process for care improvement and better resource allocation. Thus, the aim of this study was to characterize severe adult burn patients admitted to a Brazilian burn ICU, with the hypothesis that survivors diverge from non-survivors early in ICU admission. Therefore, the parameters related to hospital mortality were analyzed to improve potential future interventions.

2. Methods

2.1. Patients' enrollment

Data from burn patients who were more than 16 years old and admitted to the burn intensive care unit (a four beds ICU) of a tertiary university hospital in São Paulo – Brazil (Hospital das Clínicas – University of São Paulo) from May 2005 to April 2010 were retrieved from a prospectively observational database. Of 710 patients admitted to the burn unit, 163 (23%) patients were admitted to the burn ICU (Fig. 1). The criteria used to admit patients into the ICU were: a total burn surface area (TBSA) $\geq$ 20%; inhalation injury; a need for mechanical ventilation; electrical injury; burn shock; associated severe trauma; and severe renal failure. The study was approved by the local Hospital Ethics Committee (Protocol n° 235.362) and written informed consent was waived due to the observational nature of the data collection. Usual care, as described below, was provided to the patients during the study.

2.2. Study definitions

- Total burn surface area (TBSA): second and third degree burn area extension estimated according to the Lund and Browder diagram [10].
- Lethal burn area in which fifty percent of patients died (LA50%): calculated based on the binary logistic regression model, using mortality as the dependent variable and TBSA as the independent variable [11].
- Inhalation injury: exposure to fire and smoke in an airtight environment in combination with carbon coating on the face, facial burns, singed nasal vibrissae, singed eyebrows, carbon in the tracheal aspirates or sputum, upper airway edema, a brassy cough and hoarseness, and bronchoscopic findings of airway edema, inflammation, mucosal necrosis, charring and soot [12].
- Associated trauma: bone fractures, brain injury and chest and/or abdominal blunt trauma.
- Body weight: in patients who were able to speak, the actual weight was self-reported, while in the others the weight was estimated according to the gender and height.
- Abbreviated burn severity index (ABSI): This is a specific score that has been developed to predict the hospital mortality rate of burn patients. This consists of epidemiologic variables, such as age and gender, associated with the characteristics of burn trauma, such as inhalation injury, TBSA and the presence of a full thickness burn [13].
- Ryan's score: This is a specific score that has been developed to predict the hospital mortality rate of burn patients. This consists of three clinical variables: age greater than 60 years old, a TBSA greater than 40%, and the presence of inhalation injury [14].
- Simplified Acute Physiology Score (SAPS) 3: This is a score that has been developed to predict the hospital mortality rate in patients admitted to the general ICU. It uses epidemiological variables including the origin of the patient

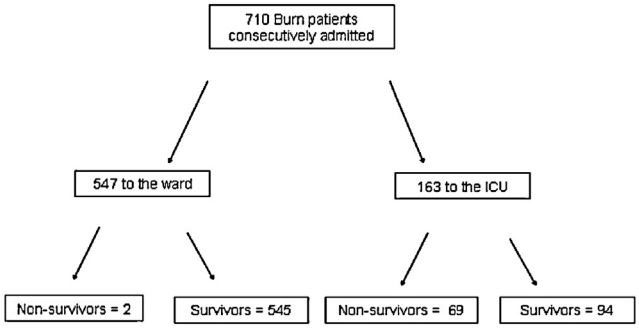

Fig. 1 – Flowchart of the study.