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A 10-year experience with major burns from a non-burn intensive care unit

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ABSTRACT

Objective: The aim of this study was to review clinical data and outcomes of patients with burns in a Mexican non-burn intensive care unit (ICU).

Methods: We did a retrospective analysis of our single-centre database of burn patients admitted to the ICU in the Hospital Civil Fray Antonio Alcalde (University Hospital). The sample was divided for analysis into two groups according to the outcome 'death' or 'discharge' from ICU.

Results: Overall mortality was 58.2%, without a decreasing trend in mortality rates through the years. We identified the presence of third-degree burns (odds ratio (OR) 1.5, $p = 0.003$), and >49% total burned surface area (TBSA; OR 3.3, $p \leq 0.001$) was associated with mortality. Mean age was higher in deceased patients (38.2 years vs. 31.3 years, $p = 0.003$) as was the TBSA (62.8% vs. 36.4%, $p \leq 0.001$). At multivariate analysis, inhalation injury was not associated with increased mortality, but it was with more mechanical ventilation days. Early surgical debridement/cleansing was performed in most patients; however, the mean of the procedures was 1.7 per patient in both groups.

Conclusion: We identified significant factors associated with mortality. These variables and prognosis from non-burn ICUs differ broadly compared with burn intensive care units (BICUs); thus, more structured, multidisciplinary and specialised treatment strategies are still needed.

Major burns are injuries with necrosis at the epidermis and the dermis, resulting from thermic, chemical, electric or radiation exposure [1], with children and the elderly being the most affected [2]. Although scalding injury is the most common mechanism of injury in adults at emergency departments, direct fire is the most common mechanism in hospitalised cases, especially in men, which is associated with greater mortality [3,4].

The main risk factors associated with mortality identified so far are age, inhalation injury and total burn surface area (%TBSA) [5–8]. Age contributes significantly to mortality, as survival in most paediatric population series is around 90–100%. Airway injury is reported in up to 43% of all hospitalised patients with major burns, giving an 8–10-fold risk of death [9]. In addition, there is a marked correlation between %TBSA and death rising considerably from >20% TBSA [5].

In a systematic review with >186,500 patients in Europe, Brusselaers reports a mortality rate from 1.4% to 18% (maximum 34%) in major burn patients [10]; however, much of these data come from reference centres, patients with a mean %TBSA between 11% and 24%, with less strict admission criteria, and patients not necessarily critically ill. On the other

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hand, mortality has been changing around the world, with a decreasing trend at almost 50% approximately, due to advancements in initial resuscitation, antibiotics and wound care [11].

Besides a paediatric report from a Trauma Burn Unit at 'Magdalena de las Salinas' Hospital, Mexico [12], there are no epidemiologic data published about adult critically ill burn patients from Mexico. With the goal of finding relevant data that could help us to improve the outcomes of our patients, we did a retrospective analysis of the past 10 years' experience in management of critically ill burn patients at our unit.

1. Materials and methods

1.1. Setting

Hospital Civil de Guadalajara "Fray Antonio Alcalde" is a third-level university hospital with 964 licensed beds in which approximately 144,500 patients are attended to at the emergency room every year [13], including patients from Jalisco and neighbouring states of the country. We do not have a multidisciplinary triage system around the region for burn patients without health insurance; therefore, most patients with burns are hospitalised from an emergency department to our open, medical-surgical, 14-bed intensive care unit (ICU), as this is the only facility available for treating critically ill burn patients in our centre. The plastic surgery department is responsible for surgical and wound care of the patients.

1.2. Patients

We did a review of our local database, including all patients with 'major burn' as the main diagnosis hospitalised from August 2002 to November 2012. Inclusion criteria for analysis were major burn, as defined by American Burn Association [14], namely a TBSA ≥25% (>20% in >40-year-old patients or >10% third-degree burns); burns involving eyes, ears, face, hands, feet or perineum; electric burns and/or co-morbid injuries like major trauma or inhalation injury. Exclusion criteria were superficial burns and <14-year-old patients.

A plastic surgeon on call assessed burn extension and depth according to the Lund–Browder scheme [15]. The diagnosis of inhalation injury was based on the need for mechanical ventilation [5,11] associated with clinical data like singed nasal or facial hair, carbonaceous sputum/matter in the nose, mouth or oropharynx, as well as the accident occurring in a closed space, from a blast injury or known exposure to hot gases; a pO_2/FiO_2 ratio ≤300 at admission also supported diagnosis but was not necessary. It was not possible to discriminate between upper or lower injury because of the unavailability of bronchoscopy. The laboratory in our centre lacks the facilities to measure carboxyhaemoglobin or cyanide levels. The diagnosis of ventilator-associated pneumonia (VAP) was based on new lung infiltrates observed in chest X-rays along with purulent sputum from the endotracheal tube, fever, elevated white blood cells and/or another biochemical markers of acute inflammation at >48 h from admission; bacterial isolation was not strictly necessary. In our unit, every patient with a TBSA >15% undergoes fluid resuscitation based on the Parkland formula [16]. Discharge from the ICU to the general ward is indicated when haemodynamic stability and/or extubation is attained, continuous cardiopulmonary monitoring is not needed, wounds are almost healing, patients are on enteral nutrition and rehabilitation has been initiated.

1.3. Statistical analysis

The entire sample was divided into two groups 'death' and 'discharge' (from the ICU) for analysis. We made bivariate comparisons between the groups using Pearson's chi-square or Fisher's exact test if needed; for continuous variables, we employed Student's *t*-test or Mann–Whitney *U* test as adequate, based on Shapiro–Wilk test for normality. To define the %TBSA associated with increased mortality, we built a receiver operating characteristic (ROC) curve and calculated L50-%TBSA (%TBSA predicting 50% mortality) with probit regression analysis. We also calculated Spearman's correlation between nonparametric data, as well as Mantel–Haenszel's stratified analysis and binary logistic regression between multiple variables. All *p* values were two-tailed and 0.05 was considered statistically significant. Analysis was made with Statistical Package for the Social Sciences (SPSS) for MAC OSX (IBM, Ver. 20.0, SPSS Inc. 2011).

2. Results

The total sample included 146 patients, 28 (19.2%) were women and 118 (80.8%) were men; the mean age was 35 years. Only second-degree ($n = 86$, 58.9%) and third-degree burns ($n = 60$, 41.1%) were registered. Mean TBSA was 51.8%. The most common cause was direct fire ($n = 120$), as seen in Fig. 1.

With respect to other acute co-morbidities, 74 patients (50.7%) suffered inhalation injury, three (2.1%) had a diagnosis of mild traumatic brain injury, three (2.1%) had medullary trauma, seven (4.8%) had long bone fracture and laparotomy for traumatic acute abdomen was performed in three (2.1%) patients.

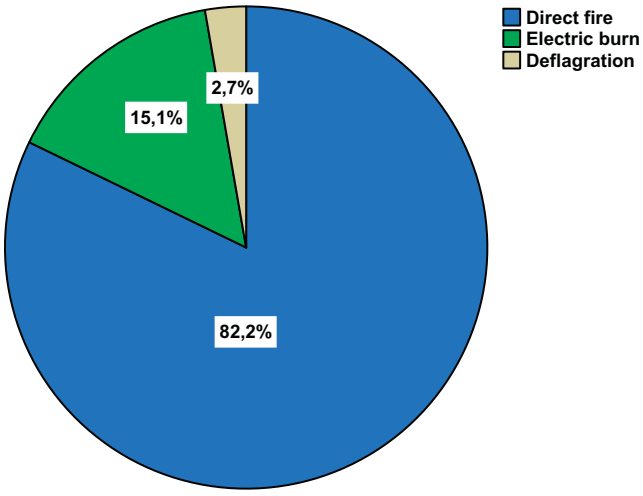

Fig. 1 – Causes of burns, expressed in percentages.