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Risk factors for mortality in burn children

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ABSTRACT

Studies about risk factors for mortality in burn children are scarce. We conducted this study to evaluate the risk factors for mortality in pediatric burn patients. We included 110 patients. Mean age was 31.5 months (range: 1 to 204). The burn surface was between 1% and 95% (median 27%) Type of burn was: A or superficial in 39 patients (36%), AB or intermediate in 19 (17%), and B or full thickness in 52 (47%). Inhalatory injury was present in 52 patients (47%). Invasive procedures were: venous catheter, 90 patients (82%), arterial catheter, 83 patients (75.5%), urinary catheter, 86 patients (78%), and mechanical ventilation, 75 patients (68%). In 84 patients, 128 infections were diagnosed. In 53 cases (48%). Multiresistant *Pseudomonas aeruginosa* and *Acinetobacter baumannii* were the most common organisms isolated. The median length of hospital stay was 33 days (r: 8–139 days). Seventeen patients (15%) died and 14 of them of infection-related causes. Age \leq 4 years, Garcés 4, full thickness burn, \geq 40% burn surface, presence of inhalatory syndrome, use of venous catheter, arterial catheter, urinary catheter and mechanical ventilation, positive blood cultures, colistin use in documented multiresistant infections, antifungal use and graft requirement, were identified as risks factors for mortality in the univariate analysis. By multivariate analysis: age \leq 4 years, Garcés 4, colistin use in multiresistant infections, mechanical ventilation and graft requirement were independent variables related with mortality.

Conclusions: In this series of burn children age \leq 4 years, Garces index score 4, colistin use in documented multiresistant infections, mechanical ventilation and graft requirement were identified as independent variables related with mortality.

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Introduction

Burns are very frequent and affect approximately 1% of the general population every year.¹

The immunocompromising effects of burns, hospital stay; diagnostic and therapeutic procedures put these patients at increased risk of morbidity and mortality. In the last few years patients who survived to burn injury has increased,

but despite advances in the management of burn patients, infections remain the most common cause of morbidity and mortality following burn injury.^{1,2}

The mortality rate in burn centers varies depending on different factors, like age of patients, being the extremes of life more vulnerable, and particularly the pediatric population aged less than four years. Furthermore, type and mechanisms of burns have also been associated with mortality.

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Full thickness burns, burns secondary to flame associated with inhalation injury have higher rate of infections and mortality.¹⁻⁵

Localization of burns in perineal area and face has increased risk of mortality too.⁵

In developing countries mortality due to infections is very high and an important risk factor to prevent.

The literature reporting on mortality risk associated with burn in childhood is scarce. Therefore, risk factors for mortality are not well known and strategies for their prevention and the prompt referral of the patients to specialized centers cannot be implemented.

The aim of this study was to evaluate epidemiological features and risk factors for mortality in cases of childhood burn admitted in our tertiary hospital.

Patients and methods

All children with acute burns admitted to the Burn Center at J. P. Garrahan Hospital between June 2007 and December 2009 were included.

Type of study: prospective and observational study. Patients were followed prospectively during hospitalization and data collection was made through discharge or death.

Definitions

Independent variables

- (1) Gender: male–female.
- (2) Age in months.
- (3) Type of burn: superficial (A), intermediate (AB), and “full-thickness” or (B).
- (4) Mechanisms of burns: classified as: flame, scalds, inflammables liquids; explosion, and others mechanisms.
- (5) Burn surface: Defined as percentage of body according Lund & Bowder chart.⁵
- (6) Garcés’ Index: it is an index of prediction for mortality and is calculated according the following formula⁶:
40 – age of patients + the percentage of burn body surfaces for 1 (burn type A), for 2 (AB) or for 3 (B).
0–60 points: first degree (low risk).
61–90: second degree (moderate risk).
91–120: third degree (severe risk).
≥121: fourth degree (critical).
- (7) Invasive procedures: use of mechanical ventilation, central venous line, arterial and urinary catheters.
- (8) Inhalation syndrome: suspected in facial burn, stridor, and/or exposure to heavy smoke and confirmed by endoscopic examination.
- (9) Type of infections were defined according to The American Burn Association⁷ and based in clinical and/or microbiological parameters.
- (10) Positive blood culture.
- (11) Type of microorganisms isolated in sterile material.
- (12) Use of colistin: in patients with documented infections by multiple-resistant microorganisms only susceptible to colistin or, in some cases the use was empirical, pending culture results.

(13) Use of antifungal drugs.

(14) Type of surgical treatment: scarectomy and graft requirement.

Dependent variable

Mortality: mortality was considered infection related if the patient had clinical and/or microbiological evidence of infection at the time of death.

Microbiology

Cultures: blood cultures, wound cultures, and urine cultures were taken when appropriate according to clinical features.

Cultures were performed according to the Clinical Laboratory Standard Institute (CLSI) methods. Susceptibility testing was performed according to the CLSI using automated methods.⁸

Multiresistant *Pseudomonas* spp. and *Acinetobacter* spp. were defined as resistant to at least three classes of drugs (e.g. beta-lactam antibiotics, carbapenems, aminoglycosides, and fluoroquinolones).

Treatment

Antibiotic treatment was indicated in the presence of positive cultures and/or according to clinical features.

Statistical analysis

Data were summarized in frequencies and percentages for categorical variables and as means and ranges (for continuous variables). The Mann–Whitney Rank Sum test was used to assess differences between groups for two continuous variables. Dichotomous variables were analyzed using the Chi-square test (with Yates correction). To estimate the multivariate predictive value of independent covariates for mortality stepwise multiple logistic regression models were used (software in <http://statpages.org/logistic.html>) including all significant variables in univariate analysis.

The predictive value for each covariant was expressed as the relative risk (RR) and 95% confidence interval. A *p*-value of ≤0.05 was considered significant for both sides.

This study was approved by the Ethics committee of the Hospital J. P. Garrahan.

Results

Epidemiological characteristics

We included 110 patients.

The median age of patients was 31.5 months (range: 1–204), and 71 patients (65%) were male.

Underlying diseases were found in six patients (5%): genetic syndrome in two patients, one metabolopathy, one oncohematological disease, one cardiopathy, and one patient with neurological disease.

Mechanism of burns was flame in 43 patients (39%); scalds, 31 patients (28%); inflammable liquids, 20 patients (18%);

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