

Risk Factors for Infection and Mortality in  
Burned Children: Where are we going?

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Burns are very frequent and affect approximately 1% of the general population every year. The immunocompromising effects of burns, hospital stay; diagnostic and therapeutic procedures put those patients at increased risk of morbidity and mortality. Pediatric burn patients are susceptible to a broad spectrum of infections representing the most common and severe complication in this population.

Over the last few years patient survival after burn injury has increased; however, despite advances in the management of burn patients, infections remain the most common cause of morbidity and mortality.

In burn units in developing countries mortality is very high and an important to prevent.

Reported mortality varies between 3.5% and 7%, and infections are the main cause of death in burn units. Studies on mortality focusing on risk factors in the pediatric population remain scarce.

Studies on risk factors associated with the development of infection and mortality are necessary.

In our multivariate analysis published about risk factors for infection in burn children [1] the presence of venous lines, antibiotic prophylaxis, and graft requirement were independent risk factors for infection in burned children.

## However what can we change to avoid them?

The presence of a line or catheter was an independent risk factor for infection and, since this may be a modifiable risk factor, prevention measures should be maximized at the time of line or catheter insertion and while the vascular access is maintained. Infection prevention has been attempted with the use of antibiotics-impregnated lines or catheters, more frequent line or catheter replacements, a strict control of the insertion procedure, among other measures. Results have been variable. Colonization was registered more frequently in the catheter close to the burned area. Thus some authors concluded that the line or catheter should not be inserted near the burned area or replacements should be more frequent. In pediatric patients, this is complicated by the lack of venous access and burn extension on the child's total body surface area.

A graft is considered as the best definitive treatment and has proven to be useful for infection prevention. Graft requirement was an independent predictive factor for infection in our patients. However, since this is correlated with burn depth and a greater burned body surface area, it could be concluded that these factors would be related to the fact that the graft was not a protection factor against infection or that, in average, the graft was placed later in the infected group.

One of the challenges in burn units at the time of preventing infections is the adequate use of antibiotics, whether topical or systemic. We concluded that, in children, the routine use of prophylactic antibiotics is not beneficial and may increase the risk of multi-resistant germs so education for the prudent use of antibiotics is very important tool in burn units.

Other risk factors associated with infections are mechanical ventilation which has been related to ventilator-associated pneumonia in critical patients. In our study, it was not an independent risk factor for infection. A urinary catheter is associated with the risk of urinary tract infection. In our series, it was not an independent risk factor for infection. Balneotherapy can be a potential source for microorganism transmission that may be avoided if recommendations for prevention are adequately followed. In this study, balneotherapy was not an independent risk factor for infection.

A burn patient may die because of different causes: shock in the first hour's post-burn, respiratory failure, usually secondary to inhalation syndrome, multiple organ failure secondary to the extension and deepness of the burn wound, among others.

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 sometimes.

Awareness of risk factors related to increased mortality in burn patients allow for extreme safety measures and adequate referral of patients to tertiary care centers to be implemented.

In our study about risk factors for mortality in burn children [2] the high mortality rate (15%) could be attributed to the fact that our facility is a referral center for critical patients, and may have caused patient selection bias. Infection was the leading cause of death.

Age  $\leq 4$  years, Garcés' score 4 (severity' score), colistin use in documented multi-resistant infections, mechanical ventilation and graft requirement were independent variables associated with mortality.

Age less than four years has been considered as a major risk factor for mortality in children in line with our report.

A high Garcés' score was significantly associated with a higher risk of death. Type B, "full thickness" burns has been viewed as a risk factor by several authors a finding that was confirmed in the present study.

Inhalation syndrome is a clear and strong predictor of mortality. In univariate analysis inhalation syndrome was a predictor of mortality in our patients but not significant in multivariate analysis. Nevertheless, requirement of mechanical ventilation was significantly related to mortality and may indirectly reflect this condition in some cases.

Infectious complications are associated with increased risk of mortality and the development of sepsis is a predictor of poor outcome. The majority of patients in our study died because of sepsis. Multiresistant *Acinetobacter* spp. and *P. aeruginosa* have emerged as important microorganisms in critical areas such as burn units and

are related with increased mortality. A high proportion of infections in our study were caused by multi-resistant *P. aeruginosa* and *Acinetobacter* spp.

The use of Colistin in documented multi-resistant infections was associated with mortality in our series. It is possible that this association indirectly reflects the impact of multiresistant Gram-negative bacteria, although univariate and multivariate analyses did not show a relationship between type of infection, type of microorganism and mortality.

Early surgical excision and temporary or permanent closure with grafts are important measures for prevention of infections. In our series graft requirement was a protective factor for mortality as pointed out in the literature.

Knowledge on risk factors for infection and mortality could be useful for the development of strategies to prevent this outcome which together with adequate referral to specialized centers will warrant a better management of these vulnerable patients.

Although the sample size of the papers commented are not large enough to draw definitive conclusions, these findings are important and serve as the foundation to continue studying these patients to collect a larger population to evaluate risk factors for infection and mortality in burn children and how to prevent them.

There remains much to be done to prevent infection and death in burned children: An important future challenge!

## References

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