EPIDEMIOLOGY OF MAJOR BURNS AT THE LEBANESE BURN CENTER IN GEITAWI, LEBANON

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SUMMARY. Burn care is one of the few areas in medicine considered both medically and surgically challenging, with burn injuries affecting people of all ages and both sexes. Between May 1992 and March 2012, 1,524 patients were admitted to the Lebanese Burn Center in Geitawi, with an average length of stay (LOS) of 36.5 days. The most frequently encountered injuries were thermal burns, generally resulting from domestic accidents. Of our patients, 47% were from rural areas and burned body surface (BBS) was the most serious factor, with 36% of all those admitted having suffered burns of 20% to 40% of their total body surface area (TBSA). Our team of experienced physicians, nurses, nutritionists and physical therapists was essential to successful burn care and outcomes were improved with adequate early fluid intake. The main causes of death were multiple organ failure due to hemodynamic instability, followed by respiratory failure from inhalation injury. A week after the injury, risk of infection was the main threat to the burn victims. Although this threat was compounded by malnutrition and immunodeficiency, excessive use of antibiotics was not justified. The fatality rate was about 18% and correlates with higher TBSA percentage of the burn.

Keywords: TBSA, thermal burn, inhalation, sepsis

Introduction

The Lebanese Burn Center in Geitawi is a national intensive care unit which receives patients who arrive on their own accord as well as those sent via various health institutions around the country. It has 6 rooms with 10 beds each, including 2 beds for serious burns and an operating room. The multidisciplinary team, consisting of the burn surgeon, anesthesiologist, nurses, therapists and nutritionists has proven to be the most efficient method for treating major burn injuries.

To date, the unit has treated 1,524. This experience enables us to determine the main causes of burns and mortality, and also to propose a treatment regimen that can aid prevention and improve treatment results.

Materials & Methods

This study is a review of the Burn Center’s work over a period of 18 years from May 1992 to March 2012.

Upon admission, patients were received by the anesthesiologist/re-animator, who was required to ignore the burn and, as with any form of trauma, check the airways, breathing, and circulation in accordance with strict procedure.¹

Inhalation injury was suspected in all patients with flame burns; hoarseness, expiratory wheezing, and carbonaceous sputum were all positive signs of an inhalation injury.¹ Patient history was important when assessing the extent of the injuries and thus epidemiologic data was gathered to identify the patient’s age, sex, and origin, as well as the circumstances, time, type, depth, TBSA, and any prior treatment of the burn.

The following criteria was used for admission: adults with second and third degree burns, adults with 15% to 20% TBSA or greater, children with less than 10% TBSA, inhalation injuries, electrical burns, and extended chemical burns.²

Patients were weighed upon admission and a weight curve was conducted. A low threshold was required for endotracheal intubation, especially if an inhalation injury was suspected. Facial burns could lead to severe edema, rendering later intubation impossible.³

The initial biological assessment served as a reference and included daily determination of hematocrit levels, albumin, renal function, and electrolytes to assess the effectiveness of hydration and the impact of fluid leakage on renal function. ECG tests were conducted on patients with electrical burns.

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Both peripheral and central venous lines were placed for fluid transfer. The purpose of fluid replacement was to maintain adequate tissue perfusion and oxygenation. The Parkland formula was used to calculate the resuscitation volume: the amount of Lactated Ringer solution fluid (ml) required in the first 24 hours after the injury was 4cc x patient’s weight (kg) x TBSA percentage of burn. Half the volume was given in the first 8 hours after the injury. It was important to remember that the volume calculated must be given from the time of injury. 3 Urine output of 30cc to 50cc per hour for adults and greater than 1cc x patient’s weight (kg) per hour for children proved an excellent guideline for adequate fluid resuscitation. 3

As burn wounds are prone to tetanus, any patients with an unknown immunization status required hyperimmune serum, whereas patients immunized within the previous 5 years did not.

Although thermal injury causes profound immunosuppression, prophylactic systemic antibiotics were not used as they don’t reduce septic complications and only lead to increased bacterial resistance. 1 These antibiotics were used when escharotomies were required for full thickness circumferential burns of the extremities or the chest wall when the eschar compromised thoracic cage extrusion. 2

Topical antimicrobial dressings, with silver sulfadiazine applied locally over greasy gauzes, were used to prevent skin microbial contamination. Dressings were renewed every 3 days in aseptic conditions. It was also important to bear in mind that no topical antimicrobials could eliminate bacterial colonization of major burn wounds. 4

For analgesia, paracetamol IV and subcutaneous morphine were used.

Results

1,524 patients were admitted, of which 938 (61%) male and 586 (38%) female. The average age was 34 years (ages ranged from 5 months to 98 years). The majority of patients were aged between 15 and 40 years old, followed by children up to the age of 10 (Fig. 1).

Domestic accidents were the most common, accounting for 56% of cases (Fig. 2). Domestic accidents mainly occurred in the kitchen or resulted from fraudulent manipulation of electric meters.

Thermal burns were the most common (90.7%), including 27.9% by flame and 62.8% by hot liquid. Electrical burns accounted for 6.9% of the cases (Fig. 3). 47% of the patients lived in rural areas (Fig. 4). 36% of cases presented 20% to 40% TBSA (Fig. 5).

The average length of stay in the burn unit was 36.5 days.

Injuries were mostly to the face and limbs. The main sites of infection were the skin, the catheters and the urine. The main types of infection were Pseudomonas, E. Coli, Staphylococcus and Acinetobacter species. It is important
to note that, between 1992 and 2006, the most prevalent pathogens were Pseudomonas Aeruginosa and S.Aureus. In the later years, we began finding Acinetobacter as commonly as Pseudomonas. 20% to 30% of patients suffered weight loss, and it was in these patients that infections evolved pejoratively.

A mortality rate of 18% was recorded, with half the deaths occurring in the first week. Over the years, the number of deaths decreased. Thanks to new generation antibiotics, better patient nutrition, and better training of the burn center team, mortality was reduced to around 10%. The main causes of death were firstly hydroelectrolytic disturbances, then inhalation injuries, then sepsis after the first week of injury (Fig. 6). The percentage of death correlates with TBSA (Fig. 7).

**Discussion**

Most victims of major burns come from poor, underdeveloped areas. These people have little formal education and are either low skilled temporary workers or unemployed. In these areas, there is more frequent usage of lamps and candles due to the lack of electricity. The most common accidents among children occur at preschool age and are due to hot liquid burns in the kitchen at meal preparation times.

143 patients were admitted with serious burns. When the TBSA exceeds 25%, even before respiratory failure, the early morbidity and mortality of these patients is caused by fluid translocation. The release of inflammatory mediators can lead to decreased cardiac output and increased vascular permeability. The purpose of fluid resuscitation is to replace fluid lost through the skin and into the interstitium from systemic capillary leakage. Some studies even showed, that fluid is not only deposited in the interstitial space but that marked intracellular edema also develops. 13% of cases required pressors for myocardial depression.

The prognosis is made worse by respiratory damage, which is the second most common cause of death from day 2 to week 2 after the injury. Thermal burns caused by flames were responsible for most of these deaths. 70% of cases involved facial burns. Evaluation of inhalation injuries included an arterial blood gas and test of carboxyhemoglobin levels. Early intubation is necessary to prevent respiratory distress. In addition to the respiratory tract injury, bronchial lesions are aggravated by vasoactive mediators which are liberated by the burned tissues, as well as by the bronchial epithelium after direct inhalation of toxic particles.

The infectious phase was noted after the first week of injury. Antibiotics were not used systematically, except in cases of electrical burns, when escharotomies were made, or for late arrivals to the center. Contributing factors to the risk of infection are: prolonged stay in the intensive care unit, prolonged periods of intubation, high colonization potential of burn eschar, and indwelling vascular and

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**Fig. 5** - Percentage of burn patients by TBSA.

**Fig. 6** - Percentage of death relative to the cause of the death and to the TBSA.

**Fig. 7** - Mortality rate relative to TBSA.
bladder catheters. Presumptive broad spectrum antibiotics were administered until directed otherwise by multiple culture results. The situation is also worsened by the burn patient’s hypercatabolic state, leading to malnutrition which further depresses resistance to infections. Cachexia is a very severe and potentially fatal complication of poor nutritional support in catabolic burn patients. The burn team’s nutritionist was therefore consulted to make appropriate adjustments to the patient’s diet plan. The adjusted feeds, whether oral or enteral, were initiated as soon as possible following admission. Parenteral nutrition is rarely required in burn patients, and is generally reserved for patients in a critical state. However, the most common indications of this requirement are prolonged post-op or narcotic induced ileus that cannot be resolved with medication.

Conclusion

Burns are a serious public health problem given the age of the population concerned and the high mortality rate. Thermal burns are the most prevalent. The early phase of managing burn injuries is principally concerned with hemodynamic disturbances, can which lead to multiple organ failure. The second phase primarily involves dealing with respiratory issues. In the later phase, focus moves to the risk of infection, which is exacerbated by malnutrition and immunodeficiency. It is worth noting that, over the years, there were many developments within our team, resulting from continuous training in Lebanon and abroad, and regular round table meetings to discuss ways of improving the quality of patient care.

Finally, as more than 60% of accidents are due to human error, these must be avoided through nation-wide preventative action. Knowledge and understanding of burn epidemiology should be used to deliver nationally coordinated multidisciplinary action to educate people, especially those most at risk, on how to avoid burn injuries.

RÉSUMÉ. Le traitement des brûlés est l’un des rares domaines de la médecine qui sont à la fois médicalement et chirurgicalement difficiles. En plus, les brûlures affectent les personnes de tous âges et des deux sexes. Entre mai 1992 et mars 2012, 1.524 patients ont été admis au Centre des Brûlés Libanais à Geitawi. La durée moyenne de séjour (DMS) était de 36,5 jours. Les blessures les plus fréquemment rencontrées sont des brûlures thermiques, et la plupart des brûlures étaient dues à des accidents domestiques. De nos patients, 47% viennent de zones rurales. La surface corporelle brûlée (SCB) était le facteur le plus grave: 36% des patients avaient des brûlures sur 20% à 40% de la surface corporelle totale (TBSA). Notre équipe de médecins expérimentés, d’infirmières, de nutritionnistes, et de physiothérapeutes a été essentiel au succès du traitement des brûlures. En plus, les résultats sont améliorés avec l’apport hydrique précoce et adequat. L’instabilité hémodynamique était la cause principale de décès en provoquant la défaillance multiviscérale. La seconde cause de décès était l’insuffisance respiratoire due à l’inhalation. Après le septième jour, le risque d’infection était la menace principale pour la victime de brûlures, et ce risque est aggravé par la malnutrition et l’immunodéficience. Tout le même, cela ne justifie pas l’utilisation excessive des antibiotiques. Le taux de léthalité était d’environ 18% en corrélation avec TBSA.

Mots-clés: TBSA, brûlure thermique, inhalation, septicémie

BIBLIOGRAPHY


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