

MULTIPLE ESCHAROTOMY AS AN ALTERNATIVE BETWEEN COSERVATIVE AND EARLY ESCHARECTOMY

Gjergji Belba, Gentian Zikaj, Monika Belba, Ilir Nezha, Albana Aleks

Hospital University Center "Mother Teresa", Surgery Department

Abstract

Surgical treatment of severe burns is crucial in the treatment with efficacy of the severe burn patients. It is up to surgical team to select the appropriate surgical technique in concordance with many factors like thickness of burn, localization, general condition of the patient, asepsia and the modality that we have to close the wounds with grafts.

The aim of this study is to present our surgical choices which are early multiple escharotomy, late escharectomy and closure of wounds with meshed skin graft.

The authors give data regarding the hospitalization and mortality of the severe burned patients during 2008-2010. At the same time mortality is analyzed in group-ages (children, adults and aged) as well as is given data for general mortality.

According our data there is a reduction of mortality during years up to 2,7% in 2010. The mean surface area for severe burn patients more than 30% BSA has been $50 \pm 4,5\%$, with full-thickness burn present in 150 cases or 27% of the patients. As an average for each case we have done after the debridement two or three plastic procedures closing nearly 10% of the wound in each intervention. Length of Hospital Stay for survivors has been $28 \pm 5,6$ days. Multiple escharotomy create a local irrigation of the burn wound helping the surgical procedures that we can do in the future. After the stabilization of the general condition of the patient, late escharectomy in stages give us the opportunity to perform the debridement as soon as possible being active surgically. Application of meshed auto skin grafts has a good impact fastening the recovery of the patient. Although this treatment is conservative for the literature, according our data it is possible to save lives of burned patients with 60% TBSA in which full-thickness is not more than 30-40% TBSA.

Key words:

multiple escharotomy, late escharectomy, meshed autoskin graft.

Introduction

Surgical treatment of severe burns is essential for survival or efficacy of treatment for the patients with severe burns. It belongs to the surgical team to select the most appropriate surgical technique depending on many factors, important among them are the depth of burn, location, general condition of the patient, his age and above all the modalities available to medical staff both in terms of base material and environmental conditions for a more rigorous asepsis [1]. Certainly tangential excision and early escharectomy, is the best surgical method to eliminate as soon as possible the burn eschar, which would establish premises that severely burned patient undergo a clinical performance with stabilized parameters as possible while avoiding the complications of septic phase of the pathology [2,3,4].

In this paper we will present our surgical method of treating burn necrosis. It includes multiple early escharotomy combined with late escharectomy as an active act which concluded with meshed auto skin graft for closure of the wounds.

This type of surgery, unlike simple escharectomy divides the necrosis into parts, eliminates strangulative phenomena across the surface of the burn, significantly reduces edema in unburned areas and significantly improves vascular circulation in the affected areas by facilitating even the burn pain. Furthermore, escharotomy allows adequate irrigation of the burn wound where local topical agents operate more effectively since they are in direct contact with healthy tissues along the incision lines. The purpose of this paper is to present our surgical technique for the treatment of major burns through the presentation of clinical data of patients with severe burns treated at the Service of Burns and Plastic Surgery in Tirana, Albania during 2008-2010. Although in this article we will present data on mortality and other prognostic factors of severely burned patients.

Material and method

Patients

The data used was obtained by the analysis of the medical records of 554 patients hospitalized in (ICU) Intensive Care Unit of the Burns Service near UHC Albania during 2008-2010. The data collection is retrospective. We have extracted the data from the clinical charts of all burned patients hospitalized in ICU of our Service.

The burn patients firstly present at the Emergency Department and after the first evaluation they are admitted in the ICU, in the ward or they are medicated in outpatient settings. Actually admission takes place for all burn referrals from regional hospitals or when they come directly in our Service. The lowest percentage of BSA included is 10%. In fact, at ICU we admit patients with 10% BSA, especially children during the resuscitation period if the clinical situation does not allow us to admit them to the ward. After stabilization we discharge them from the ICU and transfer them to the ward for further treatment.

General and local treatment

All patients were treated by means of presumptive standard protocols for nutritional support, infection control, and physiologic maintenance. Systemic antibiotics were routinely given perioperatively and once clinical evidence of infection and sepsis was apparent.

All patients received conservative wound care with topical antimicrobial agents during the period before admission to our institution. This included dressing with silver sulfadiazine cream applied once daily and routine administration of systemic antibiotics according to the wound bacterial culture.

Burn surgery

Our surgical choices especially for burns more than 30% BSA are early multiple escharotomy, late escharectomy and closure of wounds with meshed skin graft.

Outcome measurement

Outcome measurements were mortality rate, number of operations for wound closure and LOS (length of hospital stay).

Statistical analysis

SPSS 15 software is used for the conduction of the statistical analysis. Descriptive analyses are conducted to compare demography, injury and medical characteristics through the mean, standard deviation and percentage. (Kendall's tau_b) is used to predict the causal relationship between LOS and independent variables. Mortality is given in

percentage in each year and as relationship of mortality (%) by burn surface area (% TBSA).

Results

Frequency

During 2008-2019 900 hospitalizations were presented in our Service, while 554 patients were admitted at ICU. Our Service is responsible for the treatment of severe burns across the country, with a population of approximately three million and severe burn incidence 7 patients per 100,000 persons.

Burn injury data

In table nr.1 we provide the clinical and burn injury characteristics. The total number of cases increases across the age range from 1 month to 92 years old with burn incidence appearing to peak at 21.2 years (mean age is 21.2 ± 11.9). From all patients admitted 346 (62.4%) are male and 208 (37.6%) female with 1.6:1 ratio.

A large percentage of child burns namely 370 cases (66.89%) are observed followed by 150 cases (27%) of adults and 34 cases (6.2%) of elderly people. The main causes of burns are found to be the scalds in 342 cases (61.8%) followed by flame in 127 cases (23%), chemicals in 50 cases (10.7%) and electrical injury in 25 cases (4.5%). Inhalation injury accounts for 10.6% of the total number of patients.

The overall mean estimated BSA (%) is 22.8 ± 14.7 with minimum 10 and maximum 100. In the figure nr.1 we observe the distribution of burns by BSA (%). The mean surface area for severe burn patients more than 30% BSA has been 50 ± 4.7 . With full thickness burn present in 150 cases or 27% of the total number of patients.

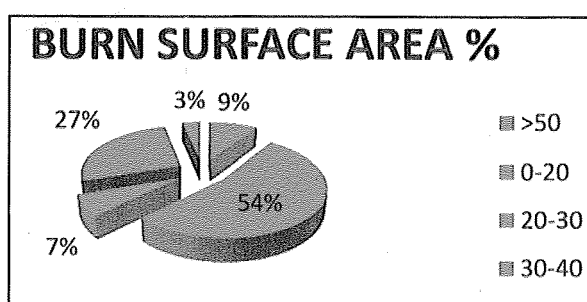


Fig.1- Distribution of burns by BSA%

We have performed surgical excision and meshed graft in 150 patients with full thickness burns. We have done two to three plastic interventions for each case that corresponds with the total number of plastic interventions in 300 (table nr.1).

Table nr. 1. Clinical and burn injury characteristics of burned patients

| Table 1- Clinical and burn injury characteristics of burned patients | |
|--|-------------|
| Number of patients , %(n) | 100 (554) |
| Age, mean (SD) | 21,2 (11,9) |
| Gender, % female (n) | 37,6 (208) |
| Group-ages, %(n) | |
| Children (0-14 years) | 66,8 (370) |
| Adults (15-65 years) | 27,0 (150) |
| Aged (>66 years) | 6,2 (34) |
| Mechanism of injury, %(n) | |
| Scald | 61,8 (342) |
| Flame | 23,0 (127) |
| Electrical | 4,5 (25) |
| Chemical | 10,7 (50) |
| Inhalation injury,%Yes(n) | 10,6 (58) |
| BSA , mean(SD) | 22,8 (14,7) |
| BSA ,in >30%BSA ,mean(SD) | 50 (4,7) |
| Full-thickness burn,in >30%BSA, %(n) | 27 (150) |
| Plastic interventions, %(n) | 54 (300) |
| LOS , mean(SD) | 11,6 (10) |
| LOS in full-thickness,mean(SD) | 28(5,6) |
| Mortality ,%(n) | 4,1(23) |

Los data (Length of Hospital Stay)

As we see in table nr.1 the mean LOS of our patients is 11.6 ± 10 days, with the minimum 1 and the maximum 58 days; LOS for burns with full thickness is higher (28 ± 5.6) with a minimum of 1 and a maximum of 134 days. Table nr.2 clearly shows that there is a statistical significance in difference between LOS and age ($p=0,011$), full thickness ($p=0,001$), inhalation burn ($p=0,016$) and burn cause ($p=0,013$) while there is no difference between LOS and gender or BSA.

| Parameter | r | p value |
|---------------------|-------|---------|
| Age | 0.191 | 0.011 |
| Gender | 0.019 | 0.797 |
| Full thickness burn | 0.186 | 0.003 |
| BSA (%) | 0.094 | 0.082 |
| Cause of burn | 0.149 | 0.013 |
| Inhalation burn | 0.152 | 0.016 |

Table nr.2. Correlations of the independent variables confronted with LOS**Mortality Data**

From 554 patients 23 expired. The overall mortality is 4,1%. In the table nr.3 we give data regarding the mortality during years with a reduction in 2010 up to 2,7%. Figure nr.2 illustrates mortality (%) of age-groups in years and in figure nr.3 we demonstrate mortality (%) by burn surface area.

| Patients (n) | | | | |
|---------------|----------|--------|------|-------|
| Years | Children | Adults | Aged | Total |
| 2008 | 102 | 75 | 12 | 202 |
| 2009 | 90 | 64 | 8 | 169 |
| 2010 | 106 | 66 | 11 | 183 |
| Deaths (n) | | | | |
| 2008 | 1 | 5 | 3 | 9 |
| 2009 | 1 | 7 | 1 | 9 |
| 2010 | 1 | 3 | 1 | 5 |
| Mortality (%) | | | | |
| 2008 | 0.9 | 6.6 | 25 | 4.4 |
| 2009 | 1.1 | 10.9 | 12.5 | 5.3 |
| 2010 | 0.9 | 4.5 | 9 | 2.7 |

Table nr.3. Patients in group-ages and mortality in three years

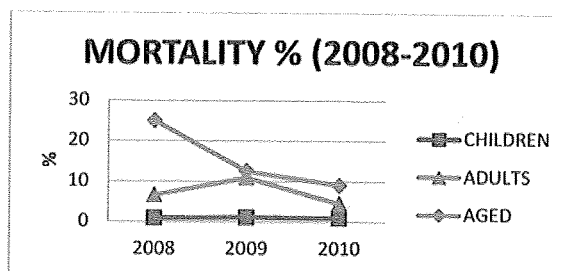


Fig.2 Mortality in group ages during 2008-2010

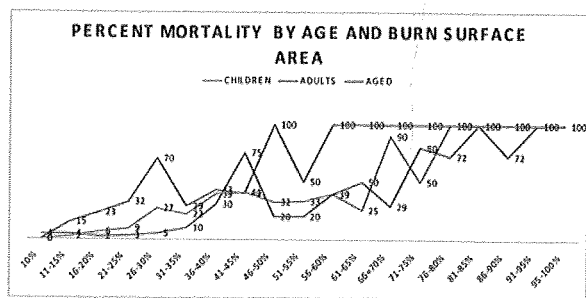


Fig.3 Mortality (%) by burn surface area

Discussion

Surgical wound closure through an aggressive, earlier and more frequent use of definite surgical therapy for deep burns has become the norm in the Western world [5,6]. When the deep burns are not life-threatening, early and aggressive treatment clearly has benefit, but the question remains open for patients with burns so extensive that survival is problematic. If burn size increases or if inhalation injury coexists, the mortality probability also increases. Thus outcome appeared to be determined not only by surgical approach, but also by other important factors perhaps underestimated by enthusiastic surgeons.

As we see in our results, the average burn size in our Service is about 22% of total body surface area (BSA) that corresponds with the data from other burn centers in the world [7]. According the literature about two-thirds of the patients admitted to burn centers have burns of 30% BSA or less and if these patients are less than 50 years of age, the survival rate exceeds 97% [8]. Our study supports these findings taking in consideration the overall mortality 4,1%.

From our data about one-third of the hospitalized burn population has injuries exceeding 30% BSA and the major part of the burn deaths occur in these series of patients. The non survivors had bigger burns and a higher incidence of inhalation injury and they were judged too unstable to tolerate operations and burn itself. The mean surface area burned in this group is higher 50 ± 4 , 7% that is accompanied

with a higher hospital stay compare with overall hospital stay (28 versus 11,6) and with the presence of full-thickness in 27% of the total number of patients.

We will discuss regarding our surgical approach precisely in this group of patients which consists in an alternative less aggressive approach achieved by a series of operative procedures. Our surgical approach is realized through multiple early escharotomy combined with late escharectomy as an active act which concluded with meshed auto skin graft for closure of the wounds.

Early escharectomy or early excision includes several operative sessions within the first few days to complete the excision and cover the wounds with a combination of autologous and temporary wound substitutes. In patients with non-life threatening burns less than 30% TBSA, management of deep dermal component of the injury is accompanied with a shorten hospital stay and reduction of early pain but there are questions regarding long term outcome and the severity of hypertrophic scar since mortality is not the issue [8]. From another point of view, in two prospective randomized trials of early total excision there are questions about survival advantage with excision performed within 24 hours of injury [9,10].

In many burn centers is applying the staged surgical wound closure which consists in stages excisions of full-thickness burn areas at approximately 7-days intervals beginning within 10 days post burn, depending on physiological status and on clinical evaluation of the burn depth [5]. In other burn centers the surgeons use the modification through topical wound therapy with cerium nitrate which help in protection against bacterial colonization till the autologous skin become available [11].

In the actual condition that is our Service of Burns in University Hospital Centre "Mother Teresa" in Tirana and impossibilities to provide a modern material base, applying skin substitutes, Keratynocyte Cell Culture or existence of a skin bank, we tried to be more active surgically giving priority to multiple escharotomy combined with serial excisions of the eschar. So we are active on the surgical view from the second or third day after burn performing multiple escharotomy incisions in all burn surface area which is full-thickness.

Stabilization of the general situation of the patient, reduction of inflammation in the wound allows us, starting from the second week after burn to apply serial excisions of the eschar now fragmentized in parts. This surgical procedure in the context of burn surgery is called now late escharectomy. Due to the multiple escharotomy it is performed easily, without aggravated patient's overall situation,

without significant loss of blood, not always or necessarily under general anesthesia. The patient is taken to the operating room often where the change of dressings is performed under local anesthesia so that at the same time removing as much necrotic tissue.

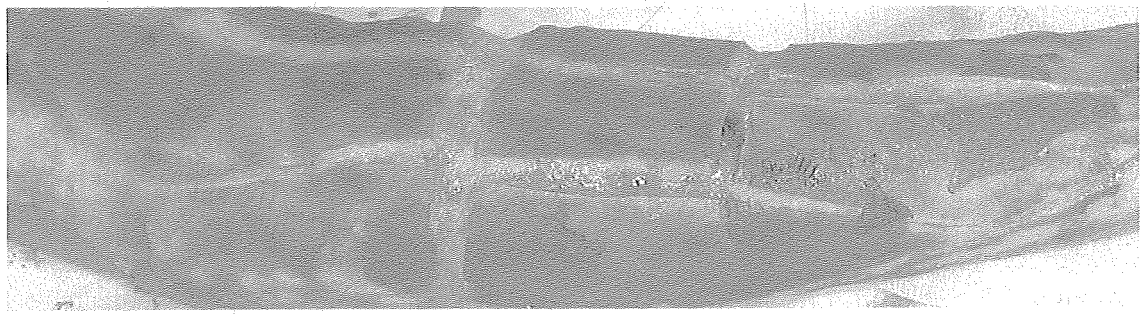
Usually at the end of the third week ends full elimination of burn eschar. To gain time, the last session of escharectomy is performed under general anesthesia where we perform closure of the wounds now clean areas with meshed autotransplant. After 10 days, we perform the second session of wound closure to continue with additional sessions depending on the remained wound. Generally in one stage of the plastic intervention we realize closure with meshed auto skin graft of the 10% of the wound. In the last two sessions it is necessary to remove the hyper granular bed, which does not favor the success of the transplant. We present a demonstration of this surgical approach in the photograph 1.

From our data, deaths have been justified because the non surviving patients have had burns over 60% of the body surface, in major part full thickness and associated with inhalation injuries. In these patients severe clinical situation did not allow us to make surgical intervention.

Conclusions

Early echarectomy certainly is the best way to treat a severely burned patient by eliminating the necrotic tissue as quickly, which gives the the premises for a clinical performance with as few complications. Unable to perform early echarectomy a possible alternative would be fragmentation of necrotic tissue by multiple escharotomy. This intervention allows us to eliminate as soon as necrotic tissue and then to close wounds with meshed autotransplant.

Although multiple escharotomy technique is typically not surgical, it has helped us to reduce mortality and to effectively treat severe burns.



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