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BURN

EFFECTIVENESS OF EARLY EXCISIONAL DEBRIDEMENT IN BURN INJURIES TO SEPSIS INCIDENCE AND MORTALITY RATE AT BURN UNIT OF HASAN SADIKIN HOSPITAL

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ABSTRACT

Background: Sepsis is an important cause of mortality in patients with burn, although many factors influence it. Early excision debridement as source control treatment has been done routinely in our center. It was intended to prevent sepsis and decrease mortality rate.

Methods: We performed a retrospective, cross sectional study over 4 years (2012-2014) among patients with flame burns in Burn Unit Dr. Hasan Sadikin Hospital who underwent early excisional debridement. The criteria of patients were adult, with full thickness burn, without inhalation injury and co morbid disease. The mortality, length of stay, and incidence of sepsis were analyzed by simple regression linier statistics using SPSS 16.0 for Windows.

Results: Mortality rate of all patients was 43.3%, and 42.3% was directly caused by sepsis. Thirty-nine patients matched the criteria, 20 patients had early excision (≤ 3 days) and 19 patients had late excision (> 3 days). In early excision group, 75% got sepsis and 55% died. Mortality and incidence of sepsis wasn't significantly different in both groups (p=0.252 and p=0.855). Both groups have same length of stay (mean : 13.1 and p=0.236). Sex as confounding factor wasn't significantly different (p=0.774). The extent of TBSA and age were significant factors causing mortality rate ($p < 0.05$).

Conclusion: There are many factors that contribute to the success of treating burn patient. Excision debridement was proven by this study not a major factor and ineffective to decrease sepsis and mortality in burned patients.

Keyword: *Early Excision, debridement, burn, sepsis, mortality*

Latar Belakang : Sepsis adalah penyebab kematian terbesar pada pasien dengan luka bakar, walaupun terdapat banyak faktor lain yang dapat mempengaruhi. Debridement dengan eksisi dini sudah secara rutin dilakukan di rumah sakit kami. Eksisi tersebut bertujuan untuk mencegah sepsis dan menurunkan angka kematian.

Metodologi : Studi retrospektif *cross-sectional* ini mengambil data dari pasien Unit Luka Bakar Rumah Sakit Dr.Hasan Sadikin tahun 2012 sampai dengan 2014 yang menjalani debridement dengan eksisi dini. Kriteria pasien adalah pasien dewasa dengan luka bakar derajat 3 (*Full Thickness Burn*) tanpa trauma inhalasi dan penyakit penyerta. Angka kematian, *length of stay*, dan insidensi sepsis dianalisa menggunakan regresi linier sederhana menggunakan SPSS 16.0 untuk Windows.

Hasil : Angka kematian tercatat sebesasr 43.3% dan 42.3% disebabkan oleh sepsis. Tiga puluh sembilan pasien memenuhi kriteria inklusi, 20 pasien menjalani eksisi dini (≤3 hari) dan 19 pasien menjalani eksisi setelah lebih dari 3 hari. Pada grup eksisi dini, 75% mengalami sepsis dan 55% meninggal. Angka kematian dan insidensi sepsis tidak berbeda secara bermakna antara kedua grup tersebut (p=0.252 dan p=0.855). Kedua grup mempunyai durasi length of stay yang sama (rerata: 13.1 dan p=0.236). Jenis kelamin sebagai factor perancu tidak mempunyai perbedaan yang bermakna (p=0.774). Luas area luka bakar (TBSA) dan usia merupakan factor yang secara signifikan mempengaruhi angka kematian (p<0.05).

Kesimpulan : Terdapat banyak factor yang dapat mempengaruhi keberhasilan dalam penatalaksanaan pasien luka bakar. Eksisi debridement bukan merupakan faktor utama dan kurang efektif dalam mencegah sepsis dan menurunkan angka kematian pada pasien luka bakar.

Kata Kunci : *Early Excision, debridement, burn, sepsis, mortality*

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INTRODUCTION

Burn is a devastating form of injury and represents a major cause of mortality and morbidity, as well as significant drain on limited health care resources. Burn injury causes mechanical disruption at the skin, which allows environmental microbes to invade the deeper tissue, so burn patients are at high risk of infection. Wound infection mostly originates from nosocomial infection. As a result of the nature of the burn injury itself, the immune compromise effects of burns, prolong hospital stays, invasive diagnostic and therapeutic procedure.[1,2] Advance in resuscitation, critical care, protective ventilator strategies, early burn wound debridement and the institution of appropriate nutritional support complemented by prompt recognition and treatment of burn related wound sepsis have reduced mortality due to thermal injuries worldwide.[3]

The principal cause of death following massive burn injury is wound sepsis. Sepsis is an important cause of mortality in patients with burn, although many factors influence it. Approximately 73% of all deaths within the first 5 days post burn have been shown directly or indirectly caused by septic processes.[4,5]

Studies using historic controls have reported a decrease in mortality and length of hospital stay as a result of early excision therapy. Many authors concede that improvements in burn care occurred simultaneously during the time of their studies and might have contributed to apparent decreases in mortality attributed to early excision. Increasing age, burn size, and the presence of inhalation injury have been reported to significantly increase mortality.[4,5]

Wound debridement is a standard surgical procedure in burn injury patients. There is a generalized consensus among surgical community that necrotic tissue impedes healing. Timely debridement aims not only to promote healing but also reduce patients' infection, reduce blood loss, length of hospital stay, and improve survival.[1,2,3,4,5]

Herndon et al conducted a comparative study in 85 adult patients with at least 30% total body surface area burns. The study also included 259 pediatric patients. Patients were randomly selected to either receive early excision or topical antimicrobial therapy. Results show mortality was lower in those who had early excision. As resuscitation guidelines improved, staged burn excision by 3rd day post burn was possible.

Attempted excision within the first 24 hours was trialed, however resulted in difficulties in haemodynamic stability. A staged approach at 72 hours post burn appears to be the safest option.[3]

Excisional debridement as source control treatment has been performed routinely in our center. The procedure is done as soon as possible, depending on patients' condition. The intention of early excisional debridement was to prevent sepsis and reduce mortality.

METHOD

We performed a retrospective, cross sectional study over 4 years (2012-2014) among patients with flame burns in Dr. Hasan Sadikin Hospital Burn Unit who underwent early excisional debridement ($\leq$ 3 days) and late excisional debridement (> 3 days). Wound care was done every 3 days with silver sulfadiazine gauze or *sibro* gauze. Diagnosis of sepsis was established if microorganism was found in the wound culture or blood culture. The data is obtained through medical record. The extent of burn injuries is > 20% Total Body surface area (TBSA). The inclusion criterias of patients were : adult, with full thickness burn, without inhalation injury and with no comorbid disease. The mortality, incidence of sepsis and length of stay were analyzed by simple regression linier statistics using SPSS 16.0 for Windows. Age, sex, and the extent of burn injuries were assessed as confounding factors

Acute Respiratory Distress Syndrome (ARDS) is a major cause of death in burn injuries (53.5%), followed by sepsis (42.3%). Both conditions are dominant cause of death in burns (Diagram 2).

This study included 39 patients matched to the inclusion criteria, with the average of burn extent reaching 42.6 % total body surface area. The incidence of sepsis in late excision group was higher than in early excision group. There were 32 patients who developed sepsis despite undergoing excisional debridement before. (Diagram 3).

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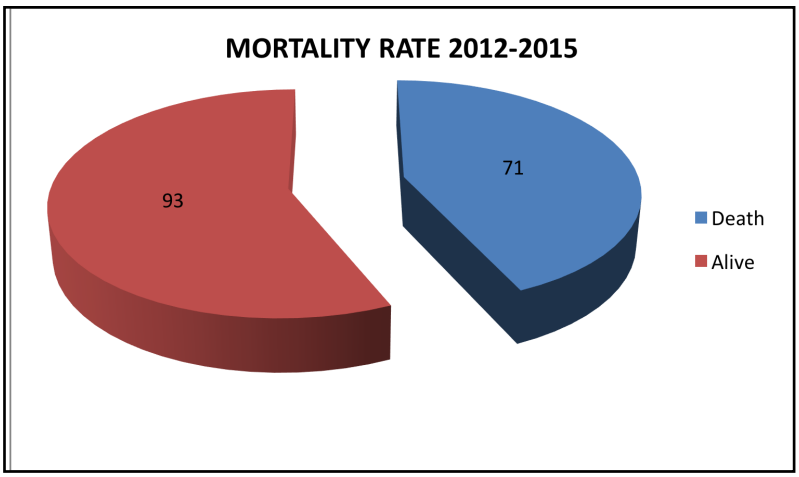

Diagram 1. Mortality rate in burn unit RSHS 2012-2015

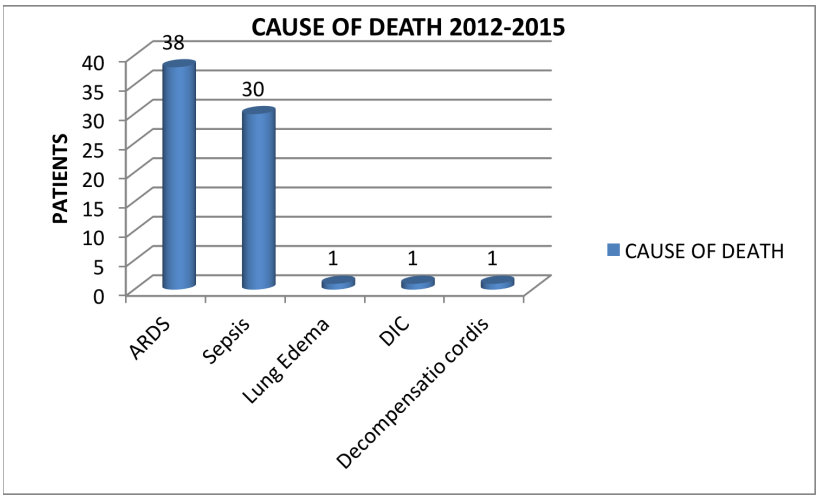

Diagram 2. Caused of death burn injuries patients in RSHS

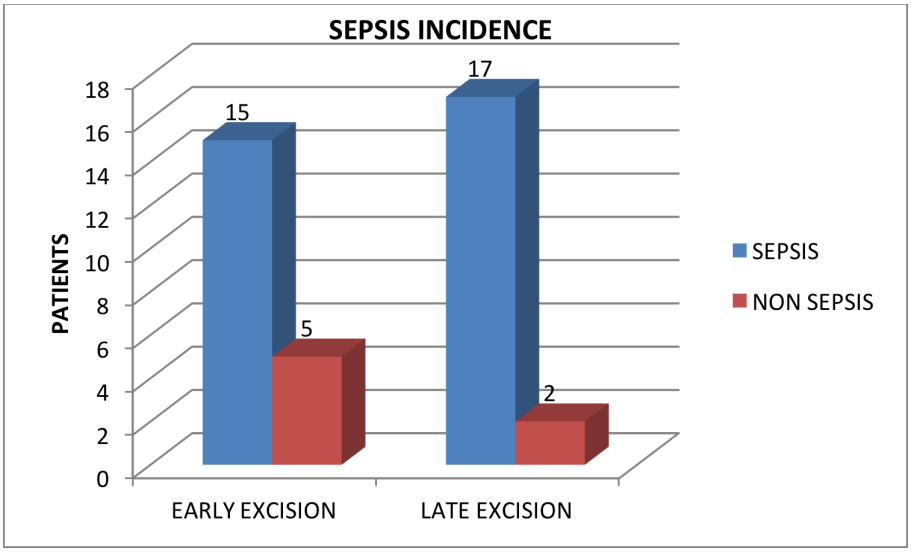

Diagram 3. Relationship between excisional debridement to sepsis incidence

Mortality rate in this study was high. Twenty-two patients from total of 39 patients died despite undergoing excisional debridement. Mortality rate in early excision group is similar to the late excision group. (Diagram 4).

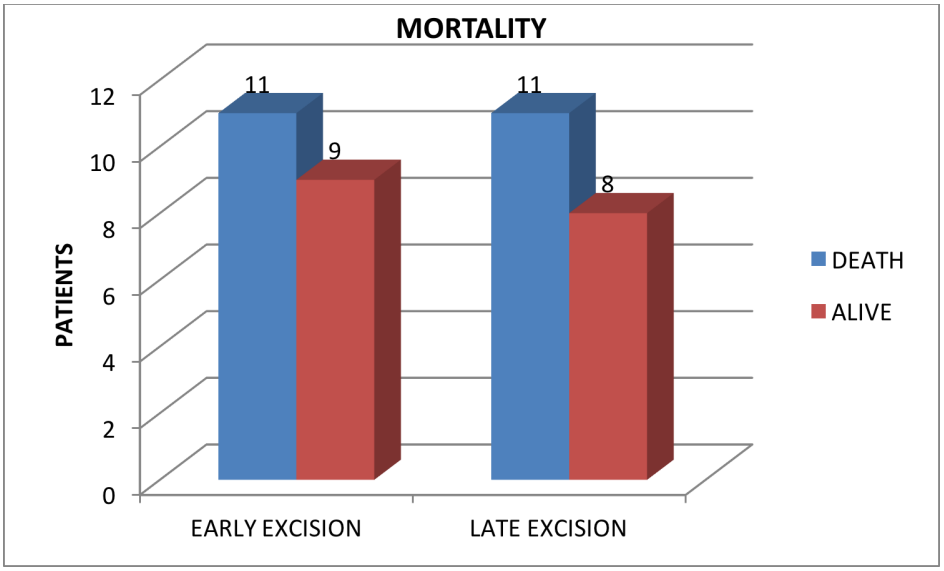

Diagram 4. Relationship between excisional debridement to mortality rate

Multivariate analysis was performed with simple logistic regression, excisional debridement as risk factor for mortality rate and sepsis incidence. There was no significant difference between early excisional debridement or late excisional debridement in sepsis incidence (p=0.855) or mortality rate (p = 0.252). The average of patients' length of stay in this study was 13,1 days and there was no significant difference in early excision group compared to late excision group (p= 0.236). Age, sex, and extent of burn injuries acted as confounding factors in this study. Sex and extent of burn injury were statistically significant as confounder to sepsis incidence and mortality rate. Meanwhile, age was not shown to be a confounding factor to sepsis and mortality rate in this study. (Table 1)

Table 1. Confounding factors to sepsis and mortality

Variable	P Value
Age	0.744
Sex	0.026
Extent of Burn Injury	0.006

DISCUSSION

Currently burn wound infection and systemic sepsis are among the most serious complications associated with burns, being responsible for many of the deaths in victim burns.[1,2,3,4,5,6] Sepsis condition caused directly 42.3% of all death. In this study, the incidence of sepsis are 32 patients from 39 patients (82.1%). Thus, prevention of burn infection forms one of the cornerstones of burn care.

The eschar, made up of burned and traumatized tissue, is the hallmark of burn wound. This prevents accurate assessment of wound depth and may lead to the extension of injury to neighbouring tissue. The eschar also serves as a medium for bacterial growth, and consequent sepsis. As a result, prompt removal of the eschar is imperative to the healing of burns. While effective, surgical debridement has several major disadvantages. It can be non selective and my sacrifice healthy surrounding tissues. Furthermore, surgical excision is painful and could expose patients to the risk of repeated anesthesia and significant bleeding.[7] Under the current study conditions, early post burn epidermal debridement of second degree burns resulted in more infections and slower re-epithelialization rates in swine.[6]

The aim of excision was to remove the zones of necrosis and stasis beyond the level where the dermal vessels have been thrombosed. At the same time, viable dermis should be preserved to optimize the functional and cosmetic result. In full thickness burns, all of dermis has to be removed until a bed of viable, well vascularized fat, fascia or muscle remains.[7,8]

One of the major transformative concepts in burn care since the 1970s is the survival advantage that early burn wound excision and grafting confers. This is a surgical procedure performed to remove the burn wound eschar and cover the exposed wound with autograft, allograft skin or artificial skin substitutes. The aims were to prevent or control infection, conservation of all viable tissue, maintenance of form and function, timely closure of all wounds, early return to rehabilitative therapy and decrease mortality. In developed countries, early tangential burn wound excision with immediate skin grafting is considered as a standard of care in the treatment of severely burned patients. The optimal timing of early burn There are no differences statistically between early excisional debridement or late excisional debridement in sepsis incidences (p=0.855). Mortality rate in early excision group is the same as in late excision group (11 patients; with p=0.252). This is probably due to many factors. We performed only early excisional debridement without immediate grafting so there was no difference in sepsis incidence and mortality rate. Inadequate early debridement could be the factor contributing to this result. In the absence of adequate burn care infrastructure makes us must be careful to do aggressive burn therapy.

The average of total burn surface area is 42.3%, so we did early excisional debridement without immediate graft because there was no donor area and skin substitute materials were not available. The percentage of TBSA is a significant risk factor for burn wound infections, although it is not a risk factor for the device associated infection. The raw surface acts as *port d'entree* to microorganisms causing infection and this may lead to sepsis. Duration of urinary catheters usage and ventilation are identified as risk factors for the corresponding hospital-acquired infection. As an effective infection control policy, decreased usage of invasive devices, better infection control procedures and improved aseptic technique while inserting devices could decrease the rates of infection in burn unit.[7,10] Finally it will influence the outcome of burn patients.

CONCLUSION

There are many factors that contribute to the success of treating burn patient. Early excisional debridement was proven by this study to not be major factor and it was ineffective to decrease sepsis and mortality in burned patients.

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