

Delayed Grafting as a Valid Technique in Burn Management: Experience from a Burn Unit in Oman

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Abstract

Background: Early excision and grafting has been the preferred method of managing major burns around the world since 1970. Considering the advances in health care and the development of new antibiotics over the past 50 years, delayed grafting as a technique for the management of burns over 15% - 20% of total body surface area (TBSA) could have comparable results to that of early excision. This study aims to highlight the outcomes of practicing delayed grafting in burn patients. **Methods:** A case series analysis was performed of 51 patients who were admitted to the burns unit in Sultan Qaboos Hospital Salalah with over 20% TBSA between January 2014 and December 2019. The patients received prophylactic antibiotics and silver sulphadiazine dressing until the burn eschar had completely separated, followed by grafting. **Results:** Two patients were lost during the entire duration of the study. The mortality rate was comparable to that of early excision, while the rate of hypertrophic scarring was lower than the range reported by other studies. **Conclusion:** In the management of patients with over 20% TBSA, delayed grafting after complete separation of eschar is still a valid technique.

Keywords

Burns, Burn Units, Burn Management, Delayed Grafting, Major Burns, Treatment Efficacy

1. Introduction

In 1970, Janžekovič introduced the concept of early tangential excision and grafting of burn wounds with subsequent reduction in mortality [1]. Since then, early excision has become the standard practice in many centers. Concurrently, there were developments in intensive care unit (ICU) facilities and the introduction of new antibiotics. This also improved patient survival. Although early excision is practiced in many centers, the timing of excision of burn wounds is still controversial. A recently published meta-analysis found that most studies that looked into early vs delayed excision were based on very low-certainty evidence [2]. There have been multiple studies conducted in the Middle East regarding Demographic characteristics and outcomes of burn patients requiring skin grafts, Clinical, epidemiological, and management aspects of burn injuries, and Early excision and skin graft [3] [4] [5]. However, no recent studies have been found in the region that concern delayed grafting.

Major burns are defined as burns of more than 15% - 20% TBSA [6]. One of the burns units in Oman is located in Salalah. In this burn unit, delayed grafting is practiced. The patients are managed in a modern burn unit by a multidisciplinary team. In this article, we review the outcome of delayed grafting for major burns in the era of modern intensive care unit (ICU) care and new antibiotics. This study is the first of its kind to be conducted in Oman and brings the perspective of practicing delayed grafting in burn patients in developing countries.

2. Patients and Methods

This retrospective study included 51 burn patients who were admitted to the burns unit in Sultan Qaboos Hospital, Salalah during the period from January 2014 to December 2019. The inclusion criterion was patients with burns involving 20% or more of the total body surface area (TBSA) who required skin grafting.

Wound debridement and skin grafting was performed after a minimum of 3 weeks post-burn. The protocol of management consisted of Intravenous fluid resuscitation, antibiotics, analgesics, dietary supplements, regular wound care and dressing using Silver Sulphadiazine cream (till separation of the eschar), and subsequent wound debridement and skin grafting.

The variables investigated in the study are total hospital stay, requirement for blood transfusion, positive blood culture for pathogenic bacteria, depigmentation, hypertrophic scarring, and contractures. The data was obtained from reviewing the hospital's electronic health record (EHR) software.

3. Results

There were 51 patients (35 male and 16 female) admitted to the burn unit during the 6-year period. Of these, 12 patients (23%) were under the age of 10. 7 patients (14%) were in the age group 10 - 19 years. 12 patients (23%) were in the age group 20 - 29 years. 10 patients (20%) were in the age group 30 - 39 years. 6 patients (12%) were in the age group 40 - 49 years, and the remaining 4 patients

(8%) were 50 and above. The range of TBSA was 20% to 70% (mean: 35%).

Of the study sample, 49 patients survived and 2 patients died (mortality rate: 3.9%). The time till first surgery ranged from 8 to 68 days (mean: 27.3 days), while total hospital stay ranged from 16 to 142 days (mean: 49 days). Blood transfusion range was 0 to 37 units (mean: 2.9 units), and intraoperative blood transfusion was required for 31 (60%) patients. Positive blood cultures were found in 10 (20%) patients—1 (10%) patient grew *Acinetobacter*, 1 (10%) patient grew Methicillin-Resistant *Staphylococcus Aureus* (MRSA), 2 (20%) patients grew Carbamazepine-Resistant *Enterobacter* (CRE), 3 (30%) patients grew Multi-drug Resistant *Klebsiella*, and 3 (30%) patients grew *Pseudomonas*. Of the survivors, 13 (27%) patients had hypertrophic scarring, 9 (18%) patients had contractures, 37 (76%) had hyperpigmentation and 7 (14%) had hypopigmentation (Table 1).

4. Discussion

In this review, we excluded burns which were less than 20% TBSA to observe the effectiveness of our protocol on major burns. The mortality rate was only 3.9%, which is very low and is comparable to reported mortality from centers that practice early excision. A study on the Dutch population showed a 3.2% mortality rate [7]. Outcome and Mortality depend on many factors besides the practice of early excision. Some of these are resources, fluid resuscitation, the arrival of the patient to the facility in time without delay, adequate intensive care facilities, availability of proper antibiotics, presence of multidrug-resistant organisms, and adequate nutrition. Keshavarzi *et al.* expressed in their 2016 study of early excision, “Early excision and grafting is limited by several factors such as anemia, resuscitation, malnutrition, unstable hemodynamics and unavailability of the skin graft. According to these limitations, early excision and grafting is not considered the standard of care” [8]. Mortality rate is higher in centers with lesser resources, evident through reports from Cameroon and Iraq that showed a mortality rate of 23.4% and 29% respectively [9] [10]. A multicenter study concluded that in modern highly specialized burn centers, adults with more than 40% TBSA burns and children with more than 60% TBSA burns were at high risk of mortality [11]. In general, there is a trend of reduction of mortality over time which can be attributed to many reasons apart from the development of burns care. These factors include awareness, education, and prevention programs [12] [13].

Table 1. Post-surgical complications observed in the surviving patients.

| Complication | Number | Percentage |
|-----------------------|--------|------------|
| Hypertrophic scarring | 13 | 27% |
| Contractures | 9 | 18% |
| Hyperpigmentation | 37 | 76% |
| Hypopigmentation | 7 | 14% |

There is no consensus regarding the threshold of blood transfusion since the decision to transfuse is affected by multiple elements [14]. There are two approaches to blood transfusion—liberal and restrictive [15]. Our practice borders on the liberal approach. Due to variations in practice and a lack of international standards, it is not possible to draw a conclusion regarding the blood requirement in this study. MDR and MRSA colonization and infection is a global issue and has a negative impact on the survival of burn patients. As with any other country, Oman has these organisms present and they are typically difficult to eradicate [16].

The high rate of hyperpigmentation can be explained by the skin type of the study population. It is very common to have hyperpigmentation after burns and after grafting. Similarly, the hypopigmentation rate can be explained by skin type, but could also be the result of delayed grafting. The rate of hypertrophic scars is on the lower side of reported figures from other studies, which is 32% to 94% [17]. This indicates that hypertrophic scarring is part of the burn process itself and is not necessarily reduced by early intervention.

5. Conclusion

Delayed grafting after complete separation of eschar is still a valid technique for the management of burns. The mortality rate in our review is comparable to that of early excision, on account of the development of new antibiotics, availability of intensive care unit, multidisciplinary team care, and modern techniques of patient care.

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Ethics Approval

Ethical approval was waived by the local Ethics Committee of Sultan Qaboos Hospital in view of the study's retrospective nature and all the procedures being performed were part of the routine care.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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