

FACTORS THAT INFLUENCE THE DEVELOPMENT OF LATE BURN COMPLICATIONS: AN ANALYSIS OF 100 CASES

JABIR R HAMEED

FICMS, consultant plastic surgeon, Al-Sadder Teaching Hospital, Basrah

Abstract

Deep partial or full thickness burn if untreated, neglected, infected or managed conservatively can develop severe deformity & scar contracture in the joint with significant reduction in patient activities.

In this study, the patients who underwent excision and grafting had significantly shorter hospital stay, lower hospital charges and fewer infectious complications.

One hundred cases of burn injury admitted to the department of Plastic Surgery in Al-Sadder teaching hospital for the period between January 2009 to January 2010. They were referred because of late complications of burn injury. They were 60 males and 40 females. Patients burned with dry heat are most likely to get complication according to this series, 67% of the patients with complication are injured by dry heat, far less are scalding which forms 18%.

The types of reconstructive operations depend on severity of the deformity, site of the deformity and patient preference. About 35% of the patients needed excision and grafting, but also some needed surgical interference ranging from simple grafting to more lengthy procedure as tissue expander.

First degree burn can be treated conservatively, 2nd&3rd degree are treated by early surgical excision & grafting within 24 hours when the general condition is stable. This will decrease the duration of wound healing, decrease time of patient morbidity & hospitalization, early return to their jobs.

Introduction

Burn is a type of skin injury caused by heat, electricity, chemicals, light, radiation, or friction¹⁻³. Most burns only affect the skin (epidermal tissue and dermis), rarely deeper tissues such as muscle, bone and blood vessel which can also be injured. Proper management of burns is important because burns are a common, painful experience and can result in disfiguring and disabling scarring. Burn injuries can be complicated by shock, infection, multiple organ dysfunction syndrome, electrolyte imbalance and respiratory distress. Large burns can be fatal, but modern treatments, developed in the last 60 years, have significantly improved the prognosis of such burns, especially in children and young adults⁴⁻⁵.

Skin is the largest organ in the body; it serves as a protective barrier against bacteria and

evaporative water loss from the underlying tissues. Dehydration, infection, hypothermia and damage to internal organs are frequent short-term complications resulting from a burn injury. Long-term complications include severe emotional and physical scarring⁶.

Burns are classified according to their degree, based on the severity of the tissue damage. A first-degree burn causes redness and swelling in the outermost layers of skin (epidermis). A second-degree burn involves redness, swelling and blistering; the damage may extend beneath the epidermis to deeper layers of skin (dermis). A third-degree burn, also called a full-thickness burn, destroys the entire depth of skin causing significant scarring. Damage also may extend to the underlying fat, muscle or bone. The severity of the burn is also judged by the amount of body surface area (BSA) involved.

The "rule of nines" is the simplest and easy way to determine the percentage of BSA affected in patients more than 9 years old. This rule cannot be applied to a young child's body proportions. The severity of the burn will determine the type of treatment and where the burn patient should receive treatment. Minor burns may be treated at home or in a doctor's office. These are defined as first- or second-degree burns covering less than 15% of an adult's body or less than 10% of a child's body, or a third-degree burn on less than 2% BSA. Moderate burns should be treated at a hospital. These are defined as first- or second-degree burns covering 15%-25% of an adult's body or 10%-20% of a child's body, or a third-degree burn on 2%-10% BSA. Critical, or major, burns are the most serious and should be treated in a specialized burn unit of a hospital. These are defined as first- or second-degree burns covering more than 25% of an adult's body or more than 20% of a child's body, or a third-degree burn on more than 10% BSA. In addition, burns involving the hands, feet, face, eyes, ears, or genitals are considered critical. Other factors influence the level of treatment needed, including associated injuries such as bone fractures and smoke inhalation, presence of a chronic disease, or a history of being abused. Also, children and the elderly are more vulnerable to complications from burn injuries and require more intensive care⁷⁻⁹. History of burn excision: Although early excision and grafting has been considered a procedure of the late 20th century; it was actually first described by Lustgarten in 1891. The fire at the Coconut Grove Nightclub in Boston in November, 1942, brought new insight into many aspects of the care of burned patients. Cope suggested then that patients with early wound closure had improved survival¹⁰. Several reports are scattered throughout the literature over the next 30 years, but results were discouraging since they showed little clinical improvement from the usual practice of waiting for spontaneous eschar separation followed by grafting on granulation tissue. Janezekovic reported good

results in 1970 with sequential shaving of burns of varying depths in. The surgical community began to take notice; however, the need to estimate the depth of burn and ancillary support required for a major burn excision made acceptance of this technique difficult. The University of Washington Burn Center was formed in 1974. In 1978, a major change in approach to burn care was instituted: burns judged to require more than 3 weeks to heal to be managed by excision and grafting. Before that, all burns were treated in the non-operative manner.

A study was done to compare the two methods using matched subjects. The patients who underwent excision and grafting had significantly shorter hospital stay, lower hospital charges, and fewer infectious complications.

Based on that information, a randomized prospective study was done in patients with burns of indeterminate depth. The results again found that those with excision had shorter hospital stay, lower hospital charges, fewer reconstruction surgeries, and returned to work sooner¹¹⁻¹³.

Material & methods

In this a prospective study of 100 cases of burn injury admitted to the department of Plastic Surgery in Al-Sadder teaching hospital for the period between January 2009 to January 2010. They were referred because of late complications of burn injury. Evaluation of the patients was done according to the age, sex, type of burn, percentage of burn, depth of burn, duration, type of early treatment, the different type of complication.

Results

Patients in this study were randomly selected according to age, from 1 year to over 50 years. Table I show that most of the patients were falling in the age group of 11-20 years of age, followed by the 21-30. These two group form 57% of all patients, and they are the ages which are most likely to get complications.

Table I: Age distribution of the patients

Age	Number	Percentage
1-10	19	19
11-20	30	30
21-30	27	27
31-40	15	15
41-50	7	7
> 50	3	3
Total	100	100

According to sex, these patients were randomly selected; it turns to be 60 males and 40 females. Patients burned with dry heat are most likely to get complication according to this series, 67% of the patients with complication

are injured by dry heat, far less are scalding which forms 18%, Table II. Degree of Burn has a direct relation to the number of complicated cases referred to the unit. The more depth of burn the more complicated cases seen as shown in table III.

Table II: Type of burn distribution.

Type of burn	Number	percentage
Flame	67	67
Scald	18	18
Electrical	8	8
Chemical	3	3
Contact	4	4
Total	100	100

Table III: Degree of burn.

Degree of Burn	Number	Percentage
1st	14	14
2nd	42	42
3rd	44	44
Total	100	100

In this series, the relation of the burned surface area to complication, shows those with small surface area have more chance of having complication, in table

IV, we see clearly that less than a half of the complicated cases have 5% Burn surface area.

Table IV: Percentage of burn surface area.

Surface area	Number	Percentage
5	42	42
5-10	15	15
10-20	12	12
20-30	15	15
30-40	12	12
40-50	3	3
>50	1	1
Total	100	100

The complications which were received after primary treatment have different variety, ranging from simple raw area which need simple skin graft to contracture which need more lengthy procedures, or Keloid scar & hypertrophied scar which cause a lot of

itching and pain for the patients. These three complications, in this series, presented nearly equal, Table V. But contractures with deformity and limitation of joint movement form one third of the complications presented for treatment.

Table V: Burn complications

Type of complication	Number	Percentage
Raw area	22	22
Keloid & hypertrophic scar	27	27
Contracture	33	33
Pigmentation	10	10
Alopecia	5	5
Total	100	100

The time between getting burned and arriving to a plastic surgeon seeking advice or surgery varies a lot. Patient with any sort of complications may come to the OPD or private clinic within a month up to 10 years after burn.

Those late presenter are usually show because of joint pain or appearance of malignant ulcer, Table VI.

Table VI: period relapsing till surgical treatment.

Duration of illness	Number	percentage
<1mounth	12	12
1-3m	18	18
3-6m	16	16
6-12m	10	10
1-5yrs	33	33
5-10yrs	7	7
>10yrs	4	4
Total	100	100

The types of reconstructive operations depend on severity of the deformity, site of the deformity and patient preference. About 35% of the patients may need

Table VII: Types of surgical correction.

excision and grafting. But surgical interference ranging from simple grafting to more lengthy procedure as tissue expander, Table VII.

Type of operations	Number	Percentage
Skin graft	22	22
Release & graft	35	35
Excision & graft	15	15
Serial excision	12	12
Flaps	10	10
Tissue expander	5	5
Total	100	100

Discussion

Deep partial or full thickness burn if untreated, neglected, infected, or managed conservatively can develop sever deformity & scar contracture in the joint with significant reduction in patient activities. Treatment

strategy in burn is prevention rather than their mangment¹⁴.

The only way to reduce the incidence of burn injury is through prevention. There is a need to create awareness at all levels of society to impart information on prevention from burn injuries. At present there is no organization to promote this campaign and burn care units

must therefore the work of prevention through awareness. This will go long way toward reducing the incidence of burns.

The purpose of reconstructive operation in post burn sequel is the closure of the wound & removal of scarring, the elimination of contracture, restoration of full movement of a joint to maintain normal function & normal growth especially in children¹⁵. In our study the% of burn in children below 10 years (19%) less in compares with other study in Egypt (50%)¹⁶. Its 30% between 20-30yrs like other studies in India¹⁷. Incidence of flam burn very high (67%) co inside with previous result from Basrah (62.8%)¹⁸. while scald burn form only 18% which is the same as the previous study (18.7)¹⁸, That means the

causative factors are still acting between 2005-2010, this result vice versa the result in Egypt¹⁵.

Most of the burn patient 57% presented with contracture, keloid & hypertrophic scar not responding to the usual non surgical treatment & the time relapsing between acute burn till surgical interference variable in this study. In some patients it reaches many years like other study in India¹⁷. All patients treated conservatively, most of them by not well experienced staff, causing increase duration of treatment & patient illness spending more time waiting for complete healing of the large full thickness burn leading to more contractures, joint stiffness, even joint dislocation and growth abnormalities especially in children.

Most of the patient refuse early surgical interference by the plastic surgeon within the first months of illness, that means there is no role for diagnosis of the deep burn which need early surgical excision & closure by skin grafting for decreasing the period of treatment & early return to their job .Four patient have chronic ulcer more than 10 yrs 2 of them develop margolin tumor.

Facts: In Basra there is a serious lack of burn facilities, most of the patient treated conservatively despite of the severity of the burn. There is no program for health education about the real treatment of burn, & how they avoid the disaster complication of deep burn. There are no special burn centers that deal with the burns .lack of referral system, which re-orientes the burn patients when &where he cans obtain the ideal management of the burn.

Conclusions & recommendations:

Early diagnosis of the depth of burn injury after evaluation of general condition & resuscitation play major role in choosing the type of treatment. First degree burn can be treated conservatively, 2nd&3rd degree are treated by early surgical excision & grafting within 24 hours, when the general condition are stable. This will decrease the duration of wound healing, decrease time of patient morbidity & hospitalization, early return to their jobs, this will offer more money, prevent the disaster burn wound complications, so there is no more surgical reconstruction. This idea can be applied after initiation of burn centers according to the percentage of population in each area.

References

- 1-Burns. At: <http://www.nlm.nih.gov/medlineplus/burn.html>. Accessed on: February 25, 2008.
- 2-Antoon AY, Mary KD. "Burn Injuries." In: Nelson Textbook of Pediatrics. 17th edition. Philadelphia: Saunders; 2003: 330-337.
- 3-Bosworth C. Burns Trauma. In: Management and Nursing Care. 2nd ed. London: Whurr Publishers; 2002.
- 4-Brigham PA, McLaughlin E. "Burn incidence and medical care use in the United States: estimates, trends, and data sources". J Burn Care Rehabil. 1996; 17 (2): 95-107.
- 5-Jaun P. Barret-Nern, David-N Herndon, Principle & Practice of burn surgery(2005) by Marcel Dekker.
- 6-Greenwood JE. Burn injury and explosions: an Australian perspective. At: <http://www.ncbi.nlm.nih.gov/pubmed/19834533>. Accessed on: Sep 16, 2009.
- 7-Orgill DP. Excision and skin grafting of thermal burns. N Engl J Med. 2009 Feb 26;360(9):893-901. [PubMed Citation]
- 8-David M. Heimbach and Lee D. Faucher ,principle of burn surgery.University of Washington Burn Center, Seattle, Washington, U.S.A.

9-Burn Wound Management and Preparation for Surgery Juan P. Barret and Peter Dziewulski Broomfield Hospital, Chelmsford, Essex, United Kingdom

10-Cope O, Laugohr J, Moore F, Webster R Expeditionary care of full thickness burnwounds by surgical excision and grafting. *Ann Surg* 1947; 25:1.

11-Engrav L, Heimbach D, Reus J, Harner T, Marvin JA. Early excision and grafting vs. nonoperative treatment of burns of indeterminate depth: a randomized prospective study. *J. Trauma* 1983; 23:1001.

12-Park DH, Hwang JW, Jang KS, Han DG, Ahn KY, Baik BS. Use of laser Doppler flowmetry for estimation of the depth of burns. *Plast Reconstr Surg* 1998; 101:1516-23.

13- Wilmore DW. Postoperative protein sparing. *World J Surg* 1999; 23:545-52.

14-Mustoe TA, Cooter RD, Gold MH et al. International clinical recommendation on scar management. *Plast reconstr Surg* 2002; 110:560-571.(s)

15-El-Ottify M.A. A versatile method for the release of burn scar contracture. *Br. J. Plast. Surg.* 1988; 51:623-25.(s)

16-AXILLA EVALUATION OF THREE METHODS OF MANAGEMENT Plastic Higazi M., Mandour S., Shalaby H.A. POST-BURN CONTRACTURE OF THE Axilla Reconstructive Surgical Unit, Faculty of Medicine, Tanta University, Tanta, Egypt Post-burn scars and scar contractures

17-ArunGoel, Prabhat Shrivastava Departments of Burns, Plastic, Maxillofacial & Microvascular Surgery, Lok Nayak Hospital & Associated Maulana Azad Medical College, New Delhi - 110 002, India

18- Fathallah ZF;Epidemiological profile of burn injuries in basrah. *Bas J Surg*, March, 11,2005,(74-75).