

The Effective Management and Outcome of Hand Burns

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Abstract

Burns is a common public health problem and these injuries can be accidental, suicidal or even homicidal in nature. Hands being the most active part of the body, are often involved in burns. Hand burns represent three percent of body surface area, and are involved in more than 80% of all severe burns. Hand burns predominantly affect young adults and therefore have serious social and financial implications. The hand is one of the most frequent sites of burns scar contracture deformity. The deformities and contractures result in lifelong physical problems and affects the normal functioning of the person.

Keywords: hand burn; public health; injuries; patients; tertiary hospital; silver sulfadiazine ointment; burn wound excision; proforma; anesthesia

Introduction:

Burns is a common public health problem and these injuries can be accidental, suicidal or even homicidal in nature. Hands being the most active part of the body, are often involved in burns. Hand burns represent three percent of body surface area, and are involved in more than 80% of all severe burns [1]. Hand burns predominantly affect young adults and therefore have serious social and financial implications. The hand is one of the most frequent sites of burns scar contracture deformity [2]. The deformities and contractures result in lifelong physical problems and affects the normal functioning of the person.

Materials and Methods:

A prospective observational study of 74 patients with hand burns attending in a tertiary hospital burns unit within 2015 to 2018 was carried out.

Aim: To study the hand function outcome following the management of hand burns.

Objectives:

1. To study the incidence and distribution of hand burns in different age groups and gender.
2. To study the aetiology and pattern of presentation of hand burns.
3. To study the various treatment modalities of hand burns and their outcome.
4. To correlate between the severity of burns and hand function outcome.

Inclusion criteria:

- 1) Patients of all age groups and both sexes having less than sixty percent TBSA thermal burns and involves the hand.
- 2) All Electrical burns of all age groups and sexes involving hand

Exclusion criteria:

- 1) Patients who expired within 2 days of burn injury.
- 2) Patients who were not compliant for follow up for at least once a month following discharge from hospital.
- 3) Any patient who had previous injury or congenital deformity of the hand with restricted hand function.
- 4) Patients with chemical and radiation burns.

All patients were treated with standard resuscitative measures. Fluid resuscitation by Parkland formula and high calorie and high protein diet was initiated. After stabilization of the general condition, decision about conservative or operative treatment was taken. Wounds were assessed by me along with senior consultant for depth. Wounds were again reassessed after 24 hours to decide on treatment. It was decided to manage conservatively all the superficial partial thickness burns. All standard treatment options of conservative management like dressing with silver sulfadiazine ointment, amniotic membrane or collagen dressing for superficial partial thickness burns were explained to patient and bystanders and a collective decision was taken. They were advised to do all active movements and night splinting from day one onwards.

Early burn wound excision and skin grafting was planned in case of second degree deep and third degree burns. Surgical management of

removal of eschar, early burn wound excision and skin grafting and flap coverage were carried out as indicated. Hands were splinted in the position of immobilization with wrist in 20 degrees extension, fingers in 70 degrees flexion of metacarpophalangeal joints and interphalangeal joints in extension and with the thumb in palmar abduction at CMC joint and IPJ at 5 degree flexion for 5 days.

Patients on silver sulfadiazine ointment dressing were reviewed every 5 days, after discharge from hospital. Patients with amniotic membrane dressings were reviewed on every 5 days after discharge or earlier if patient develops fever, redness around wound or increased wound discharge. Physiotherapy was started on the same day with the help of therapist. Splinting was advised at night. Postoperative care included frequent dressing change at fourth and sixth day in case of skin grafting and every third day in case of flaps and care of donor site. Once the graft settles, after 2 weeks, patients were started on active physiotherapy for hands and ADL as per the protocols followed by the Department of Physical medicine and rehabilitation at this hospital. Patients were advised to wear the splint when not exercising and at night.

Patients were on regular follow up after discharge for a period of at least 6 months (once weekly for one month, twice weekly for two months, once a month for three months). They were observed for any complications like hypopigmented or hyperpigmented patches, contractures, hypertrophic scar or keloid, joint stiffness, clawing and mallet deformity at each visit and documented. Scar massage and compression garments were advised

Score	Extrinsic feature	Range of motion	Return to work
1	Symptomatic tightness	>80% of normal	Resume to normal work
2	Minimal scarring with no architectural distortion	>50%-80% of normal	Resume to suitable work (no heavy manual work)
3	Early scarring with mild residual architectural distortion	>30%-50% of normal	Limited to essential daily activities
4	Significant scarring & architectural distortion	< 30% of normal	Significant loss of hand function

Table 1: Scoring system for hand function

The collected data was entered into Microsoft excel. Statistical analysis was done using statistical package and social science (SPSS) software version 16. Quantitative variables were summarized using Mean. Qualitative variables were summarized using Proportions and Percentages. Pearson Chi-square test was used for correlation.

for six months in all patients. Photographic record of patient at presentation, during surgery, immediate postop, at discharge and during each subsequent follow-up was maintained. Details of every patient was recorded by a questionnaire proforma.

The compiled data was analyzed for the following study variables,

1. Distribution of various etiology and pattern of presentation in hand burn injury.
2. Mean recovery time assessment - calculated by adding total number of days taken by each patient for complete wound healing divided by number of patients in each study groups.
3. Incidence of complications in each study group
4. Assessment of Hand Function Score in each study group.
5. Correlation between depth of burns and hand function outcome.

The hand function outcome was assessed following each treatment modality using a hand function score.

Outcome of management of hand burns was measured by assessing the extrinsic feature, range of motion, return to work and scars. Patients were assessed by a hand function scoring system at the end of six months as given in (table 1) [3,4]. With Score 1 indicating excellent hand function and Score 4 indicating bad hand function outcome.

Statistical significance of p value was taken as $p < 0.05$

Results

All the results were shown in (tables 2-8)

Degree of burns	Number of patients
Second Degree burns	63 (85.1%)
Third Degree Burns	9
Fourth Degree Burns	2

Table 2: Degree of Burns

Etiology	No. of Patients
Scald burns	35 (47.2%)
Flame burns	25
Cracker blast burns	9
Electrical burns	5
Total	74

Table 3: Etiology

Treatment modality	No. of patients	Mean Recovery Time (Days)
Daily dressing with Silver sulfadiazine ointment + Physiotherapy + Night splintage	1	12
Amniotic membrane application + Physiotherapy + Night splintage	50 (67.5%)	25
Early Tangential Excision and Skin Grafting + Physiotherapy + Night splintage	22	30
Flap cover + Physiotherapy + Night splintage	2	45

Table 4: Management Principles Applied and Mean Recovery Time

Complications	No. of Patients
Hyperpigmented Patches	23 (31%)
Hypopigmented Patches	16 (21.6%)
Contractures	2
Keloid	2
Hypertrophic Scar	2
Joint Stiffness	1
Mallet deformity	1

Table 5: Complications

Score	Extrinsic feature	Range of motion	Return to work	No. of Patients
1	Symptomatic tightness	>80% of normal	Resume to normal work	69 (93.2%)
2	Minimal scarring with no architectural distortion	>50%-80% of normal	Resume to suitable work (no heavy manual work)	4
3	Early scarring with mild residual architectural distortion	>30%-50% of normal	Limited to essential daily activities	1
4	Significant scarring & architectural distortion	< 30% of normal	Significant loss of hand function	0

Table 6: Outcome Analysis of Study Population

Treatment modality	No. of patients	Scores			
		1	2	3	4
Dressing with Silver sulfadiazine	1	1	0	0	0
Amniotic membrane application	50	49	1	0	0
Excision and Skin Grafting	22	19	2	1	0
Flap cover	1	0	1	0	0

Score 1 obtained in 98% of patients who underwent amniotic membrane application.

Table 7: Outcome of various treatment modalities

Statistical Analysis:

			SCORE			Total
			1	2	3	
Degree	2nd	Count	60	0	1	61
		% within Degree	98.4%	0.0%	1.6%	100.0%
	3rd	Count	9	2	0	11
		% within Degree	81.8%	18.2%	0.0%	100.0%
	4th	Count	0	2	0	2
		% within Degree	0.0%	100.0%	0.0%	100.0%
Total		Count	69	4	1	74
		% within Degree	93.2%	5.4%	1.4%	100.0%

P value- <0.001 (Pearson Chi-Square test)

Table 8: Degree of burns and Hand function score

Discussion:

Majority of the adult patients (53.4%) had sustained accidental flame burns. Similar results have been reported from India [5,6,7] and other countries [8,9]. Cracker blast burns contribute to 12% of the etiology and most of them happened in males. 6.7% of patients sustained burns from electrical appliances.

85.1% of patient population sustained second-degree burns, 12.1% of patients sustained third-degree burns and 2.7% of the patients had sustained fourth-degree burns. All the patients were treated with standard protocol mentioned earlier.

Daily dressing with silver sulfadiazine ointment was done for one-second degree superficial burns. This patient returned to his work by 12 days.

We routinely use amniotic membrane preserved in 85% glycerol [10] and gentamycin in sterile containers for temporary burn wound coverage. Once applied and dried, it seals the wound surface and acts as a good bacterial barrier and minimizes loss of fluid and electrolyte. This reduces the need for frequent dressing changes, skin grafting, decreases pain and lowers infection rates and reduces hospital stay. So it is a cheap alternative which is adherent and forms an impenetrable layer over burn wound [11,12].

After debridement of the blisters in the burn wounds, the amniotic membrane is applied and dried. This is a painful procedure and the choice of anesthesia is decided based on the size and patient comfort and ranges from tumescent or local anesthesia to sedation or general anesthesia (especially preferred in children). No prophylaxis antibiotic protocol is followed and appropriate antibiotics are used when there is an associated URTI or patient develops signs of infection like fever, tachycardia or leukocytosis. Fifty patients underwent amniotic membrane application soon after injury which includes second degree superficial burns. All patients underwent physiotherapy and night splintage. The mean recovery time was 25 days.

Twenty-two patients underwent burn wound excision and skin grafting for second degree deep, third and fourth degree burns. Harrison D.H and Park House had also found these advantages of early excision and grafting in their study [13]. We used meshed split thickness skin grafting and appropriate splintage was given. Dressing changes were done on the fourth and sixth postoperative days. The splint was removed after ten days. The mean recovery time was 30 days. All patients underwent physiotherapy after 2 weeks and night splintage following that.

Flap coverage was done for a patient, who had electrical burn involving the right index and middle finger with tissue loss in the adjoining surfaces and second webspace, who underwent abdominal flap cover.

Complications:

Out of the second degree hand burns, one patient who underwent silver sulphadiazine dressing developed keloid and was excised later. One patient each among 50 patients who underwent amniotic membrane application developed hyperpigmentation, contracture and keloid. Two out of fifty patients developed hypertrophic scarring. Twelve out of fifty patients (24%) developed hypopigmentation. The patients who underwent excision and skin grafting developed hyperpigmentation in 95% of patients, hypopigmentation in 13% patients, joint stiffness, mallet deformity and contractures in one patient each as complications during six months follow up.

In my study population, skin contracture developed as complication in 2.7% patients and these patients were found to have been

reluctant to do physiotherapy regularly. There were skin contractures in only two patients (2.7%) out of a total of 74 patients. These patients underwent flap cover after 6 months. One patient was a 4 yr old child who had sustained deep flame burn involving dorsum of hand and child was initially skin grafted, subsequently underwent contracture release and groin flap cover. Other patient had deep flame burns involving volar aspect of index and middle finger, and underwent contracture release and multiple Z-plasties. Kraemer et al [14] noted only a 3.7% rate of reconstructive procedures 9 years after burn scar release in a population of 839 adults and children with burn injury. Pegg et al [15] found about 7.8% incidence of contractures in about a total of 411 patients. Hypertrophic scar and keloid developed in two patients (2.7%) each. Both had deep burns and developed wound infection. Both are initially managed by massage and compression garments. Keloid excision was done for one patient. Joint stiffness and mallet deformity developed in one patient each. Joint stiffness developed because of poor compliance with physiotherapy. Loss of extensor tendon by deep burns resulted in mallet deformity of the index finger of one patient, which was managed conservatively. Both patients managed to do suitable work.

Outcome Analysis:

In the outcome analysis of these treated burns patients, the majority had recovered normal hand function. These patients include both second and third-degree burns. They were on regular follow up and had regular supervised physiotherapy for hand movements. All patients were counseled, educated and motivated.

Four patients (5.4%) had minimal scarring, but no architectural distortion (Score 2) (Table 8). Range of motion was around 80%. They all returned to previous jobs.

One female patient (1.3%) with third-degree flame burn had early scarring and mild residual architectural distortion (Score 3). Contracture developed on both hands. Her activities were limited to the essential daily routine. None of our patients had score 4 as outcome.

One patient who underwent silver sulphadiazine dressing had score 1 outcome (100%). Out of the 21 patients who underwent Excision and skin grafting, 19 patients had score 1 (90.4%) and two patients had score 2 (9.5%) outcome. One patient who underwent flap cover had score 2 (100%) outcome.

Statistical analysis showed 98.4% of patients with second-degree hand burns and 88.1% of patients with third-degree hand burns obtained a score of 1 (more than 80% normal range of motion). Score 2 was obtained in 18.2% of patients with second degree burns and 100% of patients with fourth degree burns. That means there was a significant correlation (P value <0.001) between the degree of burns and hand function outcome. Worsening of hand function was identified with an increase in the degree of burns.

Time is precious and is the key to functional recovery. Early intervention like excision and skin grafting decreases the mean recovery time and thus improves the hand function. Hand must figure higher in the priority list while addressing burn contractures.

Conclusion:

Even though the mean recovery time was more in the group of patients who underwent early excision and grafting, it resulted in early burn wound coverage, minimal scar contractures and better hand function scores in deep burns. Physiotherapy, splintage and scar management in post-operative period is highly essential to prevent contracture and stiffness. Compression stockings and silicone gel sheets are useful to prevent hypertrophic scar. Thus by following the standard guidelines

in the management of acute hand burns, the deformities can be minimized and can enable us to achieve the goal of an optimum hand function which is of paramount importance.

References:

1. Richards WT, Vergara E, Dalaly DG, Coady Fariborzian L, Mazingo DW. Acute surgical management of hand burns. *J Hand Surg Am.* 2014; 39:2075-2085.
2. Schneider JC, Holavanahalli R, Helm P, O'Neil C, Goldstein R, Kowalske K. Contractures in burn injury part II: investigating joints of the hand. *J Burn Care Res.* 2008; 29:606-613.
3. Zhong-Wei C, Meyer V E, Kleinert H E, Beasley R W. Present indications and contraindications for replantation as reflected by long-term functional results. *Orthop Clin North Am.* 1981; 12:849-870.
4. McCauley RL. Reconstruction of the Paediatric burned hand. *Hand Clin.* 2000; 16:249-259.
5. PK Bilwani, Ruchi Gupta. The epidemiological profile of burn patients in L.G. Hospital Ahmedabad. *Indian J Burns.* 2003; 11:63-64.
6. Subrahmanyam M, Joshi AV. Analysis of burn injuries treated during a one year period at a district hospital in India. *Ann Burns Fire Disasters.* 2003; 16:74-76.
7. Naralwar UW, Badge PS, Meshram FA. Epidemiological determinants of burns and its outcome in Nagpur, Maharashtra, India. Souvenir of 31st Annual National Conference of IAPSM, Chandigarh: 2004.
8. Obalanji JK, Oginni FO, Bankole JO, Olaside AA. A ten - year review of burn cases seen in a Nigerian Teaching Hospital. *J Burns Wounds.* 2003; 2:1.
9. Attia AF, Sherif AA, Mandil AM, Massoud NM, Arafa MA, Mervat W, et al. Epidemiological and sociocultural study of burn patients in Alexandria, Egypt. *East Mediterr Health J.* 1997; 3:452-461.
10. Ravi shanker R, Bath AS, Roy R. "Amnion Bank"--the use of long term glycerol preserved amniotic membranes in the management of superficial and superficial partial thickness burns. *Burns.* 2003; 29:369-374.
11. de Graaf E, van Baar ME, Baartmans MGA, Scholten-Jaegers SMHJ, Nieuwenhuis MK, Eshuis J et al. Partial-thickness scalds in children: A comparison of different treatment strategies. *Burns.* 2017; 43:733-740.
12. Mostaque A, Rahman K. Comparisons of the effects of biological membrane (amnion) and silver sulfadiazine in the management of burn wounds in children. *J Burn Care Res.* 2011; 32:200-209.
13. Harrison DH, Parkhouse N. Experience with upper extremity burns. The Mount Vernon experience. *Hand Clin.* 1990; 6:191-209.
14. Kraemer MD, Jones T, Deitch EA. Burn contractures: incidence, predisposing factors and results of surgical therapy. *J Burn Care Rehabil.* 1988; 9:261-265.
15. S. P. Pegg, J. J. Gregory, P. G. Hogan, I. W. Mottarelly, L. F. Walker. Epidemiological pattern of adult burn injuries. *Burns.* 1979; 5:326-334.



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