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Original Research Article

An observational study of the outcome between early excision and resurfacing of deep thermal burns with the results of traditional dressing at a tertiary care center

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ABSTRACT

Background: Patients hospitalized with burn wounds face special challenges. Host, environmental, and organism factors increase burn patient risk of developing infection and may prolong the course of infection, once acquired. Host immune, circulatory, and respiratory systems are often compromised. Most admitted burn patients have third-degree or full-thickness burns, requiring granulation and/or grafting for acceptable repair. The zone of necrosis surrounding the burned tissue may continue to expand for up to 48 hours after injury, enlarging and deepening the path for pathogen invasion. Hospital environments may contain resistant strains of pathogenic organisms. Many studies have proved early excision and grafting of burn to be the better modality of treatment when compared with other methods like conservative dressing with antibiotics etc. This study was conducted to observe that early excision is better in patients having burn surface area less than 30% when compared to conservative dressing.
Methods: This is an observational study of 60 patients out of which 30 received early resection and remaining 30 were treated with conservative dressing by antibiotics and other topical ointments.
Results: In this study, observation was made that early resection of burns involving less than 30% body surface area has better outcomes in various parameters than conservative dressing and this has been statistically proven.
Conclusions: This study concludes that early excision and resurfacing of deep burns is beneficial than the traditional dressing of burn wounds and saves time, resources and also gives a better outcome.

Keywords: Burns, Conservative dressing, Early excision, Grafting, Topical antibiotics

INTRODUCTION

A burn is a type of injury to skin, or other tissues, caused by heat, cold, electricity, chemicals, friction, or radiation. Most burns are due to heat from hot liquids, solids, or fire. Females in many areas of the world have a higher risk related to the more frequent use of open cooking fires or unsafe cook stoves. Alcoholism and smoking are other risk factors. Burns can also occur as a result of self harm or violence between people. Burns that affect only the superficial skin layers are known as superficial or first-degree burns. They appear red without blisters and pain typically lasts around three days. When the injury extends into some of the underlying skin layer, it is a partial-thickness or second-degree burn. Blisters are frequently present and they are often very painful. Healing can require up to eight weeks and scarring may occur. In a full-thickness or third-degree burn, the injury extends to all layers of the skin. Often there is no pain and the burn area are stiff. Healing typically does not occur on its own. A fourth-degree burn additionally involves injury to deeper tissues, such as muscle, tendons, or bone. The

burn is often black and frequently leads to loss of the burned part.

Burns are generally preventable. Treatment depends on the severity of the burn. Superficial burns may be managed with little more than simple pain medication, while major burns may require prolonged treatment in specialized burn centers. Cooling with tap water may help pain and decrease damage; however, prolonged cooling may result in low body temperature.

Partial-thickness burns may require cleaning with soap and water, followed by dressings. It is not clear how to manage blisters, but it is probably reasonable to leave them intact if small and drain them if large. Full-thickness burns usually require surgical treatments, such as skin grafting. Extensive burns often require large amounts of intravenous fluid, due to capillary fluid leakage and tissue swelling. The most common complications of burns involve infection. Tetanus toxoid should be given if not up to date.

In 2015, fire and heat resulted in 67 million injuries. This resulted in about 2.9 million hospitalizations and 1,76,000 deaths.[1] Most deaths due to burns occur in the developing world, particularly in Southeast Asia. While large burns can be fatal, treatments developed since 1960 have improved outcomes, especially in children and young adults. In the United States, approximately 96% of those admitted to a burn center survive their injuries. Burns occur with similar frequencies in men and women.

The long-term outcome is related to the size of burn and the age of the person affected. Many studies have proved early excision and grafting of burn to be the better modality of treatment when compared with other methods like conservative dressing with antibiotics etc.[2] Early excision involves removal of necrotic and inflamed tissue, resurfacing with normal skin and Eschar, being the principal nidus for bacterial infection is removed.

Deep burns constitute a challenging form of surgical lesion, typically characterized by three vertical zones of tissue insult. The area closest to the heat source coagulates, and the tissue in this zone is either necrotic at the very outset or it undergoes severe protein denaturation and becomes irreversibly damaged. Just below this coagulation zone is a zone of stasis and oedema.

Further underneath is an area of hyperaemia, where blood flow gradually increases, peaking at about 7 days post-injury. A burn that appears superficial at the outset may become deeper over the next of 48-72 h, with the zone of stasis becoming necrotic. This will ensue particularly if the wound becomes infected or there is poor perfusion of the affected area.[3-5]

Cope et al pioneered the concept of early excision and autografting of burn wounds after treating patients from the Cocoanut Grove fire in Boston in 1942.[6] Janzekovic generated renewed interest in early excision in 1970 when she reintroduced the concept of tangential excision of the necrotic tissue and immediate resurfacing with split-thickness skin grafts.[7] Excision and grafting is now the standard surgical management of deep burns. The goal is to excise all devitalized tissue and render the wound suitable for skin grafting. All layers of necrotic tissue are excised until a viable wound bed is reached, as indicated by capillary bleeding.[8-10]

The aim of the study was to study the outcome of early excision and resurfacing of deep thermal burns and to compare it with the results of traditional dressing.

METHODS

This study has been conducted between March 2015 to February 2017 in the Department of Surgery of BRD medical college, Gorakhpur and includes all patients who were willing to participate in the study and had area of burn involving less than 30% of body surface.

Patients who were not willing to participate in the study and those who were having larger areas of burn were excluded from this study

This is an observational study of 60 patients out of which 30 received early resection and remaining 30 were treated with conservative dressing by antibiotics and other topical ointments.

In this study, we have compared the two common treatment methods of deep burns <30% body surface area i.e. early resection and grafting and conservative dressing and observed the outcome with different parameters.

RESULTS

Age distribution

The age of patients studied ranged from 1 year to 75 years. Largest number of patients were in age group 20-30 years of age and the smallest representative age group was 10-20 years.

Table 1: Age distribution.

Age group	Number of patients	Percentage
1-10 Years	10	16.66
10-20 Years	3	5
20-30 Years	17	28.33
30-40 Years	14	23.33
>40 Years	16	26.66

Sex proportion

Out of the patients included in our study, the proportion of males and females is as given in Table 2.

Table 2: Sex proportion.

Sex	Number of patients	Percentage
Male	26	43.33
Female	34	56.66

Types of burn

Amongst the various patients of burn enrolled in our study, there were four modes of injury i.e. thermal, electrical, scald and chemical, out of which thermal was the most prevalent and chemical the least one.

Table 3: Types of burn.

Types of burn	No. of patients	Percentage
Thermal	32	36.66
Electrical	14	23.66
Scald	12	20
Chemical	2	3.33

Sex proportion in various modes of burn

The proportion of burn in both the sexes also differs in various modes of burn.

Table 4: Sex proportion in various modes of burn.

	Thermal	Electrical	Scald	Chemical
Males	9	11	6	0
Females	23	3	6	2

Extremities affected

The extremity affected are according to the frequency of use of that extremity. Accordingly, the most affected extremity is the upper limb.

Table 5: Extremities affected.

Affected extremity	Number	Percentage
Upper limb	31	35
Lower limb	19	31.66
Face	2	3.33
Rest body	8	13.33

Time of intervention

Various factors controlling the final outcome consists of time of intervention done after the injury sustained is one of the important factors.

Table 6: Time of intervention.

Time of intervention	Number of patients
<7 days	4
7-14 days	7
>14 days	19

Duration of hospital stay

The duration of hospital stay depends on various factors like nutritional status, mode of injury, age, time of intervention, any secondary infection etc.

Table 7: Duration of hospital stay.

Mode of intervention	1-10 days	11-20 days	21-30 days
Early resection	8	15	7
Conservative	5	10	15

Total time of healing

Total time of healing of patients who underwent early resection and those who received conservative treatment has also been compared in the following data collection.

Table 8: Total time of healing.

Days	30-45	45-60	60-75	75-90	90-105	105-120
Early resection	8	15	4	0	0	0
Conservative	0	1	3	12	11	6

Complications

Mostly wound related complications were seen in post treatment period in both groups.

Table 9: Complications.

Intervention	Complications encountered	Uneventful
Early resection	8	22
Conservative	16	14

DISCUSSION

The total no. cases included in our study were 60, out of which 30 (50%) were treated by early excision and the remaining 30 (50%) were treated by conservative technique of regular cleaning, washing and dressing with topical antibiotic regularly. Those treated conservatively were due to their denial to undergo any operative procedure.

Out of the total population studied ranging from as young as 1 years of age to 75 years old patients with a median age of 29 years (average 31.51 years), the most affected age group is from 20-30 years (n=17) i.e. 28.33% followed by 30-40 years age group (n=14) 23.33%. The age group contributing the least in this study is 10-20 years of age group (n=3) 5%. This finding is consistent with the fact that incidence of burn injury is more prevalent in the age group with more activity and social involvement.

Among all the patients in present study, the ratio of males to females is 26 males (43.33%) against 34 females (56.66%). This ratio suggests a slight dominance of female population which is not much significant. This is also possible in present social condition due to major involvement of female population in daily chores like cooking of food and other household activities like ironing of clothes etc which leads to more exposure of female population towards burn injuries.

Various modes of injuries frequently encountered in our study are basically of four types viz. thermal, electrical, scald, chemical. Out of these, the most commonly encountered mode is thermal injury occurred due to exposure to hot solid object or to direct flame. Out of 60 patients studied, 32 patients (36.66%) suffered from thermal injury followed by electrical burn (n=14, 23.66%), scald (n=12, 20%) and the least is chemical injury (n=2, 3.33%).

In present study sex-wise proportion of mode of burn is taken into consideration, we come to notice that Females are the major victim of thermal injuries. Out of total 34 females, 23 suffered thermal injury making it 67.64% (23/67) among females affected. Likewise, males on the other hand are more subjected to electrical burns. Out of total 26 males studied, 11 suffered from electrical injury making it about 47.82% (11/23) among male patients affected.

In this study scald injury shows equal incidence in both males as well as females with 6 patients each in both the sexes. Scald injuries are more prevalent in extremes of ages i.e. in very young children who are affected due to negligence or accidental exposure to very hot fluids and also in aged individuals who may undergo prolonged exposure to hot fluids unknowingly due to loss of sensations in extremities (neuropathies etc.).

For chemical injury only, population affected is females (100%). Total 2 patients were affected, and both were females. This is mainly due to the high incidence of acid attack on young females prevalent in our society. The substances causing chemical injuries are strong bases or acids which are major component of toilet and floor cleaners etc.

In this study observation was made that upper extremities involvement in thermal injury was more. The highest incidence of burn incurred is on the upper limb (n=31) 35% and lowest incidence of the face (n=2) 3.33%. This complies with the fact that the extremity in use is the extremity more likely to be injured.

Timing of surgical intervention is a very important predictor of good post-surgical outcome. In this study most of the people underwent surgical intervention after 14 days of injury. Total 19 patients underwent excision of burn wound out of total 30 patients receiving some surgical intervention making it 63.33%. There were 4 patients (13.33%) who have received the operative management within 7 days of time. This was primarily due to the fact that the patients in our study belong to poor socio-economic and low educated population lacking proper awareness regarding health problems and turn-up to specialists only after having some complication.

Duration of hospital stay is another important consideration in our study. In present study, it was observed that patients those who have undergone early resection have an average time of 15.93 days of hospital stay whereas those taking conservative treatment have an average hospital stay of about 19.43 days. In a similar study conducted by Herndon et al from 1982-1988 these results were found to be 47 days and 53 days respectively as this study involved percentage of burn greater than 30% whereas in this study patients having burn surface area less than 30% were included.[11] When we pooled the data on length of hospital stay from Engrav et al, Desai et al studies, it was found that the duration of hospital stay was significantly shorter in patients who had early excision.[12,13] Those patients who have their burns excised early tend to have their wounds covered earlier and hence have a shorter stay in hospital.

As for skin graft-take, Subrahmanyam's14 study showed that it was superior in early excision group but Desai's study found no difference between the two groups. Engrav et al. looked at hypertrophic scarring and he found more patients in the conservative treatment group with hypertrophic scars.

There are sufficient data that clearly indicates that patients undergoing early resection require lesser period of hospitalization and early return to work with good quality of life.

Further after being discharged, the patient continues to take treatment and follows up on opd basis. Therefore, we have also taken into consideration total time of healing including time of hospitalization and treatment taken in opd. In our study the total days required for healing of patients with early resection was 49.13±8.06 days at an average which was statistically significantly lower than the average time of 89.13±14.56 days in patients (with p value=.0315 i.e. $p<0.05$) undergoing conservative method of treatment.

The patients receiving the treatment and including in our present study may suffer from several complications like sepsis, intra-operative blood loss, post-operative scarring or contracture and so on. These complications have been compared between the early resection and conservative mode of treatment. Out of the patients undergoing resection, 8 out of 30 patients (26.66%) suffered from one or other complication whereas this no increased to its double value i.e. 16 out of 30 patients (53.33%) suffered from complications. This infers that complications are

also decreased in patients undergoing early resection and is better than conservative management of burn.

CONCLUSION

There is a female predilection in the incidence of burn and the number of females is higher than males and is statistically not significant with p value>0.05 (p=0.06). The age group most affected is between 20-30 years as it is the most physically and socially active group. Thermal burns are the most prevalent type of burn among various types of burn and females are affected most by thermal burns. This can be prevented by proper cooking awareness among females and use of safe cooking medium. Males are affected mostly by electric burn depicting more involvement of males with electrical instruments and unsafe mode of electrical supply which can be prevented by safe electricity distribution by government and awareness among people to refrain from dealing with electrical instruments without proper training and safety measures. Upper limb is most affected extremity followed by lower limb. Timing of surgical intervention was greater than 14 days in majority of patients. This is mainly because the late reporting of patients and can be overcome by awareness of people about seriousness of burn injury and its complications. Early resection is always better than traditional dressing in deep burn with <30% of body surface area involvement as the patient has to stay for lesser number of days in hospital, lesser number of days in total healing and also lesser number of complications are encountered in early resection.

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