

# Surgical Management of Burn Cases and their Complications

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## ABSTRACT

**Introduction:** To prevent infection, early excision of the eschar and covering of the wound are the major challenge in treating acute burn injuries. Therefore aim of present study is to evaluate the results of surgical treatment of extensive burned patients and their effect on complications.

**Material and methods:** In present study, cases of burn accidents and post burn deformities of various types admitted in emergency and plastic and burn units, S.R.N. Hospital, Allahabad, during one year period has been included.

**Results:** In mild cases, average duration of stay in hospital is 16 days while in moderate cases, it is 50 days. Out of 31 patients admitted in emergency, 15 patients were treated by debridement and split skin grafting and 13 patients by topical agents and debridement of wound and 3 patients of post electric burn gangrene by amputation and fasciotomy. Fluid and electrolyte imbalance was most common complication in burn cases during treatment.

**Conclusion:** Plastic surgeons have endeavored to take up the challenge of burn trauma. Even today burns are treated non-operatively. The surgical management in the present series of one year has considerably diminished other complications of major burn.

**Keywords:** Surgical Management, Excision, Debridement, SSG.

## INTRODUCTION

Burn injuries not only cause a very serious illness with fatal complications but also post traumatic events like complex psychological issues with multiple ramifications. Outcome of extensive burns (TBSA >25%) has been improved in last decade due to progress in the field of burns treatment<sup>1,2</sup> but current treatment of a severe burned patient desires return of the survivors back to their families, work field and communities.<sup>3</sup>

Burns injuries have high morbidity and mortality and for decade's early excision and grafting has been the standard treatment. Studies done by various authors<sup>4-7</sup> show that excision within 24-48 hours after injury is associated with decreased infection, blood loss, length of hospital stay and increased graft take.

Treatment of burn injuries is based upon adequate resuscitation, early wound debridement and closure and control of infection. Early surgical debridement removes non-viable tissue and makes wound bed infection free.<sup>8</sup> Surgical debridement depends on the depth of the burn injury. There is need for large volumes of blood for transfusion (approximately 1 cc/cm<sup>2</sup> to be excised) during excision of burn wounds.<sup>5</sup> In our set up where majority of females are in child bearing group belonging to poor and illiterate family

living in rural areas, the main problem that arises in their management is the arrangement of adequate quantity of blood and nutritional elements like albumin and dietary support for wound closure with skin grafting. The reason is that people are poor and illiterate, having a misconception in their mind of getting physically and mentally ill after donating blood.

Tangential excision gives better cosmetic outcome by but blood loss is more. On the other hand, fascial excision has opposite picture to tangential excision.<sup>4-6</sup> Autogenous grafts require the sacrifice of epidermis on another area of body and can be considered. Homograft, however, are presently the subject of intensive studies and experimentation. Early tangential excision and grafting of burns is a method used to achieve early closure of burn wound. Compared to non-operative treatment with topical antimicrobial agents, early excision and grafting requires average shorter hospitalization, lower cost and less time away from work. The objective of this study is to evaluate the results of surgical treatment of extensive burned patients and their effect on complications.

## MATERIAL AND METHODS

Cases of burn accidents and post burn deformities of various types admitted in emergency and plastic and burn units, S.R.N. Hospital, Allahabad, during one year period was included in present study. According to requirements of particular case, all necessary resuscitative measures were carried out. After that a detailed clinical examination was carried out. It includes history, general physical examination, systemic examination etc. Local examination was done in each patient to find out parts of body involved, extent of burn, depth of burn and contamination of wound.

### Treatment

**First 24 hours:** Ringer lactate was given as choice of fluid and 4 ml/kg/% of burn was given. Half amount of this given in first 8 hours and rest of amount was given in subsequent 16 hours.

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**Second 24 hours:** Half amount of estimate first 24 hours fluid was given.

**Subsequent days:** Oral sips can be allowed if bowel sound were present (usually on third day). Maintenance fluid was also given in form of DNS solutions.

Anti-tetanus immunization was given for prophylaxis.

Catheterization was done to know urinary output in patient with 20% or more of TBSA with self retaining Foley's Catheter.

In cases of respiratory and systemic stress or on development of toxemia, steroid was given in high doses for short period.

**Antibiotics:** Initially all patients were given combination of ampicillin and metronidazole. Gentamycin were added according to his renal function. Change in antibiotic was done when there were no signs of infection or toxemia.

**Fasciotomy:** In case of deep burn involving circumferentially areas, immediate fasciotomy was done simply by incising the full thickness of skin up to deep fascia releasing pressure over the underlying neurovascular bundle.

**Investigations:** Routine investigations (Hemogram, B.Urea, S.Creatinine, B. Sugar, Urine examination) and special investigations (S. Electrolyte, S.Protein, S. Albumin and A:G ratio) were done initially on third day when patient stabilized. Hb%, PCV, S. Protein were repeated on weekly interval till patient was discharged. Wound swab from various sites of burn were taken and sent for culture and sensitivity, whenever required. All the cases having sepsis, pyrexia and toxemia in the third week of burn were also investigated by blood culture to know the presence of any bacteria in blood stream, migrated from burn wound. Patient in our study were divided in 4 groups:

**Group A (Patient having 10-25% burn):** These patients were treated by sterile paraffin gauze (Jelonet) and Neosporin powder dressing.

**Group B (Patient having 26-50% burn):** These patients were treated by closed dressing and Silver Sulphadiazine cream.

**Group C (Patient having 51-75% burn):** These patients were treated by open dressing and Silver Sulphadiazine cream.

**Group D (Patient having 76-100% burn):** These patients were treated by open dressing and Silver Sulphadiazine cream.

All dressings were changed on every second days or whenever they were soaked.

### Wound Debridement

Debridement of wound (excision of all the dead and non viable tissue starting from skin down to deeper structures) was done with surgical blade no. 23 till the surface started bleeding. After debridement and cleaning of wound with saline, some patients were dressed with sterile paraffin gauze (Jelonet) over which Neosporin powder sprinkled and covered with dry cotton and compression bandage. Sometimes when infection was suspected in the wound, the

sterile paraffin gauze was incorporated with a second layer of sterile glycerine acriflavin soaked gauze pieces followed by compression bandage. Plaster of paris slabs were applied to maintain the hand, foot and neck in functional position where dressing was done by closed method. The limbs were elevated and active and passive movements were encouraged in all the immobilized patients.

### Grafting Procedure

3 to 5 weeks following burn the third degree wounds usually were ready for grafting. Wound were ready for grafting when granulating wound was free of necrotic tissue characterized by thin flat red surface and graft was applied as soon as possible. Donor areas (usually the thigh) were prepared pre-operatively. S.S.G. was done under anaesthesia. At the time of harvesting of grafts, the excessive hypergranulation tissue at the recipient site was scrapped with a knife and the grafts were applied 48 hours later when surface was dry. S.S.G. was done with Humby's knife.

Although thick grafts were better in quality, a thinner graft was generally preferred because of a better chance of take up and also for promoting the possibility of re-harvesting from the same donor site after a period of 3-6 weeks. After achieving hemostasis, the donor site was covered with a non-adherent layer of Vaseline gauze (Jelonet) and cotton roll. A gentle compression dressing was applied. Dressing was opened between 10<sup>th</sup> to 14<sup>th</sup> post-operative days, localized pain or discharge may warrant an earlier inspection. The aim was to keep the dressing dry.

Graft was applied over recipient site and non adherent dressing with sterile Vaseline guaze with second layer of acriflavin- glycerine soaked gauze and cotton roll was done. First post-operative dressing of recipient site done after 2-3 days to inspects the take-up of graft. If the take-up of graft was good then few subsequent dressings were done similarly at 3-4 day interval until complete wound healing took place and if the recipient site was infected then subsequent dressings were done at shorter interval.

Usually in cases where the graft take-up was good, complete wound healing occurred in 10-15 days time after which the wound was left opened and patient advised to do gentle massage steroid antibiotic cream (Betnovate-N) for 10 days followed by coconut oil in summer and cold cream in winters. Plaster of Paris (POP) slabs were applied in the post-operative period to maintain the joints in proper functional position. Later on pressure garments and splints were applied for 3-6 months to prevent scar hypertrophy and contractures along with physiotherapy and early rehabilitation.

The patients were followed up after their discharge from the hospital as long as they were available during the period of study. Photographs of patients were taken pre and post management in cases of burns admitted in emergency and pre and post operatively in cases where operation was done to compare the results and for documentation.

### RESULT

This study has been undertaken on about 266 cases of burn injuries, ranging from 10 to 100% of total body surface

area from January 2003 to January 2004 who underwent management of shock and burn wound care & reconstruction of post burn deformity of various types. Maximum cases (80%) of acute burn reported to the hospital within 24 hours and rest cases after 24 hours. About 19% of cases absconded most likely due to fear of medico-legal problems after death, unsatisfactory and unhygienic conditions of burn units of medical college hospital. 65% cases died within 1-3 weeks due to shock, renal shutdown or respiratory distress syndrome.

Table 1 shows relationship between average duration of hospital stay in relation to percentage burn injuries. In mild cases, average duration of stay in hospital is 16 days while in moderate cases, it is 50 days. In severe cases duration of stay varies from 4-20 days due to death of the patients.

Table 2 shows relationship between average duration of hospital stay in relation to percentage burn injuries in both conservative and surgical management cases.

Out of 39 patients who were treated, 31 cases were admitted in emergency while 8 cases were admitted with post burn deformities of various types. Out of 31 patients, 15 patients were treated by debridement and split skin grafting and 13

patients by topical agents and debridement of wound and 3 patients of post electric burn gangrene by amputation and fasciotomy. All the 8 patients of post burn deformities of various types were managed by contracture release with split skin grafting. (Table 3)

Table 4 shows complications developed during treatment in burn cases. It shows that fluid and electrolyte imbalance was most common complication in burn cases.

## DISCUSSION

Burn injury is a major socio-economic problem having more incidences among poor socio-economic group of the society with overcrowding, poor housing, and lower level of education. In present study, duration of injuries varied from 6 hours to > 1 week for burn cases admitted in emergency department of hospital. Maximum number of cases was admitted after 8-16 hours of burn injury in emergency department. This is in contrast to studies done by various authors in developed countries showing shorter time duration. Patients of post- burn deformities of various types (developed within 1-5 years of burn injuries) were admitted in hospital for corrective surgery. In developing countries like India, this delayed arrival in hospital is the major problem but even then we have adopted an approach to save the life of individuals and post burn deformities.

Out of 39 patients who were treated, 31 cases were admitted in emergency while 8 cases were admitted with post burn deformities of various types. Out of 31 patients, 15 patients were treated by debridement and split skin grafting and 13 patients by topical agents and debridement of wound and 3 patients of post electric burn gangrene by amputation and fasciotomy. In 3 out of 13 patients wound was covered with sterile paraffin gauze (Jelonet), sprinkled Neosporin powder and then covered with gauze and cotton. In rest 10 patients wound was covered with Silver Salfadiazine cream followed by glycerin acriflavin dressing.

All the 8 patients of post burn deformities of various types were managed by contracture release with split skin grafting. In one patient, local flap adjustment was done. In all of them graft taken up was good and complete wound

Burn injuries (%)	No. of Days
10-25%	16
26-50%	50
51-75%	20 (Due to Death)
76-100%	4 (Due to death)

**Table-1** Average Duration of hospital stay in relation to % of burn injuries

Burn injuries (%)	Conservative management (Days)	Operative management (Days)
10-25% (Mild)	20	12
26-50% (Moderate)	60	35
51-75% (Severe)	88	50

**Table-2:** Average Duration of complete healing in relation to burn injuries (%)

Type of cases	No. of cases	Surgical Management			
		Debridement+ SSG	Topical agent+ Debridement	Amputation+- Fasciotomy	Contracture release+SSG
Admitted in emergency	31	15	13	03	-
Post-burn deformities	08	-	-	-	08

**Table-3:** Surgical management of Burn Cases

Complication	No. of Burn Cases
Fluid & Electrolyte imbalance	20 (19%)
Toxaemia	10 (14%)
GI Problems	5 (8.3%)
Renal Failure	8(10.1%)
Urinary Tract Infection	10 (14%)
Contracture	7 (10%)
Pneumonia	10 (14%)

**Table-4:** Complications developed during treatment in burn cases

healing occurred within 15-21 days. At the time of discharge, they were advised to wear pressure garments and splints to prevent scar hypertrophy and contractures.

In 13 out of 15 patients where debridement and SSG was done, the operative procedures were delayed for a period of 3 to 6 weeks because of the poor condition, fear for voluntary blood donation and in-cooperation on the part of the patient to arrange blood and nutritional elements (albumin) to correct their anaemia and hypoproteinaemia.

At the time when the wound was cleared of the infection and ready for SSG, blood could not be arranged in these patients and in that conditions they had to be managed conservatively on regular dressing with topical antimicrobial agents and hyperalimentation with the constant advise for grafting. Patients were kept on high protein and carbohydrate diets but in none of the patients were able to infuse protein solution or start parenteral nutrition because of poor financial condition and in-cooperation of the patient. During this period of delay, there was proliferation of excessive granulation tissue which in majority of cases required a second stage of debridement of hypergranulation to make the wound ready for SSG.

Other problem which was encountered during this period of delay was the successive loss of blood with each dressing which further decreased the hemoglobin of patient. This also increased the cost of treatment, increased the hospitalization, increased the time away from the work, increased the mental stress of the patient and increased the complications and morbidity of patient because during this period besides complete healing of the superficial wound, majority of deep wound also healed by scar hypertrophy resulting into contractures.

49 patients of the study having both superficial and deep burn absconded after 21 days because more than half of their wound which were superficial had healed completely leaving small areas of deep wound and blood could not be arranged in these patients.

Average time taken for spontaneous healing of superficial wound was 2-3 weeks in this study. In all the patients where wound coverage was done by SSG, complete wound healing occurred (within 15-25<sup>th</sup> postoperatively day). An average of 3-4 units of blood were transfused and 5-7 weeks time taken for complete wound healing in each case where wound coverage was done with SSG. In majority of patients, all the investigations required for our study could not be done because of poor condition of the patient and hospital. Only Hb and PCV could be repeated at regular intervals. Culture of surface swab showed growth of staphylococcus in 4 cases and proteus, pseudomonas and staphylococcus in 6 cases.

In a retrospective study entitled "Study of present trends in management of burn cases and their complications" done from September 1996 to September 1997 in SRN Hospital, Allahabad, 3-6 weeks was the time taken to prepare the burn wound for SSG as compared to 3-4 weeks time taken in the present study. The time taken for spontaneous healing of superficial wound in both the previous and the present study was same i.e. 2-3 weeks.

Percentages of graft take up after SSG in the present study

is more as compared to that in previous study. As compared to previous studies, the total number of burn cases admitted in emergency was more but the number of cases who expired was less. In the present study, number of cases of post burn deformities were less and no distant flap were used. As compared to the previous studies, the incidence of complications in the present study was less.<sup>9-10</sup>

## CONCLUSION

In present study, patients had burn injuries ranging from 10% to 100% of total body surface area (TBSA) and underwent management of shock and burn wound care and reconstruction of post burn different deformities. From the results, it can be concluded that in extreme burn cases, open method of dressing was convenient choice. The method of early excision and grafting was preferred in all the patients of burns but it was observed that in majority of them, anaemia and hyperproteinaemia could not be corrected at the time when wound was ready for grafting. So patients were managed conservatively by topical antimicrobial agents. Early debridement and cover with split skin graft have dramatically reduced the post burn complications which otherwise used to occur in the past. The final management is, recovering the patient, physically and mentally to near pre burn state so that he becomes productive member of the society.

In the end it is concluded that plastic surgeons have endeavored to take up the challenge of burn trauma. Even today burns are treated non-operatively. The surgical management in the present series of one year has considerably diminished other complications of major burn.

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