

## Success & Failures & Problems in the Management of Post Burn Contractures

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### ABSTRACT

**Objective:** To determine the success & failures & problems in the management of post burn contractures.

**Methods:** Retrospective study carried out to evaluate release of contracture cases in Burns and Plastic surgery unit Patel hospital from January 2011 to October 2014. Information was obtained about age of patient, type of burn, region and type of contracture, type of release, initial and late outcome and recurrence.

**Results:** A total of 65 patients underwent release of contractures. Age ranged from 6 months to 53 years. 35 patients were under 12 years age group. Most common reason of burn was fire in 33 patients followed by scalds in 20 patients. Most common area involved was Hand and wrist in 23 patients followed by eyelids and elbow. Total of 76 contractures released in these 65 patients. Split thickness skin grafts were used in 30 contractures and full-thickness skin grafts in 26 contractures, local transposition flaps (z plasties, v-y plasties and commissuroplasties) in 16 and loco regional flap in 4 contractures. Initial result was good in 62 patients. Two patients had partial graft loss and one had complete graft loss. Late result was satisfactory in 39 patients, 17 patients had no follow up record. 9 patients developed recurrence, among them 6 were treated with STSG and 3 with FTSG, two of them had good result after repeat surgery. 5 patients had stiff hands. Good results were observed in patients treated with FTSG and flap and also in those patients treated with STSG who followed use of splints and physiotherapy. Lack of follow up and lack of compliance is found to be most common problem in management. Pediatrics post burn contractures are difficult in terms of post-operative therapy. We found that donor area availability is major limitation of not doing flap coverage.

**Conclusion:** Post burn contractures are difficult to treat specially in children. There are many problems associated with their treatment. Skin grafts are good and reliable options and provide good results if post-operative therapy is followed properly.

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**Key words:** Post burn, contractures, skin grafts, flaps

### Introduction:

Post burn contractures are common and very frustrating sequel of burn injury affecting form and function. In history, post burn contractures were first described in Egyptian manuscripts where use of copper splints was documented to treat them(1,2). Contractures can be defined as an inability to perform full range of motion of a joint. The development of contractures after burn injury depends on

many factors including areas involved, depth of burn, initial management, duration of immobilization, and soft tissue and bony problems(1). Post burn contractures are more common in pediatric population because of difficulties in physiotherapy and rehabilitation. Post burn contractures cause disturbance in both form and function and seriously affect life of an individual socially, economically and emotionally(1,3). Lower limb contractures cause difficulty in performing day to day activities most importantly ambulation.ref Contractures of the upper extremities may affect activities of

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daily living, such as grooming, dressing, eating, and bathing, as well as fine motor tasks(1,4).

Contracture of other body areas poses different types of problems like hygiene problems in genitilia contractures and functional problems associated with severe neck contractures. With increased survival in major burn injuries the incidence of burn contractures is not only increased but poses problems in management due to lack of donor areas.

Best way to treat post burn contracture is to prevent them as once they are formed they are not easy to deal with especially in children(3).

There are various methods to treat contractures depends on type of contracture and donor site availability. Splintage and physical therapy is as important in post burn contractures as in early burn management (5,6).

Post burn contractures are common but little is known of the scope of the problem. Dobbs and Curreri<sup>39</sup> retrospectively reviewed 681 patients who received physical therapy for burn injury and found that 28% developed contractures. The hand, elbow, and shoulder were the most frequently affected joints. TBSA and burn depth were associated with the development of contractures. In another retrospective chart review of 52 burn patients with contractures, Richard found elbow flexion (21%), ankle plantar flexion (19%), and shoulder extension/ adduction (17%) contractures were most common. In a published abstract, Kowalske et al reported contractures in 42% of 1749 adult burn patients with American Burn Association criteria for major burn injury at time of discharge. The shoulder, elbow and hand were most commonly affected. In addition, flame burns and larger burns had a higher incidence of contracture(1).

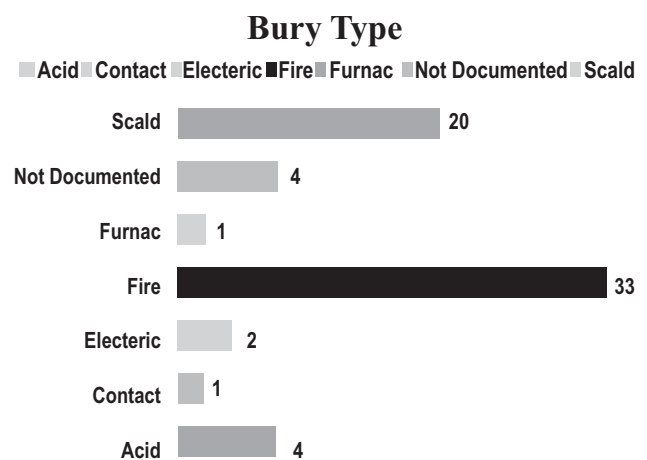
A retrospective study published in Plastic and reconstructive surgery journal evaluating use of skin grafts in treatment of post burn contractures. Authors concluded that the use of skin grafts is simple, reliable. Whenever possible, the authors recommend the use of full-thickness skin grafts in preference to

split-thickness skin grafts in postburn contracture release(5).

Post burn contractures are common and very frustrating sequel of burn injury affecting form and function. There are various methods to treat contractures depends on type of contracture and donor site availability. Author evaluated her experience of managing post burn contracture in her unit and wanted to share her experience in terms of success, failure and problems

**Methods:**

A retrospective review was carried out of all patients who had release of post burn contractures at the Burns Unit, Patel Hospital, Karachi; between January 2011 to October 2014 to evaluate the experience over this period. Details were gathered about the age, type of burn injury, duration of burn, primary treatment, contracture site, presentation (primary/recurrent) interval between burn and release of contracture, type of surgery, complications, and follow-up. Our surgical protocol was release of contracture, coverage with grafts or flaps depending on contracture site and donor availability, k wiring or splinting depending on site, physiotherapy after removal of wires/splints, scar therapy. Age of patients divided into less than 12 and more than 12 and we found that 35(53.8%) patients were under 12 years of age and 30 (46.2%) were above 12 years. Fire burn was most common cause of burn (n: 33) and other causes recorded were scald, electric, acid burn, contact burn and in four patients causes were not documented. (figure 1)



Primary treatment was non-operative in 23 patients and primary skin grafting was performed in 31 patients while in 8 patients primary treatment was not well documented. Time since burn was divided in less than 3 months, 3 months to 1 year, more than one year and not documented. 50.6% patients were burned for more than one year, 26.7% were among 3 months to one year group and 13.8% were in less than 3 months group while in 6% of patients' time since burn was not documented. 57 patients presented with primary contracture and rest of the 8 was presented with recurrent contracture during study period. Among regional distribution (Table 2)

Region	Frequency	Percent
Hand & Fingers	23	30.2
Canthus/EYELID	9	11.5
Elbow	8	10.5
PERIORAL/FACE/NL	8	10.5
NECK	6	7.8
Knee	6	7.8
Axilla	5	6.5
Foot & Ankle	5	6.5
Breast	2	2.6
Perinium	2	2.6
Trunk	1	1.3
Ear	1	1.3
Total	76	100.0

hand and wrist was the most common region involved in 30.2 % of patients. More than one region contractures were recorded in 10 patients. A total of 76 contractures were released, 30 were re surfaced with split thickness skin grafts, 26 with full thickness skin grafts, 16 with z plasties/v-y plasties/commissuroplasties while in 4 patients loco regional flaps were performed. (Table 3)

Surgery	Frequency	Percentages
ROC+ STS	30	39.4
GROC+FTS	26	34.2
GROC Multiple Zplastic/VY/ Commissuroplasties	16	21.01
Roc Local Flap	4	5.2
Total	76	100.0%

Results were categorized in two, initial and late result. Initial result was documented as good or successful if grafts take were full, flaps were healthy and healed well. Late success was documented as satisfactory result if good range of motion across joint and patients performing routine work. Complications were documented as graft loss or flap failure in early period while recurrences and functional problems were documented in late results. Follow up record was evaluated from clinical notes and last date of visit documented.

#### Statistical analysis:

Data was entered and analysis in to SPSS version 22. Descriptive statistics were calculated in term of mean $\pm$ SD as appropriate. Categorical variable were computed in term of frequency and percentages. All results were display in the form of charts and tables.

#### Results:

Initial results were successful in 62 patients. Two patients had partial graft loss and one had complete graft loss. All three patients of graft loss were from hand and wrist group. One patient who had complete graft loss was an eight years old child with history of electric burn injury and full thickness graft was used to re surface area after release of contracture and after graft loss he was managed non-operatively and developed recurrence. Two patients with partial graft losses were also from full thickness skin graft group and after

partial loss managed non-operatively, among these one had satisfactory outcome after healing and physiotherapy while other lost to follow up. There was no graft loss observed in split thickness skin grafts in initial period and all four loco regional flaps survived well. All 16 z plasties/v y plasties and commissuroplasties survived well without any complications. Most common reason for z plasties was flexion contracture of fingers and first web space contractures and axillary contractures. (Table 3)

Late results were satisfactory in 39 patients, 17 patients had no follow up record. 9 patients developed recurrence, among them 6 were treated with STSG and 3 with FTSG. Recurrence was more common in younger patients and mean age was 9.1 years. 5 of them had skin grafts as their primary burn treatment. Recurrence was more in hand and wrist region (n: 4) and more in patients who had fire burns (n: 6). All patients with recurrence were primary contractures except one who presented with recurrent contracture.

5 patients developed stiff hands mostly due to difficulties/non-compliance to physical therapy.

Satisfactory results were observed in patients treated with FTSG and flap and also in those patients treated with STSG who followed use of splints and physiotherapy.

Lack of follow up and lack of compliance was found to be most common problem in management. Pediatrics post burn contracture were difficult in terms of post-operative therapy. We found that donor area availability was major limitation of not doing flap coverage.

### Discussion:

Contractures are very common after burns injury resulting from inadequate initial management and physiotherapy. The best way to treat them is to prevent them. Inadequate initial burn management not only

alter the depth of burn but also causes hindrances in physiotherapy because of immobilization, pain, frequent anesthesia and nutritional problems. Initial adequate burn management and aggressive physiotherapy and Splintage have key role in prevention of contractures. The protocols of Splintage and physiotherapy depend on region involved by burn. In any burn crossing joint or in surrounding of joints, early range of motion exercises should be started and region specific Splintage should be done. It is documented that early excision and grafting of deeper burns reduces infection, hospital stay and improves outcome and early exercises in such patients reduced development of contractures (1). In delayed grafting if early physiotherapy is not adequate the joints are stiff at the time of grafting and immobilization after grafting worsen the situation placing patient more prone to develop contracture especially in children (1,7).

There are various methods to treat post burn contractures depending on type and site of contracture and donor availability. Method of reconstruction in burns contractures should be simple and effective (3). Options of reconstruction include local flaps like z plasties/v-y plasties, skin grafts, loco-regional flaps and free tissue transfer and all are effective methods. Skin grafts are easy and reliable and if good post-operative physiotherapy and Splintage protocols are followed, provide satisfactory results. Full thickness skin grafts provide better results than split thickness skin grafts. In our patients treated with skin grafts we found that early graft loss is common in full thickness is common than split thickness but late recurrences are more common in splint thickness for reasons well documented in literature. Inadequate release and residual scar tissue on recipient bed is also important cause of early graft loss. K wiring is essential in digital contractures and effective method

of immobilizing grafts and with aggressive physiotherapy and appropriate custom made splints after removal, range of motion can be achieved. We used custom made splints for axilla, elbow, first web space and toe contractures and gained satisfactory results. Local flaps like z plasties, v-y plasties, and commissuroplasties are reliable methods to treat contractures and should be done whenever feasible. They work well even in burned surrounding skin. We used double opposing z plasties for first web space and canthal region with good results. Multiple z plasties with or without adjunct skin grafts work well in grade I and II axillary contractures and stern grade I and II in finger contractures. Multiple z plasties are also used for linear contractures of anterior neck, dorsum of foot and popliteal fossa. For digital web creep we used z plasties and transposition flaps with or without skin grafts. (figure 4)



Young female with post burn contracture of first web space, index, middle and little finger. Multiple z platies done on index and middle fingers and FTSG on first web space and little finger.

Loco regional and distant flaps provide good coverage in contracture release depending on area involved, choice of flap and donor availability. Pedicled thoracodorsal artery perforator flap is good option for axillary contractures, supraclavicular (with or without expander) are very suitable for cervical contractures, perforator based flaps from medial or lateral thigh are reliable option for knee contractures, Pedicled lateral arm flaps provide good coverage to elbow contractures. Donor site availability is a single most important factor in not doing regional flaps. Over the last 25 years tissue expansion has

become a technique for overcoming such soft-tissue limitations (8,9 ). With survival in major burns, incidence of contractures is increased and treating surgeons face problem of donor availability. We performed 16 local and 3 regional flaps. We used genicular artery perforator flap for knee and lateral arm flaps for elbow contractures. In neck contracture we didn't find patients with good surrounding skin and very few patients refused for expanders. We have done supraclavicular flaps in cervical contracture, para-umbilical perforator flap for dorsal hand contractures which are not part of this study period. Free tissue transfer are good option in management of post burn contractures and should be planned whenever requirement is not fulfilled with other simple options (10). We routinely do micro vascular surgery in our institute for head and neck cancer reconstruction and trauma but in our post burn contracture protocol we keep them as last option, and use simpler options first. In our study there is no free flap is done for contractures.

In our study majority patients are from pediatric age group and this need special consideration. Contractures in children are very easy to develop and very difficult to treat. Post-operative physiotherapy and Splintage are very difficult in children and cause anxiety for parents as well. With growth problems recur and it needs to be discussed with parents in detail before planning any treatment. We found recurrence to be high in children and complications like stiff hand are also more in children than adults.

Post-operative plan should be discussed in details with patients and parents/caretakers. We found very high rate of lost follow-up despite of explaining all parts of treatment in details. During our study we realized that documentation should be improved and all parts of treatment planning should be well documented along with areas involved and options available and patient's compliance

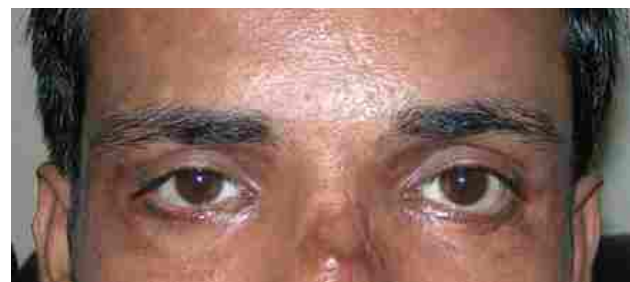
and post-operative progress should be well written in clinical notes.

### Conclusion:

Post burn contractures are difficult to treat specially in children. Defining success is difficult in their treatment as initial treatment is successful in almost all patients but late outcome may not be very good. Skin grafts are simple and reliable options and provide satisfactory results if physiotherapy and Splintage is done aggressively. Full thickness grafts should be preferred over split thickness skin grafts. Local transposition flaps are reliable even in surrounding scarred/burned skin. Regional and distant flaps are very good options and should be planned whenever feasible.

Figure: 5

Young male with post burn ectropion of both lower eyelids, released and re surfaced with FTSG



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