

## Original Research Article

# A prospective observational study on prevention of contractures of upper limb following burn

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## ABSTRACT

**Background:** Over 1 lakh people are affected by burn every year in India and 20 thousands of them die per year. Post burn contracture is a common sequela occurring after burn. Upper limb contractures are also occurring more commonly because it is most mobile part of body and likely to be involved in burn. There are many studies on management of post burn contractures but literature about prevention of contracture is little, hence this study was conducted. The aim of this study was to recognise various preventive measures to prevent post burn contractures of upper extremity.

**Methods:** This study was conducted in NSCBM Subharti Medical College and Hospital located in Meerut (North India) from October 2012 to October 2014 in Department of Surgery. It was a prospective observational study consisted of 80 cases who presented as acute burn of upper limb admitted in the hospital.

**Results:** In our study early excision with skin grafting was done in 20 patients (25%) while delayed skin grafting was done in 25 patients (31%) while 35 patients (44%) were managed conservatively. In our study 20 patients reported back with a post burn contracture. The reason found was non-compliance to antideformity splint and physiotherapy.

**Conclusions:** Early surgical management of deep burns, physiotherapy, anti-deformity position and proper splintage can significantly reduce the development of post burn contracture.

**Keywords:** Postburn contracture, Prevention, Upper extremity

## INTRODUCTION

Over 1 lakh people are affected by burn every year in India and 20 thousands of them die per year.<sup>1</sup> A survey of past few years indicated a mortality rate of between 25-49% for adult and between 6-20% for children.<sup>2</sup> Thousands of victims of burn are mutilated and handicapped every year.<sup>3</sup> Unfortunately, the incidence of post burn contractures is extremely high in our country. Management of these contractures account for up to 50% of the general plastic surgeon's workload.<sup>4,5</sup> Hence this

study was conducted to study the various preventive measures against the development of contractures in axilla, elbow and hand following acute burn. Post burn contracture is a common sequela occurring after burn. Upper limb contractures like axilla are also very common. In order to minimize contractures, the initial management of burn in this region should include proper splintage and aggressive physiotherapy.<sup>6</sup> Active and passive exercise and the application of pressure garments after wound healing or graft are essential in management of these injuries.

## METHODS

After obtaining the institutional ethics committee approval, present prospective observational study was carried out in the Department of General Surgery, NSCBM Subharti Medical College and Hospital during the two year period i.e. October 2012 to October 2014. So during this period 80 patients of acute burn of upper extremity were enrolled into this study by taking written and explained consent. In all patients presenting with acute burn of upper limb following preventive measures were undertaken to prevent the development of contractures:

- Proper dressing of the burn wound.
- Positioning of burned limb in anti-deformity position.
- Early excision and skin grafting for deep partial and full thickness burn
- Pressure garments/silicone gel sheets
- Splintage
- Physiotherapy

### Inclusion criteria

All patients of acute burn of upper extremity willing to participate were included in the study.

### Exclusion criteria

Patients who went LAMA or were lost during follow up and electric burns were excluded.

### Statistical analysis

Data from each patient collected and tabulated using microsoft excel. All the statistical analysis was carried out by SPSS version 16. Microsoft word and excel have been used to generate graphs, table etc. Statistical method use was Z test,  $p < 0.05$  considered statistically significant.

## RESULTS

In our study, the youngest member was a 2 yr old girl, and the oldest was a 70 year old man. Maximum number of patients 22 (27.5%) were in the age group of 21-30 years (Table 1). Out of 80 patients, 58 (58%) were females and 42 (42%) were male (Table 2). In our study, most common cause of contracture was thermal burn (95%) (Table 3). In our study, most of the cases (86%) were of accidental group, 10 cases were of suicidal attempt and 4 cases were of homicidal group (Table 4). In our study 44 (55%) patients are from rural area and 36 (45%) are from urban areas. Among urban areas 57.1% were females in comparison to 42.9% rural females. In our study most of the patients were uneducated/with primary education (91%) (Table 5).

Regarding initial management of burn injury, 20 patients (25%) were treated in a general surgery unit in a tertiary

care hospital or managed in plastic surgery/burn ward, and 36 patients (45%) were treated at centres which were not having burn centre for proper management of patients while 24 (30%) received no regular treatment from any hospital (Table 6).

**Table 1: Age wise distribution.**

Age (years)	No of patients	%
<b>1-10</b>	06	7.5
<b>11-20</b>	18	22.5
<b>21-30</b>	22	27.5
<b>31-40</b>	16	20.0
<b>41-50</b>	12	15.0
<b>51-60</b>	04	5.0
<b>61-70</b>	02	2.5
<b>Total</b>	80	100

**Table 2: Sex wise distribution.**

Sex	No of patients	%
<b>Male</b>	32	40
<b>Female</b>	48	60
<b>Total</b>	80	100

**Table 3: Distribution according to the mode of injury.**

Mode of injury	No of patients	%
<b>Thermal</b>	76	95.0
<b>Scald</b>	04	5.0
<b>Total</b>	80	100

**Table 4: Distribution according to type of burn injury.**

Type of burn	No of patients	%
<b>Suicidal</b>	04	05
<b>Accidental</b>	76	95
<b>Homicidal</b>	-	
<b>Total</b>	80	100

**Table 5: Distribution according to patients education.**

Type of education	No of patients	%
<b>Primary to class VIII</b>	25	31.25
<b>Secondary (class IX-XII)</b>	05	6.25
<b>College education</b>	02	2.5
<b>Uneducated</b>	48	60.0
<b>Total</b>	80	100

In our study, early excision with skin grafting were done in 20 pts (25%), while 25 pts (31%) of the patients presented with raw areas so delayed skin grafting was done while 35 pts (44%) of the patients were managed conservatively and were advised use of either splints/pressure garments along with physiotherapy. Use of

splints/ pressure garments along with physiotherapy were also advised to patients in whom grafting was done (Table 7).

**Table 6: Distribution regarding initial management of burn injury.**

Specialty	No of patients	%
Private or district hospital	36	45
General surgery unit or plastic surgery or burn ward	20	25
No regular treatment from any hospital	24	30
<b>Total</b>	<b>80</b>	<b>100</b>

**Table 7: Distribution according to various strategies for prevention of contracture.**

Presentation	No of patients	Procedure done	%
Deep partial to full thickness burn	20	Early excision with skin grafting (4-7 days)	25
Raw area	25	Delayed skin grafting (4-6 weeks)	31
Conservative management	35		44
<b>Total</b>	<b>80</b>		<b>100</b>

**Table 8: Distribution of those 20 patients who returned back with post burn contracture to our hospital.**

Procedure	No of patients	%
Early skin grafting	02	10
Delayed skin grafting	05	25
Conservative	13	65
<b>Total</b>	<b>20</b>	<b>100</b>

**Table 9: Distribution according to advice of splintage**

Distribution	No of patients	%
Splintage Advised	28	35.0
Not Advised	52	65.0
<b>Total</b>	<b>80</b>	<b>100</b>

In our study 20 patients returned back to our hospital with a contracture. In these 20 patients early skin grafting was done in 02 patient (10%), delayed skin grafting was done in 05 patients (25%) while 13 patients (65%) were managed conservatively (Table 8). In our study splintage was advised to 28 patients (35%) whereas 52 patients

(65%) were not advised the use splintage (Table 9). In our study, 02 patients (7.2 %) were regular users of day and night splint, 06 patients (21.4%) were partially compliant to the use of splints whereas 20 patients (71.4%) were non-compliant/defaulters and developed contractures (Table 10).

**Table 10: Distribution according to compliance to splintage.**

Distribution	No of patients	%
Fully compliant (24 hours)	02	7.2
Partially compliant (12 hours)	06	21.4
Non-compliant/defaulters	20	71.4
<b>Total</b>	<b>28</b>	<b>100</b>

## DISCUSSION

Present study comprised of 80 cases who presented as acute burn of upper limb admitted in NSCBM Subharti Medical College and Hospital Meerut from October 2012 to October 2014 in the Department of Surgery.

Clearly, the best treatment is prevention. Potokar et al notes that preventive strategies can be primary, secondary, and tertiary.<sup>7</sup> Primary prevention aims at reducing burn incidence through safer cooking methods, fireguards, and education of fire hazards in schools and community settings. Secondary prevention is aimed at reducing the severity of the burn through promoting good first aid practices. Tertiary prevention is aimed at reducing the mortality and morbidity of burns. The mainstay in tertiary prevention is allowing uncomplicated healing of burns whenever possible and using early primary excision and grafting to achieve stable skin cover when not possible. Pandya et al stated that there are two key elements in burn contracture prevention, namely splinting of the burned area in its anatomic position and regular exercises through each joint's full range of motion.<sup>8</sup>

Kwan and Ha et al provide an excellent description of the clinical rationale and considerations involved in choosing different splints to apply in upper-limb burns.<sup>9,10</sup> Developments in splints during the past 15 years have certainly contributed greatly in reducing burn contractures, and new advances continue to be described. Schwanholt et al describe a wrist extension or metacarpaophalangeal joint hyperextension splint to prevent contractures in deep palmar burns.<sup>11</sup>

Yotsuyangi et al describe a compressive splint that is simple and easy to apply for use following skin grafting of the palm in children.<sup>12</sup> In a study done by Parag et al from September 2011 to December 2011 on 12 diagnosed cases of moderate and severe post burn elbow contractures it was found that the use of pre-operative splinting was significantly effective in decreasing post burn contracture of elbow; it also reduced the area

required for skin grafting at future definitive surgery. Our study reflects the high frequency of post burn contractures in our country. In developed countries and affluent societies, such disabling conditions have been successfully reduced with improved standards of initial care. It is now well established that a burn victim who receives the best of initial treatment is expected to heal without any contracture.

In our study in order to prevent the formation of contracture, we instituted Intensive care programmes and rehabilitation at the very beginning of burn management. Early excision and skin grafting of deep second degree and full thickness burns was done along with splintage and anti-deformity positioning was done to avert the risk of contracture formation. In our study of 80 patients of acute burn only 20 patients returned back to us developing a post burn contracture. The reason for this was mostly found that early rehabilitation and exercises/physiotherapy could not be instituted in these patients as these patients were discharged early on personal request and most of these patients were non-compliant to the use of either splintage/pressure garments/exercises that were advised to them at the time of discharge.

In our study of 80 cases of post burn contractures, 48 (60%) were females and 32 (40%) were males. The reason for the high percentage of female patients in comparison to male is that they are commonly involved in the kitchen work and most of the burn injuries occurs at home especially in the kitchen. Various possible risk factors are floor level cooking, substandard kerosene pressure stove, loosely worn garments (sarees and dupatta), low level electric plug points, table cloth over which hot food or beverages are kept, carelessly kept match boxes within reach of children, substandard pressure cookers, etc.

In 11-30 years of age group, more married females (60%) presented with post burn contracture in comparison to 40% married males. Epidemiologic study carried out by Jayaraman et al showed that female belonging to 13-36 years had a higher incidence of burn forming a large population.

In our study 55% of cases were from rural areas while 45% were from urban area. Among the urban patients 57.1% were females in comparison to 42.9% of rural females. The reason could be female in urban areas are much more aware of their deformity so they present early as comparison to rural females.

In the present study 60% of the cases are uneducated, only 2.5% of the cases had college education. Jayaraman et al and other studies reported that 66.7% are uneducated. The results are almost similar to our studies because most of the patients in our studies are from rural background.

In the present study, 95% of the cases had thermal burn and 5% of the cases had scald. Moyer (1954), Bull (1958) and Forester and Richardson (1959) reported dry heat/flame as most common cause of burn. Ahuja and A. Goel (1992) reported flame as the most common cause of burn as flame burn due to pressure kerosene stove was the most common presentation in their study. Ganguli (1976), Gupta et al and Mukherjee observed that any heat/flame was the most common cause of burn.<sup>13</sup> Study by Jayaraman et al showed that 67.4% burns were due to open flame, 26.8% scald, 3.8% chemicals and 2% electrical. Their study confirmed with the present study.

Majority of the cases in our study were of accidental burn (95%). According to the study of Jayaraman et al, 87.4% cases were of accidental burn, 12.6% suicidal burn and 2.4% homicidal burn. High incidence of accidental burn is usually because suicidal and homicidal injury is not given by patients and attendants. Suicidal and homicidal burns are usually extensive burns and usual outcome of these burns is death in comparison to recovery leading to post burn deformity.

In our study most of the burns were domestic burns i.e. 60% of cases and out of them 44% of cases sustained burn in the kitchen. Among these females and children were more victims. Jayaraman et al in their study group reported that 84.8% of burns were in domestic group and 53.8% of females were in domestic group. So present findings are confirming with this study.

## CONCLUSION

Prevention is of utmost importance. Post burn contractures can easily be prevented by timely surgical intervention in the form of early excision and skin grafting, escharotomy, anti-deformity splinting, proper positioning of the burn wound in anti-deformity position and active physiotherapy. There is need to revisit the prevalent acute burn care practices and establish focused preventive strategies.

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