



POST BURN CONTRACTURE OF AXILLA

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**ABSTRACT**

**AIM:** Demographic study of patients with Post burn contracture axilla. To evaluate the severity of Post burn contracture of axilla. Evaluation of various modality of management of Post burn contracture of axilla. **MATERIAL AND METHODS:** This study was done on 20 patients (9 males and 11 females) admitted in Plastic surgery unit in Maharani Laxmi Bai Medical College and Hospital Jhansi between October 2009 to September 2011. **RESULT:** The youngest patient was a 16 years old boy and oldest patient was a 42 year old man. The maximum number of patients 10(50%) out of 20 were in the age group of 21-30 years. Out of 20 patients 9 (45%) were male and 11 (55%) were female. In this study, out of 20 patients Z-plasty procedure was done in 8 (40%), release and skin grating in 10 (50%) and local flap procedure in 2 (10%) patients. In this study most common cause of contracture was thermal burn (in 90% cases). In this study group out of 20 patients, Right Limb was involved in 12 (60%) cases bilateral limb involvement was in only 1 (5%) patient. In our study 11 (55%) patients were from Rural area and 9 (45%) patients belong to Urban areas. In this study group 7 (35%) were educated and 13 (65%) patients were un-educated. In our study 12 (60%) patient were Fully compliant (24 hrs), 6 (30%) patient were partially compliant (12 hrs) and only 2 (10%) patients were non-compliant for wearing splint. In Our Study out of 20 patients, 3 (15%) patients had flap tip necrosis, 1 (5%) patients had Graft failure, 2 (10%) patients had recontracture. **Conclusion:** 20 patients we come to following. **CONCLUSION:** (50%) of our patients fall in 21-30 yrs of age group, In our study 55% patients were female, Most of our patients come from rural area, More than half of our patients were Un-educated, Thermal burn was most common burn, leading to post burn axilla contracture, Right axilla was more frequently involved (60% of cases), Bilateral axilla involved in only 1(5%) patient, In our study 45% patients had type IV contracture of axilla, Release and skin grafting was most common type of procedure performed in our study, If possible Z-plasty should be used as long term results are better with this procedure, Flaps are useful in prevention of recontracture but patients complains of bulk in axilla, Splintage is helpful in prevention of recontracture, Common complication are flap tip necrosis, graft failure and recontracture

**KEYWORDS :** Axillary Contracture, Propeller Flap, Square Flap, Skin Graft.

**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>. 10% of all accidental death and 7% of all suicide in India is caused by fire. Burn trauma is still rising in India and is second largest killer after road traffic accident. Thousands of victim of burn are mutilated and handicapped every year<sup>3</sup>.

More than half of the cases are aged between 21-40 years. In this age group burn is more common in female. Male predominance in younger age group is explained by the inquisitive and exploring nature of boys of this age. 69.9% patient belong to low socioeconomic status while 21.8% patient are from middle and only 8.6% are of high socioeconomic status. 42.6% belong to an urban area while the rest are from rural area.

It is unusual for the hair bearing apex of axilla to be involved in thermal injury duo to its anatomic location and because in most instances, the upper extremity are maintained in adduction, protecting the axillary hair bearing area.

Table given below show the etiology of burn according to their percentage<sup>4</sup>.

Cause of burn	Percentage
Dry burn	51.64%
Scald	33.35%
Electric burn	3.59%
Chemical burn	2.97%
Petrol burn	2.36%
Coal Tar burn	0.79%

Industrial burn	0.7%
Miscellaneous	4.55%

Post burn contracture is a common sequelae occurring after burn. Upper limb contracture like axilla is also occurring more commonly because it is most mobile part of body and likely to involve in burn. Post burn contracture of axilla leads to functional deficit as it limits the movement of upper extremity mainly abduction and extension. Patients with axillary contracture is unable to utilize his upper limb because he is unable to take the hand at required site.

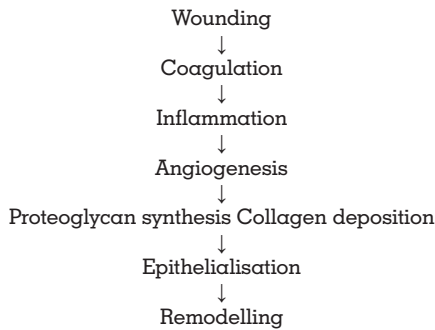
In order to minimise axillary contractures, the initial management of burn in this region should include proper positioning of the shoulder joint in an abduction splint and aggressive physiotherapy<sup>5</sup>. Active and passive exercise and the application of pressure garments after wound healing or graft take are essential in management of these injuries. In spite of all these preventive measures some patients nevertheless develop axillary contractures.

Once scar contracture is established surgical correction must be performed to prevent further involvement of the underlying structures. The goal of surgical correction of axillary scar contractures is to provide maximum correction with minimum or no local anatomic distortion.

**Wound healing and development of contracture**

Wound healing is the summation of a number of processes that follow injury. These include coagulation, inflammation, matrix synthesis and deposition. These are followed by angiogenesis, fibroplasias, epithelialisation, contraction, remodeling and scar maturation. If wound edges are apposed, healing proceeds rapidly to closure. This is known

as healing by first intention or primary healing. If the wound edges are separated, such as when there has been tissue loss, the same biological processes occur, but rapid closure is not possible. In this case, angiogenesis and fibroblast proliferation result in the formation of granulation tissue. This contracts to reduce the wound area and allows epithelialisation across its surface to achieve wound closure.



This is known as healing by second intention. The process is slower; the actual shrinkage of the wound area may cause a contracture. This will produce a disfiguring scar and may also cause limitation in movement.

**AIMS**

1. Demographic study of patients with Post burn contracture axilla.
2. To evaluate the severity of Post burn contracture of axilla.
3. Evaluation of various modality of management of Post burn contracture of axilla

**MATERIAL AND METHODS**

This study was done on 20 patients (9 males and 11 females) admitted in Plastic surgery unit in Maharani Laxmi Bai Medical College and Hospital Jhansi between October 2009 to September 2011.

Detailed history and examination of patients were done. Relevant investigations and photographic documentation of axillary deformities was done. Pre- anesthetic check up was done by concerned anesthetist. Depending over the axillary deformity most suitable procedure was selected and performed.

**Surgical procedure**

Post burn scarring and contracture affectin function remains the most frustrating late complication of burn injury various technique are used to release contracture. The choice depends on their location and/or the availability of unaffected skin adjacent to the contracture or elsewhere.

**Z-plasty**

This is procedure involving the transposition of two interdigitating triangular flap. It is mainly used to

- a) Gain in length along the direction of the common limb of the Z. It is used for treatment of the contracted scar.
- b) To change the direction of the common limb of the Z. It is used for management of facial scar.

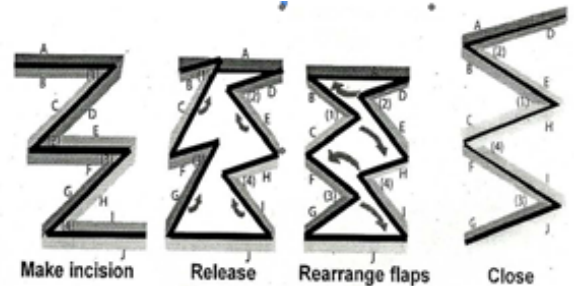
**Basic manoeuvre**

When the Z-Plasty is used to release a contracture the common limb of the Z is placed along the line of contracture the size of each angle of Z is 60. The ends of common limb spring apart when the interdigitating flaps are raised and the fibrous tissue band responsible for contracture is divided. This result in a change in the shape of the parallelogram and the triangular flaps become transposed, the contractual diagonal lengthens and the transverse diagonal shortens.

**Single versus multiple z-plasty**

The amount of lengthening achieved by each is same, but the shortening in transverse diagonal is greatly reduced in multiple Z-Plasty. The Z-Plasty is most effective where the contracture is narrow and the surrounding tissue is reasonably lax as in type 1&2 Post burn contracture Axilla.

The central limb of the Z should extend the full length of contracture but this requires a correspondingly large quantity of tissue to be brought in from the sides, tissue which is not always available as in type 3&4 Post burn contracture Axilla so this is not the best way to manage this type.



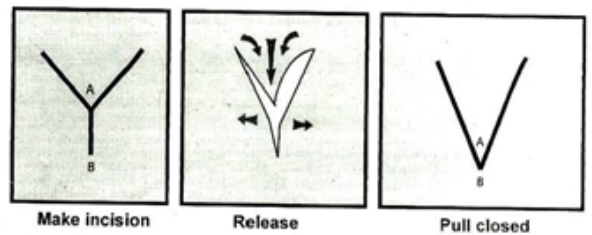
Most frequent complication of a Z-Plasty is necrosis of tip of flap and it is a particular hazard when there is scarring of the skin or more commonly, when the skin flap raised has to be excessively thin. This can be minimized by

- a) Provision of maximum vascular capacity.
- b) The tip of the flap can be broadened by modifying its shape slightly without affecting its angle size.
- c) Avoidance of undue tension-

Tension in the transposed flap is very difficult to avoid, particularly when the contracture is a dubious candidate for Z-Plasty. The single Z with its large flap, is more prone to this problem, since it concentrates transverse tension. The smaller flaps of the multiple Z-Plasty are less liable, since their effect is to reduce and diffuse the transverse tension, thereby minimizing circulatory embarrassment.

**Y-V Advancement**

The Y-V advancement is a flap that widens a localized area of tissue. It begins with an incision shaped like a Y and ends in an arrangement shaped like a V. By pulling flap A to point B, one introduces more tissue into an area. If done right flap can break up the contracture and allow increased joint mobility.



**Five Flap Plasty**

A five flap plasty (also known as a jumping man flap) combines a double opposing Z-plasty with a Y-V advancement. Pulling flap A to point B is the Y-V advancement. The act of pulling flap C to point D and flap E to point F is what creates the two opposing Z-plasties. This operation breaks up the contracture, has minimal displacement of the hair-bearing area, and results in a lightning-shaped scar.



**Local Flaps**

If there is not enough skin to cover the area directly under the axilla (due to inflexible scar tissue or a particularly severe contracture), it is better to use a flap than a skin graft to cover the joint. If the patient's back is relatively scar-free, a good flap to use is the parascapular flap. Up to 15 by 25 cm in size, this fasciocutaneous flap obtains its blood supply from the descending branch of the circumflex scapular artery. It should be dissected from inferior to superior, using the scapula as a guide. To ensure that the pedicle vessel is captured in the flap, the superior aspect of the flap must include the 'triangular space' within its border. The borders of the triangular space are comprised of the Teres major, the teres minor and the long head of the triceps. The triangular space is located on the lateral side of the scapula, approximately 2 centimeters (the width of one's finger) below the midpoint of scapula. Once the flap has been rotated and secured in its new position donor site can usually be completely closed. Alternatively, if the back is too scarred to donate skin one could use a pectoralis major or pectoralis minor myocutaneous flap.

**Release and skin grafting**

Release and skin grafting are now a day most commonly used procedure for type 2, 3 & 4 contracture.

**Release of contracture**

Complete release of contracture should be done avoiding damage to any important underlying structure, e.g. arteries, nerves, tendons, etc. Although contraction occurs in all directions, the incision should begin across the point of maximum tension, i.e. where the contracture is most tight. This point is usually opposite the joint line. The incision is deepened all the way to the unscarred, healthy tissues. After the complete release of contracture, multiple darts are made at appropriate points along the periphery of the defect created to take into account the contracture along other directions. Fish-tailing of the incision line at either end is inadequate and inferior to the multiple darts especially when the former are marked on the skin at the beginning of operation. Darts are 'cut as you go' while the fish tails are predetermined. No attempt should ever be made at undermining the surrounding healthy/scarred skin and advancing it to decrease the defect.

**Incision Versus Excision**

In general, a contracture should be released by incision rather than by excision. This is especially true for patients who have received adequate preoperative physical therapy and their scars have become soft and pliable. Incision alone decreases the requirement for skin cover. When the scars are extensive, it is futile to excise a small amount if whole of scar cannot be excised for fear of creating an extensive raw area.

In general, a contracture completely on the table in one go. However, in severe long-standing contractures, there is considerable shortening of musculotendinous units and neurovascular structures. Hence, it may not be possible to achieve complete release. Their release may limit any further release and vessels may go into spasm if forceful extension is attempted.

After the complete release of a post burn contracture, the recreated defect is covered using skin grafts or a skin flap. Commonly, the raw areas resulting after release of post burn contractures are covered with split skin grafts.

**Skin Graft**

When using split skin grafts, sheet grafts are to be preferred and no attempts should be made to expand the graft by meshing. As far as possible, try to feed in graft more than the size of the defect to take care of the postoperative, inevitable secondary contraction. The junction line of the sheets of the grafts should preferably lie parallel to the axis of joint motion.

Ordinarily, the skin grafts are applied immediately after complete release.

Patient were discharged after healing of all the wound. Proper advise was given regarding splintage.

- 24 hour splinting in hyperabduction position was advised for 3 month.
- For next 3month night splintage was advised. In severe burn injury involving the axilla, the position of least pain is one of adduction and internal rotation at the shoulder joint along with protraction of scapula. It is therefore of paramount importance that splinting in the antideformity position be effected before the capsular element of the joint begin to tighten and shorten.
- Regular follow up was done at the interval of 3 weeks.

**RESULT**

The present study has been carried out on 20 patients of post burn contracture axilla admitted in Plastic Surgery Unit in Department of Surgery, Maharani Laxmi Bai Medical College and Hospital, Jhansi.

**Table No.1: Age wise distribution**

Age (years)	No. of patients	Percentage (%)
1-10	0	0
11-20	5	25
21-30	10	50%
31-40	4	20%
41-50	1	5%
<b>Total</b>	<b>20</b>	<b>100%</b>

**Table No.2: Sex wise distribution**

Sex	No. of patients	Percentage (%)
Male	9	45%
Female	11	55%
<b>Total</b>	<b>20</b>	<b>100%</b>

**Table No 3: Grading wise distribution**

Grade	No. of patients	Percentage (%)
Grade I	5	25
Grade II	5	25
Grade III	1	5
Grade IV	9	45
<b>Total</b>	<b>20</b>	<b>100%</b>

**Table 4: Procedure wise distribution**

Procedure	No. of patients	Percentage (%)
Z-plasty	8	40
Release and Skin Grafting	10	50
Local flap	2	10
<b>Total</b>	<b>20</b>	<b>100%</b>

**Table No.-5: Distribution according to mode of injury**

Mode of Injury	No. of patients	Percentage (%)
Thermal burn	18	90
Electric Burn	1	5
Scald Burn	1	5

**Table 6: According to limb involved.**

Limb Involved	No. of patients	Percentage (%)
Right	12	60
Left	7	35
Bilateral	1	5
<b>Total</b>	<b>20</b>	<b>100</b>

**Table 7: Social background of patient-**

Residence	No. of patients	Percentage (%)
Rural	11	55
Urban	9	45
<b>Total</b>	<b>20</b>	<b>100</b>

**Table 8: Distribution according to patients education**

Education	No. of patients	Percentage (%)
Educated	7	35
Un-educated	13	65
Total	20	100

**Table 9: Distribution according to patients compliance for splint**

Compliant	No. of patients	Percentage (%)
Fully compliant (24 hrs)	12	60
Partially compliant (12 hrs)	6	30
Non-compliant	2	10
Total	20	100

**Table 10: Complication**

Complication	No. of patients
Flap tip necrosis	3
Graft failure	1
Recontracture	2
No complication	14

## DISCUSSION

In over study out of 20 patient maximum patients are in age group of 21-30 years. Mean age of presentation is 25 years.

Study done in burn unit at the **National Orthopaedic Hospital, Enugu** (2000-2004) age group range between 2-47 years. Maximum number of patients in this study were between 21-30 years of age with mean age 23 years. This figure is compatible with our study.

In our study out of 20 patients 9 were male (45%) & 11 female (55%). This study shows that contracture axilla is more common in female. It is mainly because burn injury is more common in female as they are commonly involved in kitchen work.

In the study done in burn unit at the **National Orthopaedic Hospital, Enugu** (2000- 2004) out of 37 patients there were 20 male and 17 female. This difference from our study is mainly because increase incidence of burn in female patient.

In our study out of 20 patient 5 patient (25%) belong to grade I, 5 patient (25%) belong to grade II, 1 patient (5%) in grade III, and 9 patient (45%) were belong to grade IV.

Similar study was done at **Mansoura University Hospitals**, (October, 1994 through October, 1997). In this study out of 35 patient type I contracture constitute 10 patient (28.5%), type II contracture constitute 20 patient (57%), type III and IV contracture constitute 5 patient (14.25%). In this study most of patient belong to type II (57%). This figure is not compatible with our study. Reason for this may be high incidence of suicidal cases in our study group. Chest is usually involved in suicidal burn.

In the study done in burn unit at the **National Orthopaedic Hospital, Enugu** (2000- 2004) out of 37 patient, grade I include 31 patient, grade II 4 patient, grade III and IV include 2 patient. Again this study was not compatible with our study, as due to change in trend as described above.

Similar study was done in **Department of Burns, Cairo University** in the period between May 2002 & June 2006. In this study out of 20 patients, grade I include 10 patients (50%), grade II 10 patient (50%), grade III and IV 0 patient (0%). Again this study was not compatible with our study.

In our study out of 20 patient Z-plasty was done in 8 patient (40%), release & skin grafting done in 10 patients (50%), local flap done in 2 patients (10%), so in our study release and skin grafting was most commonly used procedure.

Study similar to our was done in burn unit **National Orthopaedic Hospital, Enugu** (2000- 2004). In this study out of 37 patient Z-plasty done in 12 patient, release and skin grafting done in 6 patient, local flap done in 23 patient. This study was not compatible with our study. This is due to change in trend mainly because extensive burn involving axilla with chest wall, leaving not suitable for local flap or Z-plasty.

Study done in **Department of Burn, Cairo University** in the period between May 2002 & June 2006. Out of 20 patient multiple Z- plasty was done in 5 patient (25%), local flap in 11 patient (55%), release and skin grafting done in 4 patient (20%). This study was again not compatible with our study, this was due to change in trend as mention above.

In our study out of 20 patient, 18 patient (85%) were due to thermal burn, 1 patient (5%) due to electric burn and 1 patient (5%) due to scald burn From this study we see that most common cause of burn was thermal burn leading to contracture axilla.

In the study done in burn unit **National Orthopaedic Hospital, Enugu** (2000-2004) out of 37 patient studied, 48% patients had thermal burn, 32% had chemical burn and 20% were due to scald burn. This study is compatible with our study, here again most common cause of burn was thermal burn.

In our study out of 20 patients right limb was involved in 12 (60%) patients, left limb involved in 7 (35%) and bilateral limb involved only in 1 (5%) patients. So in our study most common limb involved was right limb because it is most active limb of the body and commonly engaged in all routine work.

In the study done in burn unit at the **National Orthopaedics Hospital, Enugu** (2000- 2004) out of 37 patients, right limb involved in 19 (51.4%) patient, left limb in 14 (37.8%) and bilateral limb involved in 4 (10.8%) patients. These findings are compatible with our.

## Complication

Partial skin graft loss was seen in 1 of our case. It is difficult to immobilise the axilla leading to increase chances of graft loss.

Flap tip necrosis was seen in 3 of our cases as these flaps were raised from scarred areas causes for this necrosis is obvious.

## CONCLUSION

After studying 20 patients we come to following conclusion:

1. (50%) of our patients fall in 21-30 yrs of age group.
2. In our study 55% patients were female.
3. Most of our patients come from rural area.
4. More than half of our patients were Un-educated.
5. Thermal burn was most common burn, leading to post burn axilla contracture.
6. Right axilla was more frequently involved (60% of cases).
7. Bilateral axilla involved in only 1(5%) patient.
8. In our study 45% patients had type IV contracture of axilla.
9. Release and skin grafting was most common type of procedure performed in our study.
10. If possible Z-plasty should be used as long term results are better with this procedure.
11. Flaps are useful in prevention of recontracture but patients complains of bulk in axilla.
12. Splintage is helpful in prevention of recontracture.
13. Common complication are flap tip necrosis, graft failure and recontracture.

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