Original Research Article

A Clinical Study on Post Burn Contracture of Axilla at a Tertiary Care Centre

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Abstract

Introduction: The joint problems and deformities noted in burn patients are mostly due to physical inactivity combined with limitation of joint movement because of scar contracture. Restoration of function in upper limb varies according to the surgical procedure opted and post operative compliance. Surgical intervention is still a challenge, because the axilla is a unique three dimensional pyramid. **Aim :**To study the outcome of various surgical procedures done for post burn contracture of axilla and their complications.**Materials and methods:** This prospective study was done on 20 patients who presented with PBC axilla to Department of Plastic & Reconstructive Surgery, Osmania General Hospital, Hyderabad during the period of study i.e., July 2019 to January 2021.**Results:** 20 patients were included in the study.8 patients presented 6 to 12 months after sustaining burns,7 patients between 13 to 24 months and 5 patients presented after 3 years. Patients gave history of no physiotherapy and splinting for their axilla during the acute burn stage treatment, pre operative abduction ranged between 20° and 90° with a mean of 48°. Post operative abduction achieved was between 90° and 160° with a mean of 130°. 10 patients(50%) had undergone contracture release and SSG, multiple Z plasties were done in 5 patients(25%), one patient had undergone transposition flap and SSG(5%), thoracodorsal artery perforator flap was done in one patient(5%), propeller flap was done in two patients (10%), parascapular flap was done in one patient (5%). One patient had partial graft loss(5%) following contracture release and SSG, one patient had reccurence (5%), one patient had tip necrosis (5%).**Conclusion:** Axillary burn contracture can be prevented by proper management of acute burns stage, positioning of the shoulder joint, use of abducted split, aggressive early physiotherapy and early resurfacing of raw area. Z plasty and local flaps are used in mild cases. Release and SSG is the best treatment for severe PBC axilla.

Keywords: Axillary burn contracture, Acute burns stage, shoulder joint, physiotherapy.

Introduction

Post burn axillary scar contractures are common after deep thermal burns to the upper extremities. Morbidity related to hypertrophic scars and contractures which are well known sequelae after burns remains high and in fact has increased as the survival of severe burns patients has increased due to better facilities. Burn injuries, regardless of the aetiology, rarely involve a joint itself. However, the joint function is often impaired because of burns. The joint problems and deformities noted in burn patients are mostly due to physical inactivity combined with limitation of joint movement because of scar contracture. The consequences of joint dysfunction are usually left for reconstruction later in the course of burn convalescence[1,2]. Because of poor positioning of the axilla during the acute burns period or improper rehabilitation post burn axilla contracture produces both functional and anatomic deformities. It is often seen in our environment following poorly treated burn injuries especially when the conservative approach is the method of treatment for a burn wound around the shoulder joint. Post burn axillary contracture almost always interferes with abduction of the shoulder joint. This interferes with the ability to feed and to perform other important upper extremity function.Disability depends on severity of contracture which guides in opting among various modalities of treatment options available. Restoration of function in upper limb varies according to the surgical procedure opted and post operative compliance. Surgical intervention is still a challenge, because the axilla is a unique three dimensional pyramid.After release of the contracture, the resulting raw area needs a suitable covering. A variety of therapeutic options such as skin grafting, multiple Z plasties, V-Y plasty, loco-regional flaps,free flap, tissue expanders are reported in literature for the treatment of axillary contracture. Flaps available for the treatment are parascapular flap, propeller flap, square flap, latissimus dorsi flap. Each of these techniques has its advantages as well as its disadvantages and limitations. There are also many methods described for post operative splinting of the axilla. Different procedures have varying levels of patient satisfaction, degree of movement achieved post operatively,

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complications.This study is done with an aim to present our experience with twenty cases of post burn contracture of the axilla treated with excision of scar contracture and cover. The extent of improvement of movements of the upper limb after surgery is studied and reported.

Materials &Methods

This prospective study was done on 20 patients who presented with PBC axilla to Department of Plastic & Reconstructive Surgery, Osmania General Hospital, Hyderabad during the period of study i.e., July 2019 to January 2021.

Inclusion criteria: All patients who present with post burn contracture axilla and willing to undergo surgical management.

Exclusion criteria: Patients who has axillary contracture in less than 6 months of sustaining burns.

The objective of the study will be explained to all patients and an informed consent will be taken from all the patients.

Preoperative assessment: The age of the patient and the onset of the condition were recorded. History was taken with special concern on the cause of the burn and the initial management in the acute phase. General examination was done. Physiotherapy was done preoperatively to address the shoulder joint stiffness and to achieve the maximum release. All the cases were examined locally for the site of contracture, type of contracture, severity of contracture and maturation. Surgery was undertaken only when the scar was matured. According to Kurtzman and Stern classification[14] patients were divided into three types:

Type 1: Contracture involves either the anterior (1A) or posterior (1B) axillary fold

Type 2: Contractures involves both the anterior and posterior axillary folds

Type 3: Contractures involve both axillary folds and the axillary dome.

State of the surrounding skin of the adjacent chest, shoulder and back was examined. Goniometer was used to measure preoperative degree of abduction at shoulder joint.

The choice of the operative procedure was determined according to the degree and site of contracture as well as the state of the surrounding skin & nature of scar as follows:

1. Linear contractures involving either the anterior or posterior folds causing mild to moderate degree of contracture with a good state of surrounding skin or having supple scar: Single or multiple Z plasties.
2.Moderate localized contracture band of the anterior or posterior axillary fold with healthy surrounding skin: Local flaps.
3.Diffuse scarring of the armpit:Release and fasciocutaneous flap or skin graft.

Pre operative marking was done while the patient was standing and the hand abducted at maximum to delineate the contracture. Photographs were taken preoperatively. Written consent was obtained from the patients before surgery after they had been informed about the advantages and possible adverse effects of the operation. Preoperative broad spectrum antibiotic was given prior to surgery. Operations were done under general anesthesia.

Procedure

Extent of skin required was estimated by measuring from normal opposite axilla measurements and a template was made. Patient was anesthetized by suitable mode planned pre-operatively, put on supine position or in lateral position depending on the site of contracture with affected axilla,upper chest and donor area were prepared and draped. The area to be released was infiltrated with tumescent fluid. Complete release or excision of contracture was done. The angle at axilla was made as much near to 180-150 degrees as possible. Fish tail cuts were made. After a satisfactory release a careful hemostasis was secured. Surgical procedure done based on the type of scar, surrounding skin scarring and the size and location of the defect. Aeroplane splint was applied with axilla in complete abduction and the position was maintained post operatively. Postoperative broad spectrum antibiotic was given for all cases for five days. Dressing done depending on the soakage of dressing for flap cases. Primary dressing was done on the 5th post operative day for graft cases. Splint reapplied. Follow up visits done after 2 weeks, 1 month, 3 months and 6 months to monitor the progress.

Physiotherapy started once graft settled well, usually begins after 2 weeks, with 4 times a day and then splint reapplied day and night for 3 months. After 3 months, day time physiotherapy done and splint applied at night time.

Result

Table 1: Demographic distribution

Age	No.of patients	Percentage
5-10 yr	2	10
11-20 yr	7	35
21-30 yr	8	40
31-40 yr	2	10
41-50 yr	1	5
Gender		
Male	12	60
Female	8	40
Side		
Right	9	45
Left	7	35
Bilateral	4	20
Etiology of burn		
Flame Burns	12	60
Scalds	7	35
Electrical Burns	1	5

20 patients were included in the study. The age ranged between 6 years and 50 years with a mean of 21.85 Years. 7 patients were in the age group of 11 to 20, 8 patients between 21 to 30 years. 12 patients were males and 8 females. The right axilla was involved in 9(45%) patients, left axilla in 7(35%) patients while both axillae were involved in 4(20%) patients. Cause of burns was flame burns in 12 patients, scalds in 7 and electrical burns in one patient.

Table 2: Duration since burns

Duration since burns	No. of cases	Percentage
6-12 months	8	40
13-24 months	7	35
>24 months	5	25

8 patients presented 6 to 12 months after sustaining burns,7 patients between 13 to 24 months and 5 patients presented after 3 years. Patients gave history of no physiotherapy and splinting for their axilla during the acute burn stage treatment.

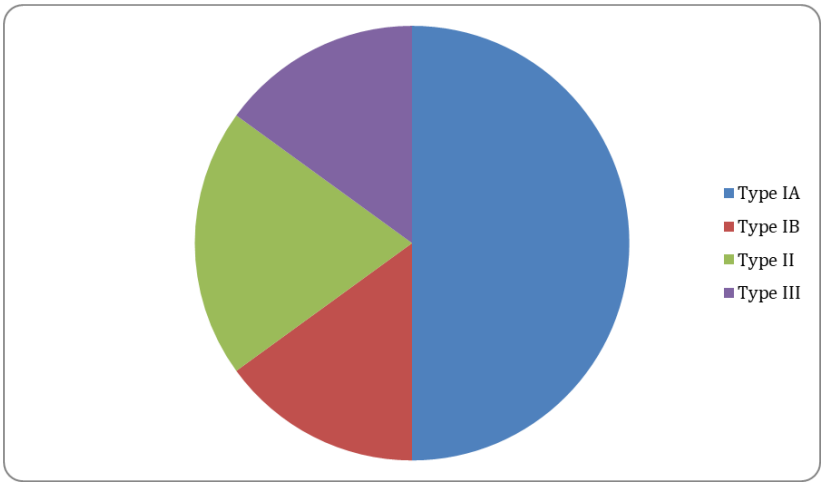

Fig 1: Type of contracture(According to Kurtzmann classification)

Table 3: Method of surgical procedure

Surgical procedure done	No. of cases	Percentage
SSG	10	50
Multiple z –plasties	5	25
Transposition flap+SSG	1	5
Parascapular flap	1	5
Thoracodorsal artery perforator flap	1	5
Propeller flap	2	10

Table 4: Degree of shoulder abduction achieved

Procedure	Degree of Abduction	
	Pre op	Post Op
Multiple Z plasty	60	120
Release & SSG	30	130
Release & SSG	20	90
Release & SSG	45	130
Thoracodorsal artery perforator flap	60	140
Release & SSG	45	110
Multiple Z plasty	90	160
Release & SSG	45	140
Propeller flap	45	120
Release & SSG	40	130
Release & SSG	20	120
Release & SSG	70	130
Multiple Z plasty	60	140
Release & SSG	30	140
Parascapular flap	45	120
Propeller flap	50	150
Transposition flap+ SSG	70	140
Multiple z plasty	60	150
Multiple Z plasty	45	140
Release & SSG	20	90

Table 5: Complications in present study

Complication	Number of patients	Percentage
Nil	17	85
Graft loss	1	5
Reccurence	1	5
Tip necrosis	1	5

Discussion

Post burn contracture is one of the most common problems in our country especially, seen in lower socio-economic people**.** The rehabilitation of patients who have suffered burns in the large joints like the shoulders remains a difficult problem in reconstructive surgery. Spontaneous epithelialization of burn wounds and late skin grafting results in various kinds of scar deformation and contractures. This significantly restricts physical and social rehabilitation. Skin scar contractures related to destruction of skin, subdermal fat, and fascia are very frequent. The axilla is one of the most frequent sites affected by contractures after severe burns and it often causes cosmetic problems and functional deficiency. Secondary contractures involve muscles and tendons (shortening and scarring of tissues around a joint), after which joint contractures develop. The goal of reconstructive operations in a shoulder joint with PBC is to remove the scar, the eliminate contracture and the restoration of full joint movement without any relapses of contractures. The particular method used in releasing these contractures and covering them depends on the type of the contracture. The present study was conducted on 20 patients of axillary contractures. Age of the patients was between 6 to 50 years. Mean age was 21.85 years. In Olaitan et al[3] study, a total of 37 patients presented over the study period with axillary contractures involving a total of 42 axillae. Their age range was between 2 years and 47 years with a mean of 23.1 years. In Agebenorku et al[4]study, age range was between 11 and 57 years with a mean of 25.2 years. In Sarker et al[5] study, age of 42 patients that were studied ranged between 6 and 38 years with a mean age of 14.7 years. In Karki et al[6] study, the mean age was 17.1 years. In Kumaran et al[7] study, the age range was between 3 to 62 years and the mean age was 26.2 years. In L.Ndiaye et al[8] study, a mean age of 21 years. In Durga Karki et al[9] study, the mean age of the study group was 17.1 years.The present study included 12 males and 8 females. In Olaitan et al[10]study,there were 20 males and 17 females. In Agebenorku et al[4] study, out of 16 patients included in the study group 10 were male and 6 female. In Sarker et al[5] study,42 patients were studied, 26(61.9%) were males and 16 (38.1%) were female patients. In Karki et al[11]study,out of 44 patients 25 were male and 19 female. In Kumaran et al study, the male to female ratio was 1: 3.42. In L.Ndiaye et al[8] study,22 males and 45 females were included. In Durga Karki et al[12]study,forty-four patients consisting of 25 males (56.82%) and 19 females (43.18%) presented with axillary contractures were studied.In the present study, 9 patients had involvement of the right axilla (45%), 7 left(35%) and 4 had bilateral axillary contractures(20%). In Olaitan et al[10]study,the right axilla was involved in 19(51.4%) patients, left axilla in 14(37.8%) patients while both axillae were involved in 4(10.8%) patients. In Karki et al study, the ratio of involvement of right and left axilla was 1:1.8. In the present study, 10 patients had involvement of anterior axillary fold, 3 had posterior axillary fold involvement and both in 4, both folds plus axillary dome in 3 patients. In Agebenorku et al[4] study, 7 patients had involvement of anterior axillary fold, 9 had axillary fold involvement and both in five, both folds plus axillary dome in four patients. In L.Ndiaye et al[8] study,15 cases (23%) of type 1 contracture, 7 cases (10%) of type 2 and 45 cases (67%) of type 3. In Durga Karki et al[9]study, contractures involved the anterior axillary fold in 8 (18.18%), posterior fold in ten (22.72%), both folds and axillary fossa in 14 (31.81%) and both folds plus part of the chest wall and arm (sparing the axillary fossa) in 12 (27.27%) axillae.

Table 6: Comparison of type of contractures

	Present study	Agebenorku et al[4]	Olatian et al[10]	Sarker et al[5]
Type l A	50%	28%	59.4%	42.8%
Type l B	15%	36%	24.31%	28.5%
Type ll	20%	20%	10.8%	19%
Type lll	15%	16%	5.4%	9.5%

The cause of the burns in the present study was flame burns in 12 cases(60%), scalds in 7 cases(35%) and electrical burns in one patient(5%). In Agebenorku et al[4] study,the cause of burns was flame burns in 12 cases(75%),scalds in four patients (25%). In Olaitan et al[10]study,agent responsible for burn injuries were flame (48%), corrosive (32%) and scalds (20%). In Sarker et al study, the causes of burns were flame burns (66.7%),scalds(33.3%). In L.Ndiaye et al[8] study, burns were due to flames in 43 cases (64%),hot fluids in 18 cases (27%),by chemical fluids in 3 cases (4.5%). In 3 other cases, patient couldn't precise the etiology because they didn't remember. In the present study, mean duration since burns was 25.75 months. In Sarker et al study, mean time from initial burn to release was 3 years, range 1 to 8 yrs. In Karki et al study, the duration since burns ranged between one to 5.5 years. Mean duration was 28 months. In Kumaran et al study, the duration of post burn scar contracture of axilla was a mean years of 3.7 (range from 1 to 30 year). In L.Ndiaye et al[8]study,mean duration since burns was 3.3 years [1 month–20 years]. 20 patients in the present study gave no history of splinting or physiotherapy during acute burn stage. In Agebenorku et al study, all patients gave no or minimal history or splinting during acute burn stage treatment. In Durga Karki et al study, none of the patients had undergone initial splinting or physiotherapy. In the present study, pre operative abduction ranged between 20° and 90° with a mean of 48°. Post operative abduction achieved was between 90° and 160° with a mean of 130°. In Agebenorku et al[4] study, the degree of abduction ranged between 20° and 100° with a mean of 60°. In Sarker et al[5] study, the pre operative degree of abduction ranged between 20° and 90 with a mean of 60°. After intervention, the abduction ranged between 110° to 160° with a mean percentage of 140°.In Karki et al[6] study, pre operative abduction ranged between 20 and 100° with a mean of 48°. The degree of abduction obtained post operative ranged between 100 and 180° with a mean of 156°. In Walash et al[13] study, the improvement in abduction postoperatively ranged from 25 to 80 degrees with a mean of 55°. In Durga Karki et al study, pre-op degree of abduction ranged from 20° to 100° with a mean degree of abduction being 48°. The degree of abduction obtained 1-month post-operative ranged between 100 and 180° with a mean degree of abduction being 156°. In the present study, 10 patients(50%) had undergone contracture release and SSG, multiple Z plasties were done in 5 patients(25%), one patient had undergone transposition flap and SSG(5%),parascapular flap was done in one patient(5%),

thoracodorsal artery perforator flap was done in one patient (5%), propeller flap was done in 2 patients (10%).

In Agebenorku et al study, the commonest reconstructive technique was split thickness skin grafting in 7 patients(28%), z plasty in 4(16%), flaps in 5(20%). In Sarker et al[5] study, Z plasties were done in 14 cases(33.1%), five flap plasty was in one case (2.4%), SSG was done in one case (2.4%), flaps were done in 26 cases(61.9%). In Karki et al[11] study, SSG was done in 15 patients(34.1%),Z plasties in 4 (9.1%), flaps in 19 patients(43.1%), square flap was done in 6 (13.64%). In Walash et al[13] study, SSG was done in 4 cases(16%),Z plasty was done in 6 patients(24%),five flaps in 10 patients(40%), regional flaps in five patients (20%).In Olaitan et al study, the surgical options used in managing the patients following contracture release includes local fasciocutaneous flap which was the commonest method in 18(42.8%)axillae, single z-plasty in 6 (14.3%) axillae, split thickness skin graft in 6(14.3%) axillae, multiple z-plasty in 3(7.1%), double opposing z-plasty in 2(4.8%) while v-y plasty and 5-flaps z- plasty were used in 1(2.4%) each and myocutaneous flaps including latismusdorsi in 5(11.9%).In L.Ndiaye et al study, twenty-six patients(68.4%) underwent local reconstruction with Z plasty, trident (five Z) plasty or V-Y plasty or combined local plasties. Eleven patient's(29%) were treated by skin grafting and one(2.6%), patient by para-scapular flap. In DurgaKarki et al[12] study, surgical treatment included split-thickness skin graft in 15 (34.1%), local skin flaps in 4 (9.1%), Z-plasties in 4 (9.1%), parascapular flaps in 3 (6.82%), while propeller flaps in 12 (27.27%) and square flap were used in 6 (13.64%) patients.In L.Ndiaye et al study, physiotherapy was prescribed for all patients over a period of two months by a professional. In immediate post operative care, all patients had splinting for 2 or 3 weeks. In the present study one patient had partial graft loss(5%) following contracture release and SSG, one patient had reccurence (5%), one patient had tip necrosis (5%).In Sarker et al[5] study, the complications seen were tip necrosis in one case of Z plasty, one case of wound infection, one case patchy area of graft loss, one case of recontracture. In Karki et al[6], complications in the form of tip necrosis and partial graft loss were seen in 18.8 % cases. In Walash et al[13] study, two cases had tip necrosis, one had partial graft loss. In Olaitan et al[10] study, 4 graft shifts and 3 recontractures occurred in patients who had skin grafts. Recurrence was also observed in one patient with V-Y flap cover. Tip necrosis was a common problem in patients who had multiple z-plasty and 5 flap z-plasty. Often these healed with minimal intervention and with good results. Epidermolysis was also a common complication among the patients who had multiple z-plasty that healed with no problem. In L.Ndiaye et al[8] study, skin graft loss and partial local flap necrosis was seen in 9 cases(24%). Five patients had undergone secondary procedures by skin grafting to cover wounds left by graft or flap necrosis. In Durga Karki et al study, complications in the form of tip necrosis and partial graft loss were seen in 18.8% cases.

Conclusions

Axillary burn contracture can be prevented by proper management of acute burns stage, positioning of the shoulder joint, use of abducted split, aggressive early physiotherapy and early resurfacing of raw area. The surgical procedure to be performed for reconstruction of post burn axillary contracture is decided based on the type of contracture, size, shape, location, and depth of scar and the surrounding skin. Whenever feasible, Z plasties are always preferred due to simplicity of technique. Z-plasty is good option for linear band contractures in Type IA, IB contractures. Local flap using hair bearing area with grafting over surrounding areas gives better results for Type II contractures. Release and SSG is the best treatment for severe PBC axilla. The results of PBC axilla treated by contracture release & SSG are sustained with mandatory splinting of the part for 6 months and aggressive physiotherapy. Advantages of using flaps are restoration of skin characteristics with minimal wound contraction and can be used on poorly vascularized wound bed, exposed vital structures or a site with chronic open wound. The PBC axilla treated with flap cover shows functional recovery to maximum, gradually with physiotherapy with minimal or no splinting. Postoperative rehabilitation is very important to avoid recurrence and to maintain the result achieved.

Conflict of Interest: Nil
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