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Plastic Surgery

A CLINICAL STUDY AND MANAGEMENT OF POST BURN CONTRACTURES OF HAND

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ABSTRACT **Background:** Hands are considered as a mirror image of mental state. Hands are involved in more than 80% of all severe burns.The hand is the third most frequent sites of burn scar contracture. Although each hand represents less than 3% of the total body surface area, burns of the hand is classified as major injuries1. One of the major determinants of the quality of life in burns survivors is the functionality of the hands. Postburn hand deformities, especially if bilateral, can make a burn survivor a total cripple2. **Materials and Methods:** The prospective clinical study was conducted in the Department of Plastic, Reconstructive surgery & Burns, Osmania general hospital, Hyderabad in the period between November 2019 to October 2021. Forty patients with post burn deformities of hand were included in this study. **Results:** The patient's age ranged between 1 and 60 years with the mean age being 14.6 years Majority patients had contractures of right hand. In bilateral contractures of hand,unilateral release of contractures were performed at a time. The most common etiological factor was flame burns and majority patients sustained grade III contractures. The operative procedure was chosen according to the pattern of scar and the condition of the surrounding skin. The results were satisfactory in most of the cases. **Conclusions and Recommendations:** In the management of post burn contractures of hand, selection of a proper reconstructive option is very important. Most of the defects can be covered with skin grafts. In paediatric age group, full thickness skin graft is a better option as the grows with the child. Timing of treatment & maintenance of joint suppleness before surgical procedure will improve the functional outcome. Strict postoperative regimen of physiotherapy & splinting are a must for optimum outcome.

KEYWORDS :

INTRODUCTION

Hands are considered as a mirror image of mental state. Hands are involved in more than 80% of all severe burns.The hand is the third most frequent sites of burn scar contracture. Although each hand represents less than 3% of the total body surface area, burns of the hand is classified as major injuries[1]. One of the major determinants of the quality of life in burns survivors is the functionality of the hands. Postburn hand deformities, especially if bilateral, can make a burn survivor a total cripple[2]. Burns of the hand have devastating consequences not only for the functional outcome but also for the aesthetic appearance[3].

Early initiation of physiotherapy, splinting, passive exercises, topical treatment, early excision, and grafting where indicated and a multidisciplinary approach are the most important treatment principles[4]. Even if the acute burns is managed properly, post-burn deformities still occur and still remains the most common cause of skin contractures of the fingers[5,6].

The most common sequelae of deep burns of the hand are dorsal hand contracture with hyperextension of metacarpophalangeal joint (MPJ) and variable flexion contractures of interphalangeal joints (IPJ). If it is associated with adduction contracture of the first web, patient may find it impossible to attain any of the basic positions of the hand. Hence the hand becomes nonfunctional. The disability is worse, if the presentation is bilateral. So the goal of treatment in these patients should be converting the nonfunctional hands into functional hands by the quickest method possible that decreases the rehabilitation period[7].

Reconstruction of post-burn contractures of fingers poses a formidable challenge to the plastic surgeon for it is important to restore length, function, and provide good quality skin cover, particularly in children[8,9]. Complete excision of scar, tendon lengthening and dorsal capsulotomy permits achievement of better functional position of the hand.In all fixed deformities, the most viable option would be arthrodesis of the joints in functional position.

The goal of our study is to study the appropriate reconstruction chosen for post burn scar contractures of hand, to assess the results as per successful reconstruction, options chosen and performed, patient satisfaction, donor site morbidity, and complications. We also aim to study the functional and cosmetic outcome of our results.

Aim Of The Study

To study the outcome of various surgical procedures done for post burn contracture of hand.

Objectives Of The Study

1. To study the appropriate reconstruction chosen for post burn contracture of hand.
2. To assess the postoperative complications.
3. To study the Recurrence rate.

METHODOLOGY

The prospective clinical study was conducted in the Department of Plastic, Reconstructive surgery & Burns, Osmania general hospital, Hyderabad in the period between November 2019 to October 2021. Forty patients with post burn deformities of hand were included in this study.

Inclusion Criteria

1. Post burn finger contractures both flexion and extension and post burn deformities.
2. Post burn contracture of inter phalangeal joints, metacarpo-phalangeal joints.
3. Post burn contracture web spaces.
4. Age : 1 to 60 years.

Exclusion Criteria

1. Patients unfit for anaesthesia.
2. Post traumatic contractures.
3. Patients with multiple comorbidities.
4. Patients not willing to participate in the study.
5. Post burn contractures less than 6months old.
6. Immature scars.
7. Age group <1 year and >60yrs.

Patients & Methods

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 to exclude any medical problem and looking for other burn deformities. Physiotherapy was done for all cases of post burn contracture fingers preoperatively to decrease the joint stiffness and to get the maximum release.

All the Cases were Examined Locally for:

Site of contracture, type of contracture, severity of contracture and scar maturation and surgery was undertaken only when the scar was matured , surgery was considered usually after 6 months of burn injury, if patient presented at later stage > 6 months after burn injury then the patient is considered for surgery at the time of presentation.

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.

In thick, severe post burn flexion contractures, release is performed perpendicular to the contracture extending from one neutral line to another or released along the line of contracture or scar excised intoto. Contracture release was performed 360 degrees with fish tailing and back cuts on to the normal skin.

The raw area resurfaced using thick split thickness skin graft, full thickness skin graft or flap cover. Lot of care taken in cases of long standing childhood contractures as vessels are at risk of spasm during release.

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 IV 2 hours prior to surgery. Operations were done under general anaesthesia or brachial block.

Procedure

Extent of skin required was estimated by measuring from opposite hand and a template was made and sterilized. Patients were anesthetized by suitable mode planned pre-operatively, put on supine position, hand and donor area were prepared and draped. Tourniquet applied to the respective arms.

The area to be released was infiltrated with saline .This would ease the dissection. Complete release of contractures were done, sometimes excision of scar was required. Fish tail cuts were made at suitable intervals to avoid a straight line and also to ensure complete release. These areas were to be fed with skin during covering the area. After a satisfactory release a careful homeostasis was secured and the field made dry off any oozing.

Surgical procedures done based on the type of scar, surrounding skin scarring and the size and location of the defect i.e SSG/FTSG/Y-V plasty/multiple Z-plasty /flap cover. Bolster dressings applied. POP splints placed with fingers in extension (flexion contractures). Patients were extubated under supervision as to not disturb the dressing. Postoperative antibiotics were given for all cases for a week. On the 5th to 7th post operative day, primary dressings done for graft cases, tie over dressings opened and long sutures removed. Splints reapplied. Dressings changed basing on the soakage in cases of flaps. Patients discharged after 2 dressings if flaps were healthy or after good graft uptake.

Follow up visits were done after 2 weeks, 1 month, 3months and 6 months to monitor the progress. Postoperative photographs were taken on follow up visits. Physiotherapy advised once graft has settled , usually after 2 weeks, started with 4 times a day splint removal and physiotherapy. Splint applied continuously for 3 months and only during nights for 3 months. Meanwhile lubricant massages were done daily. Donor site dressings of graft were opened on 14thpost operative day followed by lubricant massages. Outer dressings were changed in cases of soakage

Observations

Table -1: Age Distribution

S NO	AGE	NO OF CASES	PERCENTAGE
1	1-10	18	45%
2	11-20	12	30%
3	21-30	8	20%
4	31-40	1	2.5%
5	41-50	1	2.5%
6	51-60	-	-
		40	100%

The most common age group in this study is 1 to 10 years constituting 45% and the least common being 41 to 50 years constituting 2.5%

Table – 2: Side Prevalence

S No	Side	No of cases	Percentage
1	Right	24	60%
2	Left	13	33%
3	Bilateral	3	7%
		40	100%

Right hand contractures are more commonly seen in this study.

Table–3: Sex Distribution

Sex	No of cases	Percentage
Male	22	55%
Female	18	45%
Total	40	100%

Males are affected more frequently than females in this study.

Table – 4: Cause Of Burns

S No	Cause of Burn	No of cases	Percentage
1	Scalds	4	10%
2	Flame burns	25	63%
3	Electric burns	10	25%
4	Cracker burns	1	2%
5	Chemical burns	-	-
	Total	40	100%

Flame burns is the leading cause of post burn contractures affecting hand in this study.

Table – 5: Duration Since Burns

S No	Duration since burns	No of cases	Percentage
1	6-12 months	14	35%
2	13-18 months	3	7%
3	19-24 months	6	15%
4	>24 months	17	43%
	Total	40	100%

Most of the patients presented to our institute after 2 years in this study.

Table 6: Severity Of Contracture

S No	Grade	No of cases	Percentage
1	I	-	-
2	II	8	20%
3	III	30	75%
4	IV	2	5%
	Total	40	100%

Most of the contractures are of Grade III severity in this study.

Table 7 – Type Of Surgical Procedure

S No	Type of surgical procedure	No of cases
1	Release + SSG	25
2	Release + FTSG	8
3	Z- plasty (multiple)	3
4	Cross finger flap	2
5	Combined procedures	2
	Total	40

Majority of the post burn contractures of hand in this study are released and resurfaced with SSG.

Complications

Partial graft loss was seen in 4 of the 27 patients treated with release & SSG, who were managed conservatively with regular dressings. Two cases who were managed by release & SSG had a recurrence due to improper usage of splint and physiotherapy.

All the cases were satisfied with the functional results of the procedures done. All the cases were examined for donor site morbidity, all the donor sites had healed well and three of the cases developed

hypertrophic scarring over the donor site which were managed with coconut oil massages and compression garments.

Case 1: Post Burn Flexion Contracture Of Left Ring Finger- Release + SSG

Figure 1,2: Post burn flexion contracture of left ring finger following flame burns involving DIP joint.

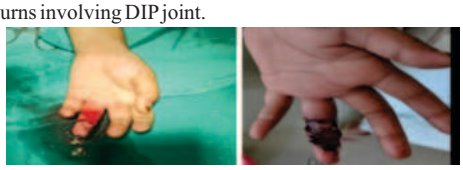

Figure 3,4: Intra op photo post release of contracture and post op photo with complete extension and covered with split thickness skin graft.

Case 2: Post Burn Contracture Of Left Ring Finger- Release By Z-plasty

Figure 1,2,3: Pre op photo of post burn contracture of left ring finger post flame burns with a band across proximal and middle phalanges, intra op photo and post op photos after release by multiple Z-plasties.

Case 3: Post Burn Contracture Of Left Index Finger - Release + Cross Finger Flap

Figure 1,2: Pre op photo showing 90 degree flexion contracture of left index finger at PIP joint showing both volar and dorsal aspects following flame burns.

Figure 3,4: Post op photo post release & resurfacing with cross finger flap from the middle finger showing full extension Donor area-proximal phalanx of left middle finger-covered with split thickness skin graft.

Case 4: Post Burn Flexion Contracture Of Left Little Finger- Release + FTSG

Figure 1,2,3: Pre op photo of a patient with flexion contracture left little finger post flame burns.

Figure 4: Intra Op Photo Post Release

Figure 5: full thickness skin graft marked over left

Figure 6: Post op – with full extension seen after release and resurfacing with full thickness skin graft.

Case 5: Post Burn Flexion Contractures Of Left Index, Middle, Ring And Little Fingers- Release By Multiple Z-plasties.

Figure 1,2: Post burn flexion contractures post electric burns, seen in PIP joints of left index, middle, ring and little fingers.Multiple z-plasties marked over the contractures.

Figure 3: Post op photo (post multiple z plasties& capsulotomy for PIP joint of middle finger)

RESULTS

Forty patients with post burn contractures of the hand were treated in the Department of Burns, Plastic &Reconstructive surgery at Osmania General Hospital, Hyderabad in the period between November 2019 & October 2021.

The patient's age ranged between 1 and 60 years with the mean age being 14.6 years and the most common age group being 1 to 10 years (45%).18 (45 %)cases were females & 22(55%) cases were males. 24(60%) patients had contractures of right hand, 13(33%) patients had contractures of left hand and 3 (7%) patients had bilateral contractures of hand for whom unilateral release of contractures were performed at a time. The most common etiological factor was flame burns (63% - 25 patients), followed by electric burns (25% - 10 patients), scalds (10% - 4 patients), cracker burns (2% - 1patient). 8 (20%) patients sustained grade II contractures, 30 (75%) patients grade III contractures, 2 (5%)

patients sustained grade IV contractures. 14 (35%) patients were operated between 6 & 12 months post burns, 3 (7%) patients between 12 & 18 months, 6 (15%) patients between 19 & 24 months, 17 (43%) patients more than 24months.

The operative procedure was chosen according to the pattern of scar and the condition of the surrounding skin.In 38(95%) patients, complete release of the contractures were possible. Release & SSG was done in 27 patients, Release & FTSG was done in 8 patients, multiple z plasties were done in 5 patients, cross finger flaps were done in 2 patients & capsulotomy in 1 patient. The complication rate was 10%, most of them were minor. Functional improvement was quite satisfactory for these cases, 2 case of SSG had recurrence due to non-compliance of the patient in usage of splint & physiotherapy. The results were satisfactory in most of the cases.

CONCLUSIONS

Post burn contractures fingers were seen with increased frequency in males. The most commonly affected age group was children <10 years of age as children in their ignorance of danger are mostly affected. Right sided involvement is most common as most patients were right handed. Flame burn was the leading cause of post burn contractures of fingers. Most of the patients presented with grade III flexion contracture (McCauley). Most of the patients presented for contracture release after 2 years of burns. Complete release was achieved in most of the cases irrespective of the grade. Release & resurfacing with split thickness skin grafting is the most common reconstructive modality chosen in this study. Complication rate is minimal. Only 10% presented with partial graft loss which is supplemented with SSG. Recurrence of contracture was seen in 2 patients post resurfacing with SSG as the patients were non-compliant in splint usage & physiotherapy.

SUMMARY

In the management of post burn contractures of hand, selection of a proper reconstructive option is very important. Most of the defects can be covered with skin grafts. In paediatric age group, full thickness skin graft is a better option as the grows with the child. Timing of treatment & maintenance of joint suppleness before surgical procedure will improve the functional outcome. Strict postoperative regimen of physiotherapy & splinting are a must for optimum outcome.

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