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ORIGINAL RESEARCH

A study to assess the outcome of Split Thickness skin graft in post-burn contracture release of upper extremities

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Abstract

Background: Postburn contractures are distressingly common and severe in developing nations and are a significant problem in developed countries as well. The present study was conducted to assessthe outcome in incisional release post burn contracture of upper extremities followed by split thickness graft.

Material & Methods: Source of the data for observational analytical study was 21patients. The study period was from march2015-september 2016.. The severity ofcontractures was recorded in degrees. Multiple planes of motion were measured and recorded before surgery. General anaesthesia was given and brachial block was given in patient with hand contracture and surgery was performed. After surgery the active range of motion of the operated joint(s) wererecorded. Any post-operative complications were recorded. The patient was then discharged and given adate for follow-up.

Results: In this study out of 21 cases, postburn contracture of axilla was 15 (71.4%), of elbow 3 (14.3%), of wrist 2 (9.5%) and fingers & hand 1 (4.7%). Split skin graft uptake was more than 80% in 81% cases. Hematoma was seen in maximum patients (14.3%). Maximum patients (76.2%) were treated with single contracture. In maximum cases (76.2%) range of motion at 1 month after surgery was 46-90. In maximum cases (61.9%) range of motion at 3 month after surgery was 46-90. The comparison of pre-op and post-op goniometry shows that post op 1 month goniometry had significantly higher range. The comparison of change in range of motion at 1 month post-op and 3 month post op shows that that post op 1 month goniometry had significantly higher range. Recontractures after 3 months were absent in 61.9% cases.Outcome was satisfactory in 61.9% cases.

Conclusion: The present study concluded that surgical procedure followed by had significant outcome after 1 month and after 3 month.

Keywords: incisional release, post burn contracture, split thickness graft.

Introduction

Burn injury is still the common cause of trauma especially in low- and middle-income countries [1]. Burn scar contractures are severely disfiguring, painful, and itching. As such thing, patients with burn scar contractures which interfere with activities of daily living are

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often marginalized and experience difficulties in receiving education and securing work [2]. Burn injuries are amongst one of the most devastating of all injuries, resulting in an estimated 195000 deaths annually [3,4]. Clearly, the best treatment is prevention. Potokarl notes that preventive strategies can be primary, secondary, and tertiary. 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 [5]. 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 [6,7].Contraction is a normal process of wound healing. Contraction is the active biologic component of wound healing that decreases the dimension of the involved connective tissue. Contracture is the end result of the process of contraction. In large open wounds left to heal without skin replacement, this phenomenon may be the salvation of patient and surgeon alike. If extremity amputations were all when wound were left open to close by contraction against primary closure which would have led to a high rate of morbidity and mortality from sepsis [8].Generally, release of burn contracture is considered once the scar forming of the contracture is thought to be matured. This is based on the conventional idea that interfering with an active scar will lead to further contracture formation. This waiting approach is representative of what the contracture release and split-thickness skin grafting was the most widely performed procedure until recently. If split-thickness skin grafting is applied to a wound, this wound would contract with the potentiality of recurrent contracture again. Additional procedures would be required to normalize subsequent contractures. These include physiotherapy to mobilize the joints and splints to preserve the range of motion (ROM) [9]. The present study was conducted to assessthe outcome in incisional release post burn contracture of upper extremities followed by split thickness graft.

Material & Methods

Source of the data for observational analytical study was 21patients who presented with post burn contracture of upper extremities to the plastic surgery outpatient department and who were admitted under the department ofplastic surgery, Dr. B.R.A.M. Hospital, Raipur. These patients meet theinclusion criteria for this clinical study. The study period was from march2015-september 2016.

Inclusion criteria

1. Patient with diagnosisof post-burn contracture in upper extremities
2. Patientwho had given consent for study
3. Patient with age group between 1 year to 80 year
4. Patients with contractures of shoulder, axilla, elbow and hand.
5. Intrinsic and extrinsic contracture
6. Contractures secondary to thermal, chemical and electrical burns

Exclusion criteria

1. Patient with post traumatic, post inflammatory, congenital contracture and contracture other than post burn contracture
2. Post Burn contracture in infants and neonates
3. Burns of less than 6 months duration.

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Study procedure

After obtaining informed consent, the participant's socio-demographics,history of burn injury, and history of contracture were obtained.Examination of the affected joints for type of postburn contracture, presence of ulcers,hypertrophic scars and/or keloids was done.The active range of motion at each involved joint was measured using amanual goniometer with a standardized technique. The severity ofcontractures was recorded in degrees.

In most of the patients with contracture of upper extremities general anaesthesiawas given in patients. Split skin grafts were harvested from the thigh region. After incisional release of contracture, split skin graft applied to raw area created after release and secure with either stapler or suture after proper hemostasis. After dressing joint is immobilized with either POP cast or by k wire fixation in case of fingers.

After surgery the active range of motion of the operated joint(s) wererecorded. Any post-operative complications were recorded. The patients were seen by a physiotherapist and/or occupational therapist for splinting and mobilisation exercises. The patient was then discharged and given adate for follow-up.

After 1 month post-operation the patient's use of splints, joint mobilizationregimen and supervision of physiotherapy were asked and recorded. Theactive range of motion of the operated joint(s) was measured using agoniometer. The presence of any complications was sought and recorded.After 3 months post-operation the use of splints, joint mobilisation regimenand supervision of physiotherapy were again asked and recorded. The rangeof motion of the affected joint(s) was measured again. The presence of anycomplications at the operated joints was sought and recorded.

Results

Table 1: Site of contracture in study subjects

Site of Post-burn contracture	Frequency	Percent
Axilla	15	71.4
Elbow	3	14.3
Wrist	2	9.5
Fingers and hand	1	4.7
Total	21	100.0

Out of 21 cases, postburn contracture of axilla was 15 (71.4%), of elbow 3 (14.3%), of wrist 2 (9.5%) and fingers & hand 1 (4.7%).

Table 2: Graft uptake

Outcome (Graft uptake)		Number of subjects	Percentage
	</=80%	4	19
	>80%	17	81
		21	100.0

Out of 21 cases, in 4 cases (19%) graft uptake was less than 80% and in 17 cases (81%) graft uptake was more than 80%.

Table 3: Complications of graft placement

Complications	Number of subjects	Percentage
Hematoma formation	3	14.3
Graft infection	1	4.8
Graft rejection	1	4.8
	5	23.8

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Out of 21 cases, 5 cases (23.8%) developed skin graft complications, in which 3 cases (14.3%) develop hematoma formation, 1 case (4.8%) develop graft infection and 1 case (4.8%) develop graft rejection.

Table 4: change in range of motion in study subjects at 1 month after surgery

Change in range of motion(□)	Frequency	Percent
</=45	3	14.3
46-90	16	76.2
>90	2	9.5
Total	21	100.0

After 1 month of surgery, out of 21 cases, 3 patients had range of motion </=45 degree and 16 patients had range of motion between 46-90 degree and 2 patient had range of motion >90 degree.

Table 5: Change in range of motion in study subjects at 3 month after surgery

Change in range of motion(□)	Frequency	Percent
</=45	8	38.1
46-90	13	61.9
Total	21	100.0

After 3 month of surgery, out of 21 cases, 8 cases improve range of motion from 0-45 degree and 13 cases improve range of motion from 46-90 degree.

Table 6: Comparsion of pre-op and post-op goniometry finding in study subjects

	Mean	N	Std. Deviation	Std. Error Mean	T	P value
Pre-op Goniometry	79.90	21	22.80768	4.97704	-16.933	<0.0001
Post-op Goniometry	154.76	21	11.45384	2.49943		

Table 7: Comparison of change in range of motion at 1 month post-op and 3 month post op in study subjects

	Mean	N	Std. Deviation	Std. Error Mean	T	P value
Change in range of motion at 1 month	70.0952	21	19.87940	4.33804	3.050	0.006
Change in range of motion at 3 month	54.76	21	14.956	3.264		

Comparison of change in range of motion at 1 month post-op and 3 month post op in study subjects was performed using paired t test. Significantly higher range of motion was found in the post op 1 month goniometry compared to post-op 3 month goniometry (p=0.006).

Table 8: Recontractures in study subjects after 3 months

Recontractures after 3 months	Frequency	Percent
Absent	13	61.9
Present	8	38.1
Total	21	100.0

Recontractures in study subjects after 3 months were absent in 61.9% and present in 38.1%.

Table 9: Outcome in study subjects

Outcome in study subjects	Frequency	Percent
Not satisfactory	8	38.1
Satisfactory	13	61.9
Total	21	100.0

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Out of 21 study cases, satisfactory result were found in 13 cases (61.9%) and not satisfactory result were found in 8 cases (38.1%).

Discussion

Contractures are defined as an inability to perform full range of motion of a joint [10]. They result from a combination of possible factors— limb positioning, duration of immobilization and muscle, soft tissue, and bony pathology. Individuals with burn injuries are at risk for developing contractures. Patients with burns often are immobilized, both globally, as a result of critical illness in the severely burned, and focally, as a result of the burn itself because of pain, splinting, and positioning. Burns, by definition, damage the skin and also may involve damage to the underlying soft tissue, muscle, and bone. All of these factors contribute to contracture formation in burn injury [11].

Study done by Durga karki et al over the post burn axillary contracture and multiple procedure were used and found large no. of propeller and square flap method with good success rate. In our study we opted contracture release with split thickness skin grafting [12].

We found 61.9%satisfactory outcome in contracture release with split thickness skin grafting. Higazi M. et al study over post-burncontracture of the axilla evaluation of three methods of management andsuggested that split skin graft was satisfactory when applied on a double release incision. The central flap created by the incisions or by mobilizationof anterior and posterior bridges aids in preserving the hair-bearing area andthe successful take of the graft. This also minimizes the tendency of thegrafted axilla to recontract [13].

Out of 21 cases, in 4 cases (19%) graft uptake was less than 80% and in 17cases (81%) graft uptake was more than 80%. Higazi M. et al use Single incision and SSG and 7 cases treated with this method out of which 2 regrafted, 2 cases evaluate good, 3fair and 2 bad result, hyperpigmentation of grafted areas manifested in 3cases [13].

In our study complication were found in 5 cases (23.8 %),in which 3 cases (14.3%) develop hematoma formation, 1 case (4.8%) develop graft infection and 1 case (4.8%) develop graft rejection. This complication rate is still higherbecause of due to free graft, early mobilization, hematoma formation, even after adequate care.

In this series out 21 cases, 3 cases have improvement in the range ofmotion after 1 month < 45 degree, 16 cases have improvement in therange of motion from 46-90 degree and 2 cases have improvement in therange of motion >90 degree.

After 3 month of surgery, out of 21 cases, 8 cases improve range of motion from 0-45 degree and 13 cases improve range of motion from 46-90 degree. Re-contracture after 3 month in 21 study cases, re-contracture was found in8 cases after 3 month of surgery and in 13 cases was improve without re-contracture. Above data indicate that 8 cases who developed re-contracturebecause of less use of splint and post operative physiotherapy.

Out of 21 study cases, satisfactory result was found in 13 cases(61.9%) andnot satisfactory result were found in 8 cases(38.1%).

Greenhalgh et al reported 62% success rate with skin grafting [14].

Comparison of pre-op and post-op goniometry findings in study subjectswas performed using paired t test. Significantly higher range of motion wasfound in the post op 1 month goniometry ($p<0.0001$).

Comparison of change in range of motion at 1-month post-op and 3 monthpost op in study subjects was performed using paired t test. Significantlyhigher range of motion was found in the post op 1 month goniometrycompared to post-op 3month goniometry ($p=0.006$).

Conclusion

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The present study concluded that:

1. Pre and post operative Goniometric assessment after three month ofcontracture release followed by split thickness skin grafting of contractureof upper extremities indicate that significant change was found inimprovement in range of motion and satisfactory result was found in 61.9%of study cases.
2. Post operative physiotherapy and splinting has important role to preventre-contracture in post operative period. In our study out of 21 cases, 8cases develop re-contracture, it was because of due to not following of properphysiotherapy and splinting protocol.
3. Prevention of contractures was of utmost importance and was very effective.
4. In treatment of contractures, using Split Thickness Skin Grafting appearan easy solution, but actually it was not so because of complication like graft infection, graft rejection, hematoma formation etc. which is 24% in this study even after adequate care.
5. In our study we had concluded that surgical procedure followed by ushad significant outcome after 1 month (P value <0.0001) and after 3 month(<0.006).

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