Reconstruction of post burns contractures: an observational study of skin grafts versus local flaps to cover the wound after contracture release

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Abstract

Background: An extensive burn is the most devastating injury a person can sustain. Survival is no doubt the immediate concern, but post burn contractures are also important to consider as restoration to pre-injury status, and return to society becomes important for the victim and the treating team. So here the aim was to observe the outcomes of different contractures treated with with different modalities.

Materials and Methods: The study was a Prospective observational study carried out at C.R.G.H. & R.D. Gardi Medical College, Ujjain, (M.P.) between January 2018 to April 2019. Sample size was 67 patients which included all the patients who were operated for post burn contractures.

Results: The burn contractures occured after Flame burns were 73% followed by scald burn 14.9 % .We used STSG in 35 patients, FTSG in 14 patients and Flaps in 18 patients. Post operatively outcomes were assessed based on their color, contour, texture, infection, graft loss, recontracture and ROL.

Conclusions: The lack of proper initial burn management, anti-deformity splinting and physiotherapy leads to the burn contractures. Due to easy availibity and safe procedure STSG was most commonly performed, but aesthetic results appears to be better achieved with Local flaps and FTSG than STSG. Also graft procedure appears to be more associated with complications.

Keywords: STSG - split thickness skin grafting, FTSG - Full thickness skin grafting, ROL - Range of motion, PBC - Post burn contractures, Recontracture, Plasty.

Introduction

Trauma is the leading cause of death and disability in the first four decades of life and the third most common cause of death overall. Among the trauma related deaths both in developing and developed countries, the Burn trauma constitutes the second most common cause of trauma-related deaths after vehicular accidents. An extensive burn is the most devastating injury a person can sustain and yet hope to survive. Survival is no doubt the immediate concern, but it is the restoration to pre-injury status, and return to society becomes important for the victim and the treating team.[1]

Burn scar contracture refers to the tightening of the skin after a second or third degree burn. Delayed healing and scar formation leads to an over-proliferation of myofibroblasts causing pathological contracture.[2]

Burn scar contractures do not go away on their own, but they may improve with the passage of time, with physiotherapy, and with splinting. If persistent the person may need the contracture to be surgically released. Techniques may include local skin flaps (z-plasty) or skin grafting (full thickness or split thickness).[3] A split-thickness skin graft (STSG) is a skin graft including the epidermis and part of the dermis.

Another option is Flap covering. A flap is a portion of tissue that can be dissected, elevated, and inset into a non-anatomic position as a consequence of its vascular supply and outflow.

A skin flap consists of skin and subcutaneous tissue that survives based on its own blood supply. Skin flaps are classified by the source and pattern of that blood supply.[4] So here the aim was to observe the outcomes of different contractures treated with skin grafts and flaps in terms of colour texture aesthetic results and functionality of joints.

Materials and Methods

The study was a Prospective observational study carried out at C.R.G.H. & R.D. Gardi Medical College, Ujjain, (M.P.) after approval by RGC and IEC between, January 2018 to April 2019. Sample size was 67 patients which included all the patients who were operated for post burn contractures in the mentioned time in RDGMC Ujjain.

Methodology

Total 67 patients with matured PBC of any body part or region underwent into surgery. After informed and written concent from patient and their relatives this observational study was done.

Procedure was decided according to the area involved. All the routine investigation and pre-op work up was done. Patients were administered one dose of antibiotic at the time of induction.

Types of surgical procedure which were done in patients were –

1. Release of contracture with STSG
2. Release of contracture with FTSG
3. Release of Contracture with STSG with K wiring
4. Release of Contracture with Local Flaps like Z plasty, V-Y Plasty, 5 Flap plasty or 7 Flap plasty
5. Release of Contracture with Local Flap with STSG

After the surgery in case of STSG or FTSG, the grafted site was dressed with cuticell, antibiotic ointment and tie over dressing. All the patients were given splintage with cast or

slab prepared by plaster of paris. Post operatively Continues 24 hour's splintage was adviced for 2 months with physiotherapy. Then splintage only during night time was adviced for 4 months.

In cases of flaps or flaps with grafts, the suture for flaps was dressed with light dressing and splintage was done with plaster of paris. After that physiotherapy adviced with splintage as required.

Patients were followed up for 3 months. Assessment of outcomes of surgery was done on following variables.

1. Color
2. Texture
3. Contour
4. Infection
5. Graft loss
6. Recontracture
7. Range of motion

So in this way a master chart prepared for all 67 patients and outcomes were analyzed on SPSS 23 software.

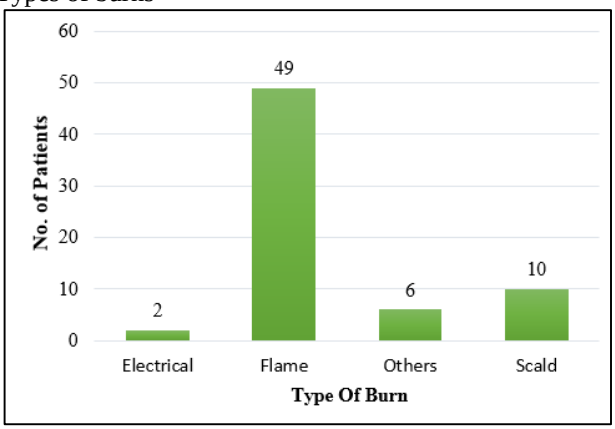
Observation and Results

In our study we observed total 67 patients of Post burn contractures who underwent surgery i.e. release of contracture with STSG/ FTSG/ Flap or combination of them. The Outcomes were analyzed over a period and they are as following

Types of Burns

In our study we found that majority of the burn contractures occur after Flame burns 73% (49 patients) followed by scald burn 14.9 % (10 patients).

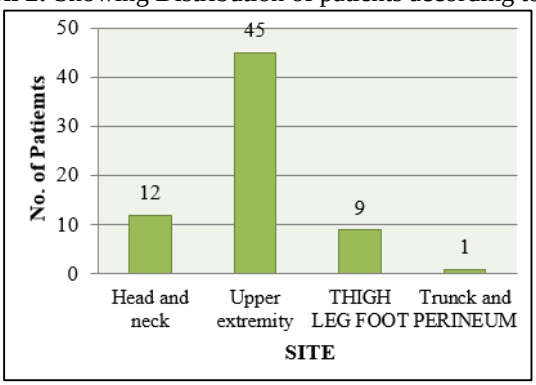
Graph 1: Showing Distribution of patients according to Types of burns



Types of Sites involved

45 patients (67.2 %) had upper extremity burn contractures i.e. Axilla, arm, forearm, hand and fingers. About 12 patients (17.9 %) had head and neck burns i.e. face, chin, eyelid and neck. We had only one patient of perineum burn contracture and no patients with trunk burn contracture.

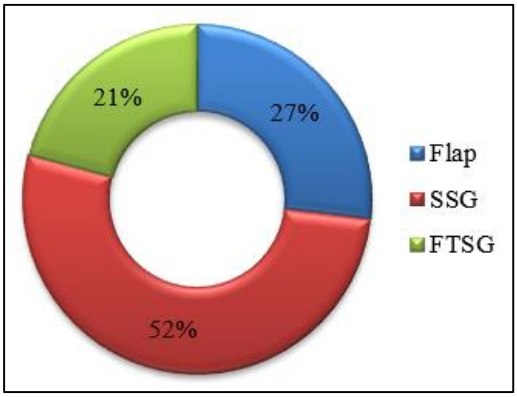
Graph 2: Showing Distribution of patients according to Site



Treatment modalities used

Following burn contractures, patients undergone different operative procedures which were STSG, FTSG, Flaps and Combination Flaps and STSG but we took Flaps and Flaps with STSG as very little piece of skin graft used in it. So, we used STSG in 35 patients (52.2%), FTSG in 14 patients (20.9%) and Flaps in 18 patients (26.9%).

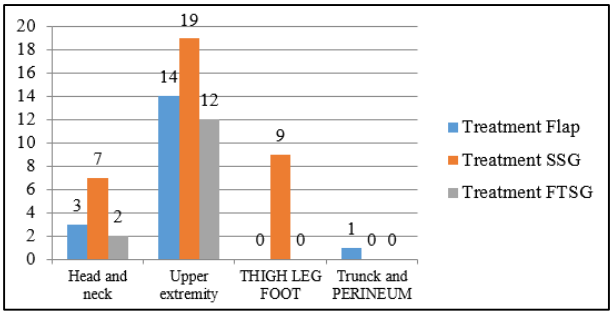
Graph 3: Showing Distribution of patients according to Treatment



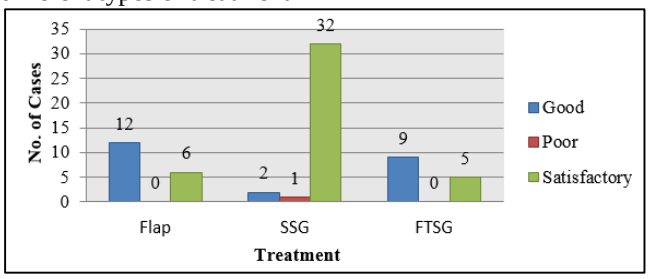
Site and Treatment

Although we used all the procedure in every site but flaps were mostly used in cases (14 patients) of upper extremity while FTSG was used in 12 patients. But overall STSG was mainly used.

Graph 4: Showing Distribution of Treatment according to site



Graph 5: Showing association of colour and texture with different types of treatment

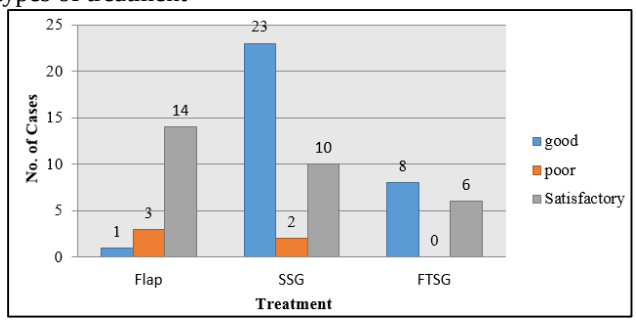


We found that Good outcome in terms of colour and texture was associated with Flaps (66%) and Colour and Texture FTSG (64.3%) while satisfactory outcome was associated with STSG (91.4%). Our results were statistically significant with p value 0.000.

Contour

We found that good outcomes in terms of contour was associated with STSG (65.7%) followed by FTSG (57.1%). While satisfactory results were associated with Flaps (77.8 %). Our results were statistically significant with p value 0.001.

Graph 6: Showing association among contour with different types of treatment



Infection

Infection was present in about 16 cases (23.9%) while absent in 51 cases (76.1%). It was absent in 16 cases of flaps while present in 2 cases of flaps. In FTSG it was absent in 11 cases while present in 3 cases. We found that STSG was one modality with infection present in 11 cases (31.4%)

Graft Loss

There was minor graft loss in 12 patients (34.3%) of STSG group while 1 patient (7.1%) of FTSG group. We had only one patient with major graft loss. Graft loss was absent in total 35 patients including both STSG and FTSG.

Recontracture

We found that none of the patients had recontractures who went under flap surgeries. In FTSG group only 1 patient (7.1 %) had recontracture. We observed that recontracture was mostly seen in STSG group occurring in 7 patients (20 %). Our results were statistically significant with p value 0.03.

Range of motion

Apart from aesthetical outcome, range of motion is important in terms of outcomes of reconstruction surgeries. We observed that Flap group had more no of patients (8 patients 44.4%) with excellent range of motion as compared to STSG and FTSG with statistical significance (p= 0.01). We had poor range of motion in one case of Flap and 3 cases of STSG.

Graph 7: Showing Association among treatment and Range of Motion

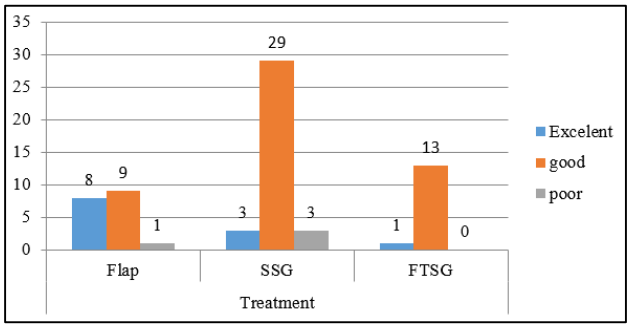


Fig. 1: PBC Lower lid Ectropion (Before & After)

Fig. 2: PBC Neck (Before & After)

Fig. 3: PBC Neck (Before & After)

Fig. 4: PBC Axilla (Before & After)

Fig. 5: PBC Axilla (Before & After)

Fig. 6: PBC Ring and Little Finger (Before & After)

Fig. 7: PBC Popliteal fossa (Before & After)

Discussion

Despite advances in management of acute burn injury, contractures still occur and burn trauma happens to be most common cause of skin contracture. Best initial treatment along with Intensive programmes and rehabilitation should be instituted at the very beginning of burns management. Our study was an observational study conducted in rural medical college over 67 patients of post burn contractures. Most of the patients were young. In our study, we found flame burns to be the most common cause of PBC (73%) and Most of the studies favors this and concluded flame burns to be the most common cause of Post burn contractures like Saaiq et al[5] where flame burn patients were 81.69 %.

In our study the most common site was upper extremity that include axilla arm forearm, hand and fingers. In a study conducted by Tyagi et al,[6] they also have found upper extremity to be more involved including commonest site as hand in 25 cases followed by elbow 12 cases. Similarly study done by F C Iwuagwu[7] on 129 patients showed that axilla and hand (59 cases) was the most common site of contracture.

Study done by Saaiq et al[5] on 213 patients revealed contradictory results as compared to our study results stating that neck was the most common site of post burn contracture. This difference may be because their sample size was large as compared to ours.

In our study we used different techniques for the resurfacing.Skin grafting was the most common method used 35 cases (52.2%) followed by Local flaps 18 cases (26.9%) followed by Full thickness skin grafting 14 cases (20.9%). The Advantage with the skin grafts is that we are harvesting a new, non-bulky skin from an uninjured area of body and also it is easier to do so as it is not always possible to take flaps due to scarring of surrounding skin and compromised vascularity. But the skin grafts carries disadvantages like tendency to recontracture etc. Our results were similar to many authors like Saaiq et al,[5] Nikunj et al[8] & Goyal et al[9] where STSG was most common surgical technique used followed by Flaps.

When we talk about the reconstruction of post burn contractures then their aesthetic as well as functional outcomes are two important aspect which defines the final result of the a reconstructive surgery. The flaps indeed have better aesthetic outcomes, in about 12 cases (66%) of flaps had good colour and texture with satisfactory contour in14 cases (77.8%). We noticed that defining surface landmarks were compromised in cases where bulky flaps taken. In FTSG group slight hyperpigmentation was seen after some time but it gradually reduced. Contouring was better achieved with skin grafts as compared to flaps. We observed that although aesthetic results with Flaps are better as compared to skin grafts but resurfacing the defect with STSG was much easier and feasible. Saaiq et al[5] showed good outcomes in 161 patients (84.29%), fair in 13 patients (6.8%) and poor in 17 patients (8.9%). This difference in the outcome as compared to our study may be because the number of flap procedure were more in their study and as we discussed earlier that flaps have better aesthetic outcome. Nikunj et al[8] on 22 patients of neck contracture where he used mostly STSG and results were good in 59 % cases, fair in 27% cases & poor in 14% cases.

We assessed functional outcomes on the basis of range of motion. Out of 67 patients 18 patients had reconstruction using Flaps & we got excellent results in terms of range of motion in 44.4% (8 patients) and Good results in 50% (9 patients). The compromise in range of motion was found to be more in skin grafting patients and it may be because grafts

were frequently associated with infection, graft loss, hypertrophy of the graft. Also the outcomes in grafted patients depends upon the compliance of the patients itself and we found that many patients did not follow the splinting and physiotherapy as they were adviced.

In the post op period, we experienced some complication like graft loss, infection, hypertrophic scar over doner site and recontractures. We found that infection rate was much more common in grafting techniques (STSG- 31.4% & FTSG - 21.4%). The high infection rate in in grafts may be because it require long standing dressing, which also increases overall post op stay of patients thus causing increased hospital expenses. STSG was more associated with graft loss as compared to FTSG. There was only one case of major graft loss. We did not found any flap necrosis in our study. While minor graft loss was seen mainly in cases where large sheet of STSG used like in cases of neck contracture but it did not affected the range of motion and other outcomes much.

Recontracture is often a late complication. In our study we found that total 8 patients (11.9%) had recontracture. Recontracture was mainly associated with STSG group while only 1 patient of FTSG group had recontracture. Nikunj et al[8] also noted a recontracture rate of 13% in his case series associated with STSG. The association of STSG and recontracture in study we found to be statistically significant with p value = 0.03. Saaiq et al[5] reported 3.7% early contracture rate that include 5 finger contracture & elbow contracture with 1 neck recontracture case. The strong association of STSG with recontracture can be due multiple reasons like, its own tendency to re-contract, Infection, graft loss and poor compliance of patient for splinting and physiotherapy. In our study mostly PBC finger cases have recontracture. Also in children if there is long standing burn contracture then it can lead to shortening of neurovascular bundle which may further add difficulty at time of the release of the contracture.

Conclusion

Post burn contracture have a great impact on society. The lack of proper initial burn management, anti-deformity splinting and physiotherapy leads to the burn contractures. Flame burns were the major cause of burn injuries. Upper extremities appears to be the most common region involved.

Due to easy availibity and safe procedure STSG was most commonly performed, but aesthetic results appears to be better achieved with Local flaps and FTSG than STSG. Also graft procedure appears to be more associated with complications. Post operative stay in hospital found to be less in flaps thus decreasing overall hospital expenses and appears to be more economic option. So, whenever possible Flaps should be considered for reconstruction. Proper planning of reconstructive procedures, rehabilitation, restoration to pre-injury status and return to society are the goals that the treating team hopes to achieve.

Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

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