Original Article

Postburn Mentosternal Contractures

Supraclavicular Flap as a Better Option Than Skin Graft in Postburn Mentosternal Contractures

Ijaz Hussain Shah, Muhammad Bilal Saeed and Naheed Ahmed

ABSTRACT

Objective: To determine the functional and aesthetic outcome of the use of supraclavicular artery flap versus skin graft in release of post burn mentosternal contractures, in terms of contracture reformation and aesthetic outcome.
Study Design: Quasi-experimental study.
Place and Duration of Study: This study was conducted at the PIBC, Nishtar Medical University Multan from January, 2017 to January 2018.
Materials and Methods: This study included 60 patients of post burn mentosternal contracture divided in two groups A and B with 30 patients in each group, in group "A" skin grafting was done and in group "B" Supraclavicular artery flap was done after release of contracture. Functional and aesthetic out come in terms of contracture reformation, colour matching and texture was compared in both groups.
Results: The graft was "take" well as the functional and aesthetic outcome was good but reformation of contracture seen in 18 (60.0%) cases. The colour match was excellent in only 4 (13.3%) patients, good in 13 (43.3%) and satisfactory in 10 (33.3%) while poor results due to hyperpigmentation were seen in 3 (10.0%) patients. All flaps survived except in 04 case; due to formation of band in the suture line, the functional outcome was excellent in only 9 (30.0%) cases and good in 19 (63.3%) cases; 2(6.7%) cases had satisfactory results and no patient showed poor results after flap being done.
Conclusion: The aesthetic outcomes was excellent in 23 (76.7%) patients, good in 5 (16.7%) patients and 1 (3.3%) patient fell in satisfactory and poor group.
Key Words: Neck contracture, Supraclavicular artery flap, Skin grafting, Burn reconstruction

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INTRODUCTION

The treatment of postburn scar deformities and contractures of the neck is one of the complicated challenges in reconstructive surgery. The skin of the neck is thin and pliable and as flexion is position of comfort it is prone to the formation of contractures[1]. They can lead to deformities of the lower face and can be reduced by keeping the neck extended during theperiods of rest by placing a pillow under the neck or by use of cervical collar and Watusi Splint[2]. The traction forces caused by burn scar contracture may pull the chin, cheeks, and lower lip caudally, resulting in incomplete oral occlusion and aldopion, in addition to possible tracheal alterations affecting respiration and to distortions of the cervical spine.

Many surgical procedures have been used to correct these contractures, including free skin grafts, local flaps with or without tissue expansion, and free flaps[3]. To achieve good functional and cosmetic results the operative procedure should fulfill the cosmetic and functional criteria of the neck.Split Skin graft remains the standard and acceptable resurfacing option for graftable wounds following incisional release of contractures and excisional removal of hypertrophic scars. Skin graft is easily available from any site and can easily be applied in patients of neck contracture[4]. But there is problem of mismatch and reformation of contracture. Fasciocutaneous flaps based on the supraclavicular artery is an extremely reliable local flap for this purpose. It offers thin and pliable skin with good colour match, with respect to the cervicohumoral shoulder region and minimal donor site morbidity.

As a basic concept, first formulated by Gillies in 1920, the more adjacent the donor site is, the better the skin will match the recipient[5].The head and neck region itself suffers from a lack of local tissues available for reconstruction. The areas which are adjacent to the head and neck are chest and shoulder.

The supraclavicular and shoulder areas can provide skin which fulfils most of the criteria of an 'ideal flap' for this region. The flap raised from this area, known as supraclavicular artery flap, is an extremely reliable, local, pedicle fasciocutaneous flap. It is based on the supraclavicular artery, which is a branch of the

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transverse cervical artery, or, less frequently, of the suprascapular artery. Its skin paddle consists of a defined region around the shoulder cap. It can be pre-expanded to cover larger defects and further reduce donor site morbidity[3]. An additional advantage is that when used for neck resurfacing after release of post-burn contractures, this skin can stretch postoperatively to allow further improved neck contour and mobility[1].

On the other hand the limitation in the use of supra-clavicular flap is that, mostly in cases of burn neck the area to be used as a flap and/or its feeding vessel is in zone of trauma, and some times primary closure of the donor site is not possible so a skin graft is to be applied there causing further cosmetic problems.

MATERIALS AND METHODS

It was a Quasi experimental study and was conducted in Pak Italian Modern Burn Center, Nishtar medical University, Multan from January 2017 to January 2018.

Sample Size: A total number of 60 patients of Mentosternal contracture divided into 2 groups of 30 each.

Sampling Technique: Convenience non probability sampling technique.

Data Collection Procedure: Informed consent was taken from all the patients admitted from out door patient department or shifted from other wards before including them in the study and purpose was also explained. Sixty confirmed cases of Mentosternal contracture based on clinical features were divided into two equal groups by using the random numbers table. All the patients were assessed by detailed clinical history and physical examination.

Skin grafting was performed in patients of group `A` by taking a split skin graft with a dermatome and tie over stitches were applied over the graft. Whereas the patients in group `B` was managed by doing Supraclavicular artery based flap.

All the patients were subsequently followed-up at one, three and five months. Some patients were followed-up for even more than six months.

Data Analysis: The collected data was analyzed by SPSS statistical package. Following variables were studied:

Age & sex."Take" of graft i.e. survival (percentage).

Flap survival (percentage).Functional restoration at one, three and five months follow-up. Aesthetic restoration at one, three and five month follow-up.

RESULTS

A total number of 60 patients divided in two groups of 30 patients each, were included in this study. All of them were studied during the six months of this one year study. Out of 30 patients in group A, 11 (36.67%) were male and 19 (63.33%) were female. In group B, 14 (46.67%) were male and 16 (53.33%) were female.

At one month follow-up, the functional restoration in group A was noted to be excellent in 2 (6.7%) patients, good in 18 (60%) patients, and satisfactory in 10 (33.3%) patients. None of the patients (0%) at one month follow-up was found to have a poor functional restoration. Functional restoration in group B at one month was excellent in 4 (13.3%) patients, highest number that is 22 (73.3%) patients had good results while 4 (13.3%) had satisfactory and none had poor results.

The functional restoration deteriorate in group A with skin grafting as at three months follow-up it was excellent in only 1 (3.3%) patient while good and satisfactory results in 14 (46.7%) patients each and 1 (3.3%) had poor results. The results showed improvement in group B patients at three months follow-up as it was excellent in 10 (33.3%), good in 18 (60.0%) and only 2 (6.7%) had satisfactory results, there was no case with poor results at this stage.

At six months follow-up, still further deterioration in results was noted in group A. It remained excellent in 1 (3.3%) patient; good in 11 (36.7%) patients, satisfactory in 13 (43.3%) patients and 5 (16.7%) had poor results. Improvement was seen in the functional restoration in group B Patients. It became excellent in 9 (30.0%) patients, good in 19 (63.3%) patients, and remained satisfactory in 2 (6.7%) patients. Again none of the patients (0%) was found to have a poor functional restoration at this stage of follow-up.

At one month follow-up, out of 30 patients of skin grafting the aesthetic restoration was noted to be excellent in 9 (30.0%) patients, good in 15 (50.0%) and satisfactory in 5 (16.7%) patients. One patient (3.3%) had a poor aesthetic outcome. While the 30 patients of Flap the colour match was found to be excellent in 18 (60.0%), good in 7 (23.4%) patients, 4 (13.3%) had satisfactory result while 1(3.3%) patient had poor result as in group A.

Like the functional restoration, the aesthetic restoration regarding colour match was also seen to be decreasing in patients of skin grafting as only 5 (16.7%) patients had excellent result at three month follow up, 15 (50.0%) had good results and number of patients with satisfactory and poor results increase as 8 (26.6%) and 2 (6.7%) respectively. While the patients in other group in which flap was done the colour match also improved with h the passage of time. At three months follow-up, it became excellent in 22 (73.3%) patients, good in 5 (16.7%) patients and remained satisfactory in 2 (6.7%) patients. One of the patients (3.3%) had a poor aesthetic outcome at this follow-up.

At six months follow-up, in patients of skin grafting the results remained almost static with little deterioration. It became excellent in 4 (13.3%) patients, good in 13 (43.3%) patients and remained satisfactory in 10 (33.3%) patients. The patients with poor results increased to 3 (10.0%). On other hand some further improvement was noted in the aesthetic restoration in

the group in which flap was done but the results were almost the same as at three months follow up. It became excellent in 23 (76.7%) patients, good in 5 (16.7%) patients, satisfactory in 1 (3.3%) patient. Again one of the patients (3.3%) was seen to have a poor aesthetic outcome regarding colour match at this stage of follow up, as shown in table 2.

Table No.1: Functional Restoration at 1, 3 and 6 Months N=30

	Group A Skin Graft			Group B - Supraclavicular Flap		
	1m	3m	6m	1m	3m	6m
Excellent	2 (6.7%)	1 (3.3%)	1 (3.3%)	4 (13.3%)	10 (33.3%)	9 (30.0%)
Good	18 (60%)	14 (46.7%)	11 (36.7%)	22 (73.3%)	18 (60.0%)	19 (63.3%)
Satisfactory	10 (33.3%)	14 (46.7%)	13 (43.3%)	4 (13.3%)	2 (6.7%)	2 (6.7%)
Poor	(0%)	1 (3.3%)	5 (16.7%)	(0%)	(0%)	(0%)

Table No.2: Aesthetic Outcome at 1, 3 and 6 Months N=30

	Group A Skin Graft			Group B - Supraclavicular Flap		
	1m	3m	6m	1m	3m	6m
Excellent	9 (30.0%)	5 (16.7%)	4 (13.3%)	18 (60.0%),	22 (73.3%)	23 (76.7%)
Good	15 (50.0%)	15 (50.0%)	13 (43.3%)	7 (23.4%)	5 (16.7%)	5 (16.7%)
Satisfactory	5 (16.7%)	8 (26.6%)	10 (33.3%)	4 (13.3%)	2 (6.7%)	1 (3.3%)
Poor	1 (3.3%)	2 (6.7%)	3 (10.0%)	1(3.3%)	1(3.3%)	1 (3.3%)

Figure No.1: Skin grafting for neck contracture

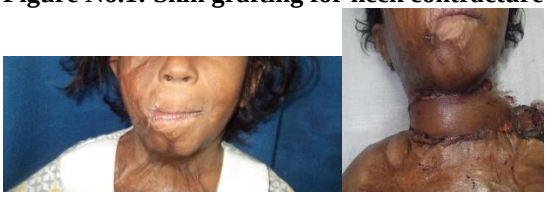

Figure No.2: supraclavicular artery flap for neck contracture

DISCUSSION

Reconstructive procedures in the postburn mentosternal contractures have to take account of anatomic, aesthetic and functional aspects.[6-10]First, normal contours have to be achieved; in the neck, the cervico-mandibular angle has to be reformed. Second, the aesthetic units have to be taken into account. Third, the functional outcome has to ensure full range of movements, both of the lower face and neck. Finally, additional scarring of the upper chest should be avoided. To achieve these goals, a thin reliable flap, harvested close to the face/neck region with good colour and texture match, and a smooth hairless skin surface is needed. Everyday clothing should conceal the donor site.

Numerous methods have been used to restore form and function in the head and neck region. The best colour and texture match is achieved with local and regional flaps.[5,11]The skin graft has the obvious advantage of having large donor site availability away from the contracture, like thighs of the patient[12]. It is easy to learn and swift to perform. Modern uses of skin grafting were described in the mid-to-late 19th century, including Reverdin's use of the pinch graft in 1869 (Davis, 1994); Ollier's and Thiersch's uses of the split-thickness graft in 1872 and 1886, respectively As reformation of contracture was a problem in skin graft after release of neck contractures, in 1961 Cronin TD[13] published his research of use of molded splint to prevent reformation of neck contracture after splint skin grafting on neck.

In our study we used skin grafting after release of mentosternal contracture in 30 patients. The “TAKE” of graft was 100% in 17 (56.7%) patients, it was 70-90% in 7 (23.3%) patients and remaining 6 (20.0%) patients the “TAKE” was less than 70%. Babar AH et al.[12] also reported similar results in their study on 65 patients in 1999. In our study the aesthetic outcome regarding colour match was seemed to be good in more than 50 % of patients but 43% had poor results due to pigmentation of the grafted skin, as the neck is an area which is exposed to ultraviolet rays from sunlight. Babar AH et al.[12] also reported similar results in their study on 65 patients in 1999. For thin, flexible and smooth hairless resurfacing with acceptable donor site camouflage, supraclavicular artery flap which is raised from region of shoulder seems to be the best choice.Lamberty was the first to describe a supraclavicular artery based flap in 1979.[14]Pallua modified it as an island flap to increase its versatility and to minimize dog ears and scars in the supraclavicular region.[15]

Each patient was followed up for a period of at least six months. Chaudhry et al.[16] have also presented their results after a follow-up of six months. Functional and aesthetic restorations were recorded at one; three and

five months follow up. With the passage of time, a progressive improvement in the range of motion in reconstructed areas. At one month follow-up, the functional restoration was noted to be excellent in 4 (13.3%) patients, good in 22 (73.3%) patients, and satisfactory in 4 (13.3%) patients. None of the patients (0%) at one month follow-up was found to have a poor functional restoration. At three months follow-up, it became excellent in 10 (33.3%) patients, good in 18 (60.0%) patients and remained satisfactory in 2 (6.7%) patients. Not a single patient (0%) was found to have a poor functional restoration at this stage. At six months follow up, 9 (30.0%) patients had excellent, 19 (63.3%) patients had good while 2 (6.7%) patients had satisfactory functional restoration. None of the patients (0%) had poor functional outcome. This significant deterioration in function was mainly due to band formation in the suture line of the flap and the tenting of flap, this tenting later settle due to postoperative expansion of the flap. These results are comparable to those reported by Rashid et al[.1] They followed-up their patients at 3, 6 and 12 months, measured the width of the flap at each follow-up and found an average of 63% increase in width at one year. We used Philadelphia neck collar for three months and stretching exercises for up to six months. Significant improvement in the release of the tenting of flap was noted but the bands formed in suture line needed surgical revision like Z-Plasty.

The gradual improvement was seen in the aesthetic appearance with the passage of time. At one month follow-up, the aesthetic restoration was noted to be excellent in 18 (60.0%) patients, good in 7 (23.4%) and satisfactory in 4 (13.3%) patients. one patient (3.3%) had a poor aesthetic outcome due to the necrosis of distal 10% of the flap. At three months follow-up, it became excellent in 22 (73.3%) patients, good in 5 (16.7%) patients and remained satisfactory in 2 (6.7%) patients. one of the patients (3.3%) had a poor aesthetic outcome at this follow-up. At six months follow-up, excellent aesthetic restoration was seen in 23 (76.7%) patients, good in 5 (16.7%) patients and remained satisfactory in 1 (3.3%) patients. one of the patients (3.3%) with tip necrosis and healing of the part of defect had a poor aesthetic outcome. These results are comparable to those reported by Di Benedetto et al.[17]and Chaudhry et al.[16]

CONCLUSION

From the knowledge of the present study the following conclusions can be made. The supraclavicular artery flap is one of the reconstructive techniques of choice for medium to large defects of the cervico-facial region. It is a reliable, thin and pliant fasciocutaneous flap, and expands significantly postoperatively.

The functional restoration has some problems due to the vertical suture line in flap in-setting; band formation occurs which needs further surgery like Z- plasty that increases the cost and hospital stay of the patient.

Skin grafting has its own advantage as it can be done in patients in which the flap pedicle is in the zone of trauma (burn), it can be done quickly, no much expertise are needed but still the problem is poor aesthetic outcome like colour match and hard texture.

Author's Contribution:

Concept & Design of Study:	Ijaz Hussain Shah
Drafting:	Muhammad Bilal Saeed
Data Analysis:	Naheed Ahmed
Revisiting Critically:	Ijaz Hussain Shah, Muhammad Bilal Saeed
Final Approval of version:	Ijaz Hussain Shah

Conflict of Interest: The study has no conflict of interest to declare by any author.

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