Al-Azhar International Medical Journal

Volume 5 | Issue 8 Article 2

8-31-2024
Section: Plastic surgery

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How to Cite This Article

Ayad, Wael Mohamed; Zayed, Tarek El Bastawesy; and Mohamed, Amr Mohamed Abd Elbaset (2024) "Evaluation of Pre-expanded Supraclavicular Flap in Reconstruction of Moderate to Severe Post Burn Contracted Neck and Lower Face," *Al-Azhar International Medical Journal*: Vol. 5: Iss. 8, Article 2.
DOI: https://doi.org/10.58675/2682-339X.2578

ORIGINAL ARTICLE

Evaluation of Pre-expanded Supraclavicular Flap in Reconstruction of Moderate to Severe Post Burn Contracted Neck and Lower Face

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Abstract

Background: ***Contracture of the neck following a burn remains a significant complication and a serious challenge for plastic surgeons. It results in functional, cosmetic, & social complications.***

Aim and objectives: ***To evaluate the pre-expansion of the supraclavicular flap in the reconstruction of moderate to severe post-burn contracted neck and lower face in terms of aesthetic and functional results at both donor and recipient sites.***

Patients and methods: ***This was prospective cross-sectional research performed on ten patients with moderate to severe post-burn contracted neck and lower face reconstructed at the Department of Plastic Surgery and Burns at Al Hussein and Sayed Galal Hospitals, Faculty of Medicine, Al-Azhar University.***

Results: ***Expansion of the supraclavicular flap provides a large flap dimension for neck contracture and direct closure for the donor site without tension. The mean hospital stay was 6.2 days, and in early post-operative follow-up, one case of seroma and hematoma, which resolved spontaneously, one case of distal necrosis responded to enzymatic debridement and local wound care, and one case of partial dehiscence. There was a statistically significant improvement in neck extension and cervical-mental angle post-operative than pre-operative p=0.01, and 50% of patients showed excellent satisfaction results, 40% showed good satisfaction, while 10% accepted their end results.***

Conclusion: ***Expansion of the supraclavicular flap for post burn contracted neck reconstruction is an excellent, reliable, thin flap with good texture, minimal donor site morbidity, and good color match.***

Keywords: Supraclavicular Flap; Reconstruction; Post Burn; Contracted Neck

1. Introduction

The neck is functionally and anatomically designed to facilitate maximal three-dimensional motion and serves as a connection between the head & the body. Contractures of the neck result in both aesthetic & functional deficits. Severe contractures can occur when the lower chin, lip, neck, &chest are affected by deep burn injuries. Therefore, patients with neck scar contracture have the following: neck movement restriction, rigidity in the shoulders, compensatory kyphosis, incomplete oral occlusion accompanied by saliva drooling, & challenges related to posture, chin development, & swallowing.[1]

Contracture of the neck following a burn remains a significant complication and a major challenge for plastic surgeons. It results in functional, cosmetic, & societal complications. Due to the neck's multidirectional movement &the quality of its tissue, particular care must be taken when reconstructing it. Reconstructing neck contractures has been proposed using a variety of techniques, such as Z-plasties, split-thickness skin grafts, local or pedicled skin flaps, full-thickness skin grafts, pedicled or free musculocutaneous flaps, & free cutaneous flaps, with or without tissue expansion.[2]

The optimal neck reconstruction should maintain the cervicomental angle, complement the color and contour of the adjacent unburned neck skin, be resistant to recurrent contracture, utilize a thin and flexible flap to conform to the contour of the cervical region, & cause minimal morbidity at the donor site.[3]

Accepted 21 August 2024.
Available online 31 August 2024

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Following the release of burn contractures, the pre-expanded supraclavicular artery flap is an alternative technique utilized to cover cervical defects. Lamberty initially defined the supraclavicular flap as an axial pattern flap in 1979. Subsequent to that, many authors have documented their flap modifications & expanded their applications to encompass anterior chest wall reconstructions and face and neck resurfacing.[4]

Major defects may develop after the burn contracture release, which may not be effectively managed until after expansion. However, in the cases where local tissues are also burned, the only possible option for management is distant tissue transfer.[5]

This study was conducted to assess the pre-expansion of supraclavicular flap in reconstruction of moderate to severe post burn contracted neck and lower face as regards aesthetic and functional result of both donor and recipient sites.

2. Patients and methods

This was prospective cross-sectional research performed on 10 cases with moderate to severe post-burn contracture of the neck & lower face were reconstructed by pre-expanded supraclavicular flap at the Department of Plastic surgery and burns at Al Hussein and Sayed Galal Hospitals, Faculty of Medicine, Al-Azhar University.

Ethical consideration

The research protocol received approval from the Local Ethics Committee, and all participants provided written informed consent.

Inclusion criteria: Proven cases of moderate to severe post-burn neck contracture, both females & males, and Patients of all age groups.

Exclusion criteria: cases unable to complete the follow-up & rehabilitation program, burnt donor site, cases who had undergone neck contracture release at another site presented with neck re-contracture, cases with a history of neck irradiation, trauma or severe scarring in the supraclavicular region and Patients who refused to give their consent to being involved in the research.

Methods

All patients included in the study were subjected to the following:

Full history taking: Personal history and Present History, Full local & general examination, routine pre-surgery investigations, Control of patient's medical condition, e.g., D.M. or hypertension and pre-surgery photography. Photography and extension angle: Photography was utilized to record patient outcomes both before and after the procedure. Photographs of the cases were taken laterally against a neutral background. They were instructed to maximally extend their necks. This resulted in the greatest extension feasible for the subject without causing facial disfigurement.

Surgical technique

Anesthesia: General anesthesia was used in all patients.

1st Stage

Flap marking

Extension of the flap territory anteriorly to the lower border of the clavicle, posteriorly to the anterior border of the trapezius muscle, the mid-deltoid muscle laterally, and the anterior contracture margins medially. The supraclavicular perforator was identified within the triangle delineated by the external jugular vein laterally, the clavicular head of the sternocleidomastoid medially, &the clavicle inferiorly, utilizing a handheld Doppler.

Tissue Expander Insertion

To prepare the flap for expander insertion, dissection was conducted beneath the flap, specifically beneath the deep fascia. Rectangular and rounded tissue expanders up to 500 ml were inserted into the pockets. the filling valve was inserted. Around ten percent of the expander volume was inflated intraoperatively & immediately to the extent that the dead space was closed. We began expansion twice weekly after two weeks post-surgery, and the expansion time from three to five months to reach the desired level of expansion. 2nd Stage: Marking of the flap was done, and the perforator was identified using a handheld Doppler. Contracture release: Release of the contracted neck and removal of the scar done, allowing the neck to be fully extended. Flap Planning: A sterile paper template was applied to the defect area and trimmed to the bloody border. The template was then applied to the flap donor area, & the flap size needed to release the contracture was marked. Flap Elevation: An explanation of the expanders was done. Laterally to medially, the flap was elevated in the subfascial plane, and the drain was placed before closure. A deeper layer of absorbable polyglycolic acid suture was used to secure the flap, while the superficial layer was secured with a nonabsorbable polypropylene suture. After undermining, the donor defect could be closed in two layers: an absorbable polyglycolic acid suture for the deeper layer and a nonabsorbable polypropylene suture for the superficial layer. Suction drains were placed. Post-operative care: Follow up on the flap vascularity; patients were mobilized for feeding. They underwent lateral rotation, physiotherapy for neck flexion extension, & shoulder abduction, and the drains were removed after two days. A soft cervical collar was given for comfort. Sutures were removed at ten days, and silicone gel was used for

suture lines. Patients were advised on pressure garments and shoulder & neck mobilization exercises. The evaluation depends on operative time, hospital stays, flap dimension, thickness, complications, functional outcome, degree of neck extension and cervico-mental angle, aesthetic outcome: donor site and recipient site (reconstructed neck), and patient satisfaction.

3. Results

Table 1 shows that the mean age of studied group was 27.2 years vast majority of the participants was male.

Table 1. Demographic properties of studied group

		MEAN	SD
AGE (YEAR)		27.2	13.2
		N	%
SEX	Male	6	60
	FEMALE	4	40

Table 2 shows that frequency of burn casualty was 50% flame, 30% scald and 20 chemical burns.

Table 2. Frequency of Causes of Burn

	N	%
FLAME	5	50
SCALD	3	30
CHEMICAL	2	20

Table 3 shows that regarding severity (Onah) of the scar our results 6 cases (60%) were moderate (II) and 4 cases (40%) were Severe (III).

Table 3. Onah classification

ONAH	N	%
II	6	60
III	4	40

Table 4 shows that the mean operative time of first stage (tissue expander implantation) was 60 min, while second stage (flap elevation and in setting) was 92 min. The mean dimension of the flap was 19.2 and 12.1 cm.

Table 4. Operative properties

	MEAN	SD
1ST STAGE. (MIN)	60	10.3
2ND STAGE (MIN)	92	26.6
LONG (CM)	19.2	4.3
WIDTH (CM)	12.1	3.6

Table 5 shows that the mean hospital stay was 6.2 days and in early post-operative follow up one case of seroma and hematoma which resolve spontaneously, and one case of necrosis respond to debridement and wound care and one case of partial dehiscence.

Table 5. Early outcome, hospital stay and complications

	MEAN	SD
HOSPITAL STAY (DAY)	6.2	1.6
EARLY	N	%
SEROMA	1	10
HEMATOMA	1	10
SUPERFICIAL PARTIAL DISTAL NECROSIS	1	10
DEHISCENCE	1	10
DONER SITE COMPLICATIONS	N	%
HYPERTROPHIC EDGE	1	10
DISRUPTION OF WOUND CLOSED PRIMARY	1	10

Table 6 shows statistically significant improvement in neck extension and cervico-mental angle post-operative than pre-operative p=0.01

Table 6. Comparison of Pre- and post-operative Angle and extension

	PRE-OPERATIVE		POST-OPERATIVE		P VALUE
	Mean	SD	Mean	SD	
EXTENSION	102	7	118	11	0.01*
ANGLE	97	9	110	9	0.01*

Student t-test; * significant

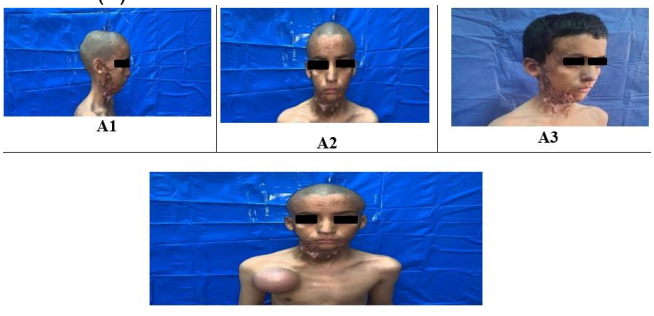
Table 7 shows that after a period of follow-up 50% of patients showed excellent satisfaction results while 10% accepted their end results.

Table 7. Post-operative satisfaction

SATISFACTION	N	%
(EXCELLENT)	5	50
(GOOD)	4	40
(FAIR)	1	10

CASE PRESENTATION

Case (1):



A1 A2 A3

B

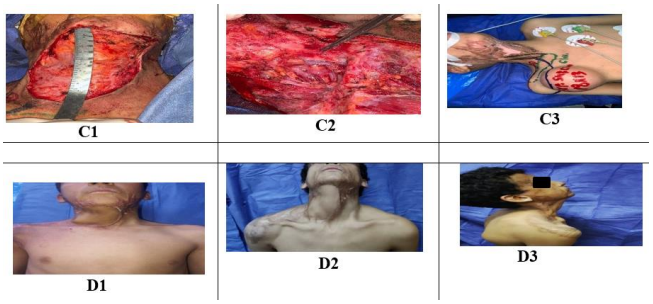


Figure 1. 12 years old boy with post burn contracted neck - post flame burn one year ago,

(A) pre-operative, (B) after implantation and complete filling, (C) intraoperative, (D) early and late postoperative

4. Discussion

The optimal solution for covering defects caused by the release of a neck contracture would be a large, supple, thin, & well-vascularized healthy tissue.[6]

The main results of this study were as follows:

In this study, we evaluate expansion of the supraclavicular flap aesthetic and functional results of both donor and recipient site.

Age in this study was ranged between 10-45 years with mean 27.2 years while, as regard sex a total 10 cases were involved in this research, 6 (60%) were males & 4 (40%) were females.

This study was supported by the results of Saaiq et al., as it was research was performed regarding 213 cases of either gender & all ages who presented with post-burn contractures, & they found that 143 (67.1%) were males and 70 (32.9%) were females.[7]

As regards the causes of burns, this study showed that the types of initial burn insults comprised scalds in 3 cases (30%), flames burn in 5 (50%), and chemicals in 2 (20%).

As regards causes of burns, Mody et al. said that initial burn insults comprised flame burns in 18 cases (82%), scalds burn in 3 (14%), and chemicals in 1 (4%).[8]

As regard distribution of cases regarding severity (Onah) of the scar our results demonstrated that, moderate (II) 6 cases (60%), Severe (III) 4 cases (40%).

In the research of Makboul & El-Oteify, they found the following regarding the severity distribution of cases: seventy-nine cases (56.4%) were classified as mild, forty-seven cases (33.6%) as moderate, and fourteen cases (10%) as severe.[9]

As regards operative data, the mean harvesting time was 92 min. The mean dimensions of the flap were 19.2 and 12.1 cm.

In a study by Zhao et al., the dimensions of the flap varied from 17 cm*8.5 cm to 22 cm*12 cm.10 We found in early post-operative follow-up one case of seroma and hematoma, which resolved spontaneously, one case of necrosis that responded to debridement and wound care, and one case of partial dehiscence. [10]

Eleven cases, according to the findings of Wang et al., survived well. Two cases presented with distal flap epidermolysis, which resolved without additional intervention, while distal flap necrosis complicated only one case. [11]

Dehiscence at the donor site is caused by inadequate undermining during the closure of the donor site or excessively large flap elevation, both of which contribute to excessive wound tension. Most dehiscence is minor and can be treated locally.[12]

We found statistically significant improvement in neck extension and cervico-mental angle post-operative than pre-operative. After a period of follow-up ranging from three to nine months, 50% of patients showed excellent satisfaction results, 40% good satisfaction, and 10% accepted their end results.

The neck region's high aesthetic & functional requirements may be satisfied without microsurgical intervention. Ultimately, the morbidity is minimal because the primary closure of the donor site rarely results in functional impairment. 4 Additionally, cases were satisfied with the functional and aesthetic results, according to the study by Zhao et al. Achieving favorable aesthetic outcomes required meticulous matching of the color, thickness, and textures. 10 In 86.7-90.24% of cases, the preexpanded supraclavicular flap is effective in reconstructing neck contractures. [10]

4. Conclusion

Expansion of the supraclavicular flap for post burn neck contracture reconstruction is an excellent, reliable, thin flap with good texture, minimal donor site morbidity and good color match.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

Funding

No Funds : Yes

Conflicts of interest

There are no conflicts of interest.

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