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Supraclavicular Flaps for Face Reconstruction with Reduced Donor Site Morbidity and Without the Need for Microsurgery

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ABSTRACT

Background: Facial reconstructive surgery is used to restore facial structure and functions as close to normal as possible. It is challenging to satisfy the patients as the facial anatomy reconstruction is very difficult. **Objective:** To determine the frequency of post-treatment complications in supraclavicular flaps for face reconstruction. **Methodology:** This descriptive case series study was conducted in department of Burns and Plastic Surgery Center, Hayatabad Medical Complex, Peshawar from July 03, 2024 to January 03, 2025. According to WHO calculator 1.1, total 110 male and female patients of age between 30 and 60, who gave informed consent were included in the study. Those patients who had scar/previous surgery in the area of supraclavicular artery flap and patients requiring radical neck dissection on the side of the flap were excluded from the study. The study was conducted after approval of the research project from ethical board. **Result:** One hundred-ten patients underwent supraclavicular flap reconstruction of a head and neck defect. The average age was 44.89 years (range, 30–60 years). After average hospital stay of 5.25 days (minimum 3 days, maximum 7 days), 30 patients developed wound dehiscence, 10 patients developed Transitory venous insufficiency, 7 patients developed contractures and 7 patients developed complete flap necrosis. There was significant association of gender, cause of injury and age with wound complications ($p<0.05$) while defect location showed non-significant association with won complications ($p=0.582$). **Conclusion:** The cause of injury was linked to a higher likelihood of wound dehiscence, and following the repair of cutaneous defects, there were no recipient surgical site infections. Patients who experienced wound difficulties were more likely to develop fistulas and stay in the hospital longer after surgery, as was to be predicted.

INTRODUCTION

Facial reconstructive surgery is used to restore facial structure and functions as close to normal as possible. It is challenging to satisfy the patients as the facial anatomy reconstruction is very difficult.(1) The researchers explored the new ways which are more successive and save time and resources. The pedicle supraclavicular island flap (SCIF) is not a good candidate for superior head defects because the vascular supply to distal flap is unreliable. In a case report the researcher performed resection of squamous cell carcinoma on the right side of frontotemporal region. The end-to-end microsurgical anastomoses were performed and the flap survived completely without the need of replacement.(2)

In a study conducted for upper and lower lip reconstructions using pre-expanded bipedicled visor flap, they include 12 male patients with post burn scars. The result showed that all surgeries were performed successfully and no major complications observed in any patient after 6 months follow up.(3) In a recent case series conducted in 2020, supraclavicular artery flap was raised and transferred inside the mouth to provide intraoral soft-tissue coverage and restore intraoral lining. There were reposted no complications after a long follow up of 3 years.(4)

In a study conducted in 2005, the researchers used supraclavicular island flap that gave satisfactory results without microsurgical prefabrication. Sixteen pre-expanded supraclavicular island flaps were used in 11 patients and found no complications.(5)

A successive case report published in 2021 in which the researcher traded a 10-year-old boy came with severe anterior neck post-burn contracture with unilateral supraclavicular flap.(6)

Shah SA et al., conducted a study on role of supraclavicular flaps for head and neck defect. Total of

210 patients were included. 42.8% had post burn deformaties, 35.23% were trauma cases, 20% were post tumor resection necrosis. According to his results only one patient had complete flap necrosis and 4 patients had distal flap necrosis.

Determining the frequency of post-treatment complications in supraclavicular flaps for face reconstruction is crucial for improving surgical outcomes and patient care. Identifying common complications can guide preoperative planning, patient counseling, and postoperative management. This data is essential for developing strategies to minimize risks and enhance the overall success of facial reconstructive procedures.

METHODOLOGY

This descriptive case series study was conducted in Burns and Plastic Surgery Center, Hayatabad Medical Complex, Peshawar to determine the frequency of post-treatment complications in supraclavicular flaps for face reconstruction. The study was carried out from July 03, 2024 to January 03, 2025. According to WHO calculator 1.1, total 110 male and female patients of age between 30 and 60, who gave informed consent were included in the study. Those patients who had scar/previous surgery in the area of supraclavicular artery flap and patients requiring radical neck dissection on the side of the flap were excluded from the study. The study duration was 6 months after approval of the research project from ethical board.

Procedure

All patients were consoled preoperatively about a visible scar over the supra-clavicular and deltoid region with the possibility of stretching of the scars. Specific investigation like orthopantomogram, paranasal sinuses views, CT scan and MRI were carried out to know proper extent of the tumour and to judge the defect size before planning the reconstruction of the defect. Both supra-clavicular areas were confirmed for flap donation and the non-dominant side was selected as the donor site. Pre-operatively, the defect was prepared and its dimensions were mapped out with the help of a template. Postoperatively, patients were observed for survival of the flap and any early flap or donor site complication. The drains were removed on 2nd postoperative day. The first dressing was changed on the second postoperative day. The patients were discharged between 3 to 7 days. The first follow-up visit was scheduled on the 7th to 14th postoperative day.

Data was analyzed by using SPSS version 23. Mean ± standard variables were calculated for continuous variables such as age, defect size and hospital stay. Frequencies and percentages were calculated for categorical variables such as sex, defect location, cause of treatment and post-operative complications (Wound dehiscence, flap necrosis, transitory venous insufficiency and contracture). Sex, age group, defect location, cause of treatment was stratified against post operative complications such as wound dehiscence, flap necrosis, transitory venous insufficiency, and contracture. Post stratification chi-square test was used with P value less or equal to 0.05 was considered as significant.

Table 1

Demographic detail

Variables	Mean±SD
Age (years)	44.89±8.74
Defect Size (cm^2)	72.82±54.66
Hospital Stay (Days)	5.25±2.07

Table 2

Descriptive Detail

Variables	n(%) n=110
Gender	
Male	60 (54.5%)
Female	50 (45.5%)
Defect Location	
Middle third face	50(45.5%)
Lower face reconstruction	40(36.4%)
Neck reconstruction	20(18.2%)

RESULTS

One hundred-ten patients underwent supraclavicular flap reconstruction of the head and neck defect. The average age was 44.89 years (range, 30–60 years). Surgery was performed for post burn deformities in 22 patients, trauma 32 patients, tumor resection 13 patients, radio necrosis 18 patients and hemi fascial atrophy 25 patients, in which 60 were male and 50 female patients. Fifty patients had defect on middle third face, 40 patients had defect on lower face and 20 patients underwent surgery for neck reconstruction. The detail is mentioned in table.1 & 2.

After average hospital stay of 5.25 days (minimum 3 days, maximum 7 days), 30 patients developed wound dehiscence, 10 patients developed Transitory venous insufficiency, 2 patients developed contractures and 1 patients developed complete flap necrosis.

Cause of Injury	
Post burn deformities	22(20%)
Trauma	32(29.1%)
Tumor resection	13(11.8%)
Radio necrosis	18(16.4%)
Hemi fascial Atrophy	25(22.7%)
Complication after surgery	
Wound dehiscence	30(27.27%)
Transitory venous insufficiency	10(9.1%)
Complete flap necrosis	1(0.9%)
Contracture	2(1.8%)

Wound Dehiscence

Eighteen males and 12 female developed wound dehiscence with 15 patients having defect location on middle 3rd of face, 10 patients had it on lower face and 5 patients had location of defect at neck. Twelve patients

who developed wound dehiscence underwent surgery due to burn deformity, 8 came for trauma, 4 came due to tumor resection, 4 came for radio necrosis and 2 underwent surgery due to hemi facial atrophy. The average age of patients who developed wound adherence was 44.8 years (30-60 years).

Transitory Venous Insufficiency

Five males and 5 female developed Transitory venous insufficiency with 3 patients having defect location on middle 3rd of face, 5 patients had it on lower face and 2 patients had location of defect at neck. Five patients who developed Transitory venous insufficiency underwent surgery due to trauma and 5 underwent surgery due to hemi facial atrophy. The average age of patients who developed wound adherence was 40.8 years (30-50 years).

Complete Flap Necrosis

One male patient developed complete flap necrosis having defect location on middle 3rd of face, underwent surgery due to traumaThe average age of patients who developed wound adherence was 47 years (40-55 years).

Contracture

Two males developed contracture after surgery with 1 patient having defect location on middle 3rd of face and other had it on lower face. One patient who developed contracture underwent surgery due to post burn deformity, other due to trauma. The average age of patients who developed wound adherence was 49 years (30-60 years).

There was significant association of gender, cause of injury and age with wound complications ($p<0.05$) while defect location showed non-significant association with won complications ($p=0.582$).

Table 3

Surgical wound complications and pre surgery characteristics

Variable		Complications after surgery n(%)				P value
		Wound dehiscence	Transitory venous insufficiency	Complete flap necrosis	Contracture	
Gender	-Male	18(60%)	5(8.3%)	1(100%)	2(100%)	0.01
	-Female	20(40%)	5(10%)	0(0%)	0(%)	
Defect Location	-Middle 3rd face	15(50%)	3(6%)	1(100%)	1(50%)	0.582
	-Lower face	10(33.3%)	5(12.5%)	0(0%)	1(50%)	
	Neck	5(16.7%)	2(10%)	0(0%)	0(0%)	
Cause of injury	-Post burn deformities	12(40%)	0(0%)	0(0%)	1(50%)	0.015
	-Trauma	8(26.7%)	5(15.6%)	1(100%)	1(50%)	
	-Tumor resection	4(13.3%)	0(0%)	0(0%)	0(0%)	
	-Radio necrosis	4(13.3%)	0(0%)	0(0%)	0(0%)	
	-Hemi fascial Atrophy	2(6.7%)	5(20%)	0(0%)	0(0%)	
Age		n=30 44.8±8.9	n=10 40.8±6.64	n=1 47.0±6.4	n=2 49.0±9.9	0.248

**p<0.05=significant*

DISCUSSION

This descriptive case series study was conducted to determine the frequency of post-treatment complications in supraclavicular Flaps for face reconstruction. Based on the supraclavicular vessels, which split off from the transverse cervical vessels, the supraclavicular flap is a pedicled flap. To the best of our knowledge, this study is the first to assess complications of surgical site infections following supraclavicular flap restoration.

After average hospital stay of 5.25 days (minimum 3 days, maximum 7 days), 30 patients developed wound dehiscence, 10 patients developed Transitory venous insufficiency, 1 patient developed contractures and 2 patients developed complete flap necrosis. There was significant association of gender, cause of injury and age with wound complications ($p<0.05$) while defect location showed non-significant association with wound complications ($p=0.582$).

For plastic surgeons, reconstructing face abnormalities is still difficult, particularly following serious burns or tumor removal. The optimal approach still has to be determined. Many flaps are being used for covering in head and neck reconstructive operations.(7) However, the main objective of each treatment is to provide flap tissue that is similar to face tissue. Thin fasciocutaneous flaps should be employed to resurface deformities in the head and neck regions.(8) The shoulder flap is one type of flap that is anatomically based on the supraclavicular arch. Recently, this flap's length and mobility have been expanded by identifying an adjacent vein and separating the vascular pedicle.(5)

The shoulder flap's effectiveness and dependability as an island flap for covering different parts of the head and neck have been documented in the past.(9) We were thus motivated to employ this flap in (full-)face reconstruction by encouraging outcomes. We prepared the flap by putting a tissue expander behind it to make it

larger. We received thin (2–3 mm) and huge (up to 30–14 cm) enlarged flaps as a result of this treatment. (10)

Shen coined the phrase "prefabrication" in 1982. He explained how an implanted vessel causes the surrounding tissue to become neovascularized.(11) It was previously unknown that large, thin flaps were connected to both a venous and arterial pedicle. For flaps that may offer the best coverage, prefabrication produced new angiosomes.(12) However, prefabrication necessitates a number of procedures and can result in substantial donor-site morbidity. For instance, there may be serious consequences if the radial artery is sacrificed.(13) Free flap transfer is expensive and time-consuming, and it may potentially result with difficulties.(14) Alternative techniques require the vascularization of extremely thin flaps by microvascular augmentation, which takes time and may result in difficulties.(15)

We employed tissue expansion to improve flap micro vascularization in addition to enlarging and thinning our flaps. Without the use of micro anastomoses, we were able to reconstruct sizable portions of the face using the supraclavicular artery's angiosome. This flap is safe due to the supraclavicular vessels' dependability. There were no indications of venous or arterial compromise in any of the flaps. Every flap healed well and showed no symptoms of necrosis. This flap is simple to construct and dissect because to the constant architecture of the arteries and the supraclavicular angiosome. Additionally, we think that a shoulder flap more closely resembles the color of the skin on the face than a flap taken from the trunk or an extremity.

The technique we outline here offers clear benefits for face reconstruction, particularly due to the microvascular enhancement of vascularization. In every instance when a face aesthetic unit was entirely changed, satisfactory outcomes were achieved. For the reconstruction of all significant flaws in the bottom two-thirds of the face, we advise this operation as the preferred course of therapy.

There were many restrictions on our investigation, individuals getting pedicled flaps may be subject to selection bias at hospitals with a large volume of microvascular flap repair. The use of free tissue may be restricted in certain individuals due to other comorbidities. Therefore, there may be a greater baseline risk of surgical site infections for this group of patients having pedicled flap reconstruction. The majority of the patients in this series, however, had supraclavicular artery island flaps performed at the surgeon's option as the best reconstructive method; they were not stratified for free tissue or pedicled flaps. Due to the limited patient population, it is difficult to identify subtle, nonrandom variations in risk variables between surgical site complications and nonsurgical site complications. This approach could be the preferred one for treating individuals with facial malignancies in developing nations where facial burns and infections are more common than developed countries.

CONCLUSION

We provide a unique adaptation of a previously described face reconstruction technique that has the same benefits a significant volume of thin tissue with acceptable texture and color but without the drawbacks of donor-site morbidity, drawn-out procedures, and high expense. Both hospitals with and without microsurgical capabilities can benefit from this reconstructive approach. The risk of surgical site infection is comparatively minimal with the supraclavicular flap. The flap is still viable with little need for further repair, even in cases of surgical site infection. On univariate analysis, the cause of injury was linked to a higher likelihood of wound dehiscence, and following the repair of cutaneous defects, there were no recipient surgical site infections. Patients who experienced wound difficulties were more likely to develop fistulas and stay in the hospital longer after surgery, as was to be predicted.

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