



Posteriorly Expanded Supraclavicular Artery Flap Can Reach Distant More Reliable and Safe

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Burn scars especially in cervico-facial areas have exclusive problems according to functional and aesthetic problems of lids, mouth, limited neck movements and so on. Among surgical options for treatments, everyone can select serial excision, partial vs

full thickness grafts, tissue expansion, or available flaps as needed. Though, free tissue transfer reconstructions are valuable options in complicated cases, but experience of surgeon is important to reach high success rate. So, regional flaps are important to help in challenges [2].

Each one has its own advantages and disadvantages, and seems flaps are more acceptable solution considering all aspects. Supraclavicular fascio-cutaneous flap can be used as a suitable coverage in defects [1]. Expansion of skin by tissue expanders, not only helps to cover big skin defects of cervico- facial area, but also, improves quality of transferred tissue by produced capsule and atrophied subdermal fats to match better. Supra- clavicle flap is an axial one based on supraclavicular vessels – branches of transvers cervical artery and vein, exactly in a defined triangle surrounded by external jugular vein, posterior border of sternocleidomastoid muscle, and clavicle itself. It is safe to harvest flap in sizes about 4-12cm widths and 20-25 cm length [9].

One of disadvantages in this flap is its limited length, and usually flap necrosis would be seen in distal ends if more than 22 cm length was harvested. On the other hands, smoking can cause in sufficient vascularity of flap. And so, donor site visibility in supra- clavicular area is unpleasant.

We considered this limitations and decided to overcome by choosing a wide broad lengthy flap on posterior side of supraclavicle and insertion of a tissue expander under flap and used it to reconstruct cervico-facial scar, and eventually evaluated outcomes in contrast to traditional procedures.

Methods and Materials

Between December of 2011 and October of 2019, a total of 11 patients underwent facial skin defect reconstruction by our senior author. The patient records were reviewed retrospectively, and properties of flaps were analyzed. All the patients had facial scars or lesions need to be reconstructed as skin defect coverage, and all patients deemed fit for supraclavicular flap reconstruction were considered for this technique, and there is no algorithm or patient selection process before contemplating this technique.

They signed informed consents and all data related to their procedures and immediate (within 30 days after surgery) and delayed problems and complications (within 6 months after surgery) extracted from available records and photos taken in peri-operative time. Patients had been consulted for their optional managements and due to distant and extended defects, expanded posterior deltoid flap was selected.

Treatment protocol

In the first surgery, a rectangular tissue expander in a properly matched size was inserted in the subcutaneous pocket of posterior margin of ipsilateral supraclavicular area. When desired size of flap was achieved following serial inflations, patient scheduled for secondary surgery to remove expander and insert flap in the resulted defect (Figure 1).



Figure 1: Left. Right side longitudinal burn scar and inflated TE in posterior supraclavicular area. Right. Postoperative photo after healed primary distal partial ischemia.

All demographic characteristics of patients and their primary and secondary surgeries , especially about complications of procedures were gathered and recorded. All statistical analyses were performed using the last available SPSS Version 23.

Results

During 8 years, 11 patients who completed the questionnaires, entered the study. The average age of patients was 22.73. 6 patients were males (54.5%). Burn scar was the most common cause of admission (81.8%). Only 1 patient was smoker who did not had surgery complication, fortunately. More details are illustrated in table 1.

The mean size of involved area was (201.579 +/- 24.73) cm² according to the altered texture of skin. Among the selected tis-

		Frequency	Percent
AGE		22.73	13.085
BMI		26.18	3.710
Gender	F	5	45.5
	M	6	54.5
Pathology	Burn	9	81.8
	Trauma	1	9.1
	Congenital facial nevus	1	9.1
Smoking former	No	10	90.9
	Yes	1	9.1
Smoking current	No	10	90.9
	Yes	1	9.1
	Total	11	100

Table 1: Demographic characteristics of patients.

sue expanders, primary mean area surface of tissue was (1063.48 +/-917.65)mm² which were inserted to be inflated. This inflation took about 3.27 months and approximately 1490.91ml was infiltrated to reach the expected size (215.92 +/-8.40) cm².

All patients assessed 30 days and 6 months after surgery according to donor and recipient site early and delayed complications which illustrated in tables 2 and 3, respectively. The most significant donor site morbidity was mild hypertrophic scar which did not need operation and only one recipient site with wound dehiscence required secondary surgery.

		Frequency	Percent	
Early	Infection	No	11	100
	Seroma	No	11	100
		Yes	1	9.1
	hematoma	No	10	90.9
		Yes	1	9.1
Wound dehiscence	No	11	100	
Delayed	Wound dehiscence	No	11	100
	Delayed Hypertrophic scar	No	5	45.5
		Yes	6	54.5
Delayed Needs to secondary surgery	No	11	100	

Table 2: Donor site early (within 30 days) and delayed (within 6 months) complications.

		Frequency	Percent	
Delayed	Hypertrophic scar	No	11	100
	Needs secondary surgery	No	8	72.7
		Yes	3	27.3
Wound dehiscence	No	10	100	
Early	Hematoma	No	10	90.9
		Yes	1	9.1
	Infection	No	8	72.7
		Yes	3	27.3
	Seroma	No	11	100
	Venous congestion	No	3	27.3
		Yes	8	72.7
	Wound dehiscence	No	10	90.9
		Yes	1	9.1
Total		11	100	

Table 3: Recipient site early (within 30 days) and delayed (within 6 months) complications.

Discussion

Head and neck as areas that are exposed to various factors (trauma, sun radiations, burn injuries, i.e.), usually took considerations of medical care givers. Plastic surgeons usually seek tissues most texture and color match of face and neck to cover skin defects. Regionally, reconstructive choices of the head and neck are anterior and posterior thorax, shoulder and supraclavicular region, and among them skin of the supraclavicular region suits the texture and color and hence considered as an ideal donor site [5]. More over this flap can be a salvage procedure as done by Till, *et al.* (2011) in a pharyngeal perforation [3].

Logmani, *et al.* (2013) presented 32 reconstructive surgeries of post burn scars treated by pedicled and island supraclavicular flaps and recommended this, because of high reliability and thinness. They suggested with expanded supraclavicular skin flap, we can increase its size and reach [6]. There is not variables about their tissue expansion and donor site or recipient site condition. We agree with this idea that tissue expansion can improve flap vasculature and quality of donor and recipient site after surgery and patients would be more satisfied. We showed it is applicable

to harvest longer flaps with less danger of distal ischemia. Though, Kokot., *et al.* (2013) were concerned about ischemia in flaps that length was greater than 22 cm and limited arc of rotation and inadequate vascularity in smokers and patients with multiple medical comorbidities [7]. However, we think our solution by posterior supraclavicular expanded flap can save more rotated flaps distally from ischemia and skin necrosis which assumes the weakness of this option.

Granzov, *et al.* (2013) found that the supraclavicular artery originates at 1 or multiple points from the transverse cervical artery surrounded by a consistent fascial cone of tissue, and they recommended to save this tissues to diminish risk of vasculature injury during flap harvesting and eventual necrosis [4]. That is a good idea and any try to have sufficient tissue in arterial origin of flap is rational, though can limit arc of rotation to some extent. However, Herr., *et al.* (2014) suggested transection of platysma muscle fibers to make needed tunnel into the neck in island supraclavicular flaps, while ensuring the safety of the underlying vascular pedicle [8].

So, supraclavicular flap as island or trans-positional, is a good idea in head and neck reconstructions. Far skin defects are challenging for surgeons in distal necrosis. Tissue expansion is helpful to reach distal sites and this is a rule, but according to our findings, it seems selecting posterior part of supraclavicular area can resulted in donor site and recipient site advantages and improved final reconstructions and we think following proper case selection, this choice is rational.

Conclusion

Expanded posterior supraclavicular flap can be safe and easily available selection in complicated head and neck soft tissue reconstructions. Less donor site morbidity and less secondary recipient site surgeries are reasonable logics.

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