Supraclavicular artery island flap reconstruction for post burn neck contractures

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Abstract:
Objective: To determine the outcome of supraclavicular artery island flap for post burn neck contracture.
Design: Prospective descriptive Study.
Setting and Duration: The study was carried out at plastic and reconstructive unit, Sindh government Hospital Korangi 5. Karachi, during the period of two and half years from July 2009 to December 2011.
Methodology: 20 patients with post burn neck contracture were included in the study. Supraclavicular artery island flap was raised after localization of Supraclavicular artery on Doppler. Exclusion criteria was contractures and scarring involving upper chest and Supraclavicular fossa.
Results: Patient were operated at Sindh Govt. Hospital Korangi 5. Nine male and eleven females patients age ranging from 16 to 36 years were operated. In all 20 patients flaps survived completely and donor site healed by primary intension. Patients were followed for 6 months post operatively.
Conclusion: Supraclavicular artery island flap is an ideal flap in post burn contracture. It is safe, easy to raise and has high rate of success in terms of survival and cosmetic results

Keywords: Post burn neck contracture. Supraclavicular artery flap. Island flap

Introduction:
Post-burn neck contracture is a major complication that still represents a major challenge for plastic surgeons. It causes cosmetic, functional, and social problems. The skin quality and the multidirectional movement of the neck necessitate special considerations in its reconstruction.

Many methods have been advocated to reconstruct neck contractures, including Z-plasties, split-thickness skin grafts, full-thickness skin grafts, local or pedicled skin flaps with or without tissue expansion, pedicled or free musculocutaneous flaps, and free cutaneous flaps.1

In the growing child, scar contractures in the cervical region impair mandible growth, and early operative correction is generally recommended. Acute deep burns in the neck are best managed with split-thickness skin graft and extension splinting for a period of six months. Many surgical procedures have been used to correct these contractures, including free skin grafts, local flaps with or without tissue expansion, and free flaps. To achieve good functional and cosmetic results the operative procedure should fulfill the cosmetic and functional criteria of the neck. This paper describes the supraclavicular island flap described by Pallua et al used for resurfacing the neck region in single stage or after delaying the flap in a few cases.

History and surgical anatomy:
In 1903, Toldt, an anatomist, first illustrated and named the vessel arteria cervicalis superficialis. It originates from the thyrocervical trunk exiting between the trapezius and sternocleidomastoid muscles. In 1949, the first clinical application of
a flap from the shoulder ("charretera" or acromial flap) was performed by Kazanjian and Converse. Charretera, in Spanish, means the shoulder area where honors are bestowed on military personnel. In 1979, the first anatomical studies were performed by Mathes and Vasconez, who described the vascular territory and clinical applications of head and neck reconstruction. The flap was renamed the cervicohumeral flap. In 1983, Lamberty and Cormack named a vessel cephalic to the clavicular insertion of the trapezius muscle the supraclavicular artery. Since it has been used, the flap has been controversial because of the reported incidence of distal flap necrosis. In the Beginning of 1990s, Pallua et al. "rediscovered" this flap and popularized its use by performing detailed anatomical studies examining the vascularity of what is known today as the supraclavicular island flap. DiBenedetto et al. further demonstrated its utility in reconstructing a variety of chest and facial defects. The supraclavicular artery is a branch of the transverse cervical artery. Less frequently, the supraclavicular artery may arise from the suprascapular artery, which may be smaller. In an elegant anatomical dissection study (n = 55), the supraclavicular artery mean diameter varied from 1.1 to 1.5 mm, its pedicle length ranged from 1 to 7 cm, and it was present 80 percent of the time. Two thirds of the vessels were found not to have crossed the clavicle. The venous drainage is usually via the accompanying transverse cervical vein. Initially described for skin resurfacing after burn/trauma scar contracture release, this thin, axial, fasciocutaneous flap can be harvested easily and quickly. Others have now successfully demonstrated its use in difficult facial/neck burn cases.

Patients and methods:
Between July 2009 and December 2011 twenty patients with post-burn neck contractures were operated upon using supraclavicular artery island flap for resurfacing the neck after release and excision of post-burn neck contractures.

When patients presented with post-burn neck contracture and we decided to perform a supraclavicular artery island flap, the exact site of the supraclavicular artery was identified by means of a Doppler. The outlines of the flap were then drawn where the anterior border arrives anterior to the clavicle; the lateral part can be extended towards the deltoid muscle and the posterior border parallels the anterior border. The dimensions may reach up to 14 cm in width and up to 35 cm length.

The patient was then operated upon, and the contracted bands and disfiguring scars were removed, up to the borders of the aesthetic unit, until the neck was fully raised on its vascular pedicle, permitting a 180 degree angle of rotation. Haemostasis was done; flap was raised carefully protecting the axially running supraclavicular vessels reaching the medial part of the flap. Care was being taken to avoid injury to the accessory nerve and the pedicle, which mostly arise from the superficial transverse cervical artery. Flap elevated and rotated 180 degree in order to cover defect.

The flap was placed in position, wrapped around the neck, and fixed by means of prolene 4/0 sutures. Suction drainage underneath the flap was used and removed two to three days later. A light dressing and a soft neck collar were applied.

The donor site was closed primarily in two layers without any need for dissection in cases where a small flap was used and skin graft was used to close the donor site in some cases.

Results:
Between July 2009 and December 2011 twenty patients with post-burn neck contracture were operated upon in Plastic and Reconstructive Unit Civil Hospital Karachi, Sindh Government Hospital Korangi. Nine patients were female and eleven male. The age range was from 16 to 36 years. The degree of contracture was severe in 12 patients, while 08 presented neck scarring and hypo pigmentation with a mild degree of neck contracture.

All the donor sites healed by primary intention, and all the flaps survived completely, with just one presenting distal congestion at the end of
the operation, when superficial sloughing of the part occurred with some effect on the cosmetic outcome. One patient complained of minor scar contracture at the proximal end of the flap, and this was corrected by Z-plasty under local anesthesia. Another minor complication was haematoma under the flap in a patient in whom the drainage system was obstructed by blood; in this case evacuation of the haematoma was performed under general anesthesia and a wide-pore drainage system was used, after which the flap survived without further problems. Dehiscence of the sutures occurred in one patient, the follow-up of our patients continued for 06 months. The functional, cosmetic, and colour match has proved very good and the patients are happy and completely satisfied.

Discussion:
Post burn contracture involving the anterior cervical neck presents a unique set of problems compared with the rest of the body. The challenge lies in the restoration of the form and function of this body region. The skin of the neck is thin and pliable and because of the neck’s flexibility it is prone to the formation of contractures, which not only affect the movement of the neck but can also affect the function of the lower face.

The application of tissue expansion to a flap is a further refinement of two well-known flaps, a method stumbled upon by Tansini late last century and rediscovered by Olivari.13,14 In post-burn neck contracture and scarring, the timing of reconstructive procedures should be as early as possible in order to avoid difficult intubation manoeuvres due to tracheal distortion.15,16

Local flaps have the advantage of colour and texture match with the injury site, with respect to the cervicohumoral shoulder region.17 According to Lamberty and Cormack such flaps can be divided into three categories. Cervicolemmoral flaps may thus be defined as follows:

Random pattern cutaneous flaps, as described by Mutter more than 150 years ago and in recent times by Zovickian.18 In more recent papers Aranmolate and Attah advocated this kind of flap as a bilobed flap for the release of post-burn neck contracture.19 Three musculocutaneous flaps based on the trapezius muscle.20 These are the upper flap, based on the occipital artery, the lower flap, based on the deep branch of the transverse cervical artery and the lateral flap, based on the superficial branch of the transverse cervical artery.21

Fasciocutaneous flaps based on the supraclavicular artery, as performed in our patients. The clinical application of this flap was performed by Kirschbaurn, who referred to the description of the Charretera flap by Kazarijian and Converse in 1949. The major disadvantages are dog-ears, bulky appearance, cervical sagging, and subsequent secondary operative procedures.22,23

Pallua et al. avoided these disadvantages by raising the flap as an island flap rotated up to 180 degree in order to cover the defect, and the donor site was closed primarily after extensive dissection.24,25 Zaki presented his experience in the management of post-burn neck contracture using the supraclavicular island flap. He used the bilateral flap in patients with extensive neck scarring and gave the flap a new name (Epaulet flap).26

Tissue expansion has recently been introduced as an additional reconstructive procedure. Karacaoğlan and Uysal used expanded fasciocutaneous supraclavicular and shoulder flaps for the reconstruction of post-burn neck contractures as axial pattern transposition flaps.27,28

In our study we supplemented the technique of
Pallua et al. with a tissue expander in three cases that offered a number of advantages - first of all, the insertion of the expander underneath the flap made it possible to have a longer and wider flap (delay procedure), which is especially helpful when the other shoulder is scarred, and, secondly, the donor site was closed very easily, without extensive dissection, so that the incidence of dehiscence and ugly scarring was low.30

Conclusion:
The supraclavicular island flap is a very useful flap for neck reconstruction as it is safe and easy to elevate and offers greater mobility and rotation owing to the isolation of the vascular pedicle30.

It also provides a good colour match. The modification that we added to the application of the tissue expander appears to be useful as it produces a large thin flap that can be used to fill considerable defects, yet still allowing the donor site to be closed directly.

References: