

THE USE OF PEDICLED SUPRACLAVICULAR ARTERY FLAP IN RECONSTRUCTION OF SOFT TISSUE DEFECTS OF THE HEAD AND NECK REGION

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ABSTRACT

Objective: To determine the performance of supraclavicular artery flap in head and neck reconstruction.

Materials and Methods: This quasi experimental study was conducted at the Plastic and Reconstructive Surgery Unit, Hayatabad Medical Complex, Peshawar and the Plastic Surgery and Burn Unit, Khyber Teaching Hospital, Peshawar from June 2008 to December 2012. A total of 120 patients underwent reconstruction of head & neck region. Supraclavicular artery flap was performed in all the patients who had soft tissue defects of the head & neck region resulting from trauma, tumour excision, post burn scarring or radio-necrosis. Excluded from the study were patients with penetrating trauma to the root of neck or requiring neck dissection. The flap was designed after Doppler identification of the supraclavicular vessels. The flap then dissected, elevated and set into the defect as an interpolation flap. After 3 weeks time flap division was performed in the second stage and the patients were subsequently followed up.

Result: All the flaps survived completely. The average flap elevation time was 45 minutes. The hospital stay ranged from 2-4 days for the initial stage of surgery and flap division was performed as a day care surgery in all patients, under local anesthesia. Complications observed were wound dehiscence at recipient site in one patient and in seven patients at the donor site. Delay in donor site healing occurred in 06 patients. Fifteen patients had widening of the scar at the donor site while there was a complete graft loss at the donor site in one patient.

Conclusion: Supraclavicular artery flap is a very reliable flap for soft tissue coverage of the head and neck defects.

Key Words: Supraclavicular artery flap, soft tissue defects, interpolation flap

INTRODUCTION

Soft tissue reconstruction of the cervicofacial region is a challenging task because of its high visibility and aesthetic concern^{1,2}. Soft tissue defects of the head and neck region result from trauma, tumor excision surgery and release of post burn neck contractures necessitating coverage with appropriate tissue^{2,3}. Radiation therapy to the cervicofacial region is another known cause of producing such defects^{3,4}.

Skin grafts or local flaps are not helpful in the reconstruction of bigger or complex defects. In addition the skin grafts do not take well and local flaps are at risk in radiation affected tissues because the ionizing radiations have both acute and chronic effects on the soft tissues and bones^{2,4}. In such conditions distant or microvascular free flaps are the best options, however the procedure are time consuming and require expertise.

Reconstruction of such deformities poses a great challenge to plastic surgeons. Many studies have been done to develop different flaps for head and neck reconstruction. The pectoralis major myocutaneous flap has been widely utilized in head and neck reconstruc-

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tion and has been acknowledged as the workhorse of pedicled flaps in head and neck reconstruction⁵. Several series of pectoralis major myocutaneous pedicled flap procedures have been reported in the literature. Even with the world wide use of free flaps, the flap is still considered the mainstay head and neck reconstruction procedure in many centers. However, the flap is usually associated with a high incidence of complications like flap necrosis, suture line dehiscence, fistula formation, infection and hematoma formation⁶. Due to its greater bulk the final aesthetic results are not comparable to the reconstruction with faciocutaneous flaps⁷.

The supraclavicular region was recognized as the most appropriate donor site for resurfacing the defect⁸⁻¹². The supraclavicular artery flap has recently gained popularity as an ideal flap for head and neck reconstruction. This axial pattern flap closely matches the color, thinness and pliability of the head and neck region. Moreover, in this region, the skin is hairless and it offers a better quality outcome when compared to the free tissue transfer from arm, thigh or abdomen. Harvesting the supraclavicular artery flap is time efficient and straightforward due to its location near to the neck and face. The use of pedicled supraclavicular artery flap permits easy identification and preservation of the supraclavicular nerves also. The visualization of this axial flap depends on supraclavicular artery, a branch of superficial transverse cervical artery that emerges from the superficial transverse cervical artery 3-4 cm of its origin. This artery appears constantly in the triangle created by the dorsal border of the sternocleidomastoid muscle, the external jugular vein and the medial half of the clavicle. The artery can be located midway between the medial end of clavicle anteriorly and the anterior border of trapezius posteriorly¹²⁻¹⁵.

MATERIALS & METHODS

This quasi experimental study was conducted over a period of 4 ½ years from June 2008 to December 2012 at the Plastic & Reconstructive Surgery Unit, Hayatabad Medial Complex and the Plastic & Reconstructive surgery Unit, Khyber Teaching Hospital, Peshawar. A total of 120 adult patients were included in the study. All these patients had soft tissue defects of the head and neck region. The soft tissue defects

resulted from trauma, tumor excision, post burn scarring or radio-necrosis. Interpolated pedicled supraclavicular artery flap was used to cover these defects. Patients with penetrating trauma to the neck and those who required neck dissection for tumor clearance were excluded due to possibility of damage to the transverse cervical artery or supraclavicular artery.

The patients, planned for reconstruction with supraclavicular artery flap, were admitted to the hospital. Detailed history, complete examination and necessary investigations were performed. All the patients were counseled pre-operatively regarding flap coverage, two stages of the procedure, visibility and occasional stretching of the scar. Informed consent was taken from all the patients. Identification of supraclavicular vessels carried out with the help of hand held Doppler during pre-operative preparation of the patient in the ward.

Flap Design and Dissection

The flap was designed in a rectangular shape with the anterior and posterior borders running from the base of the neck towards deltoid muscle insertion. The distal end of the flap was kept wider than the proximal one. The dimension of the defect was determined and the flap markings were confirmed by reverse planning using a template. The size of the flap varied according to the size of the defect. The width of the flap ranged from 7cm to 12 cm.

The skin incision was deepened down to the deep fascia and elevation proceeded from lateral to medial. Branches of the posterior circumflex humeral artery anastomosing with terminal branches of superficial transverse cervical artery and small perforating vessels from the deltoid were sacrificed. The superficial transverse cervical artery could be identified in the medial half of the flap by transillumination and was carefully preserved as the dissection continued medially towards the origin of the vessel usually from the superficial transverse cervical artery under posterior belly of omohyoid.

As the dissection reached the marked medial end of the flap it was rotated through 90°-180° and brought over the defect as a tubed flap and secured in two layers, a deeper absorbable polyglycolic acid (vicryl) suture and a superficial nonabsorbable polypropylene suture.

The procedures were performed in two stages. The first stage was performed under general anesthesia. Here after creation of the defects, the flaps dimensions were measured and marked on the donor site accordingly. Flaps were elevated, interpolated and inset to the defect. The second stage of flap division was carried out as day care surgery under local anesthesia after three weeks. SPSS version 17 was used for the analysis of the data.

RESULTS

One hundred and twenty patients were recruited in the study. Out of these 76 (63.33%) were males, and 44 (36.67%) were females. The age ranged from 16 years to 72 years with mean age of 44 years. The etiology of soft tissue defects was tumor excision, trauma, post-burn neck contracture release and osteoradionecrosis. The Details of etiology of soft tissue defects are given in table 1.

The average time for flap elevation and inset was 30 minutes. In oncologic defects it took one hour in performing tumor resection and reconstruction with the flap. The time spent in trauma cases was 45 minutes, for refreshing the defect margins and coverage with the flap. An equal average time was utilized in resurfacing the neck defects after the contracture release.

A maximum of 28 cm long and 12 cm wide flaps were harvested. All the flaps survived completely and no partial or marginal flap necrosis in any of the patients was observed. Similarly no conspicuous contracture of the flap was observed. Donor site defects up to 10 cm were closed primarily in 86 (71.6%) patients, whereas defects of greater than 10 cm width were covered with split thickness skin grafts in 34 (28.4%) patients. The second stage procedure of flap division was performed as day care surgery under local anesthesia. The average operating time of flap division and readjustment was 20 minutes.

Certain manageable complications occurred in 30 patients. Among these 50% had widening of the scar as a result of primary closure followed by donor site wound dehiscence in 23.34% and delayed wound healing in 20% cases in descending order of frequency. The details of complications are given in table 2.

Our patients were satisfied with their appearance. The contouring of the head and neck defects were performed with the like tissue. The supraclav-

icular flap provided a good texture and color. All the patients, especially the female patients were happy with the hidden donor site scar.

Table: 1

Etiological factor	n	%
Tumor	54	45
Trauma	38	31.67
Burn	25	20.83
Osteoradionecrosis	03	2.5
Total	120	100

Table: 2

Complication	n	%
Scar widening	15	50
Donor site wound dehiscence	07	23.34
Recipient site wound dehiscence	01	3.33
Delayed wound healing	06	20
Total graft loss	01	3.33
Total	30	100



(a) Pre-operative



(b) defect after tumor resection



(c) post-operative after 02 days



(d) Post-op result after 3 months

DISCUSSION

Reconstruction of the soft tissue defects in head and neck region pose one of the great challenges to plastic surgeons^{9,11}. Optimal aesthetic and functional outcomes are desired due to the visibility and social importance of this area^{1,9}. A variety of procedures have been adopted for cervicofacial reconstruction including skin grafts, local flaps, regional flaps, distant and microvascular free flaps^{2,11,16-18}. In order to achieve a good aesthetic and functional outcome the texture, color and thickness of the skin used in the procedure are essential^{19,20}. At the local level, the donor areas for reconstruction of the head and neck are anterior and posterior thorax, shoulder and supraclavicular region^{1,9}.

The reconstruction of the head and neck region needs to be performed with a thin pliable flap which possesses a good texture and color match. The skin of the supraclavicular region suits the texture and color and hence considered as an ideal donor site^{21,22}. Moreover this area is in proximity and easily accessible with lesser donor site morbidity¹³.

The supraclavicular artery flap was first described by Lamberty in 1979^{2,13}. In 1997 Pallua¹⁴ made further studies and affirmed the supraclavicular artery flap as a reliable and useful flap for neck defects after the contracture release. Again in year 2000, Pallua¹⁵ advocated its use for oncologic head and neck reconstruction, praising its easy-to-conceal donor site. Di Benedetto¹⁷ used the flap on cutaneous and oral linings, considering it his preferred method for defects of craniofacial area. Rashid et al² in 2006 described the use of expandable supraclavicular artery flap for release of post burn neck contractures. Chiu²¹, in 2009 reported several oncologic defect reconstructions in patients with co morbidities, including obesity, diabetes and poor nutrition. Recently, You et al¹³ has illustrated the use of folded extensive supraclavicular artery flap for closure of oropharyngocutaneous fistulas.

In our study we used the supraclavicular artery flap for the reconstruction soft tissue defects resulting from trauma, tumor resection, osteoradionecrosis and neck contractures. An interpolation type supraclavicular artery flap was used for reconstruction. The average time of flap elevation and inset was 30 minutes. This is much shorter than the operating time for pedicled island flap and free tissue transfer. Rashid et al² reported two hours time for pedicled island flap. Since we performed interpolated flap, we were able to finish the whole surgery including tumor resection in less than an hour time and on average 45 minutes in trauma cases. Patient with advance tumor usually present with co morbid conditions and reducing surgical morbidity and operating time should be a major concern in their treatment^{3,12}. Alves et al³ have reported mean time of 50 minutes for flap harvest in their work.

All the flaps survived completely. We did not observe any distal necrosis in flaps upto 28 cm long and 12 cm wide. It is due to the fact that we did not skeletonize the pedicle completely and the entire fascia and skin were maintained around the pedicle¹⁷.

Although Vinh et al²³ proposed the use of a split thickness skin graft or local flap for closure of donor sites wider than 10 cm; other authors prefer primary closure whenever it is possible^{14,17,21}. Pallua^{14,15} closed even a 16 cm wide donor site primarily. Alves et al³ and Rashid et al² have closed donor areas upto 12cm wide. However they observed scar widening with pri-

mary closure^{2,3}. In our study we performed primary closure of the donor areas measuring 10 cm in width whereas more than 10 cm wide defects were covered with split thickness skin grafts. As a tension closure is associated with a high risk of complication and un-aesthetic scar, the surgeon should assess donor area tension to decide between primary closure and a skin graft^{3,23-25}.

CONCLUSION

Supraclavicular artery flap is very reliable for the soft tissue coverage of head and neck defects. The flap is pliable and possesses a good texture and color. Due to the gravity factor the flap is at least risk for venous congestion. The absence of the need to isolate the pedicle offers technical ease and requires a relatively short operating time. The flap donor site lies in the same operating field and can be closed primarily. This flap can be utilized in patients who have previously received radiotherapy to the head and neck. The lesser donor site morbidity and a well hidden scar have made it the preferred choice for head and neck reconstruction.

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