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Original Research Paper

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REVISITING SUPRACLAVICULAR ARTERY FLAP FOR HEAD AND NECK ONCOLOGIC RECONSTRUCTION.

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ABSTRACT **Background:** Head and neck oncologic resections defects are often difficult to reconstruct and are time consuming. An ideal flap should have qualities of both regional and free flap. Our aim in this study is to compare pros and cons of supraclavicular artery flap in comparison to other available flap. This report is a prospective study of cases that underwent supraclavicular artery flap of which, 5 are males and 3 are females. All cases were of carcinoma of Buccal mucosa. **Result:** 5 cases were completely successful with no complication. One patient had partial necrosis, one another patient had distal marginal necrosis with wound dehiscence and one patient had pus discharge with wound dehiscence and orocutaneous fistula. No significant donor site morbidity is seen. **Conclusion:** This flap has potential to become gold standard in reconstruction of head and neck defects.

KEYWORDS : Supraclavicular artery island flap, head and neck reconstruction, axial flap, regional flap.

Background

Head and neck oncologic resections leave complex defects of mucosal or skin surfaces which are often difficult to reconstruct and are time consuming. Many regional flaps are available for closure of oncologic defects since they are easy to harvest and are very reliable such as pectoralis major myocutaneous, trapezius, latissimus dorsi, or deltopectoral flaps, but they are not ideal. Regional flaps are often massive and lead to substantial donor site morbidity from both functional and aesthetic viewpoint. Therefore free tissue transfer has become the workhouse for head and oncologic defects. Bur free flaps require special microvascular expertise, adds operating time and increase costs to patients. In facial region we have to also consider about aesthetic units and provide an appropriately thin flap to restore both form and function. According to Gilles' concept, more adjacent the donor site is, the better the skin will match the recipient site **(1)**. An ideal would be one which has benefits of both regional flap (reliable and easy to harvest) and free flap (thin, pliable and good colour match).

Supraclavicular artery island flap is a local fasiocutaneous flap harvested from skin on shoulder and supraclavicular area. In 1842 Mutter **(2)** first described the use of medial based random shoulder flaps in head and neck reconstruction. In charretera flap, representing ornamental shoulder patch worn on a military uniform decribed by Kirschbaum in 1958 **(3).** Mathes and Vasconez **(4)** described in charretera flap as cervicohumeral flap and popularized it. In 1979, Lamberty **(5)** described the supraclavicular artery flap, an axial flap taken from the shoulder and supraclavicular area. It was him who described supraclavicular artery as a distinct branch of transverse cervical artery mostly, and of suprascapular artery in some cases. Pallua et al **(6)** in late 90s and early 2000 describe supraclavicular artery island flap for cervicomental scar contractures and gives a detailed description of anatomic distribution of blood supply of flap. In their study, the supraclavicular artery branched off the transverse cervical artery in all cases. The venous drainage came from paired venae comitantes that jointed the transverse cervical vein or the external jugular vein. The surface landmark of the supraclavicular artery was located in the triangle created by the external jugular vein, the posterior border of the sternocleidomastoid muscle, and the clavicle. They verified effective flap harvest ranging from 4 to12 cm in width and 20 to 30 cm in length and found flap to be safe and dependable. Chiu et al **(8)** in 2009 reported their experience with this flap for reconstruction of oncologic defects of head and neck. Many other centres have also reported beneficial effect of using this flap. Taking this as an example we began using the supraclavicular artery flap in selected cases that would benefit from the benefits of free radial forearm flap but in which the ease of harvesting a regional flap is desired. The objectives of our study were to describe our experience using supraclavicular artery flap in reconstruction of head and neck defects after head and neck oncologic surgery and to evaluate its pros and cons in using for reconstruction in comparison to other available flap.

METHODS

This is a prospective study of cases that underwent supraclavicular artery flap between 2017 to 2021 at Head and Neck department of SRJ CBCC hospital, Indore, after taking fully informed consent. Of which, 5 are males and 3 are females. All cases were of carcinoma of Buccal mucosa. The skin island was designed to fit the resultant defect. All donor sites were closed primarily after undermining. The flap design was as follows: the outline of the flap was centred over the deltoid-acromial prominence with the size of the defect being designed lateral to the anterior border of the Trapezius muscle; the pedicle length which decided arc of transposition is calculated from this point.

Technique of flap harvest:

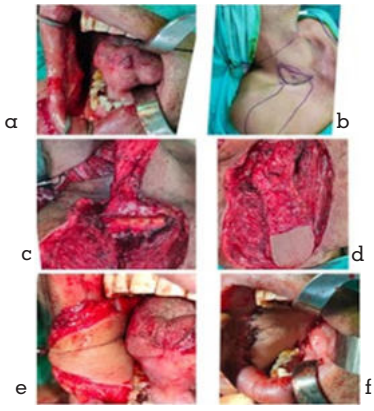

Figure: Technique of flap harvest; a: defect, b: surface marking of supraclavicular artery, c:raising of flap, d:de-epithelisation of flap, e: in-seting of graft, g: after insetting of graft

Duplex ultrasound can be done before the operation to recognize the supraclavicular artery and confirm the reliability of pedicle. The supraclavicular vessels are located in a triangle described above. It is important to ascertain absence of metastasis at level 4 and lower level 5 in preoperative evaluation. The flap is harvested in a zone defined by the edge of the trapezius muscle anteriorly and a parallel line as far as the deltoid muscle anteriorly. The size of the paddle can range from 4 to 12 cm wide and 20 to 30 cm long **(6).** Flap outline is marked posteriorly 2 cm anterior to spine of scapula, anteriorly a line parallel to posterior line in front of clavicle, while lateral margin can be extended 2 cms lateral to deltopectoral groove. Skin, subcutaneous tissue and fascia are incised over the deltoid muscle. Dissection is continued in the subfascial plane over the deltoid and the flap is harvested from distal to proximal. Perforating vessels of the deltoid muscle are sacrificed during harvesting of the paddle and dissection is easily continued as far as the supraclavicular fossa. The pedicle is identified in the middle third of the flap. The skin and subcutaneous tissue are carefully incised to preserve the pedicle according to the required dimensions of the paddle. Depending on the defect to be covered and the required arc of rotation, the vascular pedicle can be cautiously dissected as far as its origin. Section of the transverse cervical artery after its division into a supraclavicular cutaneous branch releases the pedicle and increases the arc of rotation of the flap. The flap is tunnelled under the skin of the neck to reach the defect to be repaired, by avoiding torsion of the pedicle. The donor site is usually self-closed and sutured over a suction drain. Harvesting of a very large flap (>22 cm) may require skin graft to the donor site. The long-term look of the scar is usually acceptable.

RESULTS:

8 cases underwent supraclavicular artery flap between 2017 to 2021 of which 5 were males and 2 were females. Mean age group was 45 to 50 years. Mean size of defect was 4*5 cms. De-epithelisation of pedicle was undertaken in all cases. Mean harvesting time range from 45 to 75 minutes. And insetting took from 20 to 30 minutes. All donor sites were closed primarily by undermining. Mean hospital stay for patients was from 5 to 7 days.

Table 1: Demographics of patients

Number of patients	Sex	DEFECT	Mean age	Mean size of defect
8	5 male 3 female	All were Ca buccal mucosa resection defects	45-50 years	4*5 cms

Table 2: Complications and management of complications

Complication	Management of complications
5 were completely successful	none
1 had partial necrosis	Conservative
Distal marginal necrosis with wound dehiscence	Freshening of margins and resuturing
Pus discharge with wound dehiscence and orocutaneous fistula	Managed with antibiotics, compression bandaging and nil by mouth and secondary suturing (feeding continues with ryles tube for total of 3 weeks)

5 cases were completely successful with no complication. One patient had partial necrosis which was managed conservatively. One another patient had distal marginal necrosis with wound dehiscence for which freshening of margins were done and secondary suturing was done. One patient had pus discharge with wound dehiscence and orocutaneous fistula, which was managed with antibiotics, compression bandaging, secondary suturing. No significant donor site morbidity is seen.

Table 3: Follow up assessment of patients after 21 days

Assessment parameters	Assessment results	MSc.
Mouth opening	Decreased in one	
Eating habits	Normal	
Burning sensation	None	
Hairs	None	
Cosmetics	Acceptable	1 male patient had subjective apprehension

On follow up assessment of patients after 21 days, mouth opening was reduced in one patient for whom mouth opening exercises were advised. Eating habits were normal in all patients. No burning sensation was reported. No patient developed hair follicle on site of graft. And aesthetic functionality were acceptable, only 1 male patient had subjective apprehension for which he was counselled.

DISCUSSION:

After head and neck oncologic resection reconstruction of defect is complex and requires the use of local, regional or free flaps to make certain of anatomical, practical and aesthetic rehabilitation. Flap must be selected carefully in order to preserve donor site as well as recipient site function. In head and neck surgery an ideal flap is thin, pliable and of same colour and texture to those of recipient site. In accordance with Gilles' concept local flap would be ideally adapted, but very large regional flaps are difficult for in-setting into defects and leaves with high donor site morbidity. Free flaps provide thin, malleable well vascularised tissue to cover large defects. But require microsurgical expertise and add cost to patient and also not all patients are eligible for long surgery. In head and neck cancer patients for reconstruction who have endured previous neck dissections or radiotherapy, or both, the rarity of good caliber and quality vessels for microvascular anastomosis presents a real challenge for the microvascular surgeon.

Supraclavicular artery flap can be used to reconstruct a variety of head and neck defects, allows for bypassing some of the challenges we face in vessel depleted necks. Supraclavicular artery island flap is in very much in accordance with Gilles' concept and has very similar texture and colour to that of face and neck. Supraclavicular artery flap is an axial flap based on artery branching from thyrocervical trunk or transverse cervical artery. It has advantages of both regional and free flap. It provides better colour match, thinness, pliability, hair free skin and a better cosmetic outcome. It is a time efficient flap and relatively easier to harvest as compare to free flap. In addition since it is a pedicled flap it allows easy identification and preservation of the supraclavicular nerves, so it is a neurovascular flap **(8)**, can be used in reconstruction of neopharynx. The supraclavicular artery flap can be used in variety of head and neck oncologic defects reconstruction. Epps et al **(9)** used in reconstructing defects made after partoidectomy, Chiu et al **(8)** used for reconstructing oropharyngeal defects. While Chen et al **(10)** used to reconstruct defects in head and neck after resection.

Donor site morbidity of supraclavicular artery flap is minimal in comparison to other flaps. In pectoral major flap donor site morbidity includes loss of anterior axillary fold, distortion of breast form in females and monor functional deficits due to muscle loss. Free flap donor site includes need of skin graft to close defect, tendon injuries, reduced strength of grip power and sensory disturbances.

CONCLUSION:

Supraclavicular artery island flap can be used in variety of head and neck oncologic defects reconstruction. Advantages includes less time to harvest, advantages of pedicled flap, hairless flap, have comparatively constant anatomy, pliable, can raise up to 20*8 cm graft, feasible alternative to commonly used free flap like radial forearm free flap or regional flap like pectoral major flap, leaves less donor site morbidity, has less learning curve. Some of the disadvantages of flap include cannot be done if level 4 and 5 lymphnode is present. Supraclavicular flap has great potential for becoming the gold standard for reconstruction of soft tissue defects in head and neck.

Abbreviations:

PPMC- Pectoralis major myocutaneous flap

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