# Reconstruction of Maxillary Defect by Means of Bipedicled Forehead Flap: A Novel Surgical Technical Report

**Harshmohan Pathak[1], Sobhan Mishra[2], Jayant Kumar Dash[3], Sudipta Sahu[4], Kalyan Sundar Pal[4]**

*[1]Associate Professor, [2]Professor & Head, Department of Oral & Maxillofacial Surgery Institute of Dental Sciences, [3]Professor and Head, Department of Plastic & Reconstructive Surgery, Institute of Medical Sciences & Sum Hospital, [4]Post Graduate Trainee, Department of Plastic & Reconstructive Surgery, Institute of Medical Sciences & Sum Hospital, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India*

## Abstract

Forehead and temple region of act as tissue reservoir for harvesting flap for reconstruction of the orbital, periorbital and mid-face defect. Depending on requirement different kind of flap can be harvested from this region and for this sound knowledge of vascular anatomy of this region is required. Usually large free flaps are adapted to cover a large maxillectomy deformity. Here, in this case, a bi-pedicled forehead flap harvested based on frontal and parietal branch of the superficial temporal artery and was used for rehabilitation maxillectomy with external skin deformity.

***Keywords:*** *Forehead flap, Bipedicled, Maxillectomy.*

## Introduction

The Indian physician Sushruta was the first to described skin flaps reconstruct amputated noses as a result of punishment in his book 'Sushruta Samitha' which written in 500 BC[1]. "Szymanowski, Burow, Esser, Lexer, Joseph, and Davis" were the surgeons who introduced the concept of the flap in the Western world in the 19th century.[2] In 1830s forehead flap was first performed by Warren in America. Kazanjian, refined the midline forehead flap and also describe major blood supply of flap via the "supratrochlear" and "supraorbital" arteries. He also described the method of closure of the donor site[3,4].

**Corresponding Author:**
**Harshmohan Pathak**
Associate Professor, Department of Oral & Maxillofacial SurgeryInstitute of Dental Sciences, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India
e-mail: harshpathak@soa.ac.in

Forehead and temple region of act as tissue reservoir for harvesting flap for reconstruction of the orbital, periorbital and mid-face defect. Depending on requirement different kind of flap can be harvested from this region and for this sound knowledge of vascular anatomy of this region is required. Usually large free flaps are adapted to cover a large maxillectomy deformity. Here, in this case, a bi-pedicled forehead flap harvested based on frontal and parietal branch of the superficial temporal artery and was used for rehabilitation maxillectomy with external skin deformity.

**Surgical Technical Note:** Bi-pedicled forehead flap used for reconstruction of the defect of the maxilla was done in a male patient with squamous cell carcinoma of maxilla operated in Institute of Dental Sciences, Bhubaneswar. The malar defect of size 10 cm periphery was apparent after the three-dimensional clearance done for extensive squamous cell carcinoma of the maxilla (Figure 1). The forehead flap was designed taking the superficial temporal artery (frontal branch) as the feeder vessels of the flap (Fig 2). Total length of used flap was 125% of the defect and was planned to rotate under the skin over the lateral brow region to cover surgical deformity. De-epithelialization on the region which was supposed to come under the skin of the lateral brow.

The prepared pedicled flap was comfortably reaching the defect without any compression and tension at the pedicled end.Now to give the cover to the maxillary defect we decided to turn the flap over itself to serve the purpose, de-epithelializing it again at the turning point or pivot (Fig 3). The secondary deformity over the forehead was covered by the STSG ("split-thickness skin graft") harvested from left thigh. The patient was provided with an obturator postoperatively and was recalled regularly there was no complications with the donor as well as the recipientsite (Fig 4).We recommend the use of bi pedicled forehead flap for the use of reconstruction of the cheek and malar process as a simple but innovative technique.

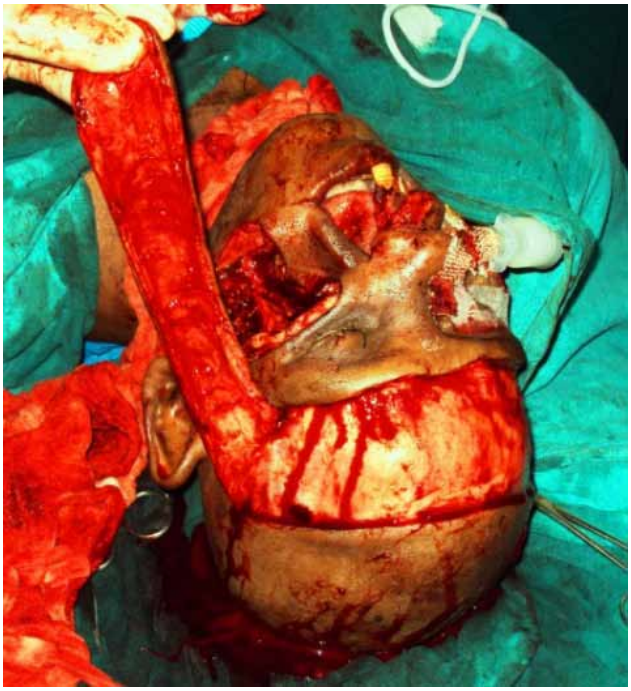

**Figure 1. Raising of Flap Post Maxillectomy**

**Figure 2: Rotation of Flap**

**Figure 3. Securing flap on defect according to the technique described**

**Figure 4. Three Month Postoperative View (without obturator)**

## Discussion

Flaps can be classified depending on the blood supply of it, depending on location and depending on the type of tissue involved.

Depending on blood supply type of the flaps are as below: (by Nihai and Mathes)

Type I: one vascular pedicle flap

Type II: flap with dominant and minor pedicle.

Type III: flap with two dominant pedicle.

Type IV: flap with segmental pedicle.

Type V: flap with one dominant pedicle and minor segmental pedicle.

Depending on location it can be local, regional or free flap. Again depending on tissue content it can be cutaneous, fasciocutaneous, musculocutaneous or composite type which contain bony component along with cutaneous, fascia and muscle.

The forehead flap is a regional axial flap containing skin and muscle. Forehead is supplied by superficial temporal artery, supra-trochlear and supra-orbital vessel. Forehead flaps used are often long concerning their breath because the distance to be travelled by the flap en-route to its destination is considerable and involves a jump over intact skin. If the flap incorporates the entire vertical width of the forehead, it is quite safe to carry it beyond the midline, even as far as the hairline of the opposite temple.

Forehead flap can be used to reconstruct various kinds nasal of defects of, defect of the upper eyelid, intraoral and extraoral mucosal and skin defect, defects created by maxillectomy. It can also be used for reconstruction of the floor of the mouth, a portion of the tongue and for covering the chin in reconstruction of mandibular defect.

**Depending on the site this flaps can be classified as below:**

1. "Median forehead flap based on primarily on Supratrochlear artery, supplemented by the dorsal nasal artery."
2. "Paramedian forehead flap based on primarily on Supratrochlear artery, supplemented by supraorbital artery."
3. "Laterally based forehead flap based on primarily on Superficial temporal artery, supplemented by the posterior auricular artery."

To harvest the lateral forehead flaps the boundaries of the flap outlined. The contour should follow the eyebrows (must not extend beyond the level of the lateral canthus to avoid injury to the facial nerve) to the anterior border of pinna at the level of the zygomatic arch and along forehead hairline more pleasing cosmetically. Bevelled incision is given along margin. This bevelled margin helps to minimize the deformity along the remaining edges of the forehead and scalp. In case of larger flap outline can be extended up to opposite side temporal hairline.

To transfer the flap from its origin a tunnel is created. Through this tunnel, the distal end of the flap id transferred to the site of the defect and used for reconstruction. Depending on the location of defect flap passed through the following route –

1. "Directly through the cheek (cheek portal)"
2. "Deep to the zygomatic arch"
3. "Posterior part of submandibular incision of neck dissection"

The secondary defect created due flap harvesting is covered by a skin graft.

Local flaps are not sufficient to close the skull base and mid-face defect because they have inadequate well-vascularized bulky tissue.

The pedicled temporoparietal fascia was used by Andrew et al for the closer of the maxillary defect but it appears to be inadequate for the closure of the defect and forehead appears to be a good option for the same.

H. Nakajima et al described the arterial anatomy of the forehead and the vascular supply of different forehead flaps. Arterial supply of the temporal region distributed in four tissue layers[5].

1. "Skin and superficial temporal fascia network"
2. "Loose areolar fascia/subgaleal network"
3. "Deep temporal fascia network"
4. "Temporal muscle network"

There is a good communication between this arterial network and depending on this vascular anatomy different type of individual or combined flaps have been outlined in this region,

Superficial temporal artery was the first used Dunham in 1893 for the pedicle flap for reconstruction of facial defects.[6]

The skin flap islands based on the frontal and parietal branches of the superficial temporal artery was demonstrated by Ozdemir et al for closer of different mid-face deformities.[7] Bi-lobed forehead flap was designed by Harun et al. It was based on the frontal branch of the superficial temporal artery. This was used to reconstruct the defects of upper and lower eyelids 2 and lateral canthus.[8] This flap involves the reconstruction of nose passed on through the centuries commonly known as the Indian method was popularized by two Indian surgeons

when they perform a reconstruction of the nose by using a median forehead flap. It was published in the Gentleman's Magazine of London.[9]

For closer of huge, full-thickness deformities of the midface and forehead acts as a great tissue reservoir.[10] The temporal branch of the superficial temporal artery and supratrochlear artery are the arteries depending on which the forehead flaps are harvested. The superomedial orbit crossed by them approximately 1.7 to 2.2 cm lateral to the midline, and in a paramedian position approximately 2 cm lateral to the midline.[11] For complex deformities of the nose, orbit, zygomatic region, and cheek region bi-pedicled forehead flap considered as a valuable resource.

**Conflict of Interests:** The authors declare they have no conflicts of interest.

**Ethical Issues:** Approved

**Funding:** None

## References

1. Thatte MR, Thatte RL. Venous flaps. PlastReconstr Surg. 1993; 91:747-751.
2. Bardach J. Local flaps and free skin grafts in head and neck reconstruction. St Louis, Mo: Mosby Year Book Inc; 1992.
3. Millard DR Jr. Total reconstructive rhinoplasty and a missing link. Plast Reconstr Surg. 1966; 37:167-183.
4. Kazanjian VH. The repair of nasal defects with the median forehead flap: primary closure of the forehead wound. Surg Gynecol Obstet. 1946; 83:37-42.
5. Nakajima H, Imanishi N, Minabe T. The arterial anatomy of the temporal region and the vascular basis of various flaps. Br J PlastSurg 1995; 48:439-50.
6. Dunham T. A method for obtaining a skin flap and a permanent buried vascular pedicle for covering defects of the face. Ann Surg 1893;17:677-9.
7. Ozdemir R, Sungur N, Sensöz O, Uysal AC, Ulusoy MG, Ortak T, et al. Reconstruction of facial defects with superficial temporal artery island flaps: A donor site with various alternatives. PlastReconstrSurg 2002;109:1528-35.
8. Cöloğlu H, Koçer U, Oruç M, Sahin B, Ozdemir R. Axial bilobed superficial Temporal artery Island Flap (Tulip Flap): Reconstruction of combined defects of the lateral Canthus Including the Lower and Upper Eyelids. PlastReconstrSurg 2007;119:2080-7
9. Zaoli G. La chirurgiaricostruttivaneicarcinomidel distrettocervico-facciale. In: Piccin, editor. Ilnaso. Padova: Piccin Editore; 1978. p.159-208.
10. Bickle K, Bennett RG. Combined hinge flap full-thickness skin graft for a through-and-through nasal defect. DermatolSurg 2008;34:389-92.
11. Potter JK, Ducic Y, Ellis E 3rd. Extended bilaminar forehead flap with cantilevered bone grafts for reconstruction of full-thickness nasal defects. J Oral MaxillofacSurg 2005;63:566-70.