Reconstruction of Maxillectomy Defect with Temporalis Myofascial Flap

Raghav Mehta, Bindu Bhardwaj, Vikas Singh, Ruchika Tiwari, Gaurang Thanvi, Prakhar Katta

ABSTRACT

The reconstruction part holds the equal importance to that of treatment part, as the restoration of normal functional and esthetics plays a major role to improve the prognosis of the treatment. Temporalis muscle flap is a thin and versatile flap which can be used for reconstruction of partial defects of the maxilla instead of using free tissue transfer flaps. Raising the flap has simple surgical procedure, but the dissection should be done carefully to prevent injury to the frontotemporal branch of facial nerve on its outer surface and to the main feeding vessels present on the inner part of the temporal muscle. Our case was completed without any major complication. No injuries occur to the branches of facial nerve. No loss of flap was experienced. Postoperative functional and esthetic results were uneventful and satisfying. The first-line reconstructive option for limited resection of the upper maxilla with sparing of the orbital floor and of the anterior alveolar crest is temporalis muscle flap.

Keywords: Maxilla reconstruction, Maxillectomy, Temporalis myofascial flap.

CASE REPORT

An 18-year-old young boy suffering from ameloblastoma 7 years back was treated by complete excision of lesion with left hemi-maxillectomy and came to the Department of Oral and Maxillofacial Surgery at Mahatma Gandhi Dental College and Hospital. Treated site showed no clinical signs and symptoms of recurrence of disease. Patient desired for a surgical intervention to get rid of the obturator he was using since long. The TM flap was the choice to reconstruct the oro-nasal defect of patient (Fig. 1) because of its reliability, good size, excellent blood supply, and ease of manipulation.

After complete health examination and on completion of preanesthetic certificate, patient was kept nil by mouth 6 hours prior to commencing the surgery. Then the patient was intubated under general anesthesia. The procedure began under aseptic environment, with Weber Ferguson incision on left side of face for exposure of the defect (Fig. 2) followed by hemicoronal incision (Fig. 3A) in order to receive the flap from temporal region. We started the incision from the preauricular area. The dissection was done, in a superior–inferior direction, which is on a superficial plane just below the temporoparietal fascia (which is the superior continuation of the superficial musculo-aponeurotic system, SMAS) (Fig. 3B). Temporal and frontal branches of seventh cranial nerve present in orbital zygomatic region are prone to injury while working in this part, so care must be taken to avoid such mishaps. The facial nerve branches are situated superficial to deep temporal fascia, so it is better to carry out dissection under the plane of the deep temporal fascia when reaching close to zygomatic arch. Near the zygomatic arch, a horizontal incision is made through the temporalis fat pad, and a subperiosteal dissection is done carefully above the zygoma (Fig. 4). In order to work easily with myofascial flap, the zygomatic arch was removed. Therefore, the osteotomies were done anterior and posterior to zygomatic arch after predrilling holes for placement of titanium plate. However, clinical experience shows that we need not replace to perform the zygomatic osteotomy. In order to free the flap completely, a subperiosteal dissection is made in...
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the temporalis fossa carefully, till infratemporal inlet. Attention is given to the vascular pedicle of the flap, running into the muscle’s medial surface. When the flap is elevated on a level below the zygoma within the infratemporal fossa, there was clear identification of paired deep temporalis arteries, anterior and posterior. The pterygoid vessel may start bleeding on dissection, which will demand accurate cautery. To preserve the blood supply to the flap, blind maneuvers must be avoided. A blunt dissection is done along the lateral surface of the temporalis muscle, so a tunnel appeared which connects the zygomatic region and the oral cavity. The strong sutures were used, fixed into the superior portion of the flap, and the flap itself is transposed and fixed into the oral cavity. Later five-hole titanium plate and screws were used to fix zygomatic arch (Fig. 5) followed by closure of hemi coronal flap and Weber–Ferguson incision (Fig. 6). One month follow-up of patient (Fig. 7) showed uneventful healing and fullness of face, intraoral and extraoral, respectively. Further improvement in functional and esthetics of face is seen after 6 months follow-up (Fig. 8).

DISCUSSION
Preoperative Assessment

There are few examinations required for preoperative planning of the TM and temporoparietal fascial (TPF) flaps. A preoperative vascular assessment can be performed with a clinical palpation of the superficial temporal artery. One should also inspect for previous surgery
around the scalp and auricular regions. If a functional TM flap is planned, the temporals function should be assessed by asking the patient to clench their teeth. A bulging of the muscle in the temporal fossa should be appreciated. Temporal wasting can be a warning sign of muscle denervation. Finally, zygomatic arch integrity also needs to be assessed because an osteotomy is commonly required to assist in flap rotation.

Figs 3A and B: Preauricular incision extending hemicoronally for TMF elevation at temporalis fossa for reconstruction. (B) TMF is elevated from temporalis fossa for reconstruction

Fig. 4: Temporalis muscle is rotated in oral cavity for reconstruction

Fig. 5: Osteotomy of zygomatic arch is fixed with five-hole titanium plate and screws

Figs 6A and B: (A) Closure of hemicoronal flap with active drainage. (B) Closure of Weber–Ferguson incision with reconstruction
Anatomy

The TM originating from superior temporal line was inserted in the coronoid process of the mandible. It is covered by a thick temporalis fascia that splits into superficial and deep layers of approximately 2 cm located superior to the zygomatic arch. These two layers are inserted into the medial and lateral aspects of the zygomatic arch and eventually form the parotideomasseteric fascia. The superficial temporal fat pad lies between the superficial and deep fascia (Fig. 9).

The deep temporal fat pad, with extension of the buccal fat pad, and the TM lie beneath the deep temporalis fascia. Separating the temporalis fascia from the overlying TPF or the muscle underneath is relatively straightforward. The TM flap has a Mathes and Nahai type III vascular pattern (two major blood supplies). The deep temporal artery (branch of internal maxillary artery) and vein enter the medial surface of the muscle below the zygomatic arch, and the middle temporal artery (a branch of superficial temporal artery) runs on the superficial surface of the muscle. The deep temporal artery dividing into anterior and posterior branches includes the anterior deep temporal artery (ADTA) supplying the anterior 20% of the muscles, whereas the posterior deep temporal artery provides blood supply to the middle 40% of the muscle. The remaining muscle in the posterior region (40%) is supplied by the middle temporal artery.3 The ADTA is located 2 cm anterior to the coronoid process and 2.4 cm inferior to the arch, whereas the PDTA is located 1.7 cm posterior to the coronoid process and 1.1 cm inferior to the arch.4 Although the middle temporal artery supplies a large part of the muscle, it is commonly sacrificed during harvesting, and there is little impact on the flap’s survival as a result. The function of the TM is to elevate and retract the mandible during mastication. The muscle is innervated by a branch of the trigeminal nerve, and this motor innervation must be preserved for facial reanimation surgery.

The TPF flap is a thin pliable tissue. The TPF represents the inferior extension of the galea after the temporal line and the superior extension of the subcutaneous SMAS above the zygomatic arch. Its blood supply is derived
Table 1: Indications for TMF

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<th>Indications</th>
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<tr>
<td>Reconstruction of oral defects</td>
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<td>Cranial base Reconstruction</td>
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<tr>
<td>Facial reanimation Surgery</td>
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<tr>
<td>Midface augmentation</td>
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<td>Obliteration of orbital defects</td>
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Table 2: Complications of TM flap

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<th>Complications</th>
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<tr>
<td>TM flap necrosis</td>
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<tr>
<td>Facial nerve injury</td>
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<tr>
<td>Hematoma/seroma formation</td>
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<tr>
<td>Temporal hollowing</td>
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<tr>
<td>Alopecia</td>
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<td>Restricted mouth opening</td>
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Data from Refs. 5, 7, 10, 19

from the superficial temporal artery in 88% of cases. The posterior auricular artery contributes 8% of supply to TPF flap, and the remaining 4% is supplied by the occipital artery.5 The superficial temporal artery can be identified above the zygomatic arch and located 2 cm anterior to the external auditory meatus.6

REVIEW OF LITERATURE

Indications/Contraindications

The TM flaps have multiple applications for reconstruction of head and neck. The TM flap provides dynamic muscular tissue, whereas the TPF flap provides thin and pliable tissue. Table 1 lists the common indications of TMF flaps.7-18 Few contraindications are associated with these flaps. Previous surgery or trauma to the scalp or temporozygomatic regions represents a contraindication for the use of these flaps. It is prudent to inform patients that there will be a significant, visible scar in bald patients or patients with receding hairlines. Alternative flaps should also be considered, secondary to a compromised vascular supply.

Composite Flap

The temporalis flap can incorporate the outer table of the calvarium 33 or the coronoid process6 when the defect requires osseous reconstruction. The quality of the bone provides excellent thickness for orbital floor, maxillary wall, and palatal bone reconstruction.

COMPLICATIONS

Donor-site morbidity is relatively minimal for TM flaps. This notwithstanding, some of the commonly reported complications include flap necrosis, temporal hollowing, facial nerve injury, restricted mouth opening, hematoma or seroma formation (Table 2), and complication of TM flap.5,7,10,19

Flap Necrosis

The TM flap is a reliable flap that realizes a failure rate of <2%.10 Flap failure may be caused by inadvertent trauma to the pedicle vessel during flap development, or severe tension created within the tunnel. If excessive tension is encountered during tunnel development, one may consider decreasing the size of the flap by incorporating the anterior one-third of the TM flap only or removing the zygomatic arch permanently.

Restricted Mouth Opening

Initial restriction in mouth opening is likely due to postoperative edema; however, permanent restriction may be associated with the defect location in the retromolar trigone, in the floor of mouth, and buccal mucosa. Clauser et al10 reported a 10% incidence rate of postoperative limited mouth opening. Although an improvement in mouth opening can be seen as the edema resolves, intense physiotherapy is recommended to restore mouth opening.

Temporal Hollowing

Temporal hollowing is a concern after TM flap rotation. Prevention of hollowing can be accomplished by mobilizing the posterior portion of the muscle anteriorly or using a high-density polyethylene implant (Medpor; Stryker, Kalamazoo, MI) to obliterate the donor-site defect.7 The posterior flap is secured at the anterior site with 3-0 Vicryl (Ethicon Inc., New Jersey, USA) sutures to the adjacent pericranium/temporalis fascia, and the Medpor (Stryker, Kalamazoo, MI) implant can be secured to the calvarium with a surgical wire or titanium screws.

Facial Nerve Injury

Facial nerve injury is relatively uncommon in association with development of the TM flap. The incidence of transient nerve injury is approximately 10%, and permanent injury is noted in 3% of cases.7 The temporal and zygomatic branches of the facial nerve are at greatest risk. Most injury is likely to be related to excessive retraction during surgery, and permanent injury is likely due to inexperience with surgical anatomy. The greatest risk of nerve injury occurs during zygomatic arch exposure. The facial nerve crosses the zygomatic arch within or beneath the TP fascia/SMAS, and it is very important to dissect in the subperiosteal plane during zygomatic dissection. Connecting the temporal region to the zygomatic region should be performed in the subtemporalis fascial plane to ensure the safety of the facial nerve. Immediate
postoperative facial nerve weakness can be managed with gentle massage and systemic oral corticosteroids for 1 week to relieve the pressure from postoperative swelling. Artificial teardrops should be prescribed to the patient for corneal protection. If no improvement has been appreciated after 6 months, surgical management should be rendered. A gold-weight implant in the upper lid is the recommended treatment option for lagophthalmos.

**Alopecia**

Alopecia along the incision line is the most commonly reported complication of the TPF flap. Thermal damage during dissection or too superficial plane dissection is the most likely cause. Management of alopecia often requires surgical removal of skin and possible advancement rotation of a scalp flap.

**CONCLUSION**

The TM flap falls under the classification of type III axial pattern flap, based on two dominant arterial pedicles that are present anterior and posterior to deep temporal arteries. It is because of this vascular supply the TM flap is said to be a versatile option for reconstruction of moderate to large-sized defects of maxillofacial region. The muscle can provide large amounts of viable and vascular tissue, with minimal to no functional morbidity or esthetic deformity at the donor site.

**REFERENCES**