



Temporalis Myofascial Flap (TMF) and Immediate Soft Tissue Reconstruction for Maxillary, Mandibular Defects: Radiated and Non-Radiated Patients with the Return of Sensory Function

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Abstract

Purpose: The purpose of this article is to present the simple, reliable and predictable temporalis myofascial flap (TMF) in rehabilitation and immediate soft tissue reconstruction for maxillary and mandibular defects: Both Radiated and Non-Radiated Patients with the return of Sensory Function.

Patients and Methods: The series includes 9 patients (6men and 3women), ranging in age from 35 to 52years. A full-thickness TMF was used for immediate soft tissue defect reconstruction.

Results: The TMF survival rate in this study revealed a 100% success rate with1 minor complication. This was a case of a delayed closure of the bicoronal flap drain site which resolved after local wound care and oral antibiotics, and did not require further flap manipulation.

Conclusions: The TMF was found, in this study to have a low complication rate, was relatively easy to use, and had a predictable outcome with lack of functional deficits. The proximity and reliability of the myofascial flap make it a favorable and highly recommended candidate for oral and maxillofacial reconstructive surgery in radiated and cancer patients, who usually have relatively poor recovery potential and decreased physiologic reserves.

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Introduction

The Temporalis muscle is a fan-shaped muscle that lies in the temporal fossa. The muscle fibers insert as two separate tendinous heads (superficial and deep) that run deep to the zygomatic arch and insert in the coronoid process and the anterior border of the ramus of the mandible. It functions as an elevator and retractor of the mandible. Anteriorly, it is attached to the lateral orbital rim and the anterior temporal crest; posteriorly, to the occipital bone; and superiorly, to the infratemporal crest. It passes deep to the zygomatic arch and inserts into the coronoid process and the anterior border of the mandibular ramus. The temporal and frontal branches of the facial nerve (seventh cranial nerve) are located just deep to the temporoparietal fascia after it passes cephalad to the zygomatic arch and in front of the frontal branch of the superficial temporal artery. These nerves can be injured during dissection of the pedicle in the Preauricular region near the zygomatic arch. The frontal branch of the superficial temporal artery therefore serves as a safe line that should not be crossed. The arterial blood flow is distributed mainly in the medial and lateral portions of the muscle, with numerous minor interconnecting vessels. The regional architecture of the blood flow enables axial blood flow to be maintained within a flap split in the sagittal plane. The unelevated muscle remains viable within the temporal fossa, limiting a severe cosmetic deformity. The temporalis muscle flap is a reliable, non-bulky, myofascial flap that has been used for closure of a variety of defects as well as reconstruction both of medium and large areas of the maxillofacial region.

Patients and Method

This series of 9 patients (6 men and 3 women), were treated at the Department of Oral and Maxillofacial Surgery, Temple University Hospital and Cooper University Hospital between 2014-2016 for reconstruction of maxillofacial defects secondary Head and neck resection or for treatment of ORNJ secondary to radiation.

Inclusion criteria:

- 1) No active evidence of tumor or neoplasm



Figure 1: Standard Bicoronal flap.



Figure 2: Exposure of the Temporalis Muscle.

- 2) No prior history of reconstructions with other local flaps.
- 3) No prior cosmetic deformity at the donor site

Surgical technique

A standard Bicoronal incision was used in all our study patients (Figure 1).

The initial incision of a bicoronal flap to minimize hairline recession and balding pattern was taken into consideration when designing the line of incision (Figure 1). For sterility and to minimize the annoyance of loose hair in surgical field the patient's hair was gathered into clumps and secured using small sterile rubber bands. The initial incision was made with no. 15 blade extending from one temporal line to the opposite temporal line, extending to preauricular skin crease on the side where the temporalis flap is raised. The blade was at a 90 degree horizontal incline to minimize hair follicle destruction. The incision is through skin, subcutaneous tissue and glea, exposing the subgaleal plane of loose areolar tissue overlying the pericranium. The flap is easily raised over the pericranium (Figure 2). On the side where the flap is being raised the incision is extended to the temporalis fascia. The skin and subcutaneous tissue are elevated in the plane situated on the temporalis fascia. Anteriorly, elevation in this plane is stopped when the superficial temporal fat pad when facial/temporal branches of the facial nerve is encountered. At this point the superficial layer of deep temporalis fascia is incised in a horizontal direction, and the underlying fat is exposed. Further dissection is done in a subfascial plane, in the fat pad, up to the lateral orbital bony rim (anterior margin of temporal fossa) and to the zygomatic arch with periosteum incised on the medial side of the arch (Figure 3). The temporalis fascia is now incised along the superior temporal line and the posterior margins of the muscle, down onto the bone. One should avoid any inclusion of pericranium beyond the margin of the temporalis muscle, because it will not

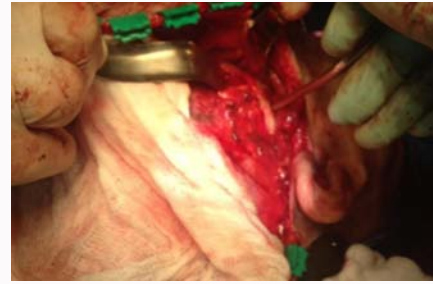


Figure 3: Adequate Exposure of the Zygomatic Arch.

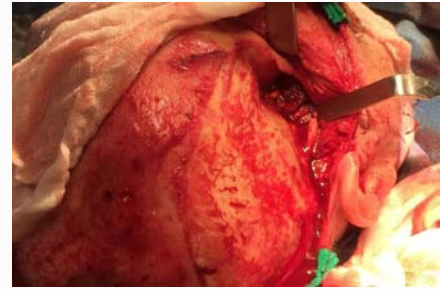


Figure 5: Raising the temporalis flap.

survive without the blood supply from the temporalis muscle. The temporalis muscle is elevated from the bone of the temporal fossa using a periosteal elevator (Figure 5). The dissection remains hard on the bone, an incision in the mouth with either standard Le Fort 1 or Bilateral Sagittal Split Osteotomy incision for access to perform a coronoidectomy. The coronoidectomy allows a full arc of rotation. With the exception, of the trauma case the flap was routed into the oral cavity with coronoidectomy and after 1cm of the zygomatic arch was osteotomized (Figure 4) to permit passage of the flap. The zygomatic arch bone segment is kept in saline and plated back into position later in the procedure. A finger is used to make a tunnel for the flap into the mouth medial to the zygomatic arch and lateral to the mandible, when advancing the flap care must be taken not to create torsion during flap advancement to avoid strangulating of its blood supply (Figure 6 and 7).

Results

Flap survival and Complications

A Full-thickness temporalis myofascial flap (TMF) was used



Figure 6: Complete mobilization of the temporalis flap.



Figure 7: Reconstruction of the Midline Defect Using the Temporalis Flap.

in all patients, Maxillary and Orbital Floor reconstruction after hemi-maxillectomy was accomplished in three patients, soft tissue reconstruction after maxillary resection and radiation in one patient, soft tissue reconstruction of the mandible in three patients after resection debridement for osteoradionecrosis of the jaw (ORNJ) and correct frontal bone and orbital rim deformity in one trauma patient. The follow-up period ranged between 6 months to 1 year. All patients' donor-site deformity in the area because of a lack of tissue bulk was anticipated. The deformity was reconstructed using a custom made implant through the existing bicoronal incision. Incisions sites were masked in all cases by the hair line. The overall flap survival in this study was reflected with no failures one minor complication that resolved without damage to the flap. This one patient, a 52 year-old female with squamous cell carcinoma of the base of the tongue had delayed wound healing. A surgical drain inserted at the site was treated successfully by in office wound care and antibiotics requiring no additional surgery. There was no incidence of facial nerve injury, temporary or permanent. The patient's hospital stay was dictated by the presence of bilateral Jackson-Pratt (J-P) drains removed when drainage was less than 25-30cc/24 hours. Recovery from surgery was rapid and uneventful. Overall, the flap provided a safe and rapid solution for intraoral and facial tissue loss after tumor resection.

Discussion

The temporalis muscle flap can be easily and safely used in a variety of oral and maxillofacial defects including ablative cancer surgery, soft tissue reconstructions after resections, temporomandibular joint surgery, congenital defects, and more. The flap can be used as a myofascial, myo-osseous, or myo-osseocutaneous flap. It can be used for reconstruction of defects of the skull base, orbit and eyelids, cheek, tongue, maxilla, palate, temporomandibular joint, and mandible up

to the midline and crossing the midline with bilateral TMF flaps. In all patients with resection due to tumor and with radiation this muscle was used as a soft tissue bed for future placement of free bone graft and dental implants. The advantages of the temporalis muscle flap are its ease of elevation and manipulation, proximity to the oral and maxillofacial area, lack of any functional defects. The axial blood supply both arterial and venous easily preserved, and with the overlying temporal fascia this flap is durable and has a very low incidence of failure. The proximity of the flap to the oral region eliminates the need for an additional distant surgical site. Loss of temporalis muscle creates no masticatory disability and in return of the sensory nerve innervation.

Disadvantages may include potential sensory disturbance but in all of these cases it was found to return within three weeks, a factor rarely reported, but important in patient recovery. Potential facial nerve injury, limitation in range of mandibular movement but usually temporary. Temporal area hollowing which can be preplanned for reconstruction. A large contour defect of the donor-site area is avoided by harvesting only the necessary amount of muscle. Alternatively, the donor-site defect can be reconstructed with an alloplastic implant [1]. Alopecia at the donor site can be avoided by the judicious use of bipolar cautery and by careful placement of the coronal incision using a parallel incision of the blade to the hair shafts [2-4]. In this study all patients had a donor-site deformity, because of a lack of tissue bulk. TMF in the mouth heals in phases, with the acute inflammatory phase initially, and then the chronic inflammatory and proliferative phases, and eventually, the phase in which epithelialization of the oral mucosa occurs, further enhancing the TMF as an extremely reliable and versatile flap for oral and maxillofacial reconstruction [5-7]. The epithelialization over the oral portion of the muscle is completed in 4 to 6 weeks [8,9]. For reconstruction of extra oral defects, skin grafting is usually needed to cover the muscle. Small skin defects, 1-2 cm, of the epithelium will migrate over the exposed flap with wet to dry dressing's changes.

A review of complications rate was presented at an annual meeting of American Association of Oral and Maxillofacial Surgeons [5]. For reconstruction of intraoral defects, the failure rate of the flap was very low. Failure may occur when the flap is brought through a narrow fenestration or through the wall of the maxillary sinus to reconstruct mid-palatal defects when the alveolar bone is intact [10]. Overall, the incidence of complications is minimal, and are mostly transient [5,6]. Another possible complication is deficit in function of the temporal branch of the facial nerve, which can be transient or permanent [11]. The contraindications for the use of TMF are tumor resection where the internal maxillary artery is divided [12], previous injury to the temporalis muscle, or any other vascular compromise to the area. A relative contraindication is radiation in the area of the temporalis muscle, which may render the muscle fibrotic with less elasticity [13].

Conclusion

The described technique is anatomically sound, easy to perform, and reliable. The TMF is a useful alternative to the microvascular free flap in the reconstruction of moderate to large-sized defects after cancer resection in the oral and maxillofacial area crossing the midline in the mandible and maxilla. The muscle provides abundant tissue with a relatively minimal complication rate and the rapid recovery time and no functional deficits.

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