

MICROSURGERY AND FLAP

The Versatility of Temporalis Muscle Flap in Reconstruction of Maxillofacial Region

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Background: The temporalis muscle flap (TMF) is a very versatile and valuable axial flap, which could be used in various reconstructive procedures in and around the maxillofacial region. The surgical anatomy, vascular pattern and technique of elevation of the flap are described, associated with our experience in different reconstructive situations.

Patient and Method: There were two patients, one case of TMJ ankylosis and one case of facial paralysis. The TMF was used as an interpositional arthroplasty for TMJ ankylosis, as a dynamic facial reanimation for facial paralysis.

Result: In the first patient, he was able to open his mouth 4 cm in 2 weeks following the surgery. There was no pain or other complication complained. In second patient, in two weeks follow up after the surgery, we found the edema was decrease gradually. The contraction on the right nasolabial sulcus was slightly seen.

Summary: These report described the reliability, versatility and reproducibility of temporalis muscle flap. The rich vascularized tissue and its proximity to the reconstruction site make this flap reliable. TMF should be taken into consideration before deciding on more extensive reconstructive procedures.

Keywords : *temporalis muscle flap, maxillofacial reconstruction, versatility*

Latar Belakang: Flap m.temporalis adalah flap aksial yang multiguna dan bermanfaat, yang dapat digunakan untuk berbagai prosedur rekonstruksi di dalam dan sekitar regio maxillofacial. g Disini digambarkan struktur anatomi, pola vaskularisasi dan teknik pengangkatan flap berkaitan dengan pengalaman kami dalam berbagai rekonstruksi.

Pasien dan Metode: Dilaporkan terdapat dua pasien, satu pasien dengan TMJ ankylosis, dan satu pasien dengan paralisis fasial. Flap m.temporalis digunakan sebagai interposisi arthroplasty untuk ankylosis TMJ, sebagai reanimasi dinamis untuk paralisis fasial.

Hasil: Pada kasus pertama, pasien mampu membuka mulut selebar 4 cm dalam 2 minggu pasca operasi, tidak ada nyeri atau keluhan lain. Pada pasien kedua, dalam evaluasi 2 minggu pasca operasi, edema mulai berkurang dan tampak sudah ada kontraksi di sulcus nasolabial.

Kesimpulan: Laporan kasus ini menggambarkan reliabilitas, versatilitas dan kegunaan flap m.temporalis (TMF). Jaringan yang kaya vaskularisasi dan letak yg lebih dekat dengan lokasi rekonstruksi membuat flap ini dapat diandalkan. TMF harus dipertimbangkan sebelum memutuskan prosedur rekonstruksi yang lebih ekstensif.

Kata Kunci : *temporalis muscle flap, maxillofacial reconstruction, versatility*

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The temporalis muscle flap was first used by Golovine to obliterate a dead space following orbital exenteration.¹ In 1948, Campbell used this flap to repair maxillary defects.² Rambo used the muscle flap in the middle ear and mastoid cavities.³ Wise and Baker mentioned the use of the temporalis muscle flap in reconstruction of the orbital floor to support the orbital contents.⁴ Horton and Bakamjian and Souther used the muscle flap for maxillary and orbital reconstruction.⁵⁻⁶ Bradley

and Brockbank, in their extensive study, illustrated the fundamental points in the use of the flap.⁷ Habel and Hensher described the use of the temporalis muscle flap after tumor resection in the maxilla, oropharynx, in facial reanimation and restoration of facial contour.⁸

The objective of this report is to present our experiences in using the temporalis muscle flap in maxillofacial reconstruction. The anatomy of the temporalis muscle was adequately described by Last and by the

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cadaveric studies of Bradley and Brockbank.^{7,9} The muscle is described as fan-shaped, bipinniform, thin peripherally and thick centrally. It takes origin from the side of the skull over the entire temporal fossa, from the inferior temporal line above to the infratemporal crest below. The muscle is inserted to the coronoid process and the anterior border of the ramus of the mandible to the level of the retromolar area.

The muscle's arterial supply runs on its deep surface and arises from two vascular pedicles, the anterior and posterior deep temporal arteries, which arise from the internal maxillary artery and supply the anterior and posterior portions of the muscle respectively. The anterior and posterior vascular pedicles enter the muscle on its deep surface anterior and posterior to the coronoid process, both vessels enter the muscle below the level of the zygomatic arch. Both vessels may lightly groove the outer plate of the skull, emphasizing the need for careful subperiosteal dissection.¹⁰ The nerve supply is through the anterior and posterior deep temporal nerves with, occasionally, a middle temporal nerve, all of which are branches of the anterior division of the mandibular nerve.

PATIENT AND METHOD

In this report, the temporalis muscle flap was used in 2 patients, one patient of ankylosis temporomandibular joint and one patient for facial reanimation.

Flap Elevation

A hemicoronal incision was performed, the galea and temporo-parietal fascia were divided and retracted to expose the underlying pericranium and superior temporal line. The pericranium was incised along the entire length of the muscle and facial origins, continued to the temporalis muscle, included its covering fascia, were elevated from the underlying calvarium by subperiosteal dissection. The temporalis fascia was then incised transversely 2 cm above the zygomatic arch (two layers) to avoid the frontal branch of the facial nerve injury. The temporalis muscle was later inserted between two apponeurotic layers, the temporalis fascia superficially and the pericranium deeply.

To facilitate the muscle delivery into the mouth and obtain a wide arch of rotation and

transposition of the flap, the muscle must be released from the coronoid process. One to be noted, the deep temporal vessels are very close to its medial aspect. The muscle flap was freed from all the skeletal attachment, i.e. temporal line, temporal bone, infratemporal crest and the coronoid process. At this point, it could be described as an island axial myofascial flap. The flap could be easily maneuvered and delivered into the oral cavity beneath the zygomatic arch and inserted into the defect. The boundaries of the flap were then sutured to the edge of the wound. The facial covered the flap served as a good material to be sutured to the surrounding mucosa. The temporal wound was closed with negative suction drainage.

Case 1

A 5-year-old boy with ankylosis temporomandibular junction (TMJ) associated with traumatic history (Figure 1&2). He fell from 2 meters height when he was 1 year old. We decided to perform reconstructive arthroplasty using temporalis myofascial flap, which provides enough tissue to cover the defect and role as an interpositional material to prevent refusion (Figure 3). The temporalis fascia and muscle can be used as a pedicled flap and interposed between the condylar stump and the glenoid fossa for the surgical treatment of TMJ ankylosis. It could be brought lateral to the zygomatic arch or be advanced medially and inferiorly to the arch. Following the separation of the ankylotic bone, we reshaped the 'new' condyle using round drill, then a layer of TMF was inserted below the zygomatic arch and then interposed between the condyle and the glenoid fossa (Figure 3).

Case 2

A 25-year-old female suffered congenital facial nerve palsy (Figure 5). She had been performed facial reanimation using temporalis musculofascial slings. The TMF was found very useful applications in the many techniques proposed for surgical reanimation of unilateral facial paralysis. The operative procedure has been described elsewhere.¹⁴ Since the length of the muscle strips was insufficient to reach modiolus of mouth, the overlying deep temporalis fascia was used as a tendon to reach and be inserted into these areas. We divided section into 3 parts to sling upper lip, modiolus and lower lip (Figure 6).



Figure 1. Pre-operative condition, the patient could not open his mouth at all.

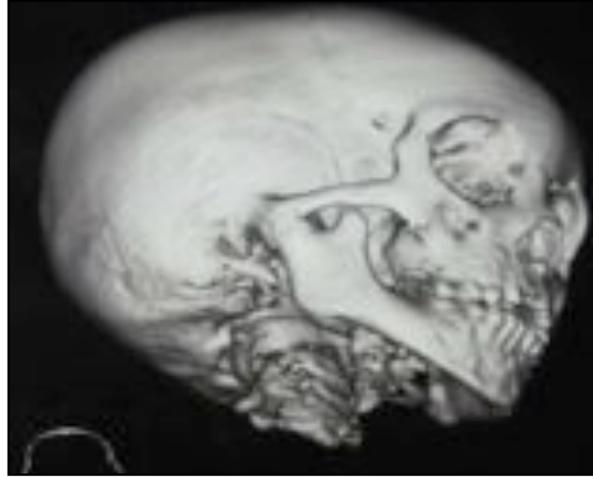


Figure 2. CT scan 3 D pre-operative showed fusion of the TMJ joint and zygomatic arch.



Figure 3. Above Left: Intra operative design. Above Right: The fusion of TMJ joint. Below Left: Temporalis muscle flap was placed between condyle and the glenoid fossa. Below Right: Post operative condition, we placed wooden stick to keep mouth opened.



Figure 4. Case 1 : Two weeks after surgery. Left: Anterior view. Middle: The patient could open his mouth 4 cm wide. Right: Lateral view of case 1. There was no pain or other complication noted.



Figure 5. Pre-operative condition of case 2. Note the right facial nerve palsy she had.



Figure 6. Elevation of temporalis muscle flap. Temporalis muscle flap was brought to the commissure of the mouth. We divided into 3 parts to sling upper lip modiolus and lower lip.



Figure 7. Post-operative figure of case 2. **Above:** Immediate Post-operative figure. **Below:** 2 weeks post operative, edema was decrease gradually, noted there was a little contraction on the right sulcus naso labial.

RESULT

In the first patient, he was able to open his mouth 4 cm in 2 weeks following the surgery . There was no pain or other complication complained (Figure 4). In second patient, in two weeks follow up after the surgery, we found the edema was decrease gradually. The contraction on the right nasolabial sulcus was slightly seen (Figure 7).

DISCUSSION

Although the temporalis muscle flap has been used for more than one hundred years ago by Golovine, it is still a very reliable modality for the maxillofacial reconstruction.¹ The TMF adapts well to multiple craniomaxillofacial reconstructions. The preparation and rotation of the flap can be easily performed if basic concepts of surgical anatomy are well understood. In

evaluating the spectrum of the different reconstructive procedures it is necessary to value four different aspects, versatility, functional and morphologic results, temporary inconvenience, and complications.

In temporomandibular joint ankylosis treatment, we used the muscle as an autogenous inter-positional material to resurface the newly formed glenoid fossa and to act as a cushion protecting the costochondral graft. Only the posterior part of the muscle was used, and contrary to Terpinas,¹¹ we passed the muscle flap medial to the zygomatic arch to avoid the postoperative bulge that might be of some cosmetic drawback. In TMJ surgery, the use of the TMF provided a valid alternative as a disc replacement material. It was not only satisfied the criteria for an ideal graft, but also offered material which conceptually fulfills the physiological functions of the disc.

For the second patient, she was treated for a long standing facial palsy. The muscle facial slings provided a dynamic suspension to the corner of the mouth. The TMF provides a valuable alternative for facial reanimation. The stigmata of facial paralysis were improved in many cases, but, as with other procedures, the possibility of spontaneous emotional expression was not completely restored. Eye closure was obtained in this patient by using gold implant. The lower facial emotion expression was not optimum yet 1 month following the surgery, but we would still observe in the next 6-9 months. The result depends largely on the patient's constant training and exercising which makes the balanced smile a conditioned reflex.

On the basis of our experience that covers almost every field of reconstructive surgery, we may state that the use of temporalis myofascial flap should be taken into account before taking decision on more complex and extensive procedures. The use of this flap constitutes a quick, reproducible method of reconstruction associated with minimal morbidity.

SUMMARY

Among the various flaps available in reconstructive craniomaxillofacial surgery, the temporalis muscle flap is particularly indicated for its reliability, versatility and facility of

employment. Other reconstructive procedures are presently available. Myocutaneous flaps are safe, but their main disadvantages are the excessive bulkiness of the flap and the morbidity of the donor site. Microvascular tissue transfer is time-consuming, it often requires two teams. A full knowledge of microvascular techniques is mandatory.

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