

THE TEMPORALIS MUSCLE FLAP IN MAXILLOFACIAL RECONSTRUCTION

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تعتبر الشريحة الصدغية ذات استعمالات متعددة وذات قيمة كشرريحة محورية يمكن استعمالها في العديد من عمليات إعادة بناء المناطق الوجهية «الفكين» وما حولها وفي هذا المقال تم وصف التشريح الجراحي ومخطط الأوعية الدموية وكذلك طريقة رفع هذه الشريحة وخبرة المؤلفين في استعمالها المختلفة. كذلك فقد نُوقشت مزايا ومساوئ هذه الشريحة بشكل شامل مع الأخذ بعين الاعتبار إمكانية حصول نكس سرطاني في المنطقة المغطاة بهذه الشريحة.

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

The advantages and disadvantages of the use of this flap are thoroughly discussed taking into consideration the potentiality of cancer recurrence under cover of the flap.

Introduction

The temporalis muscle flap was first used by Golovine¹ to obliterate a dead space after orbital exenteration. In 1948, Campbell used this flap to repair maxillary defects.² Rambo³ used the muscle flap in the middle ear and mastoid cavities. Wise and Baker⁴ mentioned the use of the temporalis muscle flap in reconstruction of the orbital floor to support the orbital contents. Horton⁵ and Bakamjian and Souther⁶ used the muscle flap for maxillary and orbital reconstruction. Bradley and Brockbank,⁷ in their extensive study, illustrated the fundamental points in the use of the flap. Habel and Hensher⁸ described the use of the temporalis muscle flap after tumor resection in the maxilla, oropharynx, in facial reanimation and restoration of facial contour.

The purpose of this work is to present our experience in the use of the temporalis muscle flap in

reconstructive procedures in the oro-maxillofacial region.

The anatomy of the temporalis muscle is adequately described by Last⁹ and by the cadaveric studies of Bradley and Brockbank⁷. 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 infra-temporal 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 via the anterior and posterior deep temporal nerves

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with, occasionally, a middle temporal nerve, all of which are branches of the anterior division of the mandibular nerve [Figs. 1,2].

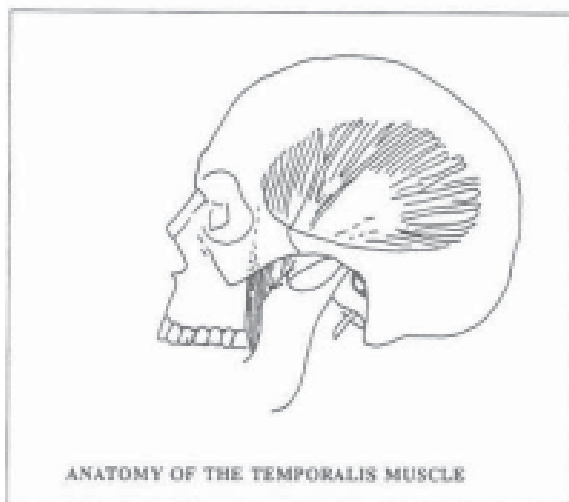


Figure 1. Anatomy of the temporalis muscle

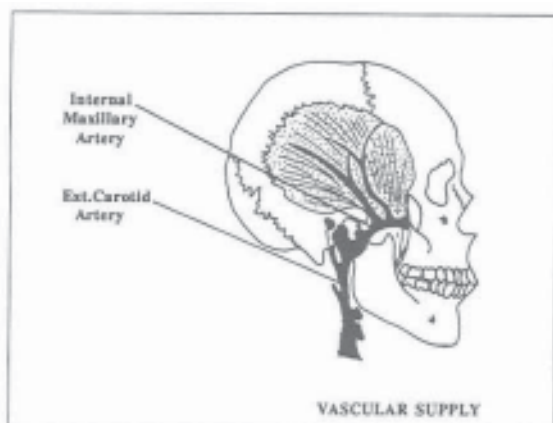


Figure 2. Vascular supply

Materials and Methods

In this work, the temporalis muscle flap was used in 76 patients; 16 of them with maxillary defects, 50 patients with temporomandibular ankylosis, three patients with retromolar carcinoma, one patient with a sarcoma of the ascending ramus of the mandible, two patients after orbital exenteration, and in two patients for facial reanimation.

Flap Elevation

A hemicoronal incision is done, the galea and temporo-parietal fascia are divided and retracted

to expose the underlying pericranium and superior temporal line. The pericranium is then incised along the entire length of the muscle and facial origins, and the temporalis muscle, with its covering fascia, are elevated from the underlying calvarium by subperiosteal dissection.

The temporalis fascia is then incised transversely 2 cm above the zygomatic arch (two layers) so as not to injure the frontal branch of the facial nerve. The temporalis muscle is now invested between two apponeurotic layers, the temporalis fascia superficially and the pericranium deeply [Fig. 3].

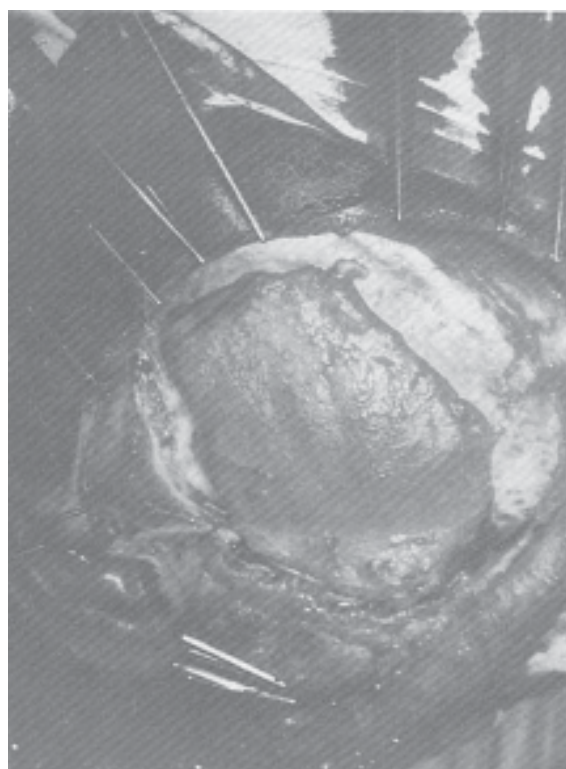


Figure 3. Elevation of the flap

To facilitate the muscle delivery into the mouth and obtain a wide arch of rotation and transposition of the flap, the muscle must be dissected freely from the coronoid process. The latter must be resected very cautiously keeping in mind that the deep temporal vessels are very close to its medial aspect. The muscle flap is now free from all its skeletal attachment, i.e. temporal line, temporal bone, infratemporal crest and the coronoid process. At this point, it can be described as an island axial myofascial flap. The flap can now be easily maneuvered and delivered into the oral cavity

beneath the zygomatic arch and inserted into the defect. The boundaries of the flap are now sutured all around the margins of the wound. The facial covering of the flap serves as a good material for suturing with the surrounding mucosa. The temporal wound is then closed with negative suction drainage [Fig. 4].



Figure 4. Flap passed intraorally

A. After Maxillectomy

The temporalis muscle flap was used as an autogenous functioning graft and obturator after hemimaxillectomy in 16 patients for immediate rehabilitation. The original diseases, which necessitate maxillary resection, are listed in Table 1 [Fig. 5].

B. After Temporomandibular joint Ankylosis

In cases of TMJ ankylosis, our policy is to do reconstructive arthroplasty, using costochondral rib grafts. The posterior part of the muscle is used to line the newly formed glenoid cavity. We used to pass the muscle flap over the zygomatic arch, but now we deliver the muscle flap from beneath the arch. It acts as an autogenous interpositional material, well vascularized and at the same time, bulky enough to protect the graft. The muscle flap was used in fifty cases of TMJ ankylosis as shown in Table 2.

Table 1. Cases of maxillectomy

Disease	Number of Patients
Upper gingival carcinoma	3
Antral carcinoma	4
Giant cell tumor	3
Pleomorphic adenoma minor salivary glands	2
Ameloblastoma	1
Vascular malformation	1
Myxoma	1
Post traumatic defect palate	1
Total	16

Table 2. T.M.J. Ankylosis

Type	No. of Patients
Unilateral	25 patients
Bilateral	25 patients
Total	50 patients

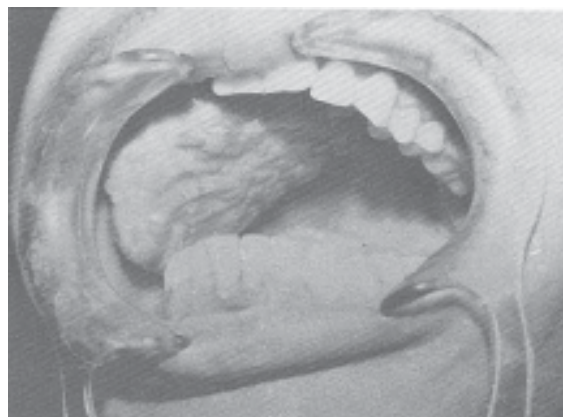


Figure 5. Post operative view with the temporalis muscle in place.

C. In Maxillo-mandibular Synostosis

Two patients presented with maxillo-mandibular synostosis. One patient was two days old and she was referred for inability to open her mouth and suckle. The second patient was four years old. In maxillo-mandibular synostosis, there is a complete bony fusion between the coronoid process, anterior border of the ramus of the mandible and the posterolateral aspect of the maxilla. Whenever this fusion is released, one is confronted with a soft tissue defect in the mucosa intraorally. The temporalis muscle flap provides enough tissue to cover the defect as well as to act as an interpositional material to prevent refusion.

D. *In Carcinoma of the Retromolar Region*

Three cases with retromolar carcinoma were treated with wide resection, radical neck dissection, and the defect in the oral cavity was reconstructed by the temporalis muscle flap.

E. *In Sarcoma of the Ascending Ramus of the Mandible*

One patient presented with fibrosarcoma of the ascending ramus of the mandible. The lesion was widely resected, and the defect was completely covered by the temporalis muscle flap.

F. *After Orbital Exenteration*

The temporalis muscle flap was used to fill the orbit in two patients after orbital exenteration of an adenocarcinoma of the globe. The muscle was covered by a forehead flap in both cases.

G. *In Facial Reanimation*

Two patients with long standing facial nerve palsy had facial reanimation by the use of temporalis muscle fascial slings.

Discussion

Although the temporalis muscle flap was used more than one hundred years ago by Golovine,¹ it is still a very reliable tool in the reconstruction of the maxillofacial region.

Recently, new and wider applications of the flap have been introduced, such as resurfacing of massive defects of the eye lids and the face, sealing of the cranial cavity and reconstruction of intraoral defects.

In two patients with maxillo-mandibular synostosis, the muscle flap was used to act as an interpositional flap and at the same time to resurface a mucosal defect in the oral cavity.

After maxillary resection, the muscle flap proved to be a very valuable method for early and easy rehabilitation as regards speech, feeding, and improving the patient's morale. The flap also helps to avoid the complicated lengthy and costly laboratory work. But, on the other hand, it might be dangerous to use such a flap to cover defects after resection of a malignant lesion, as we had three recurrences in the maxilla above the flap. The flap is suitable for reconstruction of maxillary defects after benign and locally aggressive lesions such as

ameloblastoma, myxoma, pleomorphic adenoma and giant cell tumor which could be widely and safely resected.

In the treatment of temporomandibular joint ankylosis, we use the muscle as an autogenous interpositional 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 is used, and contrary to Terpinas¹¹ we pass the muscle flap medial to the zygomatic arch to avoid the postoperative bulge that might be of some cosmetic drawback.

In reconstructing defects of the buccopharyngeal region, the muscle flap showed complete epithelialization after one month of its transfer to the oral cavity. After orbital exenteration, the temporalis muscle flap provided a good filler for the defect and a good bed for a cover with a forehead flap. In the two patients treated for a long standing facial palsy, the muscle facial slings provided a dynamic suspension for the corner of the mouth.

In our series of patients, we had two with post-operative infection and they were treated by incision and drainage together with an appropriate antibiotic. During exposure of the muscle, the temporal branch of the facial nerve is usually at risk, and this could be avoided by adopting the modified preauricular approach described by Akkayat and Bramley.¹²

The key factors for the successful use of the flap are careful dissection of the muscle in the subperiosteal plane, and coronoidectomy without harming the vascular pedicle to increase the arch of rotation of the muscle flap. A wide tunnel should be provided for the passage of the flap intraorally to avoid pedicle compression. The muscle flap should not be used above extensive or advanced malignant lesions.

A further extension of the use of this flap is to utilize it as a myo-osseous flap together with the outer table of the skull as described by Jackson et al.¹³ We think that using a myo-osseous temporalis flap might be of help in constructing an upper partial denture for patients after the flap is completely epithelialized, since it is quite difficult to fit such patients with partial dentures in the absence of bony support.

The fact that this flap must not be used to cover post-excisional defects following a carcinoma of

the upper jaw, specifically that of the antrum and advanced lesion of the upper gingiva is strongly stressed.

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