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Foreword

José Guerrerosantos

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4 Endoscopically Assisted Temporalis Muscle Transfer Harvesting for Orbit Reconstruction

Riccardo Girotto, Marco Messi, Paolo Balercia

INTRODUCTION

The temporalis muscle flap (TMF) is a workhorse in our daily surgical practice of head and neck/reconstructive surgeons.[1–8] Its main address is to reconstruct the orbital content (where removed for oncological reasons) and the upper jaw. Some authors recommend its use in retromolar trigone cancer reconstruction, but we believe that contraindications and sequelae are worse than benefits, since mouth opening can become less and less during the time with fibrotization of the flap and muscular necrosis can increase the intraoral wound healing time.

Nowadays surgery has increased its possibilities becoming less invasive and aggressive. Endoscopy gives to the surgeon the opportunity to reach otherwise difficulty reachable anatomical structures and perform the operation with great respect to nearer anatomical structures.

It is so possible to dissect the temporalis muscle without impairment of the frontalis branch of the facial nerve, with minimal periosteum elevation, and thus respect of the facial "danger zones".

With the endotechnique there is preservation of the sensory nerves and the rate of postsurgical alopecia is less. There is less numbness, less blood loss, and less recovery time. The surgical time is also shorter and the procedure can be easily applied to bald patients.[9]

It is not possible to not considerate the disadvantages. Those are represented by a higher difficulty level; the accuracy of the operation is operator and instrument dependent. The procedure is new and requires a new understanding of the surgery itself.

ANATOMICAL BASIS

The temporalis muscle is a fan-shaped muscle on the lateral skull, filling the entire temporal fossa. It passes under the zygomatic arch to insert onto the coronoid process and the anterior aspect of the ramus of the mandible (Fig. 4.1).



Fig. 4.1: Temporalis muscle flap.

The TMF has a type III pattern of circulation. The dominant pedicles are the anterior and posterior deep temporal arteries and venae comitantes. These arteries arise from the internal maxillary artery that is a branch of the external carotid artery. The vascular pedicle enters the muscle at its undersurface.

The average size of the temporalis muscle is approximately 10 × 20 cm and has its pivot at the level of the coronoid insertion/origin of the temporalis vessels from the maxillary artery.[10,11]

SURGICAL TECHNIQUE

Endoscopy has completely changed the approach to this surgery since it reduces damages to temporal "zones of

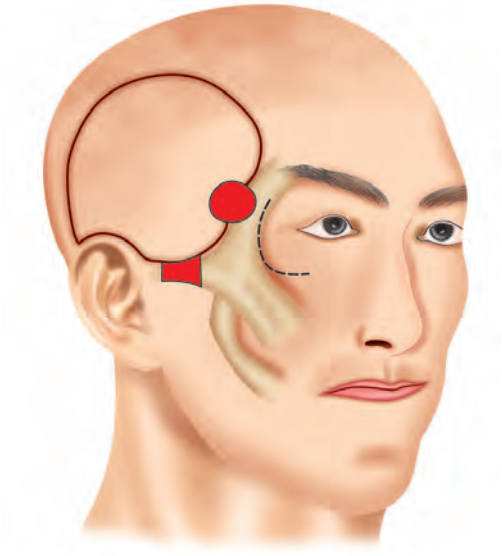


Fig. 4.2: Danger zones.

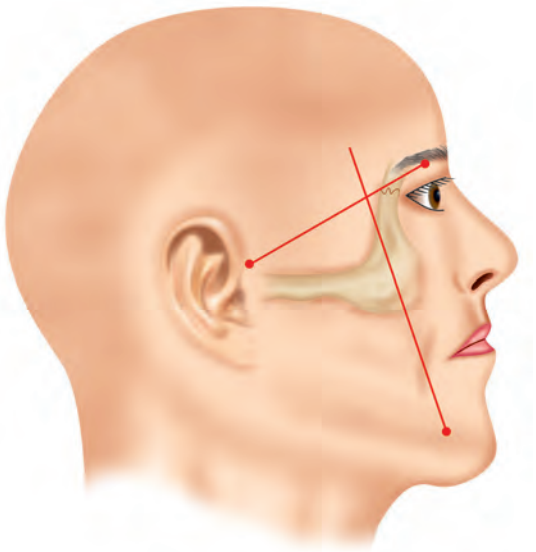


Fig. 4.3: Relationship between facial nerve and sentinel vein.

caution" (Fig. 4.2). This concept was introduced by different authors and well explained by Trinei and Nahai in 1997.[12]

The zone of caution comes from the direct dissection and visualization of a consistent relationship between the temporal branch of the facial nerve and the sentinel vein. The temporal branch comes from the main trunk immediately caudal to the zygomatic arch approximately 1.5 cm in front of the tragus, crossing the arch approximately 2.5 cm in front of the anterior border of the external auditory meatus.[12]

Hinderer et al.[13] have described the midpoint of the line between the helix and the lateral canthus as being external Landmark where the temporal branch crosses the zygomatic arch.

The temporal division courses within or immediately deep to the temporoparietal fascia and after crossing the zygomatic arch curves forward to enter the deep surface of the frontalis muscle approximately 2 cm above the level of the eyebrow.[14]

De la Plaza et al.[15] described perforating vessels in the temporal region and piercing the temporalis fascia. He named these the "sentinel vessels of the lateral wall of the orbit". This vein is located 5 mm lateral to the frontozygomatic suture line and is a tributary of the internal maxillary vein draining the temporal region. Its location relative to fixed skeletal landmarks correspond with the intersection point of a line drawn from the supraorbital notch to the base of the zygoma, and another line passing from the mental foramen to the angle formed by the superior border of the zygoma and the lateral orbital rim (Fig. 4.3).

All of these concepts reduce their importance in the case of the endoscopic approach: the dissection is deeper to any important vascular or nervous structure because performed in the virtual space between the deeper temporal fascia and superficial temporal fascia. It is recommended as the first surgical maneuver to identify immediately the deeper temporal fascia and elevate all the soft tissues lying above with a large elevator. If the surgical space is correct this action is incredibly fast and bloodless and does not require any force (Fig. 4.4).

The harvesting of the TMF is the same for orbital and maxillary reconstruction. The only difference is the transposition of the flap that is passed through a bony hole in the lateral part of the orbit for orbital reconstruction or below the zygomatic arch if used for maxillary reconstruction. The infiltration of a solution of lidocaine 2% with adrenaline 1:100.000 only on the incision site that are limited to two 2 cm incision, the first in the parietal region, approximately 2–3 cm behind the hairline in a vertical fashion, and a second one 3 cm long in the temporal region, above the auricle and above the zygomatic arch, as a prosecution of a preauricular incision (Fig. 4.5). After the injection of anesthetic solution it is advisable to wait a few minutes to allow the adrenaline to act.

The first incision is the temporal one and the skin is done with a no. 15 steel blade in the way to preserve the hair follicles. The subcutaneous tissue is dissected with

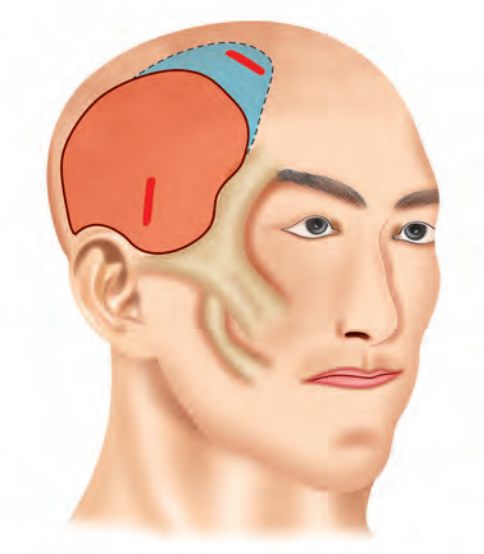


Fig. 4.4: Entity of periosteal elevation (blue) and superficial temporoparietal fascia elevation (red).

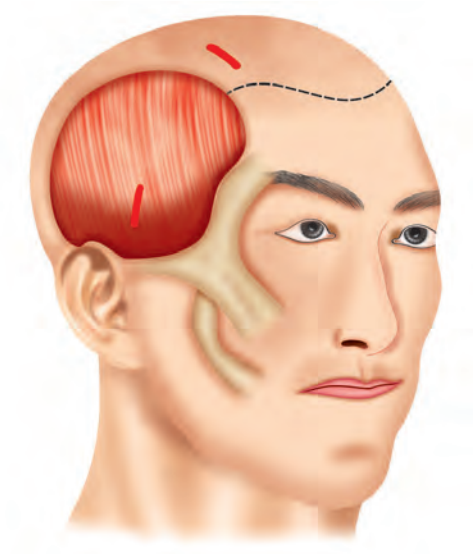


Fig. 4.5: Surgical incisions.

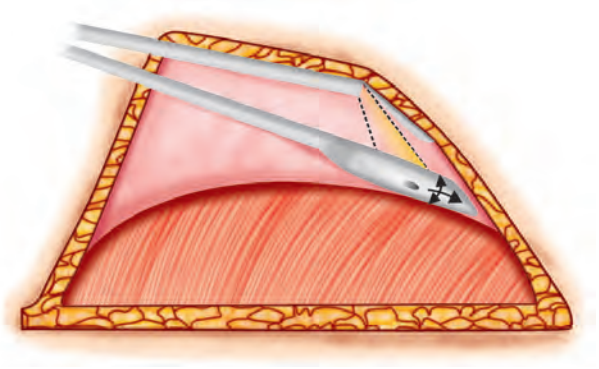


Fig. 4.6: Endoscopic dissection above deep temporal fascia.



Fig. 4.7: For anterior and upper dissection both instruments are introduced from the same access.

electrocautery to reduce the bleeding since the superficial temporalis fascia is reached. One 5 mm double skin hook is position on each edge of the wound and retracted to enlarge the wound and elevate the skin from the deeper structures. The superficial temporal fascia is incised with a tenotomy scissor, since the deep temporal fascia is encountered. The deep fascia has to be preserved and represent the guide for the first phase of endoscopical dissection. Using a large elevator a blind dissection of the deep temporalis fascia is performed until the temporal crest is identified (Fig. 4.6).

Now the incision in the parietal region is carried out with a no. 15 blade to preserve the hair follicles and electrocautery is used until the bone is identified. The elevator is used to detach the periosteum laterally. A 4-mm 30° endoscope is positioned through the temporal incision.

At this point, it is mandatory to create a unique optical cavity, thus detaching the tissues along the temporal crest. A suction-elevator, like the one used in endoscopic surgery for mandibular condylar fracture, is used to sharply detach the temporalis muscle from its upper and posterior insertion under endoscopic control. The endoscope is positioned through the same temporal hole of the elevator (Fig. 4.7).

The endoscope is then retracted and passed through the parietal access looking downward to the zygomatic

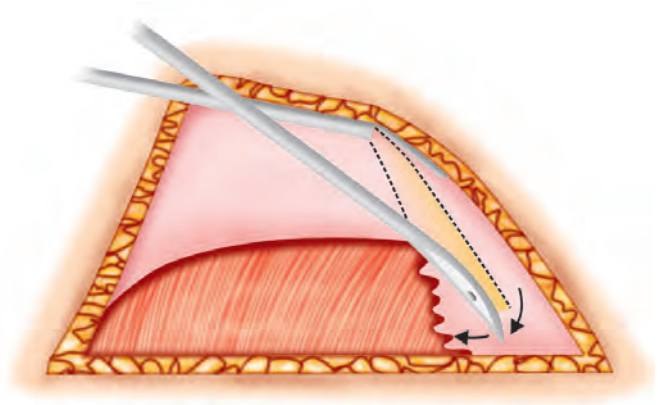


Fig. 4.8: After dissection of the outer part of the temporalis muscle, the elevator detach the temporalis muscle from the temporal bone.

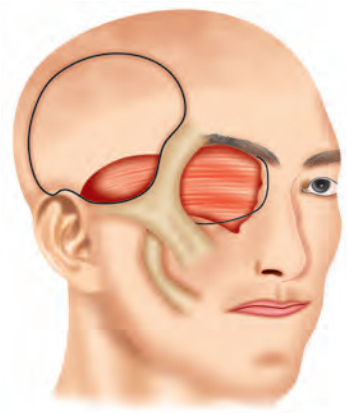


Fig. 4.9: The temporalis flap is passed in the orbit through a hole in the lateral orbital wall drilling the greater sphenoid wing, the muscle is the sutured to five to six holes made in the orbital rim and secured with resorbable sutures.

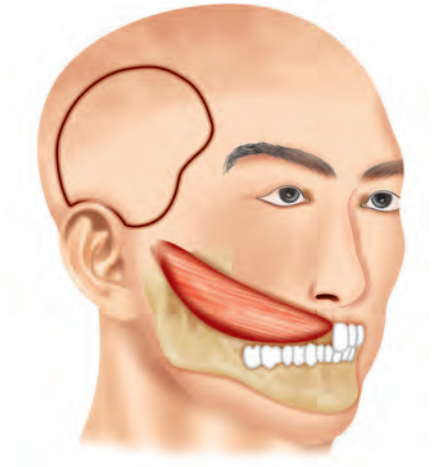


Fig. 4.10: The temporalis flap is passed below the zygomatic arch through the infratemporal fossa in the oral cavity to reconstruct the intraoral defect.

arch. With the same elevator the periosteum is incise over the upper edge of the zygomatic arch and the temporalis muscle is detached from the deeper surface of this bone until the posterior part of the body of the zygoma is exposed (Fig. 4.8). The dissection proceeds then on the anterior part of the muscle. The sentinel vein is identified and coagulated with bipolar forceps. Elevation of the temporalis muscle now can be performed easily in all its length down to the zygomatic arch.

If the muscle is used to reconstruct the orbit, from the orbital side, all the lateral orbital wall/greater sphenoid wing is removed with a drill. The TMF is passed into the orbit piercing its fascia with a Mosquito clamp and pulling it anteriorly with a gentle maneuver. The muscular part is the sutured to five to six bony holes already prepared at the level of the superior and inferior orbital rim (Fig. 4.9).

For maxillary reconstruction, after the maxillectomy is performed, a long Klemmer clamp is introduced from the mouth and driven superiorly passing in between the temporalis muscle and the zygomatic bone. Under direct vision, the deep temporalis fascia is grabbed with the clamp and pulled gently in the mouth while a large elevator push the muscle downward in the infratemporal fossa. Direct suture is performed between the muscle and the mucosal edges (Fig. 4.10).

Endoscopic surgery represents a good option of surgical improvement for several reasons:

- Requires precise anatomical knowledge and thus surgical basis
- Reduces surgical dissection and operating time
- Reduces bleeding and thus blood loss
- There is less recovery time
- Reduces local complications, i.e. local alopecia and numbness and facial soft tissues swelling.

Obviously, like any surgical advanced technique, endoscopic surgery requires longer training for understanding the goal of the surgery, how to manage the instruments and endoscope. The harvest of the temporalis muscle requires only a few instruments but, other than the endoscope, one is crucial in a safer and faster surgery and is the suction/elevator. Certainly the bleeding along this procedure is minimal but if the optical cavity is small, like in this case, even a few collected blood retained in this space can represent a problem for endoscopic view.

Figures. 4.11 and 4.12 are clinical cases.



Figs. 4.11A and B: (A) Female patient operated on for skin cancer involving the left inner canthus, lacrimal sac, and operated with orbital exenteration "en bloc" with the inner canthus and medial part of upper and lower eyelids. (B) Postoperative pictures show a good external cutaneous lining with minimal orbital retraction. A depression is still present in the temporal area probably because of extended periosteal elevation being our first endoscopic case.



Figs. 4.12A to F: (A) Male patient operated on for oral maxillary cancer involving the right maxilla up to the lower orbital rim that was preserved from resection. (B) The surgical incisions in the temporal and parietal region are made in blue. (C) Surgical incisions. (D) Right maxillectomy. (E) Dissection of the danger zone. (F) Postoperative.

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Alberto Di Giuseppe MD is a plastic surgeon practicing in Ancona, Italy and is Associate Professor in Aesthetic Plastic and Reconstructive Surgery at the University of Oradea, Romania since 2000. He often lectures, as an invited speaker in Europe and the United States. He introduced the concept of Superficial Ultrasonic internal treatment of the aging face, for achieving skin retraction, in the so-called Ultrasonic Assisted Face-Lift, or Skin Remodelling and has written chapters in multiple books on VASER-assisted lipoplasty. Dr Di Giuseppe has edited four books on Aesthetic Plastic Surgery.



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