Temporalis Muscle Flap In Midfacial Region Defects
S Yadav, V Dhupar, A Dhupar, F Akkara

Citation

Abstract
PURPOSE

The study aims at defining the role and verifying the reliability of temporalis muscle flap in reconstruction of midfacial defects. We report our experience with the temporalis muscle flap in the reconstruction of midfacial defects.

METHOD

Five patients were included in the study and their defect reconstructed with the myofascial flap of the temporal muscle in just one operation. All the patients were operated by using Waber- Ferguson flap for primary tumor resection (hemimaxillectomy). For the reconstruction of the hemimaxillectomy defect, the flap was elevated with extended Al kayat- Bramley incision.

RESULTS

Temporalis muscle provided a large amount of well vascularized soft tissue, with minimal donor site morbidity.

CONCLUSION

The temporalis muscle flap is an excellent choice for maxillofacial reconstruction. The proximity of the oral cavity, palate, oropharynx, the middle third of the face in addition to the vascular pedicle make the temporalis myofascial flap valuable for reconstruction.

INTRODUCTION

The maxillofacial form, oral competence and functions are the major aspects for the patients to meet the social needs after maxillectomies. With thorough knowledge of the anatomy of the various flaps and their applications, one can be more precise in the resection of tumors, leaving open the possibility of a primary closure of the defect and early rehabilitation. A variety of reconstruction techniques are being used to repair midfacial defects including skin grafts, local and regional flaps, as well as free-tissue transfer, but each of these techniques has its rewards and limitations. Reconstruction for the bony component of midfacial defects range from the use of soft-tissue alone to vascularized bone. The muscle provides a large amount of well vascularized soft tissue, with minimal donor site morbidity [1]. Temporalis muscle flap holds immense potential for the reconstruction of different maxillofacial defects [1]. Both its anatomical proximity to the midfacial region and to its easy transfer make this flap an excellent choice for reconstruction following the resection of midfacial tumors [2].

Golovine (1898) was the first person to use the temporalis muscle flap to obliterate a dead space after orbital exenteration. Campbell (1948) used this flap to repair maxillary defects. After tumor resection in the maxilla, oropharynx and restoration of facial contour, the use of the temporalis muscle flap was described by Habel and Hensher...
Temporalis muscle flap in midfacial region defects

Temporalis muscle is a fan-shaped, thin peripherally and thick centrally. It originates 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. Arterial supply runs on the deep surface of the muscle and arises from two vascular pedicles, the anterior and posterior deep temporal arteries which are the branch of internal maxillary artery and supply the anterior and posterior portions of the muscle respectively [4]. The nerve supply is via the anterior and posterior deep temporal nerves and occasionally from middle temporal nerve, which are branches of the anterior division of the mandibular nerve.

In this study, we report on our experience with the temporalis muscle flap in the reconstruction of 5 cases of midfacial defects. The study aims at defining the role and verifying the reliability of temporalis muscle flap in reconstruction of midfacial defects.

MATERIAL AND METHOD

All the patients were operated at Department of Oral and Maxillofacial Surgery Goa Dental College, Bambolim, Goa in one year span. A total of 05 patients were included in the study and their defect reconstructed with the myofascial flap of the temporal muscle in just one operation [Table 1]. Patients included had a large defect after hemimaxillectomy. The patients were evaluated preoperatively by clinical and radiographic examination. Definitive diagnosis could be given after preoperative pathological examination of an incisional biopsy. Medically compromised patients, who could not tolerate general anesthesia, were excluded from the study.

All the patients were operated by using Waber- Ferguson flap for primary tumor resection (hemimaxillectomy). For the reconstruction of the hemimaxillectomy defect, the flap was elevated with extended Al kayat- Bramley incision. The temporal and frontal branches of the facial nerve were included in this scalp flap. Dissection was carried out at a subgaleal level to expose the muscle. Then, it was mobilized subperiosteally in continuity with the myofascial flap in the whole of the temporal fossa, staying in close contact with the bone to preserve the vessels. The zygomatic arch was exposed to rotate the muscle into the oral cavity. The temporal fascia is freed from its zygomatic insertions and is detached from the subperiosteum at the arch. This increased the rotation arch of the flap, especially in the reconstruction of the oral cavity, reducing the possibility of strangulation of the pedicle. The muscle was pulled through the tunnel for the intraoral reconstruction and the flap was guided in the oral cavity with two silk sutures, then the temporalis muscle flap with the fascia facing the palatal aspect was sutured at the defect site intraorally. A drain was placed at the subgaleal plane, the coronal flap repositioned at the donor site, and the incision closed in layers.

No special postoperative care was required. The flap was checked clinically by intraoral examination of the patient. Feeding was reintroduced 10 days after surgery when the suture healed completely. Temporalis muscle flap was assessed by color of flap, suture dehiscence, presence of infection, necrosis of the flap, and mouth opening of the patient. Other assessment parameters were satisfaction in mastication, speech and mid facial contour of the patient.

RESULTS

There were total numbers of 05 patients among those 03 was males and 02 were females. The age group was ranging from 42 years to 57 years. Out of these 05 patients, 02 patients had ameloblastoma of maxilla, 02 patients had Pleomorphic adenoma (minor salivary glands) and 01 presented with Giant cell tumor.

The vitality of flap checked clinically by seeing the color of flap. Color of flap remained normal in all 05 patients. There was no sign of marginal necrosis and tissue loss. Margins of flap were intact in all the patients. 04 patients had no dehiscence of suture, while one patient showed the presence of dehiscence of the suture at one point in a small circumscribed area, which healed uneventfully by secondary intention. No patient had any signs of infection or pus discharge. Temporalis muscle flap healed with secondary epithelialization in 4 to 6 weeks. The new mucosal surface covering the muscle was indistinguishable from the surrounding mucosa.

Temporalis is one of the major muscles of mastication; therefore effect on mouth opening was also determined. In 04 patients, mouth opening remained normal; one patient had developed limited mouth opening initially, which came to normal after aggressive physiotherapy and regular exercises. All the patients were rehabilitated with a partial denture after the complete healing and epithelialization of the flap and good mouth opening. 04 patients were satisfied with their speech but 01 patient was unsatisfied. The functional as well as aesthetic results were excellent. All the
patients were fully pleased with mastication after the use of temporalis muscle flap. The mid facial contour obtained after the temporalis muscle flap was satisfactory with all the patients.

**Figure 1**

Table 1: cases of hemimaxillectomies

<table>
<thead>
<tr>
<th>Case no.</th>
<th>Diagnosis</th>
<th>Age</th>
<th>Sex</th>
<th>Anatomical Defect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pleomorphic adenoma minor salivary glands</td>
<td>42</td>
<td>M</td>
<td>Posterior partial maxillectomy defect</td>
</tr>
<tr>
<td>2</td>
<td>Ameloblastoma</td>
<td>65</td>
<td>M</td>
<td>Hemimaxillectomy defect</td>
</tr>
<tr>
<td>3</td>
<td>Pleomorphic adenoma minor salivary glands</td>
<td>56</td>
<td>F</td>
<td>Hemimaxillectomy defect</td>
</tr>
<tr>
<td>4</td>
<td>Ameloblastoma</td>
<td>46</td>
<td>M</td>
<td>Hemimaxillectomy defect</td>
</tr>
<tr>
<td>5</td>
<td>Giant cell tumor</td>
<td>37</td>
<td>F</td>
<td>Posterior partial maxillectomy defect</td>
</tr>
</tbody>
</table>

**Figure 2**

Figure 1 Case of pleomorphic adenoma of left posterior maxilla.

**Figure 3**

Figure 2 Case of Giant cell tumor of left posterior maxilla.

**Figure 4**

Figure 3 Showing markings of Waber- Ferguson incision & extended Al Kayat -Bramley incision.

**Figure 5**

Figure 4 Surgically excised specimen.
Figure 6
Figure 5 Temporalis muscle flap with fascia harvested from the bed.

Figure 7
Figure 6 Muscle pulled through the tunnel for the intraoral reconstruction site.

Figure 8
Figure 7 Temporalis muscle flap bulk sutured in hemi maxillectomy site.

Figure 9
Figure 8 Post-operative intraoral picture of epithelialized temporalis muscle flap.
**DISCUSSION**

The basic principle of any surgery in the maxillofacial region is to restore function, cosmetic and facial contour. After maxillectomies, soft-tissue and bone defects are associated with cosmetic and functional disability which requires reconstruction that separate nasal and orbital cavities from the oral cavity, and restore the facial contour [5, 6].

In the past many years, different procedures are being used for reconstruction of midfacial defects. Each reconstruction technique has its own advantages and disadvantages. Conventional reconstruction procedures are skin grafting and use of an obturator for maxillary defects but the cosmetic outcome is poor. In many cases the formation of fistula between the oral and the nasal cavity occurs [5, 6, 7]. Distant pedicled flaps like trapezius, deltopectoral and pectoralis major flaps are used in midfacial reconstruction but these may not provide adequate tissue volume and do not have sufficient pedicle to reach the maxilla when required [6].

Currently free microvascular flaps are used to correct maxillofacial defects after tumor resections, taking in account the large quantity of tissue that can be transferred. A variety of free tissue transfers have been used to repair midfacial defects. The most predictable are free fibular osteocutaneous flap, radial forearm flap, free scapular fasciocutaneous flap, latissimus dorsi flap. The major disadvantages of free tissue transfer are the long operative time, expensive cost, and the additional morbidity in another operative site [5]. Other than this there is an obvious need for refined techniques and the armamentarium for microvascular anastomosis.

The myofascial flap is easy to manage as compared to free microvascular flaps. Vascularization, flexibility and the fascia with the muscle are the chief advantages of myofascial flaps [2]. Most commonly used regional myofascial flaps for midfacial defects are cervicofacial rotation flap, forehead flap [8], and temporalis muscle flap.

Temporalis muscle flap was first used by Golovine more than one hundred years ago and still it is very reliable regional myofascial flap for the reconstruction of the maxillofacial defects after resection of benign and locally aggressive lesions such as ameloblastoma, myxoma, pleomorphic adenoma and giant cell tumor. The proximity of the oral cavity, palate, oropharynx, the middle third of the face in addition to the vascular pedicle make the temporalis myofascial flap valuable for reconstruction [2]. The flap is located close to the operating field and it is quickly obtained [9, 10]. It has a constant vascular supply from the deep temporal and the middle temporal vessels that are located on the deep surface of muscle [11, 12]. As the blood supply travels in the coronal plane, the temporalis muscle can be split safely. Temporalis muscle flap is widely used in the obliteration of the dead space following orbital exenteration [6] in augmentation of facial contour following major maxillofacial resection [1, 6, 13] and in intraoral reconstruction [6, 13].Temporalis muscle has a highly reliable and predictable vascular component. Necrosis of the flap is rare as the vascularization is from the deep temporal artery, a branch of the internal maxillary artery [2, 4, 14]. Vessel can be easily identified and preserved [9]. Moreover the temporalis muscle flap use in oral cavity eliminates the problem of hair growth in the mouth which is a common problem with several other regional flaps [10].
Temporalis Muscle Flap In Midfacial Region Defects

For intra oral reconstruction, the middle or posterior part of the flap is consistently longer than the anterior one [9], so to take advantage of their extra length, the middle or posterior part of the flap should be used for reconstruction. In the posterior oral defects, the long middle or posterior part of the flap has to rest on the posterior part of the mouth. This can be achieved by turning the entire flap inward [9]. Temporalis muscle flap also provides adequate tissue support for the cheek. Its adequate length and flexible arc of rotation make it suitable to cover defects in the orbit, maxilla, palate, mandible, floor of the mouth and oro-pharynx [9, 10, 15].

This flap can be rotated antero-medial for intraoral reconstruction to orient the temporalis fascia to the oral side [9]. In all of our cases we oriented the temporal fascia palatally (orally). Many authors emphasized placing the temporalis fascia on the oral side. This fascia is assumed to have a protective role for the muscle underneath [9, 10].

Temporalis muscle flap heals with secondary epithelialization, unless the flap is traumatized by occluding teeth. Complete epithelialization gets over in 4 to 6 weeks [2, 10, 15]. Once the epithelialization is complete, the new mucosal surface covering the muscle is indistinguishable from surrounding mucosa [10]. Temporalis muscle flap can also be used as a soft tissue bed for further placement of the bone graft [16].

Literature on the use of Temporalis muscle flap for reconstruction of intra oral defects has shown the flap failure rate to be very low (1.6%) and the incidence of associated complications post operatively were minimal and mostly transient [10]. In the post operative follow up the success rate of the flap was 100% in this study. Many other studies on temporalis muscle flap showed 100% success rate [10]. Total loss of the flap has been reported to occur when it is brought to the defect through a fenestration of the posterior and medial wall of the maxillary sinus to reconstruct mid palatal defects [10].

In the post operative follow up the temporalis muscle flap was found to be a versatile reconstructive tool for early rehabilitation of speech, feeding and immediate restoration of midface deformity [3]. Few disadvantages of temporalis muscle flap are bulkiness over the zygomatic arch, temporal depression, slight difficulty in temporomandibular joint movement and at times chronic temporomandibular joint pain from the loss of temporalis function. Temporomandibular joint movement can be corrected by active physiotherapy [3]. In the current study of 5 cases we had one patient with reduced mouth opening which was reasonably corrected with aggressive physiotherapy and regular mouth opening exercises.

Cosmetic deficit at the donor site can be reduced by using anterior part of the muscle and advancing the posterior part of the muscle to restore the deficit and more over, the hair can easily camouflage most of the temporal depression [10]. In our study primary closer of the donor site was done and the functional deficit was satisfactory. The aesthetic effect was limited to a mild depression in the temporal fossa which was covered by hair growth.

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 Alkayat and Bramley [17]. In all the cases of our study Alkayat and Bramley approach was used to harvest the temporal muscle for intraoral reconstruction and no such complication related to the temporal branch of facial nerve was observed. Prosthetic rehabilitation was carried out for all the patients there by restoring the speech and masticatory function. All the patients were satisfied with the esthetic appearance post operatively.

CONCLUSION

In the defect of midfacial region especially after the hemimaxillectomy, the temporalis muscle flap is an excellent choice for maxillofacial reconstruction. The proximity of the oral cavity, palate, oropharynx, the middle third of the face in addition to the vascular pedicle from deep temporal artery make the temporalis myofascial flap valuable for reconstruction. The operative time is short when compared with free-tissue transfer. Once the epithelialization of the temporalis flap is complete, the new mucosal surface covering the muscle is impossible to differentiate from surrounding mucosa. Cosmetic deficit in the donor site is acceptable as the hair can easily camouflage most of the temporal depression. Temporalis muscle flap can be considered as a primarily means of reconstruction of palatal and buccal defects. Use of this muscle flap does not impair the masticatory function of the patient.

References

Author Information

Sunil Yadav
Professor & Head, Department of Oral & Maxillofacial Surgery, PDM Dental College & Research Institute

Vikas Dhupar
Professor & Head, Department of Oral & Maxillofacial Surgery, Goa Dental College & Hospital

Anita Dhupar
Asst. Professor, Department of Oral Pathology, Goa Dental College & Hospital

Francis Akkara
Asst. Professor, Department of Oral & Maxillofacial Surgery, Goa Dental College & Hospital