Original article

Temporalis myofascial flap for head and neck reconstruction in Chiang Mai University Hospital

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Objective To determine the efficacy and long-term results of temporalis myofascial flap (TMF) reconstruction of head and neck defects.

Methods This is a retrospective review of 28 consecutive patients who had undergone head and neck surgery and reconstruction by TMF at Chiang Mai University Hospital over the period January 2005 through March 2010. Associated factors contributing to postoperative complications and long-term results were also studied.

Results A total of 28 patients were recruited with an average age at surgery of 55.25±11.63 years. Sixteen patients had nasal cavity and maxillary sinus cancer, 6 had oral cavity and oropharyngeal cancers, 3 had parotid cancer, 1 had cementifying fibroma, 1 had facial palsy, and 1 had osteoradionecrosis of the mandible. The complication rate was 17.9%. Two patients (7.1%) had total flap loss and one (3.6%) had partial flap loss. The minor complication rate was 10.7%. None of the patients had zygomatic bone exposed during the follow-up period and none experienced frontal branch palsies after flap elevation. There were no serious complications of the donor site.

Conclusion TMF is an effective technique for head and neck reconstruction with a low rate of complications. It provides a safe and well vascularized flap with less donor site morbidity and dysfunction and can be used to reconstruct many surgical defects of the mid-facial and adjacent area. TMF is an alternative to free flap reconstruction and can be used in combination with other flaps. **Chiang Mai Medical Journal 2018;57(1):21-26.**

Keywords: Temporalis myofascial flap, head and neck cancer

Introduction

Post maxillectomy defect reconstruction is quite challenging in terms of achieving both functional and aesthetic outcomes. Dental obturation is one effective option, while the use of local, regional, or free flaps can all result in good function and aesthetics. Although the obliterated maxillectomy cavity was thought to potentially delay the diagnosis of tumor recurrence.

One-stage reconstruction is preferable compare to multi-stage as it reduces post-operative time and allows for osseointegrated implants.

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A wide variety of other types of local flaps, pedicled flaps, and free-tissue transfers have also been employed for the reconstruction of combined defects of the oral cavity and pharynx.

Utilizing a temporalis myofascial flap (TMF) to reconstruct an orbital defect was first done by Golovine in 1898. TMF is a reliable, non-bulky, myofascial flap that has been used for closure of a variety of defects in the head and neck region (1-3). The mucosalized intraoral lining of TMF creates more natural looking than skin flaps.

Radial forearm fasciocutaneous free flaps give a satisfactory appearance, allow chewing similar to obturation but provide for better speech, comfort, convenience, and social interaction compared to flaps from other locations (4). Other donor sites, including the rectus abdominis (perforator flap), lateral arm, and serratus anterior muscle, have also been successfully used (5,6).

Complete palatal-alveolar-maxillary reconstruction is ideal for the patient's quality of life, and osteocutaneous free flaps seem to be the best option, but there is no generally accepted recommendation. Restoration of midfacial mastication defects and osseointegrated implants in cases of benign lesion is usually required for the permanent fixation of a dental prostheses (7). The most commonly used composite free tissue flaps for bone and soft-tissue palate and maxillary repair are the osteocutaneous radial forearm (OCRF), the fibula, the iliac crest, and the subscapular system of flaps. This study aimed to determine the effectiveness of and complications related to TMF for reconstruction of head and neck defects at Chiang Mai University Hospital.

Methods

Medical records of 28 patients who had undergone head and neck reconstruction by TMF at Chiang Mai University Hospital between January 2005 and March 2010 and who were followed up until 2015 were reviewed. This study was approved by Research Ethics Committee, Faculty of Medicine, Chiang Mai University before the project was initiated.

Assessment

Data were obtained on general patient information, operations, outcomes of TMF, and complications. Major complications were flap loss or permanent injury to the temporal branch of the facial nerve. Minor complications were infection, seroma, hematoma, temporary nerve palsy, hair loss, trismus and aesthetic donor site complications.

Surgical technique

The surgical technique for this procedure began with a hemi-coronal incision starting from the pre-auricular area and was carried out in a superior-inferior direction below the temporo-parietal fascia above the superficial musculoaponeurotic system. Care was be taken to avoid damaging the temporal and frontal branches of the facial nerve in the orbital-zygomatic region (Figure 1).

At the level of the zygomatic arch, a horizontal incision with subperiosteal dissection above the zygoma was made to mobilize the myofascial flap. Attention must be paid to the vascular pedicle of the flap, which ran into the medial surface of the muscle. During dissection, some bleeding could occur, usually from the pterygoid vessels and the emissary vein, requiring accurate cauterization. To cover the oral defect, the TMF was transposed into the oral cavity and fixed with the use of strong sutures (Figure 2).

Results

Of the 28 patients in the study, 17 were females and 11 were males. The average age at surgery was 55.3±11.6 years and the follow-

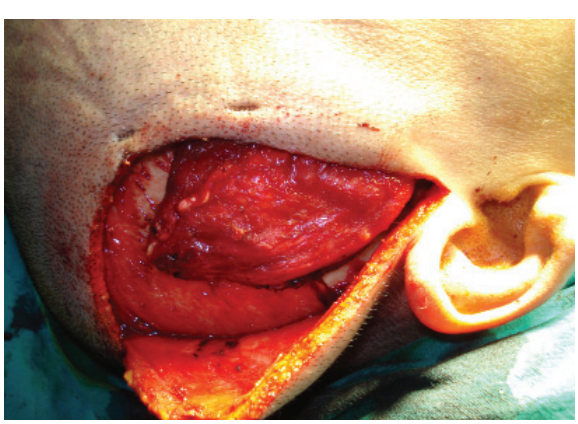

Figure 1. The flap was harvested with a hemi-coronal incision starting from the pre-auricular area and carried out in a supero-inferior direction below the temporo-parietal fascia above superficial musculo-aponeurotic system

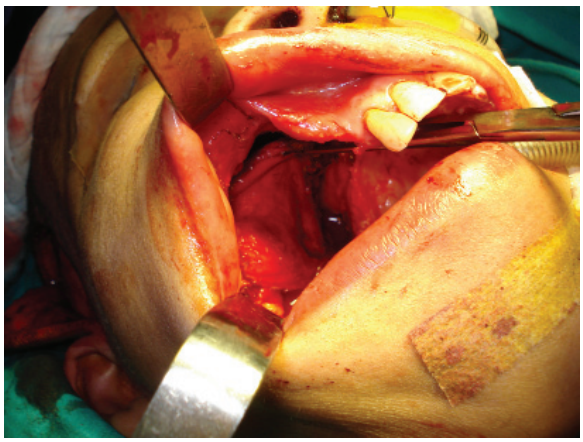

Figure 2. To cover the oral defect, the tempolaris myofascial flap was transposed into the oral cavity and fixed with the use of strong sutures

up period after surgery was at least 5 years. The most common diseases was nasal cavity and maxillary sinus cancer (16 patients), followed by oral cavity and oropharyngeal cancer (6), parotid cancer (3), cementifying fibroma (1), facial palsy (1), and osteoradionecrosis of the mandible (1). Three patients received preoperative radiation therapy while 25 patients received postoperative radiation therapy. Tumor characteristics, outcomes and complications are presented in Table 1. Table 2 lists the surgical sites of defects before surgery. For the maxillary region, surgical defects were grouped according to the Brown classification system as follows: Brown II - low; brown III - high; and Brown IV - radical maxillary defects (6). Post-operative complications, both acute and late phase, are described in Table 3. Overall, 5 of 28 TMF flaps had complications (17.86%). Three patients (10.71%) experienced minor acute complications at the recipient site such as hematoma, dehiscence wound, and partial flap loss. These required hematoma evacuation and wound repair, all with good outcomes. Two patients (7.14%) experienced major post-operative complications. One had flap necrosis and the other had total flap loss due to a high cut close to the pedicle of TMF. Both patients were treated with radial forearm micro-vascular free-flap reconstruction. One patient (3.57%) experienced partial flap loss. None of the patients were found to have zygomatic bone exposure during the follow-up period, and none experienced frontal

Table 1. Site of lesions, outcomes, and complications

Site of lesion	No. of patients	Outcomes		Complications	
		Survived (%)	Died (%)	Major (%)	Minor (%)
CA nasal cavity and maxillary sinus	16	15	1	1	2
CA oral cavity and oropharynx	6	6	0	0	0
Others lesions*	6	5	1	1	1
Total	28	26 (92.86%)	2 (7.14%)	2 (7.14%)	3 (10.71%)

CA, carcinoma

*Other lesions include CA parotid, cementifying fibroma, osteoradionecrosis, facial palsy

Table 2. Surgical site and type of defect before surg

Surgical site	Surgical defect	No. of cases
Maxilla	Low maxillary defect (Brown II)*	4
Maxilla	High maxillary defect (Brown III)*	6
Maxilla	Radical maxillary defect (Brown IV)*	7
Oral cavity/ oropharynx	Various surgical sized intraoral defects	6
Parotid	Parotid with skin involvement	3
Facial defect	Facial nerve palsy	1
Mandible	Post sequestrectomy	1

*Classification according to Brown *et al*.(6)

Table 3. Postoperative complications

Diseases (n)	Donor site	Recipient site	
		Acute complications	Late complications
Cementifying fibroma of mandible (1)	None	None	Total flap loss*
CA maxillary sinus (1)	None	Flap necrosis	Total flap loss
CA maxillary sinus (1)	None	Dehiscence wound (Palatal fistula)	Partial flap loss
CA maxillary sinus (1)	None	Dehiscence wound	None

CA: carcinoma

*Total loss due to high cut causing deep temporal artery injury

Table 4. Five year survival rate of patients with different cancer types

Type of cancer	No. of patients	Dead from cancer within 5 years	Dead from other causes within 5 years	Alive after 5 years	5 year survival rate (%)
Sinu-nasal	16	11	1	4	25
Parotid	3	2	-	1	33
Oral cavity -oropharynx	6	4	1	1	17

branch palsies after flap elevation. There were no complications at the donor site.

In our cases which using TMF, tolerated long term radiation well. The five-year survival rate for each of the different types of cancer are reported in Table 4. Non-cancer diseases are excluded.

Discussion

Speaking, chewing, swallowing, and supporting the eye are important functions to evaluate post-surgically after a maxillary defect correction. Obturation of maxillary defects has been used for a long time, but immediate reconstruction is preferable because: 1) it has psychological benefits for the patient; 2) it is possible to get an adequate view of the area with a nasal endoscope; and 3) curable recurrences are unusual so there is little rationale for avoiding reconstruction or waiting for secondary reconstruction; and 4) patients may find the necessary prosthetic device uncomfortable.

Microvascular free flap reconstruction is the most popular choice, but other options for reconstruction that may be used alone or in combination are needed. In patients with cardiovascular risks, the use of free flap may present a high risk of failure of the vascular anastomoses and some patients may not be able to tolerate a long surgical procedure.

TMF is a locally available, thin, and well-vascularized flap for restoration of large and complex oral cavities as well as for oropharyngeal, maxilla, hard palate, orbital floor, and parotid defects. TMF provides an efficient blood supply that enables flap rotation through an effective arc of 120-130º (8,9). Many studies have reported that the use of TMF for the reconstruction of maxillary defects after oncological procedures provides good results in speech, swallowing, and appearance (10-12). Palatal closure with TMF, although not ideal, but appropriate because patients can usually speak well and eat soft solids without dentures or a prosthesis.

Clauser *et al*. reported complications after TMF including partial flap loss (13.4%), temporal branch paresis (19.2%), and paralysis (2.7%) (13). In our experience, no injuries to the temporal or frontal branches of the facial nerve have been noted, and the incidence of partial flap loss we observed (3.57%) was lower than in the Clauser study (7.14%).

For aesthetic reasons, the TMF can be accessed by means of a scalp incision, leaving the incision camouflaged by hair-bearing skin and the preauricular crease. In our experience, we have not found the need for a split-thick-

ness skin graft to cover the intraoral surface. All flaps have been mucosalized within 14-21 days.

For reconstruction after repair of complex maxillectomy defects (6), the results of our study indicate that TMF should not be considered merely as an alternative to free flap reconstruction, but rather as the first choice for reconstruction in patients with severe comorbidities or a poor prognosis. Moreover, the aesthetic and functional results of TMF were good and free-tissue transfers were not warranted.

The viability of the flap permits very early post-operative radiotherapy, much earlier than with any other type of reconstruction, a potentially critical benefit in the case of cancer patients. Our study supports this, as post-operative radiotherapy was given to 24 out of 28 cases at a dose of 40-70 Gy, and only 1 partial flap loss occurred during radiation at 10 Gy. No other patients had complications related to flap viability. In our series, there was a regression in the size of the flap in about 4-6 weeks, after which it remained stable. The data presented indicate that TMF allows for reconstruction of the hard and soft palate with good recovery of swallowing and speech functions.

Prognosis of maxillary sinus cancer were still considered to be unsatisfactory, i.e., a five-year disease-specific survival rate of 30-50% (14). Most of the TMF patients in this study presented at advanced stage cancers for whom tumor control and survival rates of 25%.

Conclusions

TMF is a safe and reliable flap that can be used to reconstruct many surgical defects of the mid-facial skeleton. The duration of the reconstructive procedure is not excessively long and can be performed even in patients who cannot tolerate prolonged administration of anesthetics and in patients with a high risk of microvascular flap loss. TMF is most useful for reconstructing defects requiring a flexible, tailored muscle flap of moderate thickness. It can be used in combination with other flaps which involve less donor site deformity.

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การใช้กล้ามเนื้อเทมโพราลลิสในการแก้ไขจุดบกพร่องของศีรษะและใบหน้าในโรงพยาบาลมหาราชนครเชียงใหม่

รักษ์ ตนานุวัฒน์ และ ดนยรัตน์ เรือนมากแก้ว
ภาควิชาโสต นาสิก วิทยา คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

วัตถุประสงค์ เพื่อศึกษาถึงประสิทธิภาพของการใช้กล้ามเนื้อเทมโพราลิสในการซ่อมแซมจุดบกพร่องของใบหน้าหลังการผ่าตัด และศึกษาถึงอุบัติการณ์ของการเกิดภาวะแทรกซ้อน ในโรงพยาบาลมหาราชนครเชียงใหม่

วิธีการศึกษา การศึกษาเชิงพรรณนาแบบย้อนหลัง ในผู้ป่วยที่ได้รับการผ่าตัดและมีจุดบกพร่องที่ต้องซ่อมแซมโดยการใช้กล้ามเนื้อเทมโพราลิส โดย โสต ศอ นาสิกแพทย์ โรงพยาบาลมหาราชนครเชียงใหม่ ระหว่างเดือนมกราคม พ.ศ. 2547 ถึงมีนาคม พ.ศ. 2553 โดยศึกษาผลลัพธ์และภาวะแทรกซ้อนหลังการรักษา

ผลการศึกษา ผู้ป่วยจำนวน 28 ราย อายุเฉลี่ย 55.3±11.6 ปี โดยผู้ป่วย 16 ราย เป็นมะเร็งของช่องจมูกและไซนัส ผู้ป่วย 6 ราย เป็นมะเร็งช่องปาก ส่วนผู้ป่วยอีก 6 รายเป็นโรคอื่น ๆ ได้แก่ มะเร็งต่อมน้ำลายพาโรติด 3 ราย อัมพาตใบหน้าครึ่งซีก 1 ราย เนื้องอกของกระดูกขากรรไกรล่าง 1 ราย และกระดูกขากรรไกรล่างตายจากการฉายรังสี 1 ราย ผู้ป่วย 4 ราย ได้รับรังสีรักษาก่อนการผ่าตัด ผู้ป่วย 22 ราย ได้รับรังสีรักษาหลังการผ่าตัด ผู้ป่วย 2 ราย ไม่ต้องรักษาด้วยรังสีรักษา มีผู้ป่วย 5 ราย (ร้อยละ 17.7) ที่มีภาวะแทรกซ้อน โดยในจำนวนนี้ ผู้ป่วย 2 ราย (ร้อยละ 7.1) กล้ามเนื้อเทมโพราลิสสูญเสียทั้งหมด ผู้ป่วย 1 ราย (ร้อยละ 3.6) กล้ามเนื้อเทมโพราลิสสูญเสียบางส่วน ผู้ป่วย 2 ราย (ร้อยละ 10.7) เกิดภาวะแทรกซ้อนเล็กน้อย ไม่มีผู้ป่วยที่มีอัมพาตใบหน้าหลังการผ่าตัด

สรุปผลการศึกษา การใช้กล้ามเนื้อเทมโพราลิสมาซ่อมแซมจุดบกพร่องหลังการผ่าตัดทางหู คอ จมูก มีอุบัติการณ์ของภาวะแทรกซ้อนน้อย มีความปลอดภัย และมีเส้นเลือดที่มาเลี้ยงดี สามารถใช้แก้ไขได้หลากหลายของใบหน้าส่วนกลางและบริเวณใกล้เคียง จึงเป็นทางเลือกที่ดีอีกอย่างนอกเหนือจากการผ่าตัดย้ายเนื้อเยื่อจากที่อื่น และอาจใช้ร่วมกัน **เชียงใหม่เวชสาร 2561;57(1):21-26.**

คำสำคัญ: การย้ายเนื้อเยื่อกล้ามเนื้อเทมโพราลลิส มะเร็งที่ศรีษะและลำคอ