

Temporalis pull-through vs fascia lata augmentation in facial reanimation for facial paralysis

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S. M. Balaji

Director and Consultant Maxillofacial Surgeon, Balaji Dental and Craniofacial Hospital, Chennai, Tamil Nadu, India

Address for correspondence:

Dr. S. M. Balaji, Balaji Dental and Craniofacial Hospital, 30, KB Dasan Road, Teynampet, Chennai - 600 018, Tamil Nadu, India.
E-mail: smbalaji@gmail.com

ABSTRACT

Objectives: Surgical rehabilitation of facial palsy is challenging as each case is unique and success rate is often unpredictable. In one technique, temporalis is elevated from origin preserving vessels, and this elevation increases the length which is tunneled into buccal tissues (pull-through technique, Group A). In the other technique, a harvested fascia lata is attached to temporalis after a coronoidectomy release and the fascia lata is attached to the modiolus (Group B). The aim of this study is to compare the two different surgical techniques. **Materials and Methods:** Case records of 22 cases, 15 females, and 7 males who were operated between 2008 and 2012 for facial palsy with at least 1-year follow-up, using either of the techniques were assessed for pull of muscle, postoperative pain, recovery time, motor control, and symmetry at rest. Descriptive statistics are presented. **Results:** The Group A ($n = 7$) and Group B ($n = 15$) formed the study group. In the Group A, residual asymmetry ($n = 3$), poor postoperative muscle pull ($n = 2$) were noticed while in the modified group it was 2 and 3, respectively. The technique used in Group B had better pull of muscle, symmetry, faster recovery time, and better motor control at 1-year follow-up than the conventional technique. **Discussion and Conclusion:** The difference between the two groups is due to preservation of original muscular architecture, vascular channel supply. As the muscle is not traumatized, no fibrosis occurs aiding regaining of normal function. In addition, the facial reanimation is more successful in the Group B. The mechanism and success behind the technique used in Group B is discussed elaborately in terms of local regional anatomy and physiology

Keywords: Facial palsy, facial reanimation, fascia lata augmentation, temporalis pull-through

INTRODUCTION

Facial nerve paralysis, directly and indirectly, influences patient's quality-of-life, often in a negative way. The human face has been aptly described as "a focal point for expression and interpersonal communication."^[1] When the nerve paralysis occurs, depending on the extent of damage/involvement, the function of facial nerves' including but not limited to eye protection, speech articulation, chewing, and swallowing are affected. The therapeutics of facial nerve palsy depend on the identified underlying etiologies. There is an exhaustive list of etiology of facial nerve paralysis, each with a different clinical course. The classification, features, diagnosis, and management have been discussed elsewhere.^[1,2]

In unique situations, such as the Bell's palsy, a peripheral facial nerve deficit, where the entire or large proportion of facial nerves are paralyzed. The recovery from such disorder is relatively unpredictable and may take 6–8 months.^[2]

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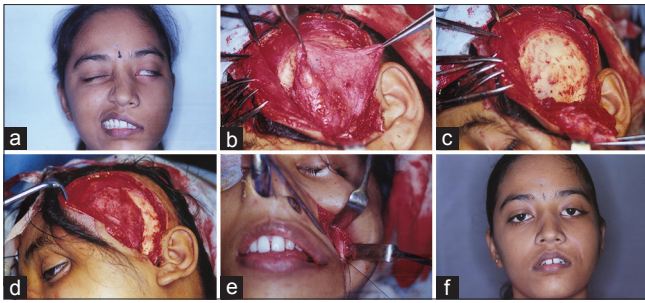


Figure 1: (a) Facial nerve palsy on the left side, (b) through preauricular approach, temporalis fascia elevated, (c) middle 1/3rd of temporalis muscle elevated. (d) After elevation of muscle, (e) through nasolabial incision, temporalis muscle sutured to orbicularis oris muscle, (f) postoperative view following 1 month

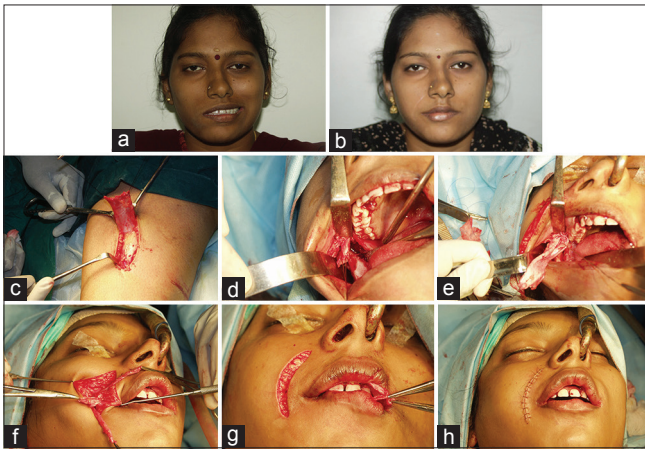


Figure 2: (a) Preoperative view showing facial palsy on the right side, (b) postoperative view. (c) Fascia lata obtained from the right dorsal surface of thigh region, (d) intraorally mucosal flap elevated in the right side and buccal mucosa, (e) fascia lata introduced intraorally through the mucosal pouch. (f) Nasolabial incision on fascia lata was released and sutured over the orbicularis muscle, (g) after fascial stabilization, symmetry achieved, and (h) immediately after suturing



Figure 3: Pre- and post-operative view

Residual deficits are more common and affect the function as well as cause esthetic concerns. Such deficits have posed rehabilitation challenge to maxillofacial surgeons and baffled otolaryngologists, neurologists, and plastic surgeons. The goal of such a therapy would be to achieve normality of the affected side along with the achievement of the functional symmetrical smile along with corneal protection (if eye is involved as in most cases).^[2] Nonsurgical measures including pharmacotherapeutics and electrotherapy have been of little use. Surgically, it is

reported that Sir Charles Balance, in 1895 attempted to repair the functional deficit and partially succeeded in restoring some facial muscle function. Several pioneers have advocated several surgical methods for rehabilitation since then. However, there was no single, uniform procedure, or an algorithm suggested as the cause and mechanism of the disease process was different to different cases. The latter part of the 20th century saw neural reconstructions such as accessory to facial nerve transfer and hypoglossal to facial nerve crossover along with other techniques for static correction with autologous muscle and fascia grafts.^[3,4] In 1934, Gillies proposed the concept of using the middle-third of the temporalis muscle, flipped over the zygomatic arch, to which he implanted a strip of the fascia lata.^[5] Later in 1949, McLaughlin described a procedure that used the entire muscle after sectioning the coronoid process through an intraoral approach, using a strip of the fascia lata too.^[6] Later, cross-facial nerve grafts were advocated by Scaramella and Smith in 1971 and were popularized by Anderl in 1973.^[7] Thompson added better result by utilizing the free-muscle transplantation to restore active facial movements.^[8] Though initially successful, as these transplants lacked adequate vascularity in the new position, muscle fibrosis set in and resulted in poor facial function on a long follow-up.^[1]

Following this complication, microvascular muscle grafts were tried out and been generally practiced now. Works of Tamai *et al.* in dogs and later by Chen Zhong Wei, China and Ikuta *et al.* from Japan reported on this procedure.^[9,10] Use of local muscle was successfully demonstrated by Harii *et al.*^[11] and subsequently refined by Terzis and Noah.^[12] These pioneering works led to single-stage reconstruction and later the regional muscle transfer technique, namely, lengthening temporalis myoplasty, with the definite advantages of being one-step, technically easier, and relatively fast. The success of the technique has been outlined by Labbé *et al.* with successful results.^[1]

There have been very few studies to compare the temporalis pull-through technique and the fascia lata augmentation in facial reanimation involving the commissure of the mouth. The purpose of this study was to compare the two different surgical techniques in facial reanimation and possibly explore relationship and outcomes.

MATERIALS AND METHODS

This is a retrospective study performed based on archival records of facial paralysis patients diagnosed only with lower motor neuron type of facial palsy patients. Only those patients who were operated on for oral commissure rehabilitation were focused. Only treatment-naïve cases, of either gender operated between January 1, 2008, and December 31, 2012, with at least 12 months follow-up were included in the study group. Patients with known systemic or other neurological or anatomical defect issues were excluded from the study. Similarly, those patients without adequate documentation and had prior surgery for the same issue were excluded from this study. All cases were operated on and reviewed by the author himself.

From records beside basic demographic records, the following were collected. The subjective assessment of (i) pull of

muscle, (ii) postoperative pain (on visual analog scale [VAS] at 5th postoperative day), (iii) motor control, and (iv) symmetry at rest.

Operative considerations

The rehabilitative treatment for a long-term facial paralysis patient needs to be customized. The surgeon needs to factor in the circumstances surrounding nerve dysfunction, etiology, and the severity/extent of the paralysis. Duration of paralysis is also a crucial factor, as any attempt after 24 months will have the degradation of the motor end plates rendering the reinnervation procedures futile.^[1] The surgical factors such as age, comorbidities, existing systemic illness, and anesthetic risk may complicate the healing. Similarly, poor oral hygiene may hinder intraoral incisions.

The operative procedure of temporalis pulls through technique (Group A)

The dynamic muscle transfer of temporalis is performed by transposing temporalis^[2] which was exclusively reserved for lower facial muscle correction. After preparation, an incision is made along the preauricular crease which is then extended into the superior temporal line, exposing the temporalis muscle, and fascia. An incision is made on the muscle down to the periosteum, elevating the muscle fibers. The middle one-third of the temporalis muscle is identified, elevated, and rotated on itself toward the corner of the mouth, and a large tunnel is made over the zygomatic arch.

Another incision is made just above the vermilion border at the oral commissure, along the nasolabial fold to expose the orbicularis muscle. The edge of the prepared temporalis muscle then is attached to the orbicularis muscle with a permanent 2-0 chromic suture and is pulled up superiorly and laterally in an overcorrected position. This method employed in the center was the modified version of the McLaughlin, Labbe, and Huault. For the ease of rotation and comfortable function without mechanical impingement and obstruction, a part of the coronoid process was removed, through which the dislodged fascia lata can be passed and then anchored to the facial musculature.

The coronoid process can be cut either through a transcutaneous approach or through an intraoral approach. If the elevated muscle is bulky, it is carefully trimmed; the edges bifurcated to suit anchorage of the muscle into the circumoral musculature. This modification facilitated excess tissue density in the region of the zygomatic arch, excessive temple depression, and renders a high degree of patient satisfaction.

The initial preauricular incision may be closed with 3-0 chromic sutures and staples, and the 2nd incision can be closed with 4-0 chromic sutures and running 6-0 nylon sutures. The dressing must ensure that the pull-up of the corner of the mouth is ensured until the graft is adequately taken up.

The operative procedure for the fascia lata augmentation for temporalis pull through technique (Group B)

In this procedure,^[2] the elevation of the temporalis muscles and its tendon remains the same. In addition, a fascia lata of the palmaris longus tendon is harvested using a tendon harvester

through appropriately placed incisions in the forearm from the wrist crease to 1.5 cm just above the area where the muscular belly of the palmaris longus starts. The full length of the tendon is harvested. Folded in a double-layered fashion and one end of the length is secured with the elevated temporalis muscle. The other end of the tendon is split into two, of which one is attached to the upper and the other to lower lip of the orbicularis oris muscle. The two splits of the tendon suspend the angle of the mouth with adequate tension to aid in restoration of function.

Appropriately, securing the tendon to the innervated circumoral musculature increases the balance of the mouth and reduces the risk of elongation of the affected (paralyzed) side. The skin is closed conventionally in two layers.

In either situation, the postoperative care remains the same. Appropriate antibiotic coverage, painkillers were prescribed. Strict aseptic conditions around the incisions were advised. For initial 3 days, liquid food was advised [Figures 1-3].

RESULTS

The study group had 12 males and 10 females. Of the 12 males, 3 were in Group A and the rest in Group B. Of the 10 females, 4 were in Group A and the remaining 6 were in Group B. The mean follow-up was 14.8 ± 2.6 months. The VAS differed between the groups. Group A had 6.2 ± 2.5 while Group B had 5.8 ± 1.6 . Sixteen (72.72%) of the group exhibited normal range of muscular control along the affected side commissure. Eighty percent of Group B ($n = 12$ of 15) and 57% of Group A (4 of 7) had near normal range of commissural movements. Residual asymmetry was found in follow-up with 3 of 7 Group A and 2 of 15 in Group B patients. Poor muscle pull at the last follow-up was seen in 5 patients (22.72%), of which 2 (28.57%) were in Group A and 3 (20%) were seen in Group B [Table 1].

DISCUSSION

The incidence of facial paralysis varies from population to population and has been reported to be in the range of 13–34 and even up to 70 per 100,000 population.^[13] Till date, to the best of my knowledge, there is no estimate of the incidence or prevalence of facial palsy and the extent of residual defect in the Indian population. The correction of the residual defect caused

Table 1: Outcomes of the facial reanimation among the study group

	Group A	Group B	Total
Sample size (n)	7	15	22
Gender			
Males	3	9	12
Females	4	6	10
Mean length of postoperative period (months)	16.84	13.51.8	14.82.6
Postoperative pain on VAS at 5 th day (on scale of 10; 0 - no pain/10 - pain)	6.22.5	5.81.6	6.11.78
Poor muscle pull (%)	2 (28.57)	3 (20)	5 (22.72)
Normal range of motor control (%)	4 (57.15)	12 (80)	16 (72.72)
Residual asymmetry at rest (%)	3 (42.85)	2 (13.33)	5 (41.67)

VAS=Visual analog scale

by Bell's palsy, especially in the lower third of the face is needed to bring about coordinated physiological function of the corner of the mouth as well as to prevent drooling of saliva and regain the symmetrical smile.

The correction of such a residual defect is largely dependent on the host factors – the etiopathogenesis of the defect, extent of the residual defect, the age of the patient, preexisting systemic disorders, expectations regarding the outcome of the surgery, the time-lapse since the palsy besides other factors. There is no single algorithm developed or proposed till date to approach a residual defect of the affected side's commissure of mouth.^[1]

Several types of surgical approaches have been evolved as detailed earlier. The standard of care today involves the use of the temporalis muscle as a part of the tissue transfer is the gold standard for dynamic reanimation. Here, a modified approach involves the attachment of a fascia lata to the reflected temporalis and suturing this to the orbicularis oris. This technique is suggested to have best long-term results. There are very few studies to compare the outcome from this part of the world.^[14-17] The present study was undertaken to address the lacunae.

Temporalis muscle is suggested to be best local tissue transfer material for long-standing facial palsy (≥ 2 years). From the result, it is observed that the pull-through technique alone causes more pain than the Group B. Similarly, on a follow-up of > 12 months, 80% of Group B ($n = 12$ of 15) and 57% of Group A (4 of 7) had near normal range of commissural movements. Residual commissural asymmetry was found in follow-up with 3 of 7 Group A and 2 of 15 in Group B patients. Poor muscle pull at the last follow-up was seen in 5 patients (22.72%), of which 2 (28.57%) were in Group A, and 3 (20%) were seen in Group B. This difference probably could be explained by the effect of the chronic stretch that the temporalis muscle is made to undergo in this type of facial reanimation. The use of the temporalis in the temporalis pulls through technique (Group A) possibly causes a chronic, slow damage to muscle fibers by virtue of the chronic stretch, repeated damage to microvasculature, and subsequent healing process that leads to healing by fibrosis of this skeletal muscle. Such a damage cause partial loss of function thereby compromising the goal of the lower third facial reanimation surgery.^[18] The progressive fibrosis cause increased collagen content, increased myofibroblast numbers, increased inflammatory cells, and leading to progressive stiffness.^[18] These cumulatively causes myofibrillar disorganization leading to decrease of muscle fiber size.^[18] Reduction of the muscle size causes further stretching (of the transferred graft) leading to another vicious cycle of the phenomenon. The above factor needs to be accounted while performing conservative approach for oral commissural reanimation.

The present study and literature support from existing literature supports that the tissue transfer for facial reanimation with fascia lata augmentation for temporalis pulls through technique provides more long-lasting results than the procedure done with the muscle alone.

Larger, prospective studies are indicated to better define associations between the two types of surgery parameters and outcomes. The quality-of-life changes following each type of the surgery to determine whether associations between quality-of-life and objective measurements exist need to be performed before an algorithm for oral commissural reanimation surgery in cases affected with facial palsy.

CONCLUSION

A single-centers' comparative experience of temporalis pulls through technique and the fascia lata augmentation in facial reanimation in the facial reanimation involving the commissure of the mouth has been presented. Owing to the chronic, progressive damage to the temporalis, imparted by the stretch, the goal of the surgery is often compromised. More research is needed in this direction to address this factor.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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