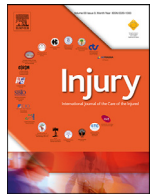




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# A modified temporalis transfer technique for facial paralysis in elderly patients<sup>☆</sup>

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## ABSTRACT

**Introduction:** In patients with chronic facial palsy where the treatment by conservative means or only nerve grafting is no longer an option, reconstruction by dynamic procedures such as pedicled and/or free muscle transfer is required.

**Patients and methods:** Five patients with chronic facial palsy were treated by temporalis muscle transfer to the eye and mouth simultaneously. In four of them, the combined Gillies-McLaughlin technique was used, but for the fifth one, a modified technique was applied.

**Results:** In all patients, immediate and late postoperative clinical outcomes were satisfactory and improved their everyday quality of life.

**Discussion:** Depending on the duration of the disease, there are different techniques that can be used. For the chronic facial palsy in elderly patients, the muscle transfer has better results, and a self-developed algorithm gives us the opportunity to choose the best possible treatment for each one of our patients. The modified technique was found to be better with less surgical time, and recovery period for the patients.

**Conclusion:** All the patients were satisfied with the results. For the fifth patient that the modified technique applied, the healing process was faster, and the aesthetic and functional reanimation achieved easiest, with no donor-site morbidity, comparatively with the rest patients where the standard Gillies-McLaughlin technique was used.

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## Introduction

The facial nerve provides conscious and subconscious motor control of the facial muscles but also enables the protection of the eye, the airflow through the nasal cavity, the oral continence, and the bilabial speech articulation. Also, it provides us the ability to smile. The injury of the facial nerve may inflict functional and aesthetic malfunctions (Table 1), which eventually can lead to psychosocial handicaps. Patients with facial nerve paralysis may be treated as "different", suffering social and workplace discrimination [1]. This results in social isolation, decreased self-esteem, and negative self-image [2]. As it appears from the literature, there is a high frequency of depression in patients with facial palsy [3]. Also,

as with any deformation, the severity of psychosocial disturbance does not necessarily associate with the degree of injury. Furthermore, psychological stress rather than functional deficits are often the key determinant in predicting social disadvantage and the need for surgery [4].

Whenever possible, surgeons should immediately repair facial nerve injuries to restore neuronal continuity from the central segment to the peripheral branches of the facial nerve. Such repairs may involve direct microsurgical nerve reconstruction or even nerve grafts. If these techniques are not possible, then other options may be taken in consideration. Herein, we quote a series of five patients where the dynamic reanimation technique was used to achieve among others facial symmetry re-establishment and mimetic movement. The temporalis muscle transfer represents an example of the dynamic reanimation techniques, and it is the muscle that mainly is used.

In Europe, the first description of using the temporalis fascia for reanimation of facial paralysis was in the early 1900s [5]. Gillies

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**Table 1**  
House-Brackmann score.

Grade description	Characteristics
I	Normal
II	Slight – mild weakness
III	Moderate – facial asymmetry and weakness but eye closes
IV	Moderately severe – total facial asymmetry and weakness with incomplete closure of the eye
V	Severe – barely detectable movement
VI	Total – no facial function

**Table 2**  
Methods and patients.

Patient	Sex	Age	Diagnosis	Duration paralysis	Technique
T E	F	75	Bacterial tooth infection	> 2 years	Gilles-McLaughlin
I F N	M	65	Herpes zoster	> 2 years	Gilles-McLaughlin
V L	F	72	Parotid gland Ca	> 2 years	Gilles-McLaughlin
N D	M	74	Bell's palsy	> 2 years	Gilles-McLaughlin
S E	F	69	Acute otitis media	> 2 years	Gilles-McLaughlin modified

described the elevation of the temporalis muscle and transposition over the zygomatic arch in 1934. Freeman [6,7] and Anderson [8], described later techniques for the extension of the temporalis muscle to facilitate its insertion into the nasolabial fold and lips. Reuben [9] is the one who described the method using the entire temporalis muscle, and Connelly and Baker [10] techniques that allow us to lengthen the transferred muscle by using the pericranium of the temporal fossa.

McLaughlin [11] suggested in 1952 the mobilization of the coronoid process of the mandible with temporalis muscle attached to fascial slings to insert into the nasolabial crease and perioral musculature. He utilized an intraoral approach to the coronoid process. Breidahl et al [12] modified McLaughlin's technique by an external approach. A modified method of McLaughlin's surgery was presented in 1997 [13], and described with a pre-auricular approach to the coronoid, facilitated by osteotomy and re-plating of the zygomatic arch.

In this article, the muscle transfer technique for facial palsy reanimation is presented, alongside with our lately modified technique (Seung-Ha Park, Prisca Hwang, Siok Baek, Byung-Il Lee. New facial reanimation method via intraoral temporalis transfer for facial nerve palsy. Personal communication at the 29<sup>th</sup> EURAPS annual meeting in Madrid, Spain, May 17-19, 2018.), as well as our algorithm used to select the most appropriate treatment for our elderly patients.

## Patients and methods

Five patients underwent temporalis muscle transfer from March 2017 to July 2019. All patients were elderly, and the palsy existed over two years. In all patients, the technique chosen was the combination of Gilles-McLaughlin's temporal muscle transfer. In four of them, the standard technique applied, but in the last one, a modified technique was used. Table 2 list the age, gender, diagnosis, duration of facial palsy, and the technique used in each patient.

Under naso-endotracheal intubation, a modified facelift incision was made, exposing the temporalis muscle and fascia. For the functional and aesthetic (symmetry) restoration of the mouth, an incision was made at the oral commissure, along the nasolabial fold, to expose the orbicularis muscle. At this point, the coronoid process was osteotomized. The bone section of the coronoid process was now free from the rest of the mandible, and above it, a hole was made in the tendon's insertion. A tunnel was created in a subcutaneous way from the mobilized coronoid process to the central perioral incision. The complex of the coronoid process with

the tendon of the temporalis was stretched to the modiolum at the perioral region.

At the donor-site an S-shaped incision made on the lateral thigh and exposed fascia lata was harvested. A fascial lata strip placed through the hole, created previously above the coronoid process. Both legs of the strip were first secured together at the modiolum, and then the one end was attached to the upper and the other to the lower lip, intramuscularly at the vermilion level.

This technique was used in four out of five patients. For the fifth and last patient of our series, a modified technique for the reanimation of the mouth was used. In this case, the patient underwent an osteotomy of the coronoid process and its direct fixation to the modiolum, without harvesting fascia lata and dissecting the orbicularis oris muscle for the tendon's fixation in the upper and lower lip (Fig. 1).

For the eye restoration, a central section of the muscle was identified. For the eyelid functional restoration, a muscle strip of about 1-2 cm width, and 5 cm length was elevated and rotated towards the lateral canthus. The fascia of the temporalis was detached, and at the free end of the raised musclestrip, a durable seam was made to strengthen the connection between the muscle and the fascia. Then, the fascia was split into two thinner strips, of which one passed through the upper eyelid and the other through the lower (Fig. 2), and were firmly secured to the medial canthus.

## Results

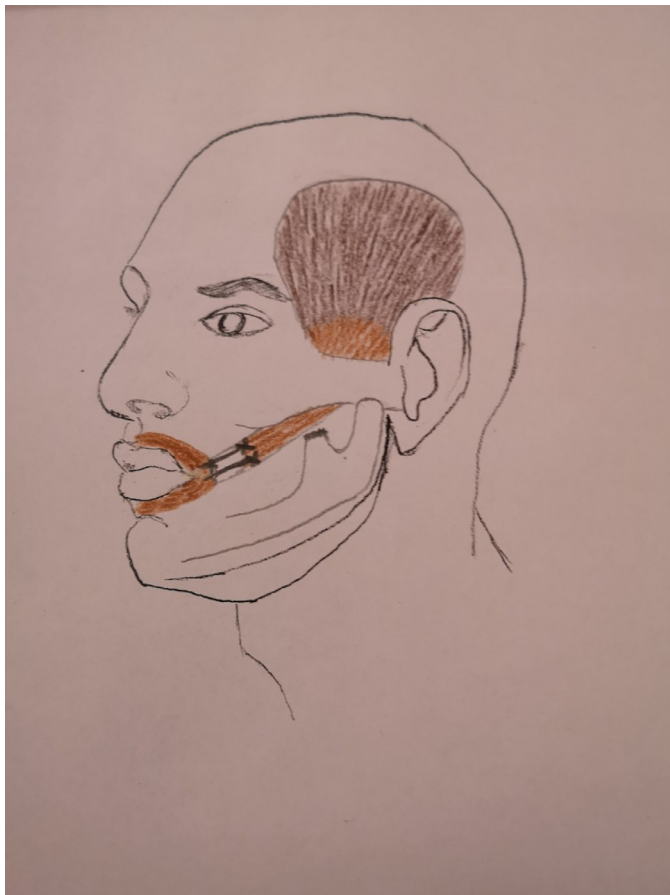
The immediate and late postoperative outcome was considered completely satisfactory for both surgeons and patients (Fig. 3). The quality of life of patients was significantly increased, and they returned to their daily activities. Each patient was assessed postoperatively for symmetry at rest, correction of flaccidity, voluntary movement, smile symmetry, spontaneous movement, and oral continence, as suggested by Breidahl [14], but also for the closure of the eyelid. The results (Table 3) of the two techniques were similar, but as it turned out in the fifth patient that underwent surgery with the modified technique, both aesthetic and functional results were slightly better in less, both operative and post-operative, time. The surgical time, as the recovery period, were shorter than with the patients where standard Gillies-McLaughlin's technique was used.

Surgery's duration for the 4 patients that underwent the standard Gillies-McLaughlin technique was 3:45 – 4:25 hours with an average time of 3:55 hours, while for the patient that the modified technique was used the duration of the surgery was 2:55 hours. Also, the postoperative hospitalization of the first group of patients

**Table 3**  
Postoperative results.

Patient	Symmetry at rest	Flaccidity	Voluntary movement	Smile symmetry	Oral continence	Closure of the eyelid
T E	2	2	1	2	2	2
I F N	2	2	1	1	2	3
V L	3	1	2	2	1	3
N D	2	2	1	2	3	2
S E	3	3	2	2	3	3

Degree of improvement: 0: none  
1: minor  
2: moderate  
3: major

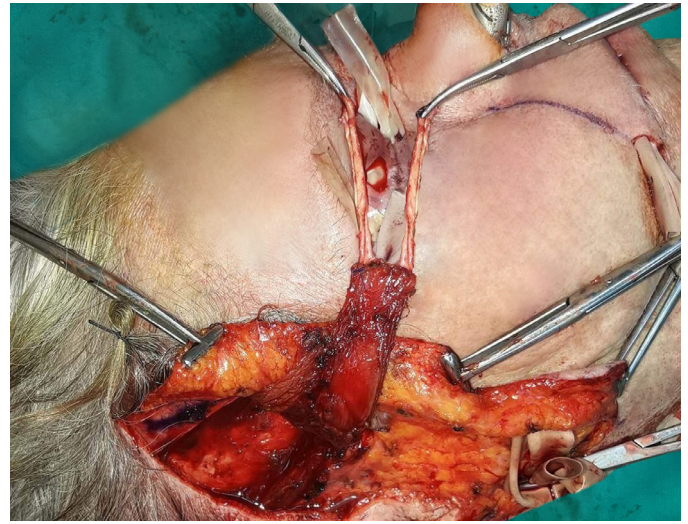


**Fig. 1.** Schematic representation of the modified McLaughlin's technique.

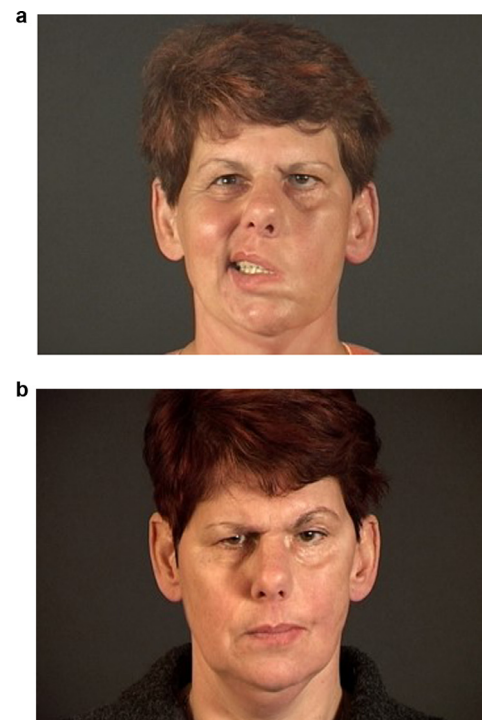
was 6 to 9 days (average 7.3 days), while the patient with the new technique hospitalized after the surgery for 3 days. In three patients, that the standard technique applied, underwent 2 times to revision surgery. For the fourth patient of this group, a revision surgery needed one time. In all four of them small interventions were performed to achieve the optimal result. For the patient with the modified technique a revision surgery needed were the corner of the mouth restored and the eyebrow raised.

## Discussion

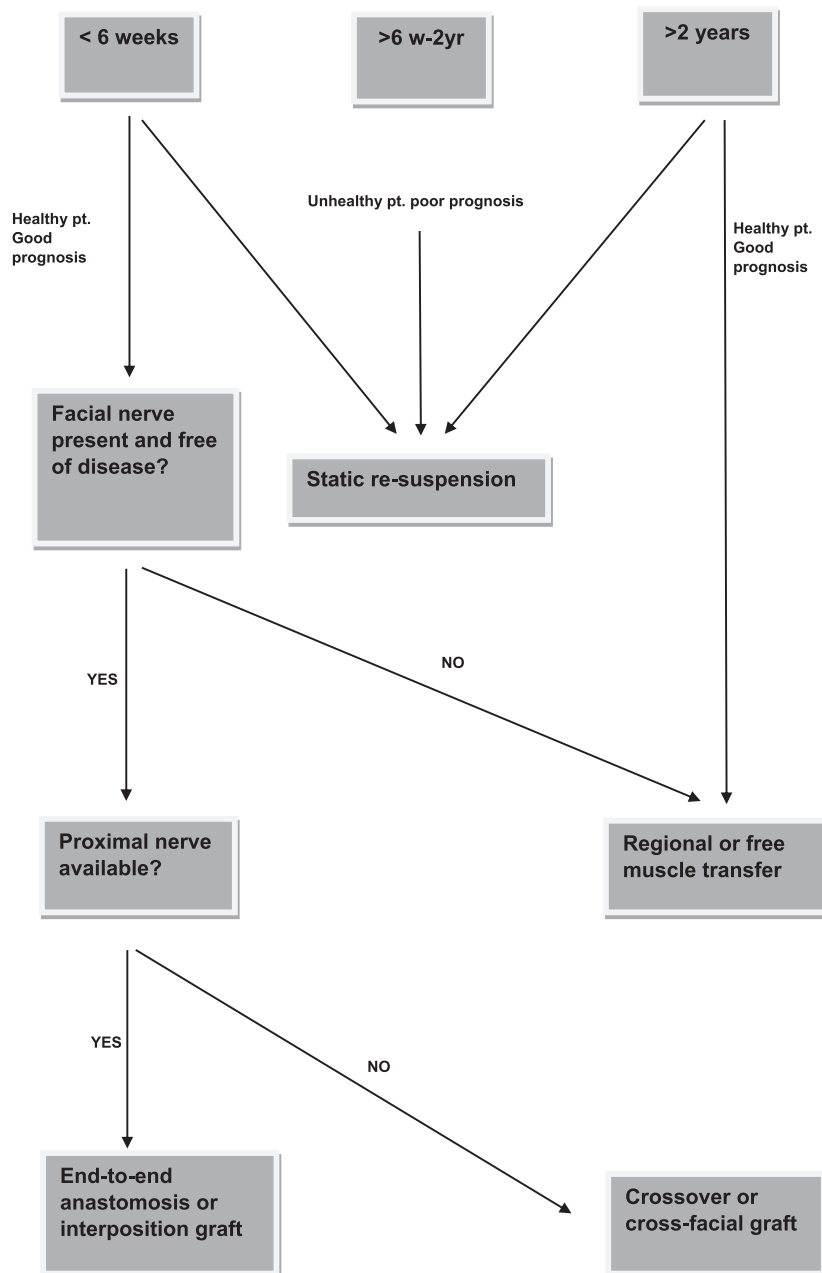
Facial palsy management is associated with pharmacologic therapy, physical treatment, and surgical procedures, such as dynamic and static techniques [15], depending of the time of paralysis injury (Table 4). In the facial palsy treatment, the early administration of a combination of corticosteroids with an antiviral agent



**Fig. 2.** The elevation of the temporalis muscle and splitting of the fascia into two strips, with one strip passed through the upper and lower eyelid, which are then firmly secured to the medial canthus.



**Fig. 3.** (a) The pre-operative clinical image; 3(b).The post-operative outcome.



**Fig. 4.** Proposed algorithm for the best treatment of our elderly patient.

**Table 4**

Surgical treatment (depending on time of injury).

Acute facial paralysis (<6 weeks)	Intermediate-duration facial paralysis (6 weeks–2years)	Chronic facial paralysis (>2 years)
Facial nerve decompression i. Transmastoid ii. Middle-fossa iii. Translabyrinthine Facial nerve repair i. Primary ii. Cable graft	Cross-face nerve grafting  Nerve transfers i. Hypoglossal ii. Masseteric iii. Spinal accessory	Regional muscle transfers i. Temporalis ii. Masseter iii. Digastric Free muscle transfer i. Gracilis ii. Serratus anterior iii. Latissimus dorsi iv. Pectoralis minor



such as valacyclovir is beneficial to the patients [16], in case the paralysis was due to virus or bacterial infections.

For the surgical treatment different factors have to be considered: patient's age, general condition, medical history, nerve injury's location, and of course patient's expectations and risk tolerance. Consequently an individual surgical approach is indicated for each patient separately. Especially for the elderly patients, the treatment is selected based on the algorithm that our team has developed lately (Fig. 4).

In case of an acute facial palsy (<6 weeks), the procedure may include the direct nerve suture/coaptation where possible, or decompression of the facial nerve: transmastoid, middle fossa, or translabyrinthine [17]. Alternatively, grafts from the great auricular nerve, sural nerve, and the medial as well as the lateral antibrachial cutaneous nerve when needed [18], or the static muscles procedures can be used.

When the paralysis is of intermediate duration (6 weeks–2 years), the surgical procedures include the static techniques for the reanimation, or nerve transfers and cross facial nerve grafting, which can be performed if the contralateral facial nerve is functional and undamaged. Procedures of nerve transposition are performed with the use of donor nerves such as hypoglossal, which is the most common, the masseteric branch of the trigeminal nerve, spinal accessory, and motor branches of the cervical plexus [19].

Usually, when the paresis of the facial nerve lasts more than two years, the facial muscles present atrophy. Therefore, for the successful facial reanimation, the use of alternative muscles is necessary. There are different techniques to achieve this, including regional and free muscle transfer. The most common regional muscle transfer is the temporalis muscle. Other muscles that are used are the digastric and the masseter. The gracilis, serratus anterior, pectoralis minor, and latissimus dorsi are used in free muscle transfer [15,20]. Also, as in the previous cases, the static procedures can be used as treatment.

This study shows a new modified technique for reanimation of the facial palsy in elderly patients, using the temporalis muscle and the coronoid process without using the fascia lata, and our lately developed algorithm for the better treatment for these patients. The advantages of this new method are numerous: By not harvesting the fascia lata from the lateral thigh we reduced the surgical time and therefore the stress of the patient. The faster surgery directly transform the procedure to an easier one, in which one team of surgeons can handle it, and accordingly there is no need of two-team surgery. Also, there is no donor-site and this lead to faster recovery of the patients, also because of the lesser intra-operative burden for them, and subsequently faster integration back to the society. Patients gain confidence more quickly and can return to their daily activities sooner. Last but not least, the results with the modified technique are long lasting with less possible complications than the standard Gillies-McLaughlin technique [21].

## Conclusion

Surgeons have a variety of surgical treatments for the management of the patients with facial palsy, and depending on the duration of the paralysis, there is a corresponding therapeutic approach indicated. In the acute phase of the facial paralysis, the facial nerve repair or the nerve decompression is usually the right treatment. For the intermediate duration facial palsy, the nerve transfer procedures have the best results, and in the chronic facial palsy the regional or free muscle flap transfer is the ideal therapeutic approach. The physiotherapy is a conventional method for facial palsy

restoration in the acute phase but also as an additional therapy after surgical treatment. Also, the static techniques of facial reanimation can be used to acute, intermediate or chronic facial paralysis as adjuncts to the overall management surgery. However, the evaluation of the patients must undergo in well-organized specialized center that has experience in such cases and can offer all possible surgical treatments to the patients. Treatment results are satisfactory with significant improvement of patient's every day quality of life, but it seems that with the modified technique, the patients get faster healing as it is less invasive (no fascia lata harvesting), and more immediate aesthetic and functional results, are achieved. Although the results are outstanding, further research is still needed to improve the existing techniques or to discover new ones.

## Declaration of Competing Interest

None.

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