Minimally Invasive Temporalis Tendon Transfer for the Treatment of Longstanding Facial Paralysis

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Facial paralysis is a devastating condition with a severe emotional impact on patients as it significantly affects appearance and impairs function. Patients complain of not being able to hold food and liquid in their mouth, not being able to speak clearly, and not being able to smile. The inability to smile is often psychologically troubling to patients. This presents a challenging problem for reconstructive surgeons as no single technique can be used to correct this ailment. Rather, a comprehensive plan tailored to the patient and utilizing a variety of procedures must be employed. In cases of paralysis of a short duration (< 1 year), direct reinnervation techniques provide the best result. However, in cases where long-standing facial paralysis is present, this is no longer possible as muscle atrophy and nerve end plate fibrosis would have occurred.2 Options in these cases are limited to either regional muscle transfer3, in which an adjacent muscle is simply transposed to provide movement, or free tissue transfers, in which a distant muscle is completely removed, transposed, and reinnervated.

The temporalis muscle (Figure 1) is an excellent candidate for regional muscle transfer as it is innervated by the mandibular nerve (CN V3), a branch of the trigeminal nerve (CN V), and is often unaffected in cases of facial nerve (CN VII) paralysis. Detaching the temporalis tendon and fixing it to the oral commissure allows for effective dynamic facial reanimation.12 The case report presented herein describes a novel technique that provides immediate return to function with a high success rate and a predictable outcome: the minimally invasive temporalis tendon transposition (MIT3).

Figure 1. The temporalis is a fan shaped muscle originating in the temporal fossa and inserting onto the coronoid process of the ramus of the mandible, which is located just underneath the zygomatic arch.

Case Presentation

The patient is a 64-year-old woman who underwent surgery for excision of an acoustic neuroma, a benign intracranial tumor, two years ago that resulted in complete right facial paralysis due to involvement of the facial nerve. She has not demonstrated any return to function over time. She had previously undergone a gold weight implant into the upper eyelid to help
with incomplete eye closure, thereby preventing damage due to drying. She is now interested in improving her appearance and wishes to have her ability to smile restored.

The patient’s physical exam reveals a complete right facial paralysis. Eyelid dropping was observed bilaterally. On the paralyzed side, upper eyelid closure was favorable due to the presence of a gold weight implant. Due to lack of innervation on the paralyzed this, this caused muscle atrophy, resulting in facial wasting with a skeletonized appearance to her midface. As a result of paralysis, there was also nasal obstruction with a septal deviation to the right side causing intranasal valve collapse and therefore compromised breathing.

Multiple options for facial reanimation and rejuvenation were discussed with the patient. In order to help improve symmetry and allow for a dynamic smile, the patient chose to undergo the MIT3 procedure, a technique that will be discussed. It was decided that an extension of acellular dermis, a human allograft from which living cells have been removed, would be tunneled into the lips in conjunction with the tendon transposition in an effort to pull the deviated center of the lip back to the midline (Figure 2). Concurrently, the patient decided to undergo septoplasty, repair of nasal valve stenosis, bilateral endoscopic brow lift, autologous fat transfer to the right side of the face, and a bilateral face-lift. These concurrent procedures were all performed in the standard fashion and will not be discussed.

Prior to surgery, the patient was asked to smile and the height of the smile on the unparalyzed side was marked. This was used as a guide for the degree of correction required on the paralyzed side. In the operating room general endotracheal

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**Figure 2.** The detached temporalis tendon is attached to the musculature of the oral commissure as well as to two strips of acellular dermis, which are tunneled into the lips just pass the midline. This is done to pull the deviated lip to a more symmetrical position in the midline.

**Figure 3.** The nasolabial fold runs from the side of the nose to the corner of the mouth, separating the cheek from the skin of the upper lip.
anesthesia was introduced. On the paralyzed side, a 2-cm incision was made in the nasolabial fold (Figure 3). Dissection was then performed bluntly to the ramus of the mandible, after which the temporalis muscle tendon was identified. An elevator was used to dissect the tendon off of its medial and lateral attachments to the ramus of the mandible. Afterwards, a sagittal saw was used at an angle to transect the coronoid process in an attempt to preserve as much tendon as possible. At this time a strip of acellular dermis was tunneled into both the upper and lower red lip just past the midline. The acellular dermis was then secured to the deep musculature just past the midline. The acellular dermis was next tightened laterally and attached to the oral commissure. The detached temporalis tendon was secured in multiple areas along the nasolabial fold, oral commissure, and acellular dermis. The incision was closed in the standard fashion. Following the temporalis tendon transposition, attention was turned to the concurrent procedures, all of which were performed in the routine manner.

![Figure 4](image)

**Figure 4.** Pre-operatively (A) the patient shows depression of the oral commissure on the paralyzed side and significant asymmetry. Post-operatively (B) the patient regains a large degree of symmetry and is able to achieve a smile. The scar is essentially unnoticeable and hidden well in the nasolabial fold.

One week postoperatively, the patient had no complications related to the MIT3 procedure. The degree of her external swelling appeared appropriate. Oral commissure elevation with temporalis contraction was quite obvious and demonstrated an excellent outcome (Figure 4). She was instructed on exercises to practice in front of a mirror in order to be able to achieve a natural smile using the temporalis muscle.

**Discussion**

For cases of longstanding paralysis, there is a consensus in literature that free tissue transfers provide optimal results. This is unquestionable as it allows patients to achieve both a spontaneous and symmetric smile. However, there are limitations to this procedure: free tissue transfers require multiple procedures and a waiting period of at least eight months before reinnervation occurs and function is restored. Additionally, they provide unpredictable outcomes, have a high revision rate, introduce additionally asymmetry to the face by transposing the muscle, and have a significant probability of the procedure failing. Older patients and those who desire an immediate return to function find both the uncertainty and time aspects as distinct disadvantages.\(^1\) In contrast, the MIT3 procedure can be performed in a single operation, offers immediate return to function, provides excellent symmetry upon smiling, has a predictable outcome, and is nearly always successful.

Previous attempts at using the temporalis muscle in facial reanimation included using a temporalis sling, in which a portion of the origin of the muscle was folded down over itself, passing over the zygomatic arch, in order to reach the oral commissure. This technique had several disadvantages: the presence of the muscle over the zygomatic arch resulted in additional bulk and asymmetry, the
contraction of the muscle was not as strong since only a portion of it was being used, the vector of contraction was not symmetric with the opposite side, and the surgical approach required an incision both at the nasolabial fold and in the temporal region. Our approach, the MIT3 technique, is superior and simpler to perform as it can be performed through the nasolabial fold alone. By transferring the entire temporalis tendon, it avoids the problem of decreased contraction and unnecessary bulk and asymmetry over the zygomatic arch.

Many patients are reluctant to have an incision placed on the face due to the resulting scar, just as this procedure produces at the nasolabial fold. However, in the senior author’s experience, patients do not complain about this scar postoperatively as it heals extremely well as a thin, fine line. Additionally, because the scar is located within the nasolabial fold this aids in its concealment, making it very difficult to notice.

Due to overcorrection in the elevation of the oral commissure, the MIT3 procedure inevitably creates some asymmetry at rest. This paradox is often observed in many facial reanimation procedures, where the attempt to return symmetry and function is achieved at the cost of asymmetry elsewhere. However, in the senior author’s experience, patients prefer a slight degree of overcorrection at rest as this results in a permanent, slight smile as opposed to the permanent frown that they had previously. Since the goal of this procedure is ultimately to restore the ability to smile, patients find this a reasonable tradeoff.

In cases of longstanding facial paralysis where direct reinnervation of the facial musculature is not possible, the MIT3 procedure is a safe, simple, and predictable procedure which offers immediate return to function. It offers distinct advantages over both the classic temporalis transfer technique and free tissue transfers. The barely noticeable scar combined with the excellent cosmetic and functional results that it provides make it an appealing option to many patients.

References


