Free Tissue Transfer for the Treatment of Facial Paralysis

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ABSTRACT

Long-standing facial paralysis requires the introduction of viable, innervated dynamic muscle to restore facial movement. The options include regional muscle transfer and microvascular free tissue transfer. There are advantages and disadvantages of each. Briefly, the regional muscle transfer procedures are reliable and provide immediate return of movement. However, the movement is not of a spontaneous mimetic nature. Free tissue transfer, in contrast, offers the possibility of synchronous, mimetic movement. It does, however, require a prolonged healing time in comparison with that of regional muscle transfer. The choice is made by physician and patient together, taking into account their preferences and biases. Muscle-alone free tissue transfer is our preferred option for reanimation of uncomplicated facial paralysis without skin or soft tissue deficits. Combined muscle and other tissue (most are skin flap) is another preferred option for more challenging complex facial paralysis with skin or soft tissue deficits after tumor excision. Gracilis flap is the author's first choice of muscle transplantation for both reconstructions. From 1986 to 2006, gracilis functioning free muscle transplantation (FFMT) was performed at Chang Gung Memorial Hospital for facial reanimation in 249 cases of facial paralysis. The main etiology is postoperative complication and Bell's palsy. The innervating nerve comes mostly from contralateral facial nerve branches, few from ipsilateral facial nerve due to tumor ablation, and from ipsilateral motor branch to masseter or spinal accessory nerve due to Möbius syndrome. We have evolutionally used a short nerve graft (10 to 15 cm) to cross the face in the first stage; after a 6- to 9-month waiting period, gracilis FFMT was performed for the second stage of the reconstruction. The technique of evolution has shown encouraging results to achieve the goal of rapid restoration and fewer scars on the donor leg.

KEYWORDS: Facial paralysis, gracilis

The goal of treatment for facial palsy is to achieve symmetric face at rest and synchronous movement, particularly with smiling.[1–3] Several procedures to restore facial functions have been advocated in the past, including local frontalis muscle transfer (for forehead wrinkling), temporalis muscle transfer (for eye closure or smiling), masseter muscle transfer (for smiling) or digastric muscle transfer (for lower lip pull-down), vascularized or nonvascularized muscle graft in the lower eyelid or gold weight in the upper eyelid (for lagophthalmos), and lower lip depressor muscles myectomy (for lower lip asymmetry).[4,5] With microsurgery, ipsilateral hypoglossal nerve, ipsilateral spinal accessory nerve, ipsilateral branches to masseter muscle, or contralateral facial nerve branch crossover nerve reconstructions have been reported. With advanced microsurgery, func-

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tioning free muscle transplantation (FFMT) is now becoming the first choice of many surgeons for long-standing facial paralysis.[6–14]

Many FFMTs have been reported for facial reanimation, including gracilis, pectoralis minor, latissimus dorsi, serratus anterior, rectus femoris, rectus abdominis, extensor digitorum brevis of the foot, abductor hallucis brevis, and external oblique or internal oblique muscle of abdomen.[7,8] Gracilis is the muscle preferred by most reconstructive surgeons.[9–14] Most surgeons use the middle third of the gracilis belly in either full, split, or trimmed shape for transfer. However, upper-third gracilis muscle including proximal attached aponeurosis is the author's preferred part for facial palsy reconstruction.[15] The purpose of this article is to describe the gracilis anatomy, clinical application along with the author's technique, and its results.

ANATOMY OF THE GRACILIS

The gracilis muscle is a long strap muscle located superficially in the medial thigh. When the patient lies supine on the table with the thigh in abduction as a frog-leg position, a bulging and tight muscle palpable in the medial thigh is the adductor longus muscle. The gracilis muscle is located medially and posteriorly to the adductor longus. The gracilis has a broad origin extending from the lower symphysis to the inferior ramus of the pubis. In an adult, the lateral half of the origin is thin tendinous aponeurosis, but the medial half of the origin is thick muscle beneath the lower symphysis. The lateral thin fascial aponeurosis and medial thick muscle origins join together to become a slender muscle that runs straight down to its insertion on the medial surface of the tibial bone (Fig. 1 addition, left lower corner).

The gracilis muscle has both dominant and minor vascular pedicles (class II vascular pattern based on the Mathes and Nahai classification[16]). The single dominant vascular pedicle includes a sizeable artery (average, 1.5 mm internal diameter) and two venae comitantes (average, 2.0 mm internal diameter). It usually arises from the terminal branch of the medial femoral circumflex artery or sometimes directly from the profunda femoral artery. At ~6 to 12 cm (or the patient's fist length in axis) inferior to the pubic tubercle, the dominant vascular pedicle enters the muscle belly in three to six branches. Small diameter of the artery is often found in child patients when age is below 4 years. If the pedicle is too small in children, the pedicle can be harvested up to the profunda femoral artery to obtain a larger diameter for easy vessel anastomosis. The pedicle length is 6 to 8 cm. Minor pedicles are usually two in number, the upper and lower: the upper minor is a branch off from the profunda femoral artery, quite often having varied relationship with the dominant pedicle. Occasionally, the upper minor and the dominant pedicle join together, becoming a common pedicle.

Figure 1 Stage 2 FFMT: Relationship of the right donor gracilis muscle (right lower corner drawing) and left recipient face. The method of the inside face measurement including vessel side (CC′), vessel opposite side (DD′), and two muscle attachment sides: infrazygomatic arch (C′D′) and upper lip wound (CD). The tail of the trimmed gracilis comes from the proximal fascial aponeurosis.

Gracilis muscle is completely innervated by the anterior branch of the obturator nerve, which enters the muscle 1 cm superior to the point of entrance of the vascular pedicle. The motor nerve can be dissected proximally beyond the adductor longus muscle up to the obturator foramen or retroperitoneum to obtain a sizeable length of 8 to 10 cm. This extra dissection can achieve additional 2 to 4 cm of nerve length.

The overlying skin is supplied by either musculocutaneous or septocutaneous perforators. The musculocutaneous perforators are variable in numbers and distribution. Most of these perforators are located in the proximal two-thirds with a marked predominance for the upper third. One or two distinctly larger perforators exit the medial or lateral side of the muscle, attributing to the transverse orientation of the gracilis perforator flap.[17] Septocutaneous perforators, arising directly from the gracilis pedicle itself, are located between the adductor longus and gracilis. The musculocutaneous and septocutaneous perforators have been applied either together as one unit (musculocutaneous flap) or separated as a two-unit compound flap (gracilis muscle and skin paddle) for complex defect reconstruction.[15] Based on components required, the gracilis flap can be harvested as a muscle flap, a musculocutaneous flap (combined muscle and skin work as one unit), compound flap (muscle flap and the overlying skin paddle are separated and work as a two-unit flap), conjoint flap (muscle flap and a transverse perforated skin flap work as a two-unit flap), or gracilis and adductor longus combined muscles flap (two muscles work as a two-unit flap) for facial palsy reconstruction. The features that make the gracilis muscle suitable as a functioning free muscle transplant for facial reconstruction are its size, shape, length, reliable vascular supply, a long single motor nerve, adequate muscle strength and excursion, minimal donor-site morbidity, and its versatility in terms of function and cosmesis with hidden medial thigh scars. In addition, it also has the advantage of allowing a two-team approach: one for the harvest of the flap and the other for the preparation of the recipient site.

MATERIALS AND METHODS

Between 1986 and 2006, 249 patients were reconstructed with 252 functioning free muscle transplants for facial paralysis at the Linkou Chang Gung Memorial Hospital by the same surgeon (D.C-C.C.). Three patients with bilateral facial paralysis due to Möbius syndrome underwent bilateral gracilis transfer. Patients treated by direct facial nerve repair, local muscle transfer, lid or lip correction alone were excluded. The etiology of the palsies was most commonly postoperative complications (such as resection of acoustic neuroma, trigeminal nerve neuroma, lymphangioma, hemangioma), Bell's palsy, congenital, and trauma.

The classic two-stage procedure, cross-face nerve graft in the first stage followed by FFMT in the second stage, for facial reanimation has evolved over the past 20 years. Gracilis FFMT has become the author's first choice for facial reanimation. The facial artery and vein has become the author's first choice of recipient vessels. Before 2001, a long sural nerve graft ~20 to 25 cm in length was harvested from one leg through multiple skipped skin incisions. After an almost 1-year waiting period for nerve degeneration and regeneration, FFMT was accomplished as a second stage. During the second stage, a preauricular incision extending down to the mandibular body was made, and a subcutaneous face lift was performed. The previous embedded nerve graft should be found first and dissected carefully from its most distal preauricular position to a second incision at the lip border, which allowed for muscle insertion. This approach was time-consuming and technique-demanding. The grafted nerve might be injured during dissection. In November 2001, we changed the techniques, using a short cross-face nerve graft (10 to 15 cm) in the first stage, trying to shorten the waiting period and promote quicker restoration of the facial paralysis.

SURGICAL TECHNIQUES

Stage 1: Short Cross-Face Nerve Graft

The procedure is done under general anesthesia with orotracheal intubation. Two small incisions within 15 cm of each other are made along the course of the medial or lateral sural nerve on the posterolateral calf. The medial sural nerve is easily identified and more frequently used (Fig. 2). A 3-cm transverse or longitudinal incision is made along the lateral calcaneus sulcus, starting from one fist in distance from the fibular malleolus. The lateral or medial sural nerve is found deep to the deep fascia. The second incision is made in the midline between the two gastrocnemius muscles in the upper calf, 10 cm proximal to the first incision. The proximal medial sural nerve will be found beneath the deep fascia in the alveolar tissue between the two gastrocnemius muscles. The sural nerve between the two incision wounds is isolated by blunt finger dissection. The nerve is harvested and transferred. In the face, a preauricular incision ~10 cm in length is made on the nonparalyzed face. The first plane is subcutaneous: dissection to lift the face between preauricular and pupil line is performed. The facial skin flap is elevated. A second plan of dissection is to elevate the fascial flap under the superficial musculoaponeurotic system (SMAS), a dissection plane above the parotid gland. In front of the parotid gland, the zygomatic and buccal branches of the facial nerve can be found through careful dissection with help of a nerve stimulator. The zygomatic branch is located at the infrazygomatic margin. The buccal branch can be found following the line between ear tragus and mouth angle. One small branch of the zygomatic and the whole buccal branch are cut for transfer. The sural nerve is placed in reverse fashion subcutaneously with help by a nerve passer. Another small hole incision (< 1 cm length) over the nasolabial fold of the paralyzed face is made. The nerve passer is used to pass the sural nerve subcutaneously from the elevated skin flap wound to the contralateral nasolabial fold wound. In the nonparalytic face, the stump of the

Figure 2 Two small incisions to harvest the sural nerve graft.

sural nerve is coapted to the cut zygomatic and buccal branches under the microscope. The sural nerve stump can be separated into two parts: two-thirds is coapted to the buccal branch; and one-third is coapted to the zygomatic branch. The other end of the sural nerve stump is passed through the nasolabial wound and sutured to the dermis of the nasolabial fold wound on the paralytic face (Fig. 3). The total operative time is ~3 hours or less. The benefits of the modification are fewer operative scars on the leg, usually two, and less numbness over the lateral foot as the lateral sural nerve is still preserved.

Waiting Period

Four months after the first-stage procedure, a positive Tinel sign will be elicited at the nasolabial fold scar. Six months later, a small neuroma nodule is palpable, and significant Tinel sign demonstrates the regenerated axons. The patients is then prepared for the second-stage reconstruction.

Stage 2: Gracilis FFMT

The second-stage procedure is performed under general anesthesia with nasotracheal intubation, instead of orotracheal intubation, to minimize the interference of the upper lip manipulation. The whole face and contralateral thigh are prepared as the recipient and donor sites. Two teams work simultaneously: one team dissects the gracilis, and the other team prepares the face for muscle implantation. On the paralyzed side of the face, after the injection of diluted epinephrine (1:200,000), an incision ~2 cm in length on the white line of the upper lip between the philtrum-lip junction point and mouth angle (but not including these two points) is made first (Fig. 4, incision 1), and the previous stump of the neuroma of the cross-face nerve graft is identified and dissected proximally as long as possible. The stump is cut from its fixed point in the nasolabial fold and placed deep inside the lip wound for protection. Another preauricular incision (Fig. 4, incision 2) extending to the mandibular body is made on the paralyzed side of the face. Subcutaneous dissection is performed from the infraorbital rim superiorly, the mandibular margin inferiorly, and to the upper lip wound without worrying about injury to the previous embedded cross-face nerve graft. Under the facelift skin flap, a 4-cm transverse incision is made along the inferior zygomatic arch (behind the zygomatic body) down to the periosteum, which is mildly elevated. On a short distance, anchoring 3-0 Dexon stitches (usually four stitches) are placed on the elevated periosteum to fix the transferred muscle. The soft tissue from the infrazygomatic margin down to the upper lip is removed to create a pocket for the muscle fill-in. The buccal fat pad is also partially removed to make the surface of the pocket smooth. Stensen's duct should be identified and protected to avoid injury. The distance between the most inner stitch over the zygomatic arch and the medial edge of the upper lip wound (D′D, line on vessel-opposite side, Fig. 1) and the distance between the most outer stitch over the zygomatic arch and the lateral edge of the upper lip wound (C′C, line on vessel side, Fig. 1) are measured. The measurement should be done loosely; 1 cm on the D′D

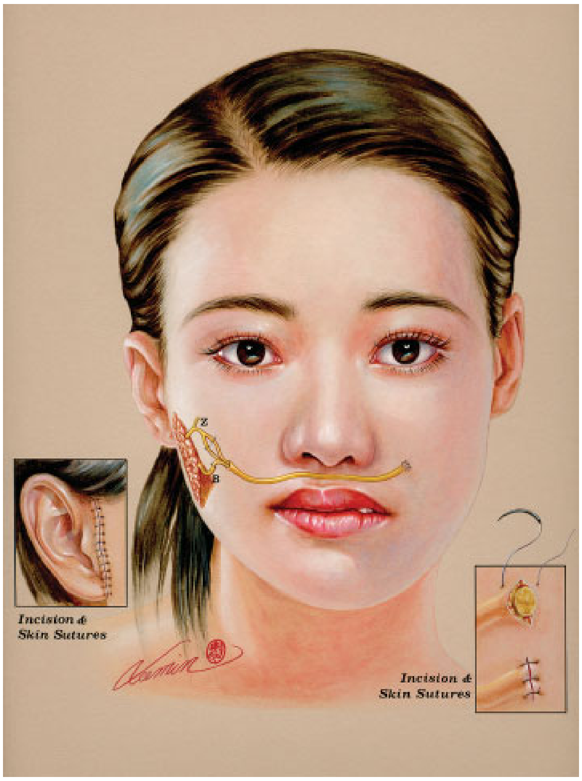

Figure 3 Stage 1: Cross-face nerve graft from the right intact facial nerve (zygomatic and buccal branches) to the left nasolabial fold.

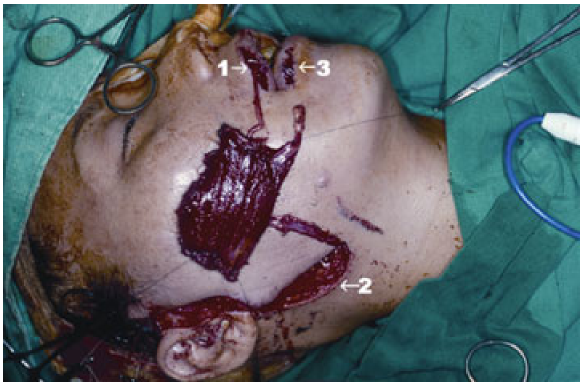

Figure 4 There are three incision lines for the second stage of free muscle transfer: incision 1, lip wound to expose the previous cross-face nerve graft; incision 2, preauricular incision for subcutaneous face lift; incision 3, for lower lip pulling.

(line on vessel opposite side, Fig. 1) and 2 cm on the C′C (line on vessel side, Fig. 1) should be added to these measurement to avoid consequent lip contracture deformity. The distances of two attachment sites (C′D′ on the zygomatic arch; and CD on the upper lip wound) are also measured. The trapezoid shape of potential implanted muscle size with four distances is drawn down (CDD′C′, Fig. 1).

On the donor thigh, a 10-cm-long incision along the medial thigh posterior to the adductor longus is performed to expose the proximal gracilis muscle and its neurovascular pedicle, which are mobilized from the surrounding tissues. The gracilis muscle is trimmed into a trapezoid shape, based on the inside face measurement. The inferior limit of the trimmed gracilis is drawn one finger below the neurovascular pedicle. The upper limit is drawn with the measured distance of the line of the vessel side (CC′, Fig. 1, left lower corner). The distance of the line of the vessel opposite side (DD′, Fig. 1, left lower corner) is usually 1 cm shorter than that of the vessel side (CC′). The trapezoid shape of the gracilis is depicted over the muscle and cut with cautery. The three cauterized sides (C′D′, D′D, and DC) are sutured with interrupted 3-0 nylon stitches to avoid bleeding. The part of the proximal thin fascial aponeurosis is dissected as far as possible to its bony insertion (Fig. 1, left lower corner). With 1 cm width in continuity with the muscle, the fascial aponeurosis is harvested as long as possible to be a long tail (Fig. 1, left lower corner, and Fig. 4). The motor nerve should be dissected as long as possible, under and beyond the adductor longus muscle, up to the obturator foramen where the medial branch is further separated from the lateral branch and transected. The vessel pedicles, usually one artery and two accompanied veins, is dissected up to the bifurcation of the femoral profunda artery and vein. The pedicle is ligated and transected before the bifurcation. The trimmed gracilis including the neurovascular bundles is then transferred and placed under the cheek flap in reverse fashion: the proximal tendinous aponeurosis is anchored to the dermis of the upper lip with 4-0 Dexon, usually four stitches. The distal muscle cut edge is fixed to the anchoring stitches set earlier. A 1-cm third incision (Fig. 4, incision 3) wound over the white line of the lower lip of the paralytic side is made. A subcutaneous tunnel around the mouth angle is created. The tail of the fascia aponeurosis, which is in continuity with the gracilis muscle, is passed through the subcutaneous tunnel and sutured to the orbicularis oris muscle in the lower lip wound under tension. Once the muscle is well set, vessel anastomoses (one artery and one vein) to the facial vessels are performed. Finally, the obturator nerve of the gracilis muscle, passing under the muscle to the upper lip wound, is coapted to the previous cross-face nerve graft in the small but adequate upper lip wound under operative microscope.

TECHNIQUE TO HARVEST A COMPOUND FLAP INCLUDING PROXIMAL GRACILIS MUSCLE AND A SEPARATE SKIN PADDLE

A compound flap with gracilis muscle and overlying skin was first reported by the author in 2004[15] for complex facial paralysis defects. The overlying skin paddle is usually drawn as an oval shape located either right on the gracilis muscle centralized at the vessel pedicle or more laterally based on the posterior edge of the adductor longus muscle where the intermuscular septum is located. The anterior skin incision is first made down to the fascia of the adductor longus muscle and the whole fascia exposed. The fascia over the adductor longus is incised longitudinally over the middle portion of the muscle and elevated posteriorly. The adductor longus muscle is retracted anteriorly and laterally. The main vascular pedicle and the anterior motor branch of the obturator nerve to the gracilis muscle are visualized. The septum is always included with the flap as it contains septocutaneous perforators that supply the overlying skin. The posterior incision is then made down through the subcutaneous tissue to the gracilis muscle with thinner skin flap without carrying too much fat. To allow for independent movement between the muscle and skin paddle, those two structures are then separated. The separation begins from posterior skin flap to anterior. Many small musculocutaneous perforators are coagulated with a bipolar coagulator and divided. The dissection is stopped once the septum is met. Rows of septum perforators are seen in the septum. Some of the musculocutaneous perforators at the muscle edge near the septum are preserved whenever possible. Those musculocutaneous perforators could be coagulated further if skin paddle rotation and movement are required at the recipient site to avoid excessive tension on the septum perforators. The septocutaneous skin vessels can be visualized inside the septum between the gracilis and the adductor longus muscles. These skin vessels, taking either a septocutaneous or a musculocutaneous course, connect well with the proximal pedicle and supply the skin over the proximal third of the gracilis muscle. In this compound flap, the muscle is inset as described previously, and the skin paddle can be rotated up to 180 degrees and advanced to the area where skin is deficient. Only one arterial and one venous anastomosis will give enough blood supply to both components.

POSTOPERATIVE CARE

In the first stage, the patient is usually hospitalized for 3 to 5 days. There is no need for postoperative rehabilitation. In the second stage, the patient is usually hospitalized for a week. The patient will be extubated after the operation and admitted to our unique micro-ICU for 3 to 5 days of intensive care. Inspection of the face swelling, local palpation of the face skin consistency, and the patient's vital signs including overlying skin flap, if associated, are frequently observed. The patient is usually kept fasting for the first 3 days, then liquid diet is introduced and pursued for the next 3 weeks. Thereafter, rehabilitation will start including massage, muscle stimulation, and cognitive training (called "induction exercise"[18] or smiling training). Patients should be followed periodically every 2 months. Patients are encouraged to have electric muscle stimulation at home 1 to 2 times a day. Usually, the muscle may start moving in 4 to 6 months postoperatively, but patients are encouraged in continuous smiling training or exercise for 1 year or longer. Surgical treatment of the sequelae deformity is usually performed 2 years postoperatively.

COMPLICATIONS AND MANAGEMENT

More than 50% of patients have satisfactory results (Figs. 5–7) with few patients having severe complications. The author does report revision surgeries including debulking procedure, release of contracture, upper and lower lip revision (upper lip thinning, lower lip myectomy, lower lip wedge), gold weight or blepharoplasty, browlift, facelift, fat injection, or even nasal augmentation to further improve the results.

Acute Complications

HEMORRHAGE, SALIVA LEAK, FLAP FAILURE

Acute complications included acute hemorrhage (one case), Stensen's duct injury with saliva leak (3 cases), and flap failure (2 cases). The hemorrhagic case occurred in the first postoperative night. Sudden swelling and induration of the reconstructed side of the face was noted, although Doppler still showed positive flow; it was immediately reopened, the hematoma evacuated, and the bleeding branch (due to vessel clip slide off) ligated. The muscle survived eventually. Stensen's duct injury occurred in three cases: one case was repaired during the reconstruction, and two cases were found later during the clinic follow-up. Repeated incisions and drainages were done but in vain. The patients were taken back to the operating room and the proximal stump was ligated to resolve the intractable problem. There were two cases of flap failure: one case was after parotid cancer surgical ablation and postoperative irradiation with absent facial vessels, and one case was bilateral Möbius syndrome with absent facial vessels in one side. Those two cases required vein grafts for artery and vein repair. Progressive cheek skin hyperemia and swelling from the 3rd to 5th postoperative days were the usual presentation. Small opening of the wound revealed dark muscle without shining. Further exploration showed no bleeding of the muscle that was removed. A second muscle flap was performed on the Möbius patient 1 year later. A trimmed rectus femoris muscle was used with success. The other patient choose not to repeat surgery and is still followed at the outpatient clinic. Acute surgical complications are now few after accumulation of experience.

Late Complications

Late complications occurred usually at least 6 months after free muscle transplantation. Lip deformities (upper and lower lips) are the most frequent sequelae after free muscle transplantation for facial paralysis.

UPPER LIP CONTRACTURE

Upper lip contracture was a quite common complication among the first patients of my series, ~30%.[6] Nevertheless, it is now less common. Too high component of the zygomatic branch of the facial nerve transfer in the first stage or too short muscle harvested in the second stage were thought to be the main causes of upper lip contracture sequelae. The more zygomatic branches related to the eye closure are harvested, the worse the upper lip contracture will be. Zygomatic branches of the facial nerve related to the eye closure have continuous discharges for eye blinking or closure in a whole day, in a similar fashion to the phrenic nerve. They are powerful donor nerves that will lead to lip contracture. Too short muscle transfer will also lead to lip contracture. An adding length (1 to 2 cm) to the inside face measurement between the zygomatic arch and upper lip is effective to lessen this complication.

UPPER LIP WIDENING

Fixing the muscle to the dermis, although it can induce more gum exposure while smiling, often results in eversion and a thickened appearance of the lip. Thinning the upper lip is often performed 1 year after muscle transfer. The procedure can result in an increased show of teeth and a more natural smile.

LOWER LIP ASYMMETRY

Lower lip asymmetry due to the muscle imbalance is also a common late complication. An additional tail created from the transferred muscle to pull the lower lip on the paralytic side is often not enough. Myectomy of the depressor muscle on the nonparalytic side is often necessary and performed simultaneously during the second-stage reconstruction. Sometimes, additional wedge resection of the lower lip is required for further correction.

LAGOPHTHALMOS

Putting a vascularized or nonvascularized muscle (such as platysma muscle) in the lower eyelid with reinnervation to correct the lagophthalmos has been descried recently.[19] Traditionally, temporalis muscle transfer or gold weight in the upper eyelid is enough for lagophthalmos correction.

Figure 5 (A) A 4-year-old girl was involved in a car accident that induced left facial nerve palsy for 1 year; (B, C) status in smiling. Good results with symmetry at rest and synchronous movement at smiling were observed 1 year after gracilis free muscle transfer.

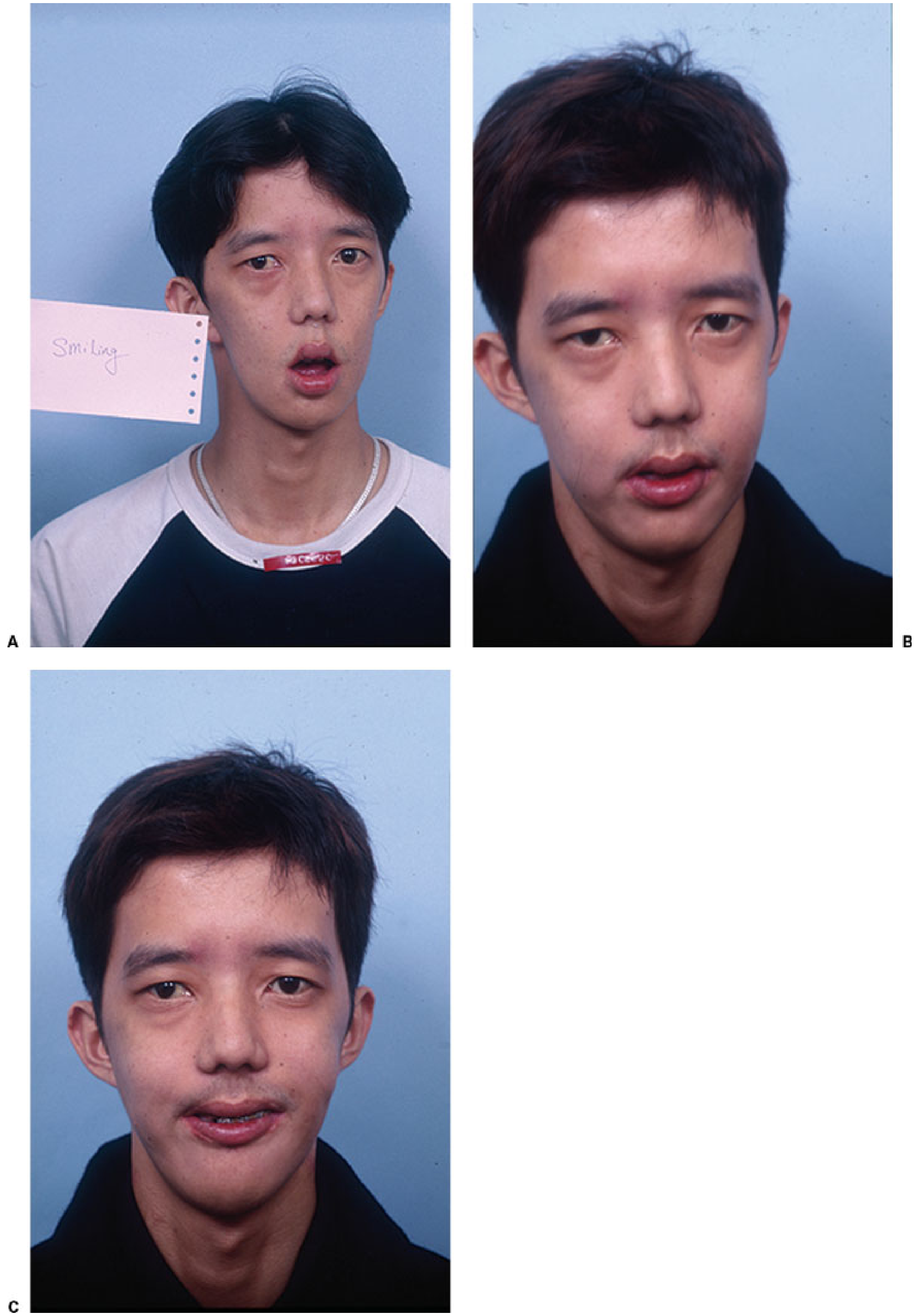

Figure 6 (A) A 21-year-old man with Möbius syndrome bilaterally was at maximal animation. (B, C) Postoperative view of the animation at rest and smiling 6 months after both gracilis muscles transferred simultaneously for smiling restoration, innervated by both spinal accessory nerves.

Figure 7 (A) A 17-year-old girl experiences right hemifacial microsomia with facial nerve palsy; (B) 2 years 6 months after gracilis free muscle transplantation.

BULKINESS

Postoperative facial bulkiness is not a frequent complication in the author's series.

INSUFFICIENT MUSCLE MOBILITY

Insufficient muscle mobility with inadequate smiling is also often seen. Prolonging the smiling exercise (even up to 3 to 4 years) and thinning the upper lip to expose more teeth can resolve the problem.

FUTURE CONSIDERATIONS

One-Stage Reconstruction

One-stage microneurovascular transfer of a portion of the gracilis muscle, innervated with contralateral seventh cranial nerve[20] or with the ipsilateral masseter motor nerve,[21] has recently been described. Although Manktelow et al emphasized that good excursion is obtained from the ipsilateral masseter motor nerve branch transfer, the author's personal experiences of reconstruction for bilateral Möbius syndrome by using ipsilateral spinal accessory nerve transfer (Fig. 6) seems to have equivalent results and will be the other potential option for one-stage reconstruction of facial palsy.

Complex Free Tissue Transfer for Complex Facial Paralysis

Complex facial paralysis at our institution means that the face is paralytic accompanied by skin, oral mucosa, or other soft tissue deficits. It happens most commonly in malignant head and neck tumor resection, or hemangioma or lymphangioma serial resections, or facial neurofibromatosis resection. Reconstruction has more challenges not only for facial paralysis restoration but also for complex tissue deficits reconstruction. The tumor type (benign or malignant), the requirement for postoperative radiation, the surgeon's ability with different reconstructive techniques, and the patient's age and motivation are all factors involved in determining the appropriate timing and reconstructive strategy in each particular case. Gracilis musculocutaneous flap as one unit, gracilis and skin compound flap as a two-unit compound flap, gracilis and perforator skin conjoined flap, or gracilis and adductor longus combined flap for different-purpose reconstruction are potential alternatives for such complex facial paralysis reconstruction.

Post–Facial Palsy Synkinesis

Post–facial palsy synkinesis is a clinical entity noted in a fairly common number of patients (20% in the author's series)[22] after recovery from a previously paralytic face and includes both incomplete facial palsy and facial twitching (synkinesis effect) problems. Traditional treatments include facial rehabilitation, botulinum toxin injection, myomectomy, and free muscle transplantation. All of them yield unsatisfactory results. Further investigation and treatment are necessary for such complex and challenging facial movement disorders.

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