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Microneurovascular free gracilis transfer for smile reanimation

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Many procedures exist to provide both static and dynamic reanimation of the paralyzed face. At the present time, microneurovascular free muscle transfer provides the best outcome in restoring dynamic facial symmetry as well as spontaneous mimetic function. Of the techniques used, free gracilis muscle transfer is currently the most common; this article describes the procedure in detail.

There are numerous surgical reanimation options for the paralyzed face, but none has the potential to provide results so closely resembling normal function as free muscle transfer. Regional muscle transpositions often provide insufficient oral commissure excursion, and may result in an unnatural smile vector, with distorting bulk in the face, thereby exacerbating the deformity. Stand-alone cross-face nerve grafts can provide excellent results when multiple branches are grafted, but this procedure must be performed within 12 months of paralysis onset because the mimetic muscles atrophy after denervation; additionally, outcomes are unreliable at best. Other cranial nerve transpositions or jump grafts have the potential to cause significant morbidity, whether tongue or shoulder weakness, and are time sensitive as well. They may provide resting tone, but severe mass movement is a major drawback. The gold standard for surgical rehabilitation today is microvascular free muscle transfer. In this article, we describe one approach to gracilis transfer.

Microneurovascular free gracilis transfer has been used since 1979.[1] The procedure is typically performed in one of 2 ways: the gracilis may be transferred in a one-stage procedure in which the masseteric nerve is used to innervate the flap; alternatively, a 2-stage approach can be used, in which innervation is provided by a cross-face nerve graft performed 6 to 12 months before muscle transfer. Superior spontaneous smiling results are obtained when gracilis transfer is performed in patients aged <50 years, and a cross-face nerve graft is used. Under these circumstances, the likelihood of obtaining a nearly normal spontaneous smile approaches 85%. A more reliable method of innervating the free muscle graft is to use the masseteric nerve, which results not only in more robust oral commissure excursion, but also a higher success rate, verging on 95%. The fundamental difference between these approaches is that use of the contralateral facial nerve to control the gracilis flap permits spontaneous emotive facial expression, whereas the patient with a gracilis controlled by the masseteric nerve frequently must initiate a smile voluntarily.

Technique

Preparation of the recipient site

The patient is positioned with the gracilis donor leg abducted and flexed at the knee. Technically, it is often easier to transfer the muscle contralateral to the paralyzed side of the face, due to pedicle position and inset geometry. We cleanse the thigh 270°, permitting fascia lata harvest from the lateral aspect of the leg, as this is often useful for

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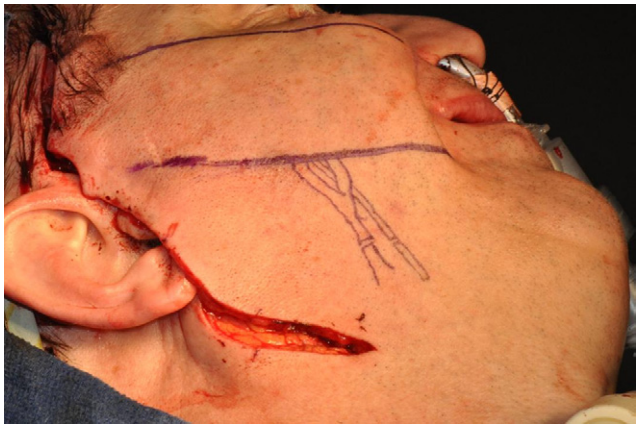

Figure 1 The preauricular incision is made from the temporal scalp to the upper neck. (Color version of figure is available online.)

suspending the nasal base during the same procedure. The entire face is prepped as well, to allow comparison between normal and paralyzed sides, and to permit assessment of commissure overcorrection. Nasotracheal intubation is required, as this prevents distortion of the mouth, and the operating room temperature is kept around 74 degrees Fahrenheit to promote vasodilation. Ampicillin-sulbactam is the prophylactic antibiotic of choice.

A modified Blair incision is made on the paralyzed side of the face, with the superior extent in hair-bearing scalp at the temporal line and the inferior extent on the neck, 1 to 2 cm below the angle of the mandible (Figure 1). The incision and initial dissection are executed using a number 15 blade, until the parotidomasseteric fascia is identified. This fascia serves as the "floor" of the dissection, which then proceeds medially, using Stevens scissors. Once the anterior border of the parotid has been traversed, care is taken to avoid transecting any branches of the facial nerve that may still have function. If this is a concern, a Montgomery nerve stimulator will aid in their identification.

Identification of the modiolus is the next objective. Although the facial muscles are may be atrophied after 12 to 18 months of inactivity, the zygomaticus major can frequently be identified, and its superficial surface is an excellent landmark for the lateral commissure of the orbicularis oris. The facial vessels should also be identified at this time; they cross the mandible at the gonial notch, usually palpable, and then converge on the oral commissure. Following these 2 landmarks will ensure efficient identification of the modiolus. Often, the risorius muscle will be encountered before the orbicularis oris, but evaluation of the muscle fiber direction will reveal that it is not the structure of interest. This is a good opportunity to isolate the facial vessels as well. Ordinarily, the facial artery lies anterior to the vein. In cases where the facial vessels are absent or have been sacrificed, the superficial temporal vessels may be used to supply the flap; regardless, they will be ligated superiorly to facilitate flap inset. The superficial temporal artery also lies anterior to its corresponding vein.

Once the modiolus is identified, inset sutures are placed. Five 0 polyglactin sutures are used; of them, 2 are placed superior to the commissure, 2 inferior, and 1 at the commissure itself. The sutures are passed superficial to deep, passing through only the muscle and avoiding violation of the oral mucosa.

At this stage, the donor nerve is identified. In the case of a cross-face drived muscle, the end of the nerve graft is isolated under the lip, and the tip is transected cleanly to facilitate neurorrhaphy.

In the case of a trigeminally driven muscle, the donor nerve is identified on the deep surface of the masseter muscle. The masseteric nerve branches off the mandibular nerve in the infratemporal fossa, then travels laterally, through the sigmoid notch between the mandibular condyle and coronoid process, innervating the masseter from the deep surface (Figure 2). The nerve is accompanied by an artery and vein, as well as numerous small perforating vessels, necessitating painstaking dissection to avoid a bloody operative field. Exposure of the masseteric nerve begins with incision of the soft tissue along the inferior aspect of the zygomatic arch; if the patient has residual upper facial function, care must be taken to identify facial nerve branches before opening the soft tissues adherent to the arch. The periosteum is divided and elevated, and the massester muscle is entered. Blunt dissection through the muscle fibers minimizes bleeding. The masseteric nerve is located 7 to 11 mm anterior to the articular tubercle; definitive identification is possible with the Montgomery nerve stimulator. Transection of the nerve should be performed as distally as possible.

Gracilis harvest

Landmarks for the medial thigh incision are the medial condyle of the tibia inferiorly, and the insertion of the adductor tendons onto the superior pubic ramus and symphysis superiorly. This second landmark is readily palpable as a firm cord, even in the obese patient. A line is drawn between these 2 points, and the incision is made parallel to it, 1 to 2 cm medially (Figure 3). Typical incision length is approximately 12 to 15 cm.

The skin is incised with a number 15 blade and dissection proceeds through the subcutaneous fat, toward the muscle belly. This portion of the dissection is largely devoid of landmarks, and care must be taken as the great saphenous vein traverses the fat superficial to the belly of the gracilis. The vein may be isolated and retracted out of the field or may be ligated, though harvesting it may be useful if a vein graft is needed for the vascular anastomosis.

The first muscle belly encountered is frequently the gracilis. However, in patients with a large amount of subcutaneous fat, the dissection may inadvertently gravitate toward the adductor magnus, adductor longus, or even the sartorius muscle. One may distinguish the sartorius from the gracilis based on the muscle fiber direction. The adductor longus and adductor magnus, located anterior and posterior to the gracilis, respectively, have fibers passing in the same direction as those of the gracilis. The best way to identify the