Chapter 88 – Facial Reanimation

Barry M. Schaitkin

Rehabilitation of the patient with chronic facial paralysis must take into account the loss of form and function. When contemplating facial reanimation, the surgeon should consider all variables that might influence the choice of procedures, including the patient's age, prognosis, pathology, the extent of paralysis and functional deficit, the current status of the nerve and the likelihood of spontaneous recovery, other neural deficits, comorbidities, and patient expectations. Reanimation of the paralytic eyelid is usually required in addition to the procedures described in this chapter.

PATIENT SELECTION

Although each patient presents unique needs and challenges, experience has led to guidelines for caring for this group of patients.

1. The surgeon should reinnervate the facial muscles as soon as possible.
2. The eye and face should be reanimated separately to minimize mass movement.
3. A combination of static and dynamic procedures usually provides the best result.
4. Each procedure is individualized to the patient's deficit.

PREOPERATIVE PLANNING

Dynamic Reanimation Procedures

The dynamic procedures can be considered within four broad categories. One can think of the facial nerve nucleus as the proximal system and the facial nerve musculature as the distal system and look at the procedures based on what is surgically available. The procedures are then dictated by the integrity of those systems for use by the surgeon.

- Proximal system intact and distal system intact
- Proximal system intact and distal system not available
- Proximal system not available and distal system intact
- Neither system available

Patients with facial nerve disruption in the temporal bone are good examples of the proximal and distal system intact. These patients are ideally suited for having the facial nerve nucleus reconnected to the facial musculature by either primary neurorrhaphy or by use of a nerve graft. Reconstituting the nerve should be performed as soon as possible for the best results.[1]

Patients with extensive facial nerve invasion by cancer can create a situation without a distal nerve graft site. Ideally, the viable proximal facial nerve can then be used to innervate a microvascular free flap, or alternatively, these patients without a distal system can be helped by muscle transposition.

Patients who have lost the facial nerve as part of acoustic tumor surgery should have the nerve reconstituted immediately, if possible, by a nerve graft. However, this frequently is not possible, and patients are often reluctant to have a craniotomy for reestablishing nerve continuity. These patients are dynamically innervated by either a nerve substitution with a hypoglossal jump graft or by use of a cross-facial nerve graft. The jump graft works best if done in the first year of paralysis. A traditional hypoglossal to facial anastomosis causes a unilateral tongue paralysis as a tradeoff, but can be done as long as 2 years after facial nerve interruption with good results.

Finally, for those lacking both systems, two dynamic options are available: the temporalis muscle transposition and the innervated free flap based on another cranial nerve (V, the contralateral cranial nerve VII, XI, and XII have been used). This situation is characteristic of the patient who has undergone radical surgery for cancer of the parotid gland who presents years later for reanimation.

In this situation, if the patient is a candidate for and desirous of a dynamic procedure, and if that person understands the risks, options, and benefits, then another cranial nerve should be used to innervate a free muscle transfer. The free muscle (often the gracilis) is anchored to the modiolus to give an active smile. Some degree of static support should be provided at this setting to take away the gravitational effects. This offers immediate

improvement because the nerve graft may not be completely functional before 18 months.

Static Procedures

These procedures can be combined with dynamic procedures or used independently depending on the desired outcome. The most common procedures to consider are the brow lift, nasal alar lateralization, suspension of the oral commissure, and digastric muscle transposition. Other minor static procedures for improvement of lip position and for providing a balanced smile can also be performed.

SURGICAL TECHNIQUE

Hypoglossal-Facial Jump Graft

Basic understanding of nerve repair is essential for many of the planned procedures. The hypoglossal-facial nerve jump graft will be described in detail to cover microscopic neural techniques essential to all of the procedures.

Surgical Principles

1. Neural repair, whether with a graft or directly, must be tension free.
2. The endoneurial surface of each end must match.
3. The ideal graft not only has the proper length but also a similar axon volume.
4. Nerve repair should always be performed under the operating microscope.

The patient is prepped and draped as for a parotidectomy, and a modified Blair incision is used. A nerve graft donor site must be prepped into the field if the preferred graft source, the greater auricular nerve, is not available. Alternatively, the facial nerve can be decompressed in the mastoid and transposed and directly anastomosed into the hypoglossal nerve.[2]

The facial nerve is found in its normal location in the parotid gland using the surgeon's preferred anatomic landmarks. The nerve may have undergone some atrophy depending on how long the paralysis has been present, but this does not make the nerve difficult to find.

If there has been previous parotid surgery and the surgeon is looking for nerve branches in a previously operated and/or irradiated bed, the surgery can be extremely difficult. The surgeon in this case must be comfortable finding the branches distal to the surgical site and working proximally. Even this may be quite difficult with the combination of nerve atrophy, scar tissue, and the inability of the nerve to respond to electrical stimulation.

Once the facial nerve is found, it is dissected to the level of the pes and meticulous hemostasis is performed to ease the microscopic nerve repair. The hypoglossal nerve is dissected to expose it just distal to the ansa cervicalis. In this way, the surgeon can be sure that voluntary tongue movement will stimulate all fibers being routed to the facial nerve.

The nerve graft is harvested and placed in a moist, saline-soaked gauze sponge for later use. The distance required is usually less than 8 cm, which is easily accomplished with the great auricular; alternatively, the medial brachial cutaneous or sural nerve can be used.

The hypoglossal nerve is elevated into the surgeon's view under the operating microscope and above the level of any blood by placing a Penrose drain under the nerve and gently elevating it with a self-retaining retractor. The hypoglossal nerve is larger in diameter than either the facial nerve or the great auricular nerve and ideally only a portion is used. The procedure requires less than half of the 11th nerve. Jack Kartush[2] has suggested passing an 8-0 nylon through a point representing one third of the neural diameter to allow the surgeon to know when this limit is reached. Sectioning the nerve under visual confirmation of serial stimulation with an electric stimulator also allows the surgeon to work with decreased risk of permanent tongue weakness. A beveled incision is made not more than one third of the way through the hypoglossal nerve, partially transecting the nerve and exposing a portion of the proximal endoneurial surface. The proximal end of the nerve graft is sutured to the proximal end of the endoneurial surface created in the 11th nerve. Two or three monofilament 8-0 or smaller nylon sutures will hold the graft in place. The Penrose drain is divided with scissors and gently removed without disrupting the graft.

Attention is then directed to the facial nerve site. The surgeon divides the nerve down to the epineurium on the posterior aspect. Preserving this epineurium will prevent the nerve from retracting into the parotid gland and greatly facilitates the repair. The nerve graft should be placed with a gentle S-curve to assure no tension on either anastomosis. Three 8-0 or 9-0 monofilament nylon sutures are adequate to prevent dehiscence.

Direct nerve repair and cross facial nerve repair is done with similar principles. If the nerve is disrupted intracranially, it is more difficult to repair because of the pulsations, cerebrospinal fluid, and lack of epineurium, but

similar principles apply. One or two sutures are generally all that can be achieved.

The cross facial repair uses one or more branches of the facial nerve. The surgeon finds the desired branch, usually a distal midface branch, and with small incisions about the nasal ala the nerve is bluntly tunneled out to the pretragal region on the paralyzed side.

Static Procedures: Smile

Support of the modiolus is a valuable primary procedure (Fig. 88-1) or can be a useful adjunct to a dynamic procedure. Many materials have been used for this purpose, including permanent suture, fascia lata, palmaris longus tendon, and a variety of cadaver and collagen products. Autologous grafts have the disadvantage of donor site morbidity, but are still superior because of the decreased risk of infection, rejection, and extrusion.

Figure 88-1 Patient with static suspension of nasolabial fold and lower lip wedge.

Measurements are taken from the zygomatic arch to the modiolus. One half of the required length of fascia lata is used as the incision length on the lateral thigh. A 2.5-cm wide segment is taken and tunneled from the oral incision, which can be either in the proposed nasolabial fold or lip skin junction, to an incision in the hairline. Preoperative planning determines the vector of pull desired to mimic the contralateral side. Incisions in the nasolabial fold work best in older patients with deep folds on the normal side.

Static Procedures: Nasal Obstruction

Patients with loss of facial tone will shift the central upper lip filtrum and collapse the ipsilateral nasal ala. A portion of the suspension material used for the smile can be used to lateralize the nasal ala through an alar incision. If just the nasal ala is addressed, the procedure through an alotomy can be used to suspend the nasal ala to a lateral position of the front face of the maxilla using a surgical anchor.

Static Procedures: Lower Lip

Static procedures on the lower lip vary depending on the desired result and the presence of other facial nerve deficits. An isolated ramus mandibularis defect can be treated with a lip plication or a digastric muscle transposition (Fig. 88-2).

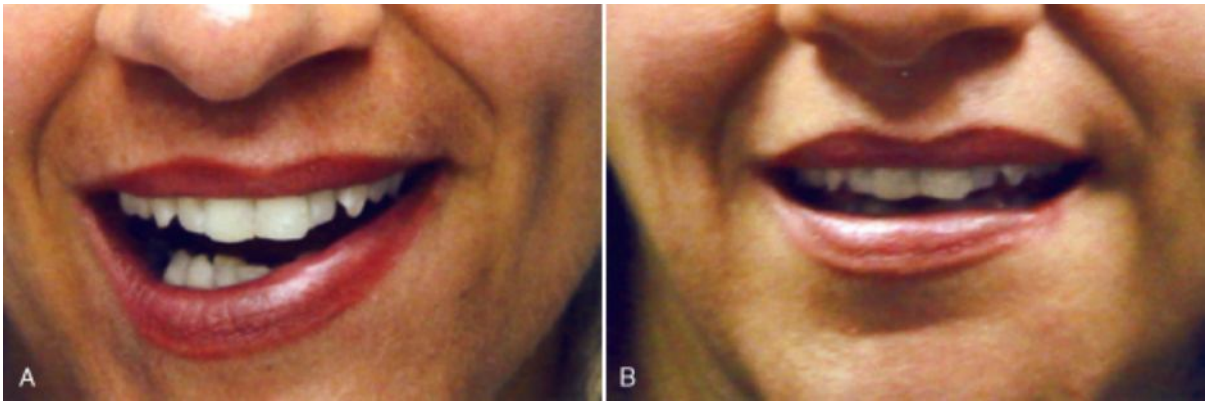

Figure 88-2 Patient before **(A)** and after **(B)** digastric muscle transposition after ramus mandibularis paralysis during parotidectomy.

The procedure is performed through multiple small incisions in the neck to mobilize the digastric muscle from its posterior aspect. Leaving the anterior muscle belly fifth nerve intact rarely provides dynamic activity but does improve the missing inferior vector present with a normal smile.

Patients who have a total facial paralysis should not have a digastric muscle transposition because the inferior pull may decrease oral competence. These patients are best served with a lower lip wedge resection (Fig. 88-3). This procedure provides horizontal shortening of the lip, allowing for improved oral competence and speech as well as better symmetry from removal of the area that takes on a “fat lip” appearance.[3]

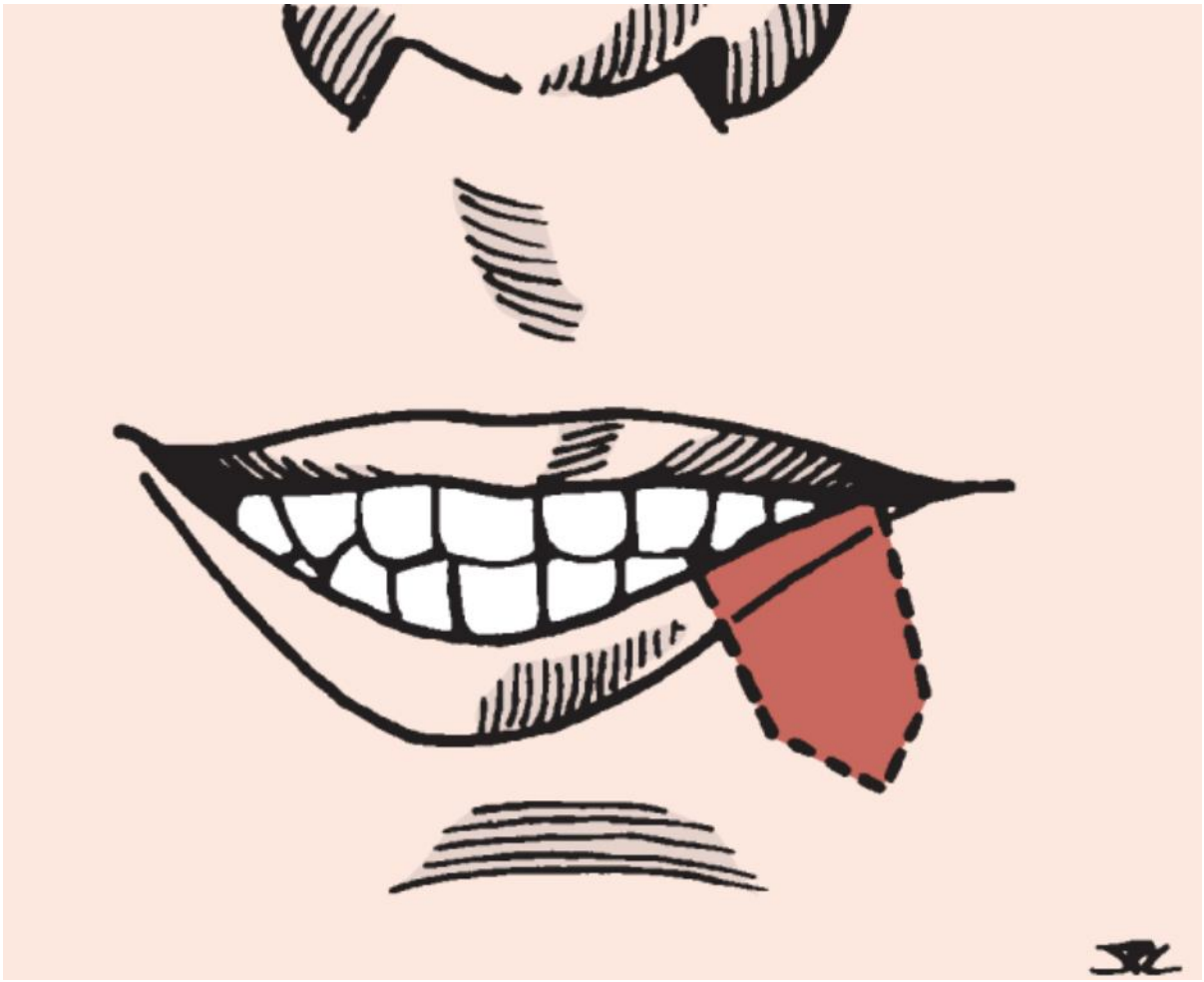

Figure 88-3 Left lip wedge excision planning.
(Reprinted with permission from May M, Schaitkin BM: The Facial Nerve, May's 2nd Edition. New York, Thieme, 2000.)

Less than one third of the lip is removed to avoid microstomia (Fig. 88-4).

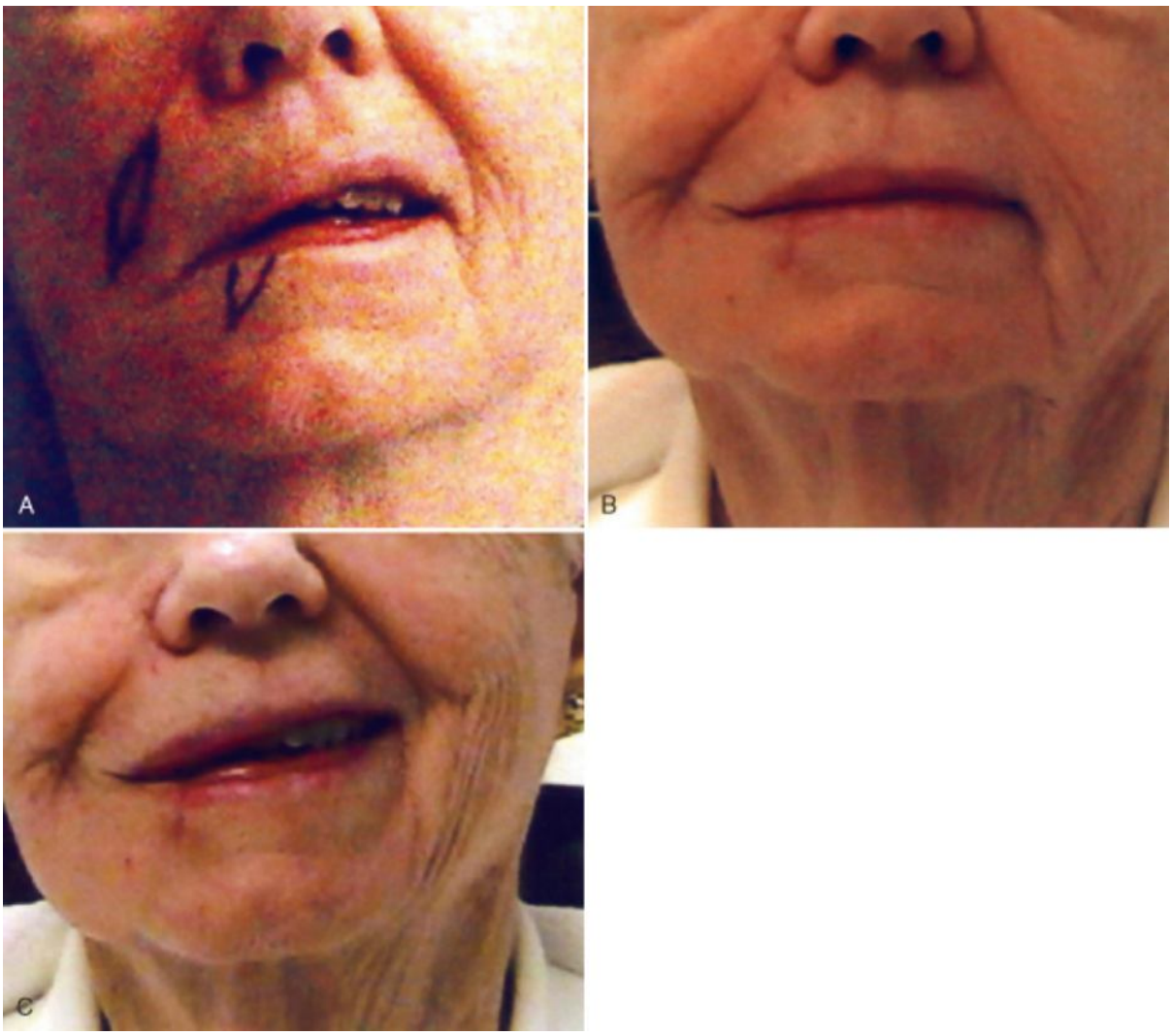

Figure 88-4 **A,** Preoperatively, patient with complete right facial paralysis demonstrating surgical planning. **B,** Patient at rest. **C,** Patient smiling after lower lip wedge excision and fascia lata suspension only.

POSTOPERATIVE CARE

Patients require very little specific postoperative care after the majority of these procedures, and most are discharged on the day of surgery. However, there are a few precautions one should take.

1. The patient with surgery that abuts the oral cavity should be covered with prophylactic antibiotics.
2. Patients with muscular or facial attachments near the modiolus should be placed on a soft diet to avoid dehiscence.
3. No pressure dressings are used over nerve grafts or muscle flaps.
4. Lower extremity fascia and nerve graft sites are treated with pressure dressings.

COMPLICATIONS

The main complication of the nerve graft procedures is the lack of recovery of nerve function at all or to the extent anticipated. Patients should be counseled about the possibility of dehiscence of the nerve or failure of the nerve to reach the target muscle. All patients who have recovery from a neural procedure will have synkinesis.

Likewise the static procedures are mostly subject to the possible dehiscence of the tissues providing support. Most of these issues are actually easier to remedy through revision surgery because the scar from the first procedure provides a better means of attachment.

The use of foreign material for reanimation is subject to the formation of granuloma, extrusion, and infection.

PEARLS

- Great results begin with careful evaluation of the patient's history and desired outcome.
- Realistic expectations are necessary for patient satisfaction. Preoperative and postoperative photos from other patients are very helpful.
- Combined procedures with multiple levels of eye, static, and dynamic reanimation provide the best results.
- Hypoglossal jump grafting avoids tongue paralysis.

PITFALLS

- Avoiding donor sites for graft material can lead to long-term infection and extrusion.
- Pulling down a paralyzed lower lip for symmetry may exacerbate oral competence problems.
- It is important to have a variety of procedures in one's armamentarium to avoid trying to place all patients into the same procedure.