Hemi-Hypoglossal-Facial Intratemporal Side to Side Anastomosis

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Conventional hypoglossal-facial anastomosis and the interposition jump graft variation are the most popular techniques for facial nerve reconstruction resulting from proximal facial nerve injury. We present a modification of this technique, the hemi-hypoglossal facial intratemporal side to side anastomosis, which overcomes many of the failings of previous techniques. The method involves mobilization of the intratemporal facial nerve, which is anastomosed to a partially incised hypoglossal nerve. It is especially indicated in patients with multiple cranial nerve palsies.

Key words: Hypoglossal-facial anastomosis. Facial paralysis. Intratemporal facial nerve.

Anastomosis hipoglosofacial intratemporal hemiterminoterminal
La anastomosis hipoglosofacial directa y la anastomosis con interposición de nervio auricular mayor son las técnicas de reconstrucción facial más utilizadas cuando el extremo proximal del nervio facial no es accesible. Presentamos una modificación de la técnica, la anastomosis hipoglosofacial intratemporal hemiterminoterminal, que soluciona muchos inconvenientes de las técnicas previas. La porción intratemporal del nervio facial se libera y anastomosa al nervio hipogloso, seccionado parcialmente. La técnica está especialmente indicada en pacientes con múltiples déficit de pares craneales.

Palabras clave: Anastomosis hipoglosofacial. Parálisis facial. Nervio facial intratemporal.

SURGICAL TECHNIQUE

The patient is positioned face up with the head turned to the opposite side from the one to undergo the anastomosis. A retroauricular incision is made to the tip of the mastoid that continues along the anterior edge of the sternocleidomastoid until the hyoid. After completing a mastoidectomy, the entire course of the facial nerve is exposed and freed from the geniculate ganglion to the stylomastoid foramen. In this area, the resection of the tip of the mastoid and the section of the periostium make it possible to follow the facial nerve to its main division in the parotid. The cervicotomy is then completed and the hypoglossal nerve is identified below the digastric muscle, in the area of the carotid bifurcation. It is wise to liberate the nerve both proximally and distally and to identify the loop of the hypoglossal nerve.

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The facial nerve is resected at the level of the geniculate ganglion and is pushed inferiorly so that the hypoglossal nerve can be easily reached. In some cases it may be useful to sever the digastric muscle to facilitate this. The section of hypoglossal nerve should include one third of the total width of the nerve. If it is severed proximal to where the loop exits the hypoglossal nerve, the calculation of the section should exclude the thickness of the loop. The anastomosis is made by suturing the free end of the facial nerve brought down from its first bend to the proximal end of the hypoglossal nerve (Figure 1). Some 4-6 stitches of nylon 10/0 are used for the epiperineural suture, connecting one third of the proximal third of the hypoglossal nerve to the full diameter of the distal end of the mastoid facial nerve. The anastomosis is protected with Tissucol. The incision is closed plane by plane and a Penrose drain left in place.

Tongue mobility is checked the day after surgery. As soon as the first signs of reinnervation are evident, generally speaking 46 months after surgery, patients begin rehabilitation. Patients start by using tongue movement to move the face and, over time, will begin to separate both movements. Figure 2 shows preoperative facial function (complete palsy) and facial function 18 months after the intervention.

DISCUSSION

At centres with experience in base of the skull surgery, fewer than 10% of the patients present complete, permanent, facial palsy, either due to anatomic discontinuity of the nerve or to loss of function despite remaining intact. When the proximal end of the facial nerve is not accessible, a reconstructive technique is needed, the paradigm of which is the hypoglossal-facial anastomosis (HFA). End-to-end HFA is a classic technique consisting of severing the hypoglossal nerve in the neck and connecting it to the trunk of the facial nerve after its exit through the stylomastoid foramen. It is an effective procedure with which excellent tone at rest in the lower half of the face and an acceptable smile can be achieved in most cases, with reproducible results. However, there are 2 fundamental problems associated with this technique. Completely severing, the hypoglossal nerve can cause atrophy of the ipsilateral hemitongue, which can hinder articulation, chewing, and swallowing. On the other hand, the difference in axonal load between the hypoglossal nerve and the facial nerve causes mass movements, synkinesia, and spasm, which are equally disfiguring for the patient.

In order to avoid the disadvantages of the classic HFA, various techniques have been reported (Figure 3). One of these consists in severing the hypoglossal nerve longitudinally and connecting part of it to the facial nerve (split technique). Axonal intertwining inside the hypoglossal nerve makes it impossible to guarantee that tongue function will be conserved with this technique. In other cases, the loop of the hypoglossal nerve has been used to reconstruct the hypoglossal nerve or to connect it to the facial nerve, with poor results. The technique that has gained the most popularity is the so-called jump anastomosis or HFA with interposition of the great auricular nerve. In this procedure, the hypoglossal nerve is partially severed and a free nerve graft is interposed between the extratemporal trunk of the facial nerve and the hypoglossal nerve.[1] In this way, atrophy of the tongue can be prevented in many cases and the smaller degree of facial reinnervation decreases mass movements. However, this lower degree of reinnervation, due to the fact that the axons must pass through 2 nerve sutures, represents a higher risk of fibrosis, axonal loss, and aberrant reinnervation; as a result, facial function is worse and recovery time is longer than with the classic HFA.

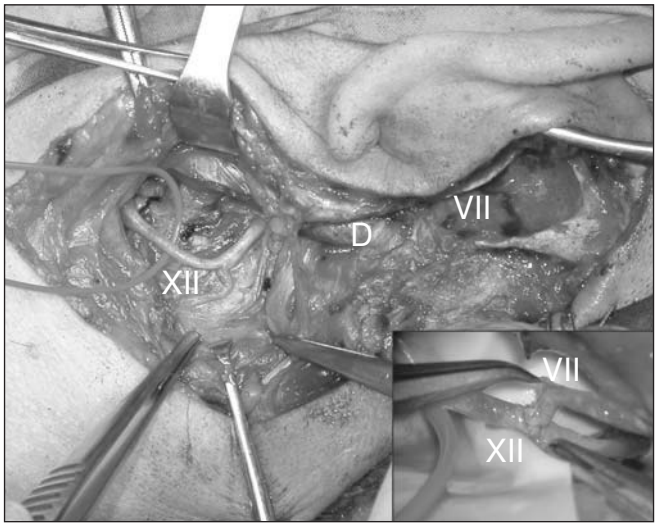

Figure 1. Surgical view of the hemi-hypoglossal facial intratemporal end-to-end anastomosis (left). D, digastric muscle; VII, intratemporal facial nerve; XII, hypoglossal nerve. Detail of the microsurgical anastomosis. The trunk of the facial nerve is connected to the proximal portion of the hypoglossal nerve section, which corresponds to one third of its thickness.

In 1997, Atlas et al[2] described a hemi-end-to-end HFA in an attempt to mitigate the shortcomings of classic HFA and jump anastomosis. With this technique, the trunk of the intratemporal facial nerve (severing it at the level of the geniculate ganglion) is connected to one third of the total thickness of the hypoglossal nerve. In this way, sufficient facial function is achieved (greater function than with the jump anastomosis), mass movements (smaller than with the classical technique) are decreased and morbidity derived from tongue atrophy is avoided.

We should not lose sight of the fact that any of the aforementioned facial reconstructive techniques will obtain good

Figure 2. Preoperative facial function (left) and 18 months after surgery (right), in which the symmetry of the nasogenian sulci and social smile can be observed.

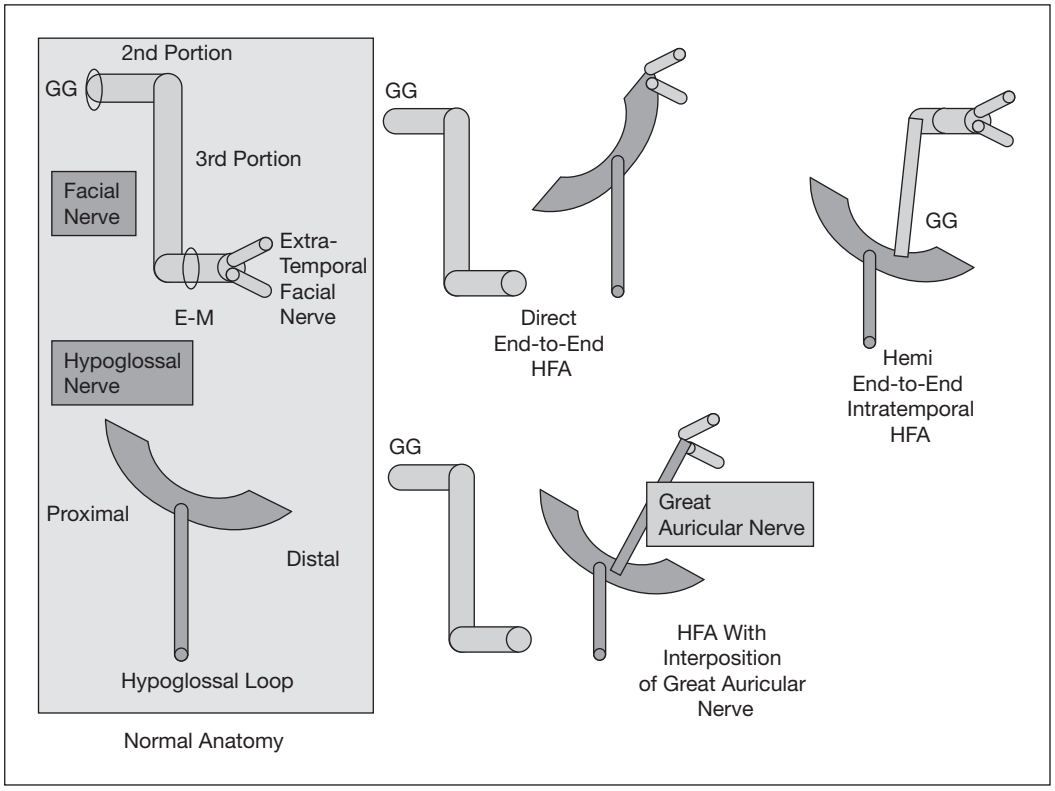

Figure 3. Illustration with the different hypoglossal-facial anastomosis (HFA) techniques. GG indicates, geniculate ganglion; E-M, stylomastoid foramen. Direct end-to-end HFA: the XII cranial nerve is incised in the neck and raised in order to connect it to the VII cranial nerve, severed at the point where it exits through the E-M. Jump HFA with interposition of great auricular nerve: section of the VII cranial nerve where it exits the E-M, and partial section of the XII cranial nerve in the neck, interposing a fragment of the great auricular nerve between both. Intratemporal hemi-end-to-end HFA: the VII cranial nerve is severed at the level of the GG and is lowered and connected to the partially severed XII cranial nerve in the neck.

outcomes in the lower half of the face, with tone and symmetry that will make it possible for the patient to go unnoticed at rest. The social smile is fairly acceptable and the vast majority of patients are happy after the procedure.[3] Nevertheless, movement of the upper third of the face is very limited; forehead function is generally minimal at best, and eye closure is achieved either by relaxing the upper eyelid or by means of a synkinesthetic movement made with the mouth. Therefore, most patients benefit from a separate procedure for eyelid closure, such as gold or platinum weights, that avoid the much feared corneal complications. Many patients prefer to maintain these even after obtaining good facial function with the HFA.

Hemi-side-to-side HFA is indicated in the same situations as the classic technique; that is, complete facial palsy of less than 1-2 years of evolution in which the proximal end of the nerve is not accessible for a primary anastomosis. It is especially useful in patients with multiple cranial nerve deficits, as in the case of many patients with type II neurofibromatosis, in which the addition of palsy of the ipsilateral hemitongue can have deleterious consequences resulting from the difficulties in swallowing and the risk of aspiration. Another advantage of this technique is the possibility of removing a recurrent intracanalicular vestibular schwannoma during the same surgery.[4] When performing this technique in long-standing facial palsies (5-10 years), this procedure also entails the extra benefit of the absence of lingual morbidity, even assuming that the results are merely moderate.[5]

In conclusion, this modification of the HFA is a more time-consuming technique than the classic technique, but has significant advantages such as sparing tongue function and minimizing mass facial movements, all without detriment to definitive facial function. Another step toward avoiding tongue function morbidity has been the recent report of the pure end-to-side HFA, in which a direct anastomosis of the intratemporal facial nerve is performed to the lateral surface of the hypoglossal nerve, without having to resect it; thereby avoiding all possibility of reduced functionality in the tongue.[6] Although the authors of this original technique believe that the axons are capable of crossing the epineurum and reinnervating the facial muscles, more studies are needed to corroborate its efficacy.

REFERENCES

1. Manni JJ, Beurskens CHG, van de Velde C, Stokroos RJ. Reanimation of the paralyzed Face by indirect hyposglossal-facial nerve anastomosis. Am J Surgery. 2001;182:268-73.
2. Atlas MD, Lowinger DS. A new technique for hypoglossal-facial nerve repair. Laryngoscope. 1997;107:984-91.
3. Sood S, Anthony R, Homer JJ, van Hille P, Fenwick JD. Hypoglossal-facial nerve anastomosis: assessment of clinical results and patient benefit for facial nerve palsy following acoustic neuroma excision. Clin Otolaryngol Allied Sci. 2000;25:219-26.
4. Donzelli R, Motta G, Cavallo LM, Maiuri F, de Divitiis E. One-stage removal of residual intracanalicular acoustic neuroma and hemihypoglossal-intratemporal facial nerve anastomosis: technical note. Neurosurgery. 2003;53:1444-7.
5. Darrouzet V, Guerin J, Bebear JP. New technique of side-to-end hypoglossal-facial nerve attachment with translocation of the infratemporal facial nerve. J Neurosurg. 1999;90:27-34.
6. Koh KS, Kim JK, Kim CJ, Kwun BD, Kim SY. Hypoglossal-facial crossover in facial-nerve palsy: pure end-to-side anastomosis technique. Br J Plast Surg. 2002;55:25-31.