Neurosurgical Techniques

Side-to-end hypoglossal-facial anastomosis via transposition of the intratemporal facial nerve

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Summary

The technique of facial nerve repair with side-to-end hypoglossal-facial anastomosis is presented and evaluated in five patients who were operated on for facial nerve paralysis after acoustic schwannoma surgery, or had cranial base trauma.

The end-to-end hypoglossal-facial anastomosis is accompanied by hemilateral paralysis, with difficulty in swallowing, chewing and speaking. In this new technique, the facial nerve is mobilised in the temporal bone, transected at the second genu and transposed to the hypoglossal nerve where a tensionless side-to-end anastomosis is performed. The hypoglossal nerve is transected in oblique fashion to about one third of its circumference. We were able to achieve a tensionless anastomosis in all patients. The idea is to bring about re-innervation of the previously denervated tissue via a collateral sprouting of axons of the donor nerve through the site of coaptation without sacrificing the innervation of the donor nerve’s original targets.

With side-to-end hypoglossal-facial anastomosis, two patients attained a House-Brackmann grade of III (one of them with independent movement of eyelids and mouth); one achieved grade IV, another grade V and grade VI. No patient had hemilateral atrophy nor any problems associated with swallowing or chewing.

Keywords: Facial paralysis; facial nerve; hypoglossal-facial anastomosis; facial nerve graft; side-to-end hypoglossal-facial anastomosis.

Introduction

Patients with total paralysis of the facial nerve have serious functional, psychic and cosmetic impairments. The preservation and repair of the facial nerve remains a major challenge in skull base and mastoid surgery.

The inability to close the eyelids (lagophthalmus) may result in injuries ranging from minimal corneal damage to severe exposure keratitis with corneal ulceration, and even perforation.

Loss of facial motion greatly affects the patient’s emotional message and ability to communicate.

The aim of facial nerve reconstruction is symmetrical, co-ordinated and synchronous voluntary and involuntary movement from a normal appearance at rest with competent sphincters and no sacrifice of other functions [26].

Surgical treatment may involve either minor operations such as tarsoraphy, the use of springs and weights, or major ones, such as facial nerve grafting, anastomosis of the facial to the hypoglossal-nerve, muscle transfers, or transpositions.

In the end-to-end facial-hypoglossal anastomosis technique, a hemiatrophy of the tongue with difficulties in swallowing develops. We would like to present an end-to-side facial-hypoglossal anastomosis which would preserve the function of the tongue.

The idea of transposition of an alternative motor nerve dates back to 1879 when Drobnik anastomosed the spinal accessory nerve to the facial nerve.

In 1904, Koerte became the first to publish reports about the anastomosis of the facial nerve to the hypoglossal nerve. He operated on a patient with infectious petrositis and transected the facial nerve at the stylomastoid foramen. The facial nerve stump was then anastomosed to the side of the hypoglossal nerve without interposition.

In 1932 Balance and Duel were the first to propagate a complete transection of the hypoglossal nerve to perform an end-to-end anastomosis [19].
The transposition of the facial nerve and end-to-end anastomosis to the hypoglossal nerve was a popular and effective technique with satisfying results. The complete transection of the hypoglossal nerve results in homolateral paralysis and atrophy of the ipsilateral tongue, which produces additional problems in those patients whose facial functions are not normal. According to Hammerschlag [10] 45% of the patients with such an operation reported speech and swallowing disorders after such an operation.

To avoid hypoglossal nerve deficits, May described a modified technique where the hypoglossal nerve and the facial nerve (at the level of the parotid gland) are anastomosed with a greater auricular end-to-side nerve graft. The hypoglossal nerve is cut by about half in a transverse direction and the interposition graft is sutured to the distal part of the incision [20]. This technique demands two nerve sutures, which probably leave axonal regrowth quantitatively and qualitatively deficient.


In 1997, articles by Darouzet [5, 6] and Atlas [1] described a new technique for hypoglossal-facial anastomosis. The first author presented four patients and the second author, three, who, among others, were operated on using the new technique. It consists of hemi-hypoglossal-facial anastomosis with rerouting (mobilisation and transposition) of the intratemporal part of the facial nerve without using a nerve graft. With this technique, the sequelae of hemi-lingual atrophy and paralysis (problems with articulation, mastication and deglutition) are reduced or even abolished. It is also possible to achieve a satisfying result with regard to facial functions.

To date, few reports presenting this new modification have been published [1, 6, 14]. The numbers of patients operated on by the new technique is small (the largest number is six patients, reported by Darouzet). Because this technique causes no additional deficits in patients, it should be considered whether or not to apply it more often. To that end, we present our results with this technique.

**Methods**

Surgical technique is illustrated in following figures (Figs. 1–4).

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Fig. 1. A retro-auricular incision is made which is continued to the hyoid bone along the sternocleidomastoid muscle. The hypoglossal nerve is located in the neck under the digastric muscle. We also mobilise the facial nerve at the exit from the stylomastoid foramen to the level of the pes anserinus in the parotid gland (XII hypoglossal nerve)

Fig. 2. A mastoidectomy is performed as a canal wall-up procedure; the facial nerve is identified and mobilised in its vertical portion. The facial nerve is cut at its second genu at the level where it leaves the tympanic cavity and where its horizontal part lies. At the level of the digastric ridge, at the tip of the mastoid, mobilisation is difficult because of bleeding from the stylomastoid artery and we have to remain under the facial nerve to dissect it from the surrounding tissue. After the nerve is mobilised and transposed, hemostasis should be made (APEX mastoid apex, VII facial nerve, I incus ossicule in the attic)

Fig. 3. The facial nerve is brought under the digastric muscle, which we believe gives additional protection to the anastomosis. The hypoglossal nerve is cut to half of its diameter before it divides to ansa n. hypoglossi (XII hypoglossal nerve, VII facial nerve, DIG digastric muscle, M mastoid)