

# Chapter 60

## Nerves Injuries During Rhytidoplasty: How to Avoid and Surgical Reparation



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Nerve injury in facial aesthetic surgery is not rare.

Specially in facial lifting, the injuries may occur in the sensory and motor nerves.

The sensory nerves more affected are the supraorbital and supratrochlear nerve and the infraorbital, great auricular and mental nerve [1], causing temporary or definitive sensory repercussions [2].

The facial nerve motor branches may be harmed as well and generate major alterations, since asymmetry in facial movements is very evident. The injured branches are the mandibular marginal, the zygomatic, the buccal, and the temporal branches [3–5]. The cervical branch injuries, that enervate the platysma muscle, are rare [6].

Another nerve that might be injured in facial lifting is the spinal accessory nerve that enervates the trapezius muscle [7].

Due to these facts, many authors like Wilhelmi et al. [8], analyze all the possible techniques available to elect the most appropriate one, but there is no consensus about which one is the best since all of them have no greater difference enough to elect one because of the other [9].

It is a common agreement between authors that among these sensory nerves, the great auricular nerve is the most injured one [10]. The patient loses upper ear sensitivity and it may cause some discomfort, but it is not so intense and the patient accepts it well. Its consequences are not severe, but depending on the patient, it can become an uncomfortable situation for both the patient and surgeon since it may disturb the patient's quality of life with numbness and even pain in the affected area [11].

The major problem in the great auricular nerve injury is the formation of neuroma, which can be an amputation neuroma, in a complete transection, or an "incontinuity" neuroma, which occurs in partial nerve injuries. To make neuroma

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diagnostic, in the physical examination, it is observed a pain spot in the infra- or behind-the-ear region. At the major pain spot, it is injected 2 cc lidocaine 2%. If the pain ceases, then it means it is a neuroma. Lewin and Tsur [12] show that the nerve can regenerate at a high speed, so if treated accordingly, it may recover the area sensation within some months. Neuroma treatment consists in surgical exploration, usually utilizing the same incision made during the lifting in the scar behind the ear and the occipital region. The skin flap is detached and the great auricular nerve is searched. A white nodular formation in continuity with the great auricular nerve is the neuroma.

There are many neuroma treatments. If it is an “in-continuity” neuroma, it is resected, and the great auricular nerve may be detached proximally and distally and an end-to-end nerve suture is attempted. If this is not possible, a nerve graft is the option.

A common situation, especially in old cases, is the non-identification of the distal ending of the auricular nerve. Some authors [11, 12] recommend, in this situation, neuroma resection and a stitch to compress the nerve applied to close the endoneurial tubes and avoid axon growth again.

Another option is to make an end-to-side loop [13]. The neuroma is resected and the nerve is rotated on itself and sutured to the side of itself [13]. Another option is to use a vein graft longer than 7 cm and introduce the extremity of the nerve inside this vein [14]. Taking into account that in all vein tubulization experimental works the axons grow up to a maximum 3 cm, the chance of the axons in growth to remain inside the vein is very high [15].

All facial motor nerve lesions are very noticeable and disturb patients and surgeons [16].

The buccal and zygomatic branches may be injured in the intra-parotid area, especially in SMAS flap techniques, but fortunately they are uncommon [8]. In the majority of the cases, the lesion occurs distally, out of the parotid gland, in subcutaneous lifting dissection [17]. The buccal and zygomatic branch injuries may cause oral and smile asymmetries, ectropium, and lagophthalmus, creating a very disabling situation for the patient [17].

The temporal nerve lesion causes paralysis of the frontal muscle and also a portion of the corrugator muscle.

The mandibular marginal branch injury usually happens at the extra-parotid and in the most distal zone, determining paralysis of the lower lip depressor muscle and sometimes the depressor anguli oris too, which causes an asymmetrical smile limited to the lower lip. When treating submaxillary hypertrophied gland through cervical incision, there is a risk to harm this gland. We recommend opening the capsule gland horizontally and caudally, since the nerve crosses the cephalic area of this capsule.

If the lesion is detected trans-operatively, dissection and identification of the stumps is mandatory, and the ideal treatment is end-to-end suture with the thinnest sutures available, even with mononylon 6-0.

The most frequent nerve trauma occurs in the distal area, after emerging from the parotid, where these nerves may be very thin and the lesion undetectable

trans-operatively. Therefore, the nerve lesion appears mostly after anesthesia recovering but should be considered only after 24 hours, because it may be due to local anesthetic infiltration.

The following months may be a very hard time for both the patient and doctor.

The doctor should ask for help to an experienced colleague in peripheral nerves and make a good psychological support to the patient.

Unless a detected nerve section has occurred, we recommend an expectant conduct.

We recommend starting with botulin toxin in the contralateral muscles to improve symmetry, electrical stimulation with portable equipment done by the patient for 15 minutes three times a day, and, in some severe cases, psychological and speech therapist support [17]. The great majority, more than 90%, presents good nerve regeneration and acceptable recovery in 3–4 months.

Electromyography should be done at the second and fourth month to evaluate muscle and nerve regeneration.

In cases with no or insufficient clinical recovery, surgical exploration is indicated until 6 months, preferably.

The surgery consists of identifying the proximal and distal endings of the affected nerve or nerves. When this occurs, both are connected end-to-end through simple epineural stitches with 8–10 zeros mononylon, according to the nerve diameter. Tensionless suture is mandatory, and sural nerve grafts, if necessary, are indicated in order to avoid any tension [18, 19].

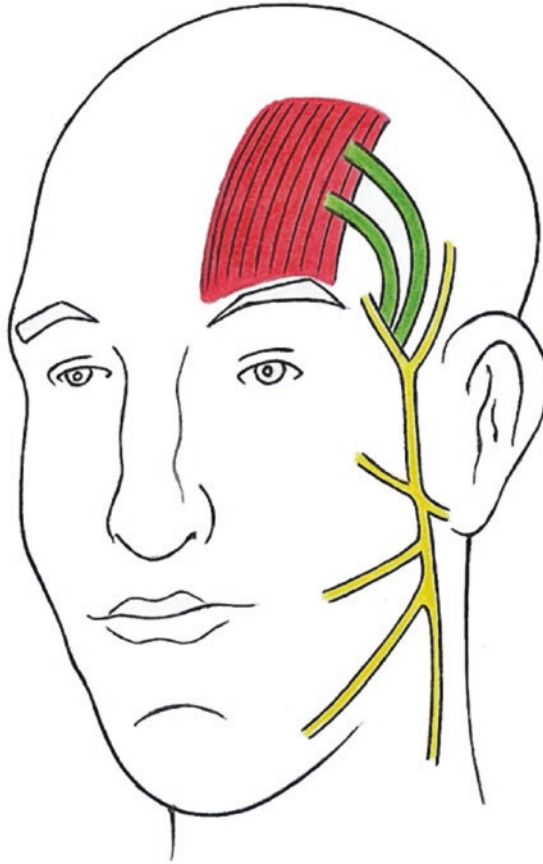
Unfortunately, in the majority of the cases, the distal ending is too thin or not found. In these cases, we prefer to do a muscle neurotization, which means a nerve graft is inserted into the denervated muscle. It is better introducing two nerves in each muscle. Reis [20], in an experimental study in rats, found that two nerve grafts were superior than one but similar to three. The proximal endings of the nerve grafts are sutured end-to-end the proximal stump of the sectioned nerve.

The sural nerve is the first choice as a nerve donor because it is a long one, and its removal results in a minimal sequel of anesthesia in the lateral aspect of the foot [18].

In the sectioned temporal nerve, it is very uncommon to find the distal ending, and we use to do the frontal muscle neurotization with two nerve grafts. These nerve grafts are sutured side-to-end [21–25] in the proximal stump of the temporal nerve due to the diameter incompatibility of the very thin temporal nerve compared with the thicker sural nerve, and the other extremities of the sural nerve graft are introduced inside the muscle (Fig. 60.1).

The other reason to do side-to-end connection is that we should connect two receptor nerves to only one donor nerve. This solves disproportion issues and may take more axons growing in the sural grafts. Another advantage of side-to-end connection is that it is possible to use more than one nerve graft.

The zygomatic nerve injury may cause orbicularis oculi palsy [26]. The treatment may be done with the neurotization of the orbicularis oculi muscle with two nerve grafts sutured in the lateral of the zygomatic proximal stump (Fig. 60.2).

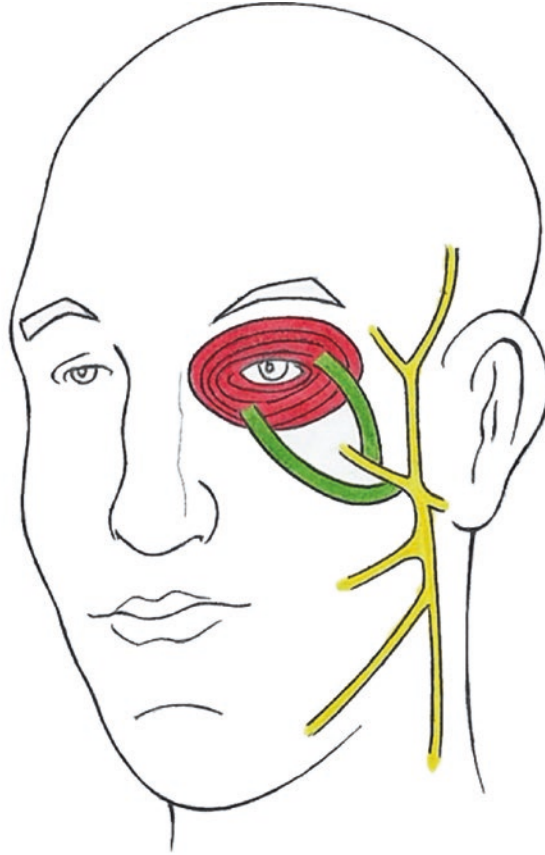


**Fig. 60.1** Frontal muscle neurotization with two nerve grafts. These nerve grafts are sutured side-to-end in the proximal stump of the temporal nerve and inserted inside the frontal muscle

The buccal branch injuries, specially the most distal one, as a rule, make impossible to identify the stumps because of its minimum caliber. In this case, the zygomatic major muscle neurotization can be done through two nerve grafts sutured in the lateral aspect of the very proximal buccal branch (Fig. 60.3).

The mandibular marginal branch injury treatment consists in connecting both sectioned endings with end-to-end repair. In many cases, where the distal part is not identified, the option is depressor muscle and/or depressor anguli oris neurotization, using as donor nerve the proximal part of the mandibular marginal branch, or, in some cases, the contralateral mandibular marginal branch, depending on the anatomy of the patient (Fig. 60.4).

The cervical branch injury is very rare and the sequel will be platysma muscle palsy, which is not important since it does not bring important asymmetry.

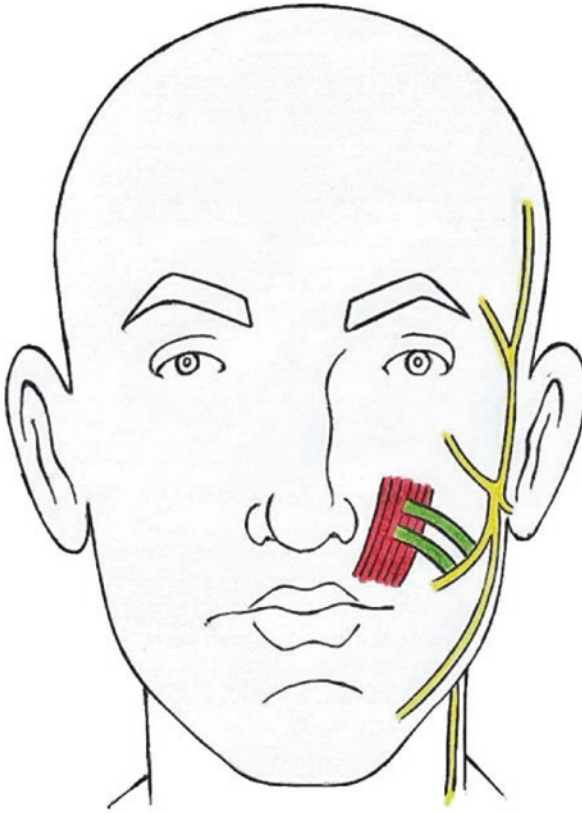


**Fig. 60.2** Orbicularis oculi muscle neurotization with two nerve grafts. These nerve grafts are sutured side-to-end in the proximal stump of the zygomatic nerve and inserted inside the orbicularis oculi muscle

Another nerve that might be injured in facial lifting is the spinal accessory nerve that enervates the trapezius muscle. Although not common, this lesion causes a very noticeable shoulder fall. The treatment should be surgical exploration and nerve cooptation directly or through the nerve graft, as soon as possible, since its spontaneous recovery is rare [27].

In most of the nerve injury cases we have received, the skin or SMAS detachment is done with scissors.

We believe that when the detachment is done with scissors at the most distal area of the flap, that is, the area next to the ear, the surgeon has a better control of the flap thickness, and nerve injuries or skin necrosis are very rare. However, as the detachment goes further, toward the proximal region, that is, near the central area of the face, it may become too close to the surface and increase the chance of developing

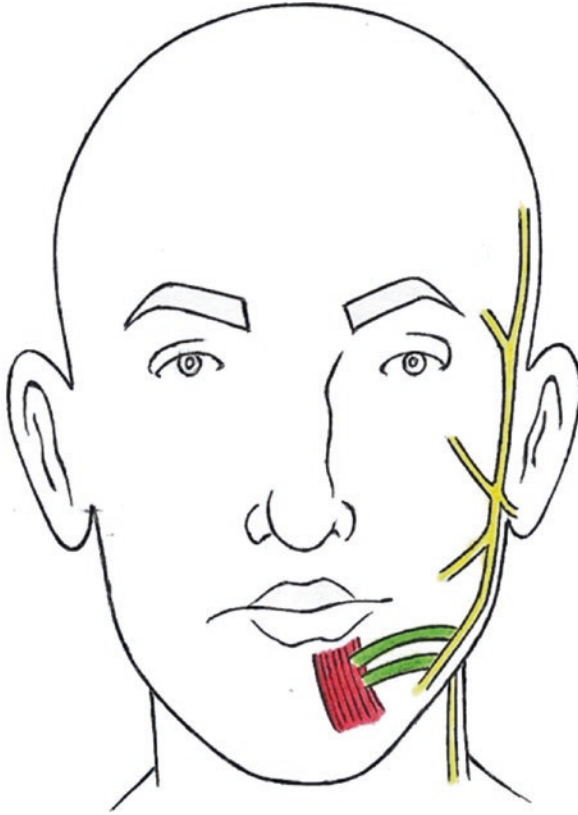


**Fig. 60.3** Zygomatic major muscle neurotization with two nerve grafts. These nerve grafts are sutured side-to-end in the proximal stump of the buccal nerve and inserted inside the zygomatic major muscle

skin necrosis, or, the opposite, if it goes too deep, it would increase the risk of harming the nerves. In general thin patients are more susceptible to nerve injuries.

To avoid this risk, Trepsat [28] described a detacher that resembles a scissor with a metallic heart-shaped piece at the point. When the scissor handles are opened, the detachment is obtained. Viterbo [17, 21, 29] described a modification in Trepsat's detacher inverting how the mechanism works; the surgeon compresses the handle and the detacher tips open, causing skin avulsion. It is a simple change that provides more comfort to the surgeon, since this detachment is done several times and avoids muscle tiredness by compressing the handles and not opening it. This modification also brings safer and faster skin detachment.

In injury occurrences, corticoids, vitamin B12, Synaxial, and Etna are commonly recommended by doctors. Corticoids are used to decrease structural edema and lower the possibility of a theoretical nerve compression. Vitamin B12, Etna, and



**Fig. 60.4** Depressor muscle and/or depressor anguli oris muscle neurotization with two nerve grafts. These nerve grafts are sutured side-to-end in the proximal stump of the mandibular marginal branch nerve and inserted inside the depressor muscle and/or depressor anguli oris muscle

Synaxial are used expecting they enhance nerve regeneration, but the scientific confirmation is still weak and we don't recommend them.

Regarding the dissection plan, we believe skin detachment, without being too deep, is very safe. As for the SMAS elevation technique recommended by some authors [30, 31], it must be done very carefully since it can easily expose the facial branches, and due to that, we strongly agree with Wilhelmi et al. [8]. Beyond the risk issues, it is not proved yet the long-term superiority of SMAS elevation techniques compared with skin elevation and SMAS plicature in the face lifting.

Hematoma occurrences do not seem to us the cause of any nerve injury; bleeding during surgery may demand a fierce cauterization and this is what may lead to a nerve injury.

We defend the use of bipolar cauteries to decrease the extension of the tissue injury, and in cauterization-resistant bleeding cases, compression must be done. If compression seems not to be effective, then a small stitch in "x" done with

cylindrical needle may settle this situation without causing nerve damage. The hemostatic net described by Auersvald and Auersvald [32] is very helpful in hematoma prevention, and we are using this for the last 4 years with zero hematoma.

When detecting a nerve injury during the surgical procedure, the surgeon must follow a routine: first, try to remain calm; second, with aid of a loupe, try to locate the affected nerve segment in its proximal and distal section. If he feels capable, he may stitch it with the thinner caliber thread available, even a nylon 6-0, with a cylindrical needle, and try to retain the stumps close with one or two stitches, depending on the nerve caliber. This, in general, solves the situation. If he doesn't have enough experience to perform this procedure, the surgeon must require for aid of a specialized colleague. Not having neither one of these options, the surgeon does not have experience and the colleague is not available to help, then he must end calmly the surgery and after finishing it, ask for someone experienced to evaluate the case.

If the case came to us after a while, we recommend the injection of botulinum toxin in the contralateral muscles to improve the symmetry.

Electrical stimulation must be initiated immediately after the nerve injuries, and applied for 15 minutes, three times a day, with micro-electric current portable device. This procedure is painless. If the patient is educated on how to use the device, he may even perform this procedure at home by himself.

The injection of botulinum toxin in the contralateral muscles to improve the symmetry is very useful while the nerve regeneration occurs.

It is important that the surgeon, in any hypothesis, must not abandon the patient. The patient should be seen weekly at the beginning of the treatment, and then every 15 days, and then once a month. Photos and videos should be taken. The patient should feel the doctor's interest in helping him.

The patient who suffers from facial palsy due to a trauma, tumor, infection, or congenital, accepts the result, even if not perfect, as a rule, with great satisfaction. The opposite happens with the nerve injury after aesthetic surgery since this patient has a higher demand level for the final result.

Ninety percent of the nerve injury cases in facial nerve during aesthetic surgeries evolves well and spontaneously. This ratio induces certain security to the surgeon, sometimes even exorbitant, leading the surgeon to be carefree with his patient too early.

The 10% of cases that does not evolve well, if not treated within 6 months after the injury, may experience definitive muscle atrophy. That is why it is important that this patient must be evaluated with electromyography every 2 months and then 6 months, and his muscle functions must be evaluated as well. If there is no improvement until the sixth month, the patient must be operated during this period with exploration and, if necessary, nerve grafting. Taking into account that the end-to-side neurotomy does not harm any nerve, the interventions in facial paralysis after lifting became safe when done early, no later than 6 months.

The electrical stimulation presents benefits both in the muscle and in the nerve. The muscle affected by atrophy will have an improvement. To muscle not affected yet, the electrical stimulation will avoid it to suffer from atrophy and the nerve will



present a higher axonal regeneration speed in comparison to the non-stimulated nerve [33–36].

It is important that the surgeon knows that face nerve injuries may occur to anyone. Prevention and being prepared are very important.

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