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Original article

# Frontal site surgery for chronic migraine therapy

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**Abstract.** *Background and aim:* According to the most current theories, chronic inflammation of some cranial nerves give rise to an inflammatory chain that would result in migraines. As for frontally located attacks, the nerves involved are two (on each side): the supraorbital and the supratrochlear. Surgical treatment includes complete neurolysis of both of these nerves. *Methods:* In this work, we describe our experience with this type of surgery. From 2011 to 2022, we treated 98 cases suffering from chronic migraine not responsive to drugs with frontal localization. The results were evaluated through a specific questionnaire three months and one year after surgery. *Results*: After three months post-surgery, we observed a success rate (reduction of monthly attacks equivalent to or greater than 50%) in 87% of patients (32% complete recovery). These results were essentially confirmed one year after surgery. The rare complications (mainly paresthesias and dysesthesias of the frontal area) have always resolved spontaneously within a few months. *Conclusions:* The surgical approach allowed to obtain good therapeutic results with a low rate of complications. (www.actabiomedica.it)

**Key words:** migraine, migraine treatment, migraine surgery, frontal nerves, mini-invasive surgery

## Introduction

The current pathogenetic hypotheses on the mechanisms underlying the onset of migraine attacks increasingly hypothesize an involvement of the cranial nerves and their inflammation (1-9). According to these theories, chronic inflammation of some cranial nerves would give rise to an inflammatory chain that would result in migraines of the type without aura (10-32). As for frontally located attacks, the nerves involved would be two (on each side): the supraorbital and the supratrochlear. The neurolysis of these nerves would allow to gain successful results in a high percentage of cases (33-44). The purpose of this paper is to describe our surgical technique for the treatment of frontal migraine.

## Operative technique

Patients must first have a diagnosis of chronic migraine located in the frontal area by a board-certified neurologist. The patient usually reports the onset of several attacks per month, starting from the eyebrow region, more frequently unilaterally; the medical therapies carried out previously have not allowed to obtain appreciable results. The affected nerves, which classically act as "trigger points" elicitating the attacks, are two: the supraorbital and the supratrochlear nerves. These nerves are usually mechanically irritated by the contraction of the adjacent mimic musculature: the corrugator supercilii and the depressor supercilii muscles. The surgical approach therefore relies on the neurolysis of the two nerves with simultaneous section

of these muscles. The surgery is performed under local anesthesia with sedation; hospitalization is one day. The preoperative drawings includes the skin incision line (parallel and close to the lower edge of the eyebrow) and the two nerves (Figure 1).

The supraorbital nerve is localized by palpating the supraorbital notch, near the hemipupillary line on the eyebrow; the supratrochlear nerve is located about 2 cm medially. The cocktail of local anesthetic that we prefer to use consists of carbocaine 1% (20cc), saline (20cc) and sodium bicarbonate 0.9% (10cc). After infiltrating the affected area, we proceed with the cutaneous incision, usually equal to about 3 cm. We then proceed to an accurate neurolysis of both nerves (Figure 2) with myotomies, medially and laterally, of the mimic musculature of the eyebrow.

Although not as frequently as in temporal and occipital localizations (45-46), also in the frontal trigger point it can happen to localize an ectatic vessel (Figure 3).

In these cases, cauterization of the vessel is a must. The procedure is completed by an accurate hemostasis and non-absorbable continuous subcuticular suture. The patient is then advised to apply ice to the operated area for a few hours. In the immediate post-operative

**Figure 1.** Preoperative markings. Horizontal line: cutaneous incision; vertical continuous line: supraorbital nerve; vertical dotted line: supratrochlear nerve.

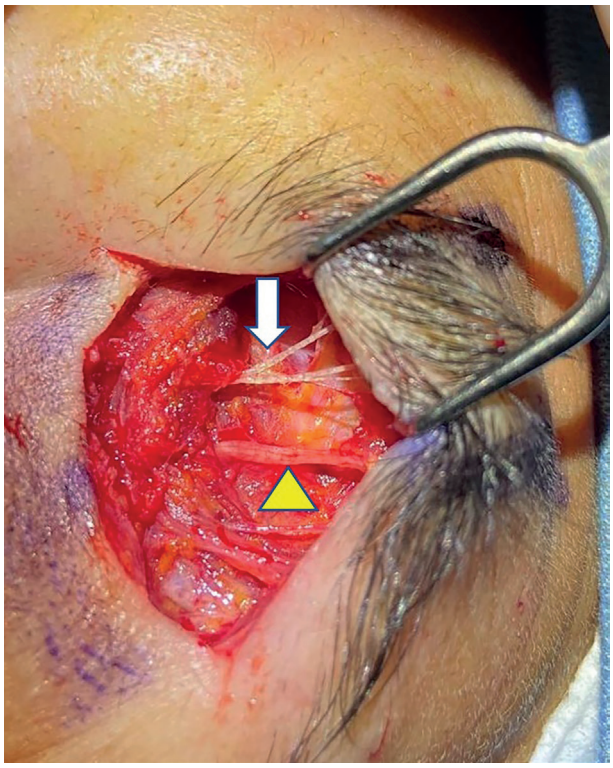

**Figure 2.** Complete neurolysis of the left suprathroclear (white arrow) and supraorbital (yellow triangle) nerves.

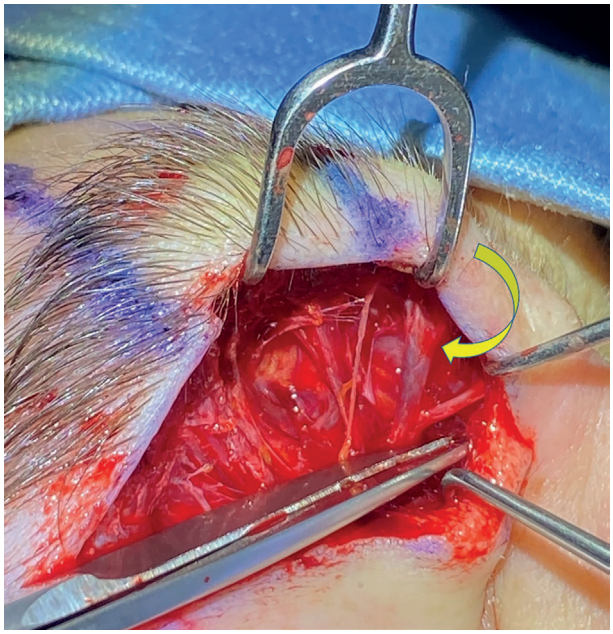

**Figure 3.** Ectatic vessel (yellow arrow) in proximity of the left supratrochlear nerve.

period, the only serious complication to be diagnosed is an orbital hematoma, a rare complication to be treated, if necessary, promptly. The appearance of ecchymosis and eyelid edema is the norm, although of varying degree from patient to patient. Both of these symptoms regress spontaneously within 2-3 weeks.

## Results

For this study, we analyzed the data of 98 patients operated from 2011 to 2022 (age range: 21 – 58 ys; 91% females, 9% males) suffering from chronic migraine not responsive to drugs with frontal localization. All the patients had a diagnosis of chronic migraine confirmed by a board-certified neurologist, after failure of several attempts of different medical therapies. Patients were asked to fill a headache diary and complete a migraine questionnaire assessing parameters before surgery, after three months and one year after surgery. Data regarding age, sex, age at onset, migraines per month (in days), associated symptoms, severity (on a scale from 1 to 10) were collected. After three months post-surgery, we observed a success rate (reduction of monthly attacks equivalent to or greater than 50%) in 87% of patients (32% complete recovery). These results were essentially confirmed one year after surgery (success rate: 83%; complete recovery: 28%). The rare complications (mainly paresthesias and dysesthesias of the frontal area) have always resolved spontaneously within a few months. In 47 patients (46%), we noted the onset of a secondary trigger point, mainly ipsilateral temporal, in the 3-6 months after surgery.

## Conclusions

After Guyuron's initial and monumental contribution over thirty years ago (47), the peripheral theory of migraine and the consequent surgical approach have met with increasing favor and applications. According to what has been described, the surgical approach adopted allowed to obtain good therapeutic results with a low rate of complications. Given the high frequency (46%) of occurrence of secondary trigger points in the post-operative period, it is important to emphasize this point well with the patient during the pre-operative visit. Although not frequently, also in the frontal area it is possible to observe vascular anomalies found more frequently in the temporal and occipital zones (48-49). In our opinion, when this happens, it is essential for the success of the intervention to coagulate the ectatic vessels. Neurolysis of supraorbital and supratrochlear nerves can be performed either endoscopically or via open access. In our experience, over the years we have increasingly opted for the open approach, which allows, in our hands, a more detailed and complete neurolysis.

**Ethic Committee:** The competent Ethical Committee do not require formal approval for retrospective studies.

**Conflict of Interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

**Informed consent:** Written informed consent was obtained from all subjects involved in the study.

**Authors Contribution:** GR wrote the paper, AA and AG collected data and pictures, ER performed the surgeries and supervised the whole project.

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