PERCUTANEOUS RADIOFREQUENCY RHIZOTOMY AND NEUROVASCULAR DECOMPRESSON OF THE TRIGEMINAL NERVE FOR THE TREATMENT OF FACIAL PAIN

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ABSTRACT - Objective: To determine the outcomes of 354 radiofrequency rhizotomies and 21 neurovascular decompressions performed as treatment for 367 facial pain patients (290 idiopathic trigeminal neuralgia, 52 symptomatic trigeminal neuralgia, 16 atypical facial pain, 9 post-herpetic neuralgia). Method: Clinical findings and surgery success rate were considered for evaluation. A scale of success rate was determined to classify patients, which considered pain relief and functional/sensorial deficits. Results: Radiofrequency rhizotomy was performed in 273 patients with idiopathic trigeminal neuralgia and in all other patients, except for trigeminal neuropathy; neurovascular decompression was performed in 18 idiopathic trigeminal neuralgia patients; 100% idiopathic trigeminal neuralgia, 96.2% symptomatic trigeminal neuralgia, 96.2% symptomatic trigeminal neuralgia, 37.5% atypical facial pain and 88.9% post-herpetic neuralgia had pain relief. Conclusion: Both techniques for idiopathic trigeminal neuralgia are useful. Radiofrequency rhizotomy was also efficient to treat symptomatic facial pain, and post-herpetic facial pain, but is not a good technique for atypical facial pain.

KEY WORDS: facial pain, neurosurgery, trigeminal neuralgia, radiofrequency rhizotomy, vascular decompression.

Rizotomia percutânea por radiofreqüência e a descompressão neurovascular do nervo trigêmeo no tratamento das algias faciais

RESUMO - Objetivo: Determinar eficácia e achados pós-operatórios após 354 rizotomias por radiofreqüência e 21 descompressões neurovasculares como tratamento de 367 pacientes com dor facial (290 neuralgia idiopática do trigêmeo, 52 neuralgia sintomática do trigêmeo, 16 dor facial atípica, 9 neuralgia pós-herpética). Método: Achados clínicos e taxa de sucesso das cirurgias foram considerados para avaliação. Uma escala avaliando alívio da dor e complicações sensoriais e funcionais foi utilizada para classificar os pacientes. Resultados: A rizotomia por radiofreqüência foi realizada em 273 pacientes com neuralgia idiopática do trigêmeo e em todos os outros pacientes, exceto neuropatia trigeminal; descompressão neurovascular foi realizada em 18 pacientes com neuralgia idiopática do trigêmeo; 100% dos pacientes com neuralgia idiopática do trigêmeo, 96.2% dos pacientes com neuralgia sintomática do trigêmeo, 96.2% dos pacientes com dor facial atípica e 88.9% dos doentes com neuralgia pós-herpética tiveram alívio da dor. Conclusão: Ambas as técnicas são úteis para a neuralgia idiopática do trigêmeo. A rizotomia por radiofreqüência foi também eficiente para tratar neuralgia sintomática do trigêmeo e pós-herpética, mas não foi uma boa técnica como tratamento da dor facial atípica.

PALAVRAS-CHAVE: dor facial, neurocirurgia funcional, neuralgia trigeminal, rizotomia por radiofreqüência, descompressão neurovascular.

Idiopathic trigeminal neuralgia (ITN) is a paroxysmal shock-like pain restricted to the innervation of one or more trigeminal branches, often set off by light stimuli in a trigger zone. Its clinical treatment includes anticonvulsants, and carbamazepine is the drug of choice, whereas surgical treatment is indicated in about 75% of the patients at any moment after diagnosis. Around 5% of patients present an intracranial expansive lesion, which make imaging exams (computed tomography and/or magnetic resonance) necessary. These patients characterize symptomatic trigeminal neuralgia (STN), and neurosurgical treatment as the first choice. Atypical facial pain (AFP) constitutes a diverse group of patients with complex diagnosis, presenting deep and localized facial pain, often described as burning, with...
out any imaging or laboratorial abnormalities. Post-
herpetic neuralgia (PHN) is a complication of Herpes
zoster infection in around 4% of patients, character-
ized by burning pain at the trigeminal branch involv-
ed. For both AFP and PHN, treatment with drugs
(e.g. antidepressants) is the first choice, but percuta-
neous neurosurgery may be a treatment option. Ra-
diofrequency percutaneous rhizotomy (RPR) is wide-
ly used to treat ITN, and may be a choice for other
recurrent facial pain. Operated ITN may recur in 18%-20% of the cases in 10 years. It is probable that higher
sensory deficit is an indication of higher success rate.
Some complications are: corneal hypoesthesia
(16-23%), corneal anesthesia (2-6%), corneal-palpe-
bral reflex deficit (19.7%), keratitis (1.4-4%), corneal
ulcer (1-2%), paresthesia (8-10.9%), anesthesia dol-
roso (0-5%), anesthesia of trigeminal branches (17%),
Herpes simplex infection (40%), numbness sensation
(58-79%), dysesthesia (0.5-18% - 5% need medica-
tion), motor massteric deficit (4-53%), paralysis of
ocular nerves. Dysesthesias are usually associated to
more intense sensory deficit. Severe complications
are rare (intracranial haemorhage, meningitis)

Neurovascular decompression (ND) is an open sur-
gery with the aim of eliminating the nerve compre-
sion at the entry zone by a vessel. Most cases present
immediate relief, with less than 36% of recur-
rence after 5 years. Up to 26% of patients do not
present the compression and need section of the
trigeminal sensitive root. Complications are: facial
hypoesthesia or hypoalgesia, anaesthesia dolorosa,
master muscle weakness, paresis of the IV cranial
nerve (4.3%), auditive deficit. Mortality rate is 1-
4.3%. It is indicated for young patients intending
to preserve superficial sensitivity, suspicion of an ex-
pansive intracranial lesion, association among facial
neralgias, bilateral ITN, ITN association to hemi-
facial spasm; its contra-indication is multiple sclerosis.

The objective of this study was to evaluate the
outcomes of a Brazilian population of patients with
ITN and other facial pains after neurosurgical treat-
ment with RPR and/or ND.

METHOD

This study is based on the retrospective evaluation of
367 patients with facial pain treated at the Neurology Clinic
of the Hospital das Clínicas, Medical School, University of
São Paulo, and at the Neurosurgery Department of the
Hospital Nove de Julho, São Paulo SP, between April, 1979
and June, 1984. Surgical treatment was indicated because of
inefficacy and/or side effects of the clinical trea
ment. Patients were diagnosed according to the IASP criteria,
and treated as followed:

Group I: Idiopathic trigeminal neuralgia - 290 patients:
272 were treated with RPR, 17 with ND and 1 by both pro-
cedures; 1 had had RPR for PHN before, and developed ITN
in other trigeminal branch.

Group II: Symptomatic facial pain (SFP) - 52 patients: 39
with malign tumors, 7 with benign tumors, 3 with multi-
ple sclerosis, 2 maxillary sinusopathy, 1 trigeminal neurona-
phy. All patients were treated with RPR, except for the last
patient, which was treated with ND.

Group III: Atypical facial pain - 16 patients were treat-
ed with RPR; 2 also had ND due to pain recurrence.

Group IV: Post-herpetic neuralgia - 9 patients, all treat-
ed with RPR.

Complementary investigation consisted in skull radiogra-
phy in all patients. Computed tomography (CT) was indi-
cated for patients younger than 40 yo, AFP, SFP, and patients
with abnormal neurological exam. After 1982, all patients
started to be scanned by CT. Cerebrospinal fluid (CSF) exam
was performed in all patients with bilateral ITN, and in asso-
ciation to CT for the diagnosis of multiple sclerosis. CT of
vertebral-basilar complex was performed when vascular
lesions were suspected, or as a routine investigation for
patients with indication of ND. Patients with other associ-
ated lesions had complementary exams, e.g. otorhinolo-
gologist or ophthalmologic evaluation.

Surgeries

Radiofrequency percutaneous rhizotomy – Patients
underwent RPR with general anesthesia or sedation, and
all had previously explanation about the surgical proce-
dure. The technique used was the one described by White
and Sweet and Siegfried. After the electrode introduc-
tion, patients were awakened to inform location of the
stimulated area. Stimuli generator of radiofrequency used
were the model RFG-3A (Radionics, Inc. Burlington, Massa-
Chusetts, USA) and Fundatec (Porto Alegre - Brasil). The
electrode used was TIC-TM trigeminal rhizotomy electrode
(Radionics, Inc., Burlington, Massachusetts, USA). The final
lesion was performed with general anaesthesia. Methil-
celulosis eyewash was prescribed for patients with hypo-
thesia of the ophthalmic trigeminal branch, for a period
of 4 weeks of application. Electrophysiological data, lesion
parameters, cerebrospinal fluid or blood leak through the
electrode, facial hyperemia or neurological post-operative
disturbances were considered during the analysis.

Neurovascular decompression – All patients were oper-
ated under inhalatory general anesthesia, and all of them
were monitorized. Surgery was performed with patients
positioned in lateral decubit with the head inclined ante-
rior-laterally. The trigeminal nerve root was assessed by
retromastoida suboccipital craniotomy, and its dissection
was performed using a surgical microscope. The petrous
vein was electrocoagulated and sectioned in all cases, in
order to facilitate the trigeminal root exposition. Veins
compressing the trigeminal root were coagulated, while
arteries were dissected and separated from the root by the
interposition of Teflon, Dacron or Nylon fragments.
Analysis – Pain relief, facial sensitivity deficit, neurological dysfunction, hypoesthesia, facial late deafferentation, clinical complications, and pain recurrence were considered for the analysis. Patients were classified in 7 degrees (Table 1). Patients were re-evaluated after 1 month, 4 months, and thereafter each 6 months. The evaluation was subjective and based on patients and relatives’ information.

RESULTS

Idiopathic trigeminal neuralgia – General characteristics corresponded to literature findings: 166 (57.3%) female; 277 (95.5%) white, 7 (2.4%) yellow, 4 (1.4%) black and 2 (0.7%) other. Pain predominated in the right side (57.6%) (p<0.05), and was bilateral in 17 (5.9%). Ages ranged from 17-88 years old (mean 62.5 yo). Patients treated with RPR (mean age of 63.8 yo) were statistically older than patients that underwent ND (mean age of 44.8 yo) (p<0.05). Mean pain duration was 91 months for ND and 99 months for RPR. Unilateral ITN distribution was: ophthalmic branch (V1) in 2.2%, maxillary branch (V2) in 17.6%, and mandibular branch (V3) in 19.4%; V1-2 in 19.0%, V2-3 in 30.0%, and V1-2-3 in 11.7%; 3 patients had familiar history of ITN (1.03%). Concomitant neurological diseases were: Parkinson disease (3), essential tremor (3), cerebrovascular disorder (stroke) (2), glossopharyngeal neuralgia (2), vertebrobasilar invagination (1) and previous parietal meningioma (1); 8 (2.8%) had hemifacial spasm. CT (53.4% for RPR and 94.4% ND) findings were in general compatible to aging.

CSF exam, performed in 51 (17.6%) patients, revealed total proteins increase in 1 patient with convulsive disorder (seizures). Angiography of vertebro-basilar complex was performed in 14 (4.8%) patients and angiography of internal carotid artery in 3 (1.0%); atherosclerosis was present in 1 that had ND and 7 that had RPR.

All patients had been treated with anticonvulsants, and all had taken carbamazepine in any moment; 6.2% had never had complete pain relief with drugs, the others were indicated to surgery due to excessive side effects or failure of drugs’ efficacy; 120 (41.4%) had previous surgical procedures: 24.8% peripheral neurotomy, 11.0% temporal retrograde rhiotomy, 16.2% trigeminal peripheral alcoholization, 0.7% ND, 0.3% trigeminal ganglion alcoholization, and 0.3% ganglion electrocoagulation. Procedures were multiple in 8.2% of patients. Cardiovascular, respiratory, hepatic, renal or metabolic disturbances are outlined in Table 2; 19 (6.6%) patients treated with RPR had absolute contra-indication for ND.

All patients treated with RPR had complete pain relief, although 8 had 2 RPR and 1 had 3 RPR for complete pain alleviation, immediately after the first RPR, resulting in a total of 283 procedures. Results are outlined in Table 1. Along the follow-up, pain recurrence occurred mostly in the first year (44.0%), and was more often in patients with bilateral RPR or ITN in

Table 1. Scale for the results of RPR and ND (N=367).

<table>
<thead>
<tr>
<th>Results</th>
<th>Degree 1</th>
<th>Degree 2</th>
<th>Degree 3</th>
<th>Degree 4</th>
<th>Degree 5</th>
<th>Degree 0</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITN</td>
<td>172</td>
<td>69</td>
<td>1</td>
<td>–</td>
<td>3</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Unilateral</td>
<td>165</td>
<td>67</td>
<td>–</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Bilateral</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>SFP</td>
<td>16</td>
<td>9</td>
<td>6</td>
<td>–</td>
<td>18</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>Maligne tumours</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>–</td>
<td>18</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Benigne tumours</td>
<td>5</td>
<td>2</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Sinusitis</td>
<td>–</td>
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<td>–</td>
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<td>–</td>
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<tr>
<td>Trigeminal neuropathy</td>
<td>–</td>
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<td>–</td>
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<td>–</td>
<td>–</td>
<td>–</td>
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<tr>
<td>AFP</td>
<td>5</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>4</td>
<td>6</td>
<td>–</td>
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<tr>
<td>PHN</td>
<td>–</td>
<td>–</td>
<td>8</td>
<td>–</td>
<td>–</td>
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<td>–</td>
</tr>
</tbody>
</table>

Degree 1: pain relief, hypalgesia or analgesia, tactile sensitivity deficit at the trigeminal branch affected, no neurological complications; Degree 2: pain relief, hypalgesia or analgesia, tactile sensitivity deficit at the branch affected and adjacent areas, minimum transient neurological complications with no functional compromise (e.g. dysesthesia, masticatory muscles paresis); Degree 3: pain relief, anaesthesia at any facial area or corneal; transient functional deficit of ocular motor nerves or other nerves, paraesthesia with need of medication, lesion of encephalic structure; Degree 4: pain relief, keratitis, paraesthesia with need of medication; Degree 5: pain relief, severe complications like corneal ulcers, unpleasant dysesthesia even with the use of medication, encephalic lesions; Degree 6: failure of treatment (no pain alleviation); Degree M: Partial improvement of pain or residual pain treated with medication.
more than 1 branch (p<0.05), but not associated to the degree of post-operative sensorial deficit: 13.5% of patients with post-operative hypoalgesia, 18.9% with partial analgesia, and 44.5% with complete analgesia had recurrence. Recurrence and complications are outlined in Table 3. Transient trigeminal paresis occurred in 13 (4.8%) but only 1 discomfortable, and facial paresthesia occurred in 36 (13.2%); 2.8% had anaesthesia dolorosa. Numbness sensation was unpleasant in 8 (2.9%) patients; 4 (1.5%) had difficulties to adapt their dental prosthesis due to facial hypoesthesia; 10 (3.7%) had ulcerate lesions in the oral mucosa clinically treated. Transient functional deficit of the VI cranial nerve occurred in 3 (1.1%) patients and of the IV nerve in 1 (0.4%); 4 (1.5%) had transient gustatory deficit and 18 (6.6%), transient auditory disturbances; 1 (0.4%) had haematoma of the right temporal lobe due to accidental cerebral cortex injury. Fortunately, he got completely well after surgical treatment. Sensitive deficits are outlined in Table 4. Hypalgesia/analgesia were transient in 30.4% of patients (Table 5). Follow-up of patients was up to 65 months (mean 22.6 months).

All patients treated with ND got complete pain relief (Table 1): 1 had still 2 days of paroxysms. Neurovascular conflict was present in all of them: 17 (94.4%) with the superior cerebellar artery, 3 (16.7%) with anterior-inferior cerebellar artery, 1 (5.6%) vertebral artery, 1 (5.6%) undetermined vein, and 2 (11.1%) arachnoiditis. Only 3 (16.7%) had depression of neural surface at the compression area, and compression was located in all at the initial 5mm of the trigeminal root. Only 1 (5.6%) had recurrence, after 30 months (Table 3). Follow-up was up to 39 months (mean of 25.5 months).

**Symptomatic facial pain** – The most prevalent gender was male (30 patients - 75.8%); all patients were white; ages ranged from 22-77 yo (mean 56.5 yo). Breathing insufficiency, hypertension and/or de-nutrition were present in 30 cases (Table 2). Recurrence rates (9.6%) and complications may be observed on Table 3.

a) Malign tumors (N=39): Tumor location was: cranial base, oral cavity, face, oropharynx and larynx. All patients had RPR as treatment, and all had pain relief (Table 1). Pain distribution was: V3 in 17 (43.6%), V2-3 in 10 (25.6%), V1-2-3 in 6 (15.4%), V1-2 in 3 (7.7%), V2 in 2 (5.1%), V1 in 1 (2.6%). RPR was bilateral in 3 (7.7%) patients. Three patients had lesion of adjacent branches during the procedure. Follow-up was up to 23 months (mean 5.2 months).

b) Benign tumors (N=7): One patient had meningioma of Meckel cave, 2 meningioma of the medium and posterior fossa, 1 clivus meningioma, 1 dermoid cyst of Meckel cave (with previous surgery without alleviation), and 1 acoustic neurinoma. All were treated with RPR, and all had pain relief (Table 1).
Multiple sclerosis (N=3): Facial pain began after 2-20 years from the initial symptoms of the disease, and pain duration ranged from 12 to 39 months (mean 29m); 2 patients had bilateral ITN and 1 unilateral AFP; 2 had pain at V3 and 1, V1-2. Neurological abnormalities including facial hypoesthesia were present in all of them. All underwent RPR, with initial pain relief (Table 1). Maximum follow-up was 56 months (mean 30.7 m).

Sinusitis (N=2): Pain was at V1-2 in 1 and at V2 in the other. Both had multiple unsuccessful previous treatments. No one had pain alleviation after RPR (Table 1).

Trigeminal neuropathy (N=1): Pain was present on the left side, associated to moderate hypoesthesia. Previous treatments with anticonvulsants and psychotropics were unsuccessful. Imaging exams and blood tests were normal. ND was performed because of arachnoiditis observed on imaging exams, but its coagulation did not relief pain (Table 1).

**Table 4. Sensitive post-operative deficits after RPR X trigeminal branch affected (N=290): sensitive deficits occurred in a different trigeminal branch than the pain location in 40 (14.7%).**

<table>
<thead>
<tr>
<th>Area of sensitive deficit</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V1-2</th>
<th>V2-3</th>
<th>V1-2-3</th>
<th>Sub-total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigeminal branch affected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>V2</td>
<td></td>
<td>31</td>
<td></td>
<td>3</td>
<td>12</td>
<td>3</td>
<td>49</td>
</tr>
<tr>
<td>V3</td>
<td></td>
<td></td>
<td>44</td>
<td></td>
<td>7</td>
<td>1</td>
<td>52</td>
</tr>
<tr>
<td>V1-2</td>
<td>2</td>
<td></td>
<td></td>
<td>43</td>
<td></td>
<td>9</td>
<td>54</td>
</tr>
<tr>
<td>V2-3</td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
<td>72</td>
<td>4</td>
<td>81</td>
</tr>
<tr>
<td>V1-2-3</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>25</td>
<td>31</td>
</tr>
</tbody>
</table>

c) Multiple sclerosis (N=3): Facial pain began after 2-20 years from the initial symptoms of the disease, and pain duration ranged from 12 to 39 months (mean 29m); 2 patients had bilateral ITN and 1 unilateral AFP; 2 had pain at V3 and 1, V1-2. Neurological abnormalities including facial hypoesthesia were present in all of them. All underwent RPR, with initial pain relief (Table 1). Maximum follow-up was 56 months (mean 30.7 m).

d) Sinusitis (N=2): Pain was at V1-2 in 1 and at V2 in the other. Both had multiple unsuccessful previous treatments. No one had pain alleviation after RPR (Table 1).

e) Trigeminal neuropathy (N=1): Pain was present on the left side, associated to moderate hypoesthesia. Previous treatments with anticonvulsants and psychotropics were unsuccessful. Imaging exams and blood tests were normal. ND was performed because of arachnoiditis observed on imaging exams, but its coagulation did not relief pain (Table 1).

Atypical facial pain – Half patients were female (8; 50%), and all were white. Pain was on the left facial side in 8 (50%) and bilateral in 1 (6.3%). Ages ranged from 2 to 79 yo (mean 55.6 yo). Pain started mostly between the fifth and sixth life’s decade. It was located at V1 in 2 (12.5%), at V2 in 1 (6.3%), at V3 in 3 (18.8%), at V1-2 in 2 (12.5%), at V2-3 in 5 (31.3%) and at V1-2-3 in 3 (18.8%). Findings were normal in imaging exams. Previous surgeries were: 6 (37.5%) trigeminal neurectomy, 6 (37.5%) subtemporal rhizotomy, and 1 (6.3%) peripheral trigeminal alcoholization. Associated diseases are outlined in Table 2, and post-operative complications in Table 3. All were treated with RPR, but only 37.5% had pain relief (Table 1). Six (37.6%) had lesion of adjacent trigeminal branches during surgery. Two patients with recurrence had complete pain relief after ND. Patients with degree 0 were treated with trigeminal tractotomy and nucleotomy without improvement. Follow-up ranged from 3 to 62 months (mean 33.4m).
Post-herpetic neuralgia – Most patients were male (55.6%); 8 (88.8%) were white. Ages ranged from 26 to 88 yo (mean 61.7 yo). Pain location was at V1 in 8 patients and V3 in 1. All had tactile hypoesthesia and allodynia at the affected area. Only 2 had previous surgical treatment (1 had peripheral neurectomy and the other peripheral V1 alcoholization). After RPR, 88.8% had pain relief (Table 1). Associated diseases are outlined in Table 2, and post-operative complications in Table 3. During the procedure, 4 (44.4%) patients had adjacent lesion at V2. Three needed further trigeminal tractotomy and nucleotomy after recurrence, but only one had pain relief. The others underwent thalamotomy with partial improvement. Follow-up ranged from 3 to 60 months (mean 25.1 m).

DISCUSSION

Neurosurgical procedures have a recognized efficacy in the treatment of facial pain, especially for ITN. The ideal surgery should eliminate pain with low risks and post-operative complications, including few cases of recurrence. There are a lot of controversies on the indication of surgical techniques and on hypothethical etiologies and their treatment. For ITN, the current techniques include RPR (apercutaneous procedure) and ND (an open surgery). Percutaneous techniques are very safe, and facial pain often affects elderly people with higher surgical risks.

In this sample, general characteristics of the patients, including gender, age, ethnic group, and pain characteristics (side, branch affected, pain location, duration) are similar to scientific literature. Patients selected for ND were usually younger and did not present clinical contra-indications to an open surgery. Only 1 patient in this sample had more than 60 years old, but he had association of hemifacial spasm to ITN, which was the reason for ND.

RPR was indicated for older ITN patients with higher clinical risks for complications, and other pain causes (SFP, AFP, PHN). For these cases, there is no advantage using more invasive techniques, and the chosen procedure should be as simpler and safer as possible. All patients had information about types of surgeries, their advantages, disadvantages and risks, and could participate during the procedure’s choice. Many patients with ND indication chose RPR because of their risks fear.

All complications that occurred in this sample were similar to literature. Carotid lesion occurred in 2.9% of the cases, but did not cause permanent damage. There was a variable degree of tactile hypoesthesia after RPR. Corneal sensory deficit was more frequent in patients with ITN at V1 (31.4%). Complaints of impossibility of bilateral mastication may occur due to oral mucosa hypoesthesia, and lingual hypoesthesia may difficult dental prothesis adaptation. The low rate of motor complications after RPR may be associated to large nerve fibers preservation. Beyond that, we did not observe any association between the degree of hypoesthesia and the recurrence rate.

When surgery is indicated to ITN, it usually presents high rate of success. In this study, RPR and ND relieved ITN in 100%, and RPR reduced symptomatic facial pain in 94.8% immediately after the surgery. The presence of a primary case, like multiple

| Location of post-operative analgesia (N=221) |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Trigeminal branch affected | V1 | V2 | V3 | V1-2 | V2-3 | V1-2-3 | V1-3 | Sub-total |
| V1 | 1 | – | – | – | – | – | – | 2 |
| V2 | – | 32 | – | 2 | 6 | – | – | 40 |
| V3 | – | 1 | 32 | – | 5 | 1 | – | 43 |
| V1-2 | – | 21 | – | 15 | 1 | 4 | – | 41 |
| V2-3 | – | 6 | 13 | 1 | 47 | 4 | – | 71 |
| V1-2-3 | – | 4 | 2 | – | 10 | 7 | 1 | 24 |

| Location of post-operative hypoalgesia (N=114) |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|
| Trigeminal branch affected | V1 | V2 | V3 | V1-2 | V2-3 | V1-2-3 | V1-3 | Sub-Total |
| V1 | 4 | – | – | – | – | – | – | 4 |
| V2 | 2 | 6 | 2 | – | 3 | – | 1 | 14 |
| V3 | 1 | – | 8 | – | – | – | – | 9 |
| V1-2 | 15 | – | 1 | 13 | – | – | – | 33 |
| V2-3 | 2 | 9 | 5 | 2 | 11 | 1 | 2 | 32 |
| V1-2-3 | 9 | 1 | 2 | 3 | – | 5 | 2 | 22 |
sclerosis, indicates RPR rather than ND, because of the non evidence of a vascular compression as etiology\(^{16}\). On the other hand, other facial pain causes without a removable cause (eg. AFP, PHN), or tumors impossible to extirpate, do not often present good results with drugs, and surgery may be a choice\(^8\). In this study, 81.3% AFP and 88.9% PHN patients had partial or complete pain relief, but neurosurgery was not efficient for inflammatory disease (sinusitis) or trigeminal neuropathy.

Dysesthesias and other sensory complications of these sample were more often after RPR, corresponding to other scientific papers, but immediate complications after ND are usually more severe\(^{12,13,21}\). Despite that, ND may be a good choice for young patients intending to preserve superficial facial sensitivity, which is an unpleasant complaint, and dysesthesia in these cases is uncommon. The recurrence rate of ND is also lower than RPR\(^{21}\).

In conclusion, both procedures were useful to treat ITN, and age, clinical conditions, and patients’ opinions are the factors that should be considered during the surgical choice. RPR was also efficient to treat symptomatic facial pain and post-herpetic facial pain, but not atypical facial pain and inflammatory pain (sinusitis).

REFERENCES