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Functional and sensory evaluation of patients with idiopathic trigeminal neuralgia: Comparison with controls

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ABSTRACT

Background: Idiopathic trigeminal neuralgia (ITN) can be associated with orofacial and sensory comorbidities.
Objective: To evaluate the masticatory functional and sensory characteristics of patients with ITN compared with controls.
Methods: We enrolled 119 patients and 30 healthy controls. They were evaluated with a systematic protocol: clinical orofacial evaluation questionnaire; a systematic approach of the mandibular function and the investigation of musculoskeletal comorbidities by the research diagnostic criteria for temporomandibular disorders (RDC/TMD) and the Helkimo indexes; and quantitative sensory testing (corneal reflex and gustative, olfactory, thermal, mechanical and pain thresholds).
Results: The study group had more loss of vertical dimension than the controls ($p = 0.011$) and restriction of the maximum mouth opening ($p = 0.024$); they had more pain on mandibular movements ($p = 0.001$), limitation of mandibular function ($p < 0.001$), masticatory discomfort ($p < 0.001$) and myofascial pain ($p = 0.001$). Occlusion Helkimo index was lower in controls than patients. The study group had high tactile ($p = 0.025$), warm ($p = 0.020$) and cold ($p = 0.003$) thresholds.
Conclusion: ITN may cause severe mandibular limitations that can be associated with the pain episodes and with sensory abnormalities. These findings indicate the affection of small and large nerve fibers and support the neuropathic nature of ITN. Sensory alterations can be part of the natural history of ITN and can be associated with the previous treatments including medication. They cause a high impact in quality of life.

1. Introduction

The idiopathic trigeminal neuralgia (ITN) is a neuropathic pain condition that affects one or more branches of the trigeminal nerve. Its diagnostic criteria by the International Association for the Study of Pain (IASP) includes: (i) shock like pain (from milliseconds to 2 min); (ii) trigger points or spontaneous pain; (iii) strong intensity; (iv) the absence of pain between crises [1]. Pain is often associated with the involuntary contraction of the facial muscles at the same facial side of the pain [2]. The pain is triggered by ordinary activities such as speaking, swallowing, chewing and brushing the teeth, as well as by non-noxious facial stimuli such as touch or a whiff of air. A simple change in the position of the head may trigger the pain, as well as lying down on the facial side with pain. ITN causes intense suffering and functional impairment, which may cause depression, weight loss, social isolation and even suicide [3]. The etiology is still unclear, and the neurovascular conflict is often associated [4]. Abnormal expression of voltage-dependent sodium channels (Nav1.7 and Nav1.3) has been described [4], and immune-glial pathophysiological mechanisms may be involved [5,6].

Although the diagnostic criteria are clear, and the patients sign and symptoms are pathognomonic, ITN is relatively rare and often misdiagnosed. The majority of patients undergo dental treatments because dental pain is attributed to them. On the other side, facial contraction, difficulties in oral hygiene and pain chronification are causes of local pain comorbidities, such as masticatory myofascial

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pain and dental diseases, that can aggravate the pain complaint and compromise orofacial function [7].

Thus, the objective of this study was to evaluate the masticatory function and orofacial sensory characteristics of patients with ITN compared with controls, as well as dental and psychological characteristics.

2. Methods

2.1. Sample

We enrolled 119 patients with the diagnosis of ITN according to the criteria of IASP [1] selected by the Orofacial Pain Clinic, Neurology Division of Clinicas Hospital of the Medicine School of the Sao Paulo University (HCFMUSP), Brazil and 30 healthy controls that had not been diagnosed with ITN, paired regarding the age and gender. The protocol was approved by the local Ethics Committee and all subjects signed the consent form. This study had financial support of the Research Foundation of the State of Sao Paulo (FAPESP) (2010/01620-4). All patients had been treated with carbamazepine (mean 775.49 mg/day) and had a mean of 5.94 years of pain duration. Ten patients (8.4%) had already underwent surgery (balloon compression of the trigeminal ganglion) 12.63 years before, in average. They had no sensorial differences when compared to the rest of the patients ($p > 0.05$).

Exclusion criteria: symptomatic neuralgia (excluded by the clinical evaluation and imaging exams: computed tomography and/or nuclear magnetic resonance), multiple sclerosis or other neurological diseases, rheumatologic systemic diseases.

Inclusion criteria: study group: ITN diagnosed according to the criteria of IASP [1]. Control group: exclusion of ITN according to the IASP criteria and the absence of orofacial complaints.

2.2. Protocol of evaluation

The entire sample was evaluated by the same examiner, previously trained by the group of orofacial pain about the correct application of questionnaires, clinical orofacial evaluation and sensory exam. This examiner had experience with the protocol and was calibrated by the experienced colleagues. The following evaluation tools were used:

(a) Clinical evaluation protocol – (Division of Dentistry of HCFMUSP) for the evaluation of the orofacial region, including main complaint, pain characteristics (location, quality, duration, descriptors, intensity by the Visual Analog Scale – VAS, causal, alleviation and aggravation factors), medical history and medications, earache, headache, generalized body pain, sleep disturbances, masticatory complaints related to parafunctional habits, laterality and the quality of mastication were also investigated [7].
(b) RDC – Research Diagnostic Criteria for the diagnosis of Temporomandibular Disorder (RDC/TMD), validated version in Portuguese [8]. It evaluated:
  (b.1) Characteristics of the patient's self report: presence or absence of pain, joint sounds, bruxism, morning pain/rigidity, tinnitus.
  (b.2) Diagnostic groups (axis I): Group I – masticatory myofascial dysfunction; Group II – articular disc displacement of the temporomandibular joints; and Group III – arthralgia, osteosrthritis, osteoarthosis.
  (b.3) Profile of the patient (axis II): chronic pain scale, depression trait, somatization trait and limitations due to affected mandibular function.
(c) Evaluation of clinical, jaw dysfunction and dental occlusion by Helkimo Indexes [9] translated into Portuguese language.

2.3. Quantitative sensory testing

All subjects underwent a standardized protocol of quantitative sensory testing (QST), which consists of tests grouped as follows [10]:

- Gustative and olfactory thresholds;
- Thermal detection thresholds for cold and warm sensations;
- Mechanical detection thresholds for touch and vibration perception;
- Mechanical pain sensitivity including superficial and deep pain thresholds.

The facial areas evaluated in the somatosensory protocol (thermal detection, mechanical detection, pain detection) were the three trigeminal branches (front, cheek, and chin), bilaterally. All subjects were evaluated in the sitting position, with the head resting at a flat surface, and in a silent room with acoustic protection at the walls and the door closed. Only the patient and the researcher were at the room. All subjects were evaluated by the same researcher. The patients and controls were oriented to keep the eyes closed during the exam and to be concentrated in the stimuli applied. Only the researcher knew the order of the stimuli [10].

Gustative thresholds [10]: the following four substances, corresponding to the four tastes, were tested. For each test, one drop was applied at the tongue, starting with the low concentration, interleaved with one drop of distillate water, and the concentrations were tested until the subject had detected and identified the stimulae. Sweet: glucose (0.01 M; 0.032 M; 0.1 M; 0.32 M; 1.0 M); salty: sodium chlorate (0.01 M; 0.032 M; 0.1 M; 0.32 M; 1.0 M); sour: citric acid (0.00032 M; 0.001 M; 0.0032 M; 0.01 M; 0.032 M); bitter: urea (0.1 M; 0.32 M; 1.0 M; 3.2 M; 10.0 M).

Olfactory thresholds [10]: the subjects were evaluated with isopropanol solutions in polyethylene bottles interleaved with distillate water, starting with the low concentration until the subject had detected the stimulae: 0.09%, 13.0%, 23.0%, 35.0%, 53.0%, 70.0%.

Thermal detection [10]: thermal testing was performed using the MSA thermo test device (Somedic, Sweden). The baseline temperature was 32 °C and the contact square area of the thermode was 9 mm × 9 mm. Cold detection threshold and warm detection threshold were assessed using ramped stimuli 1 °C/s. The evaluation consisted in 5 measurements for each thermal threshold, and the means and standard deviations were considered for the analysis.

Mechanical detection threshold [10]: touch perception was assessed using a set of standardized vonFrey filaments with rounded tips of 0.5 mm diameter, applied with an electronic device (IITC, Woodland Hills, USA). Three measurements in g/mm^2 were performed and the means and standard deviations were considered for the analysis.

Vibration detection threshold [10]: vibration testing was performed using the electronic Vibrameter device (Somedic, Sweden) with a vibrator of 650 g of weight and a contact area of 1 cm^2 perpendicularly applied for the thresholds detection, using ramped stimuli of 1 Hz/s. The method of calculation of vibration threshold consisted in the mean between the appearance and disappearance thresholds detected by the patient.

Pressure pain perception [10]: deep algometry was measured with the electronic pressure algometer (Somedic, Sweden) with a probe area of 1 cm^2 which was pressed on the skin with a ramp rate of 50 kPa/s.

Superficial pain perception [10]: the pain thresholds at the facial skin were tested using disposable needles of