DYNAMIC ELECTRICAL NEUROSTIMULATION IN COMPREHENSIVE TREATMENT OF TEMPOROMANDIBULAR JOINT PAIN SYNDROME IN PATIENTS WITH OCCLUSION ISSUES

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ABSTRACT — Occlusion issues contribute to the development of muscle-and-joint dysfunction and, in case lack of timely treatment, to pain development in the temporomandibular joint and masticatory muscle area. Aim: to evaluate the efficiency of dynamic electrical neurostimulation in stopping pain syndrome in patients with occlusion disorders. Clinical and functional research methods were employed to examine 56 patients with occlusion disorders complicated with temporomandibular joint pain syndrome. The use of dynamic electrical neurostimulation allowed stopping the pain syndrome, which facilitated rehabilitation.

KEYWORDS — electrical neurostimulation, pain syndrome.

INTRODUCTION

A complex interaction of occlusion, masticatory muscles and temporomandibular joint, coordinated and controlled by the central nervous system, maintains the entire proper chewing function [3, 7, 16, 26, 32]. Occlusion issues will disturb consistency in the dentofacial system, and the nature of the change will inevitably affect both the function and the morphology in the chewing muscles as well as in the temporomandibular joint, at the same time triggering the development of muscle-and-joint dysfunction [1, 4, 8, 17, 25, 31].

69.6% of temporo-mandibular joint dysfunction cases are accompanied with pain syndrome. The medication methods that are used currently to stop pain syndrome feature a wide range of side effects. Speaking of physiotherapeutic methods, of particular interest here is the method of dynamic electrical neurostimulation (DENS), which is based on the effect coming from neuron-like electric impulse aimed at acupuncture points and reflexogenic areas [35]. While the device is functioning, the output impulse parameters are registered thus excluding the development of the body's resistance to the therapeutic effect, which, in turn, adds to the therapy effectiveness.

Aim: to evaluate the efficiency of dynamic electrical neurostimulation in stopping pain syndrome in patients with occlusion disorders.

MATERIALS AND METHODS

The survey involved 56 patients (aged 25 to 59) suffering from occlusion disorders complicated with temporomandibular joint and chewing muscles pain syndrome. The patients underwent clinical, X-ray and graphic examination [2, 9, 10, 13, 18, 23, 27]. The nature of the dentition's occlusal interrelation was evaluated via the occlusiogram index [5, 6, 11, 19, 22, 28, 36]. The masticatory muscles functional status was evaluated through an electromyographic examination [12, 15, 21, 29, 34]. We modified the M. Helkimo clinical dysfunction index to identify and evaluate the muscle-and-joint dysfunction degree as well as the pain syndrome severity [14, 20, 24, 30, 33].

The patients were divided into two groups – Group 1 included 30 patients who underwent dynamic electrical neurostimulation (with a DiaDENAS-PC device, used in the *Therapy* mode, frequency range – 10 to 200 Hz, with the minimal, comfortable or the maximal intensity; stable, labile and labile-stable way) to relieve the pain syndrome, which limited the mandible movements (Fig. 1a–d).

The 26 patients of Group 2 were administered the following painkillers: Voltaren or Diclofenac, 25 mg 3 times a day; muscle relaxants (Sirdalud) were used as well, 1 mg 3 times a day.

For the patients of Group 1, the areas exposed to the effect of the device's built-in electrodes were the areas described directly in the patients' complaints

Fig. 1. *Setting the frequency range. Standby mode: a) 20 Hz, b) 77 Hz, c) 140 Hz, d) 200 Hz*

Fig. 2. *The impact of the device DENAS in the area of direct projection of the complaint in the area of the chewing muscles. Therapy Mode*

(Fig. 2) — cervical collar, trigeminal and auricular points 1, 7, 8, 84, 97.

The exposure intensity was minimal, comfortable or maximal, and was easily selected depending on the patient's age and pain sensitivity. The patients' orthopedic treatment was carried out in two stages with preliminary surgical, orthodontic and orthopedic preparation. The obtained data were processed via the variation-statistical method. The reliability difference criterion was estimated based on the Student's table.

RESULTS AND DISCUSSION

The proposed examination type allowed revealing pain syndrome of varying degree in all the patients. During that, 53.6% of the patients had a mild degree of dysfunction, while moderate and severe dysfunction was detected in 39.3% and 7.1% of the patients, respectively.

Regardless of the muscle-and-joint dysfunction severity, the DiaDENAS-PC device proved to ensure a high analgesic effect when stopping pain syndrome. Depending on the pain syndrome severity, a respective pattern was designed when using the device. The muscle-and-joint dysfunctions covered the following direct complaint projection areas – the parotid region, the masticatory muscle region, and the external pterygoid and supra-hyoid muscles. At a frequency of 20 Hz, the analgesic effect was reached mainly in 15–25 minutes to last up to 3–5 hours. The frequencies of 60, 77 and 140 Hz allowed the analgesic effect to appear in an average of 3–10 minutes yet for a shorter duration – up to 1.5 hours on the average.

The procedure lasted from 8–10 minutes up until the pain symptom subsided. The entire course included 8–10 procedures. A frequency of 200 Hz allowed a rapid arrest of the pain syndrome, whereas the analgesic effect lasted from several minutes to an hour.

However, in 4 cases, a frequency of 20 Hz used further produced an increase in the analgesic effect duration (up to 6 hours).

In case of a mild painful syndrome, 20 Hz of frequency were enough to reach an analgesic effect in 15–20 minutes. At a moderate degree, the analgesic effect was at its top determined at a frequency of 140–200 Hz, which further was followed by 20 Hz, whereas analgesic effect lasted longer then — up to 6 hours (in 4 cases). A severe pain syndrome was stopped at a frequency of 200 Hz, and once the pain stopped a frequency of 20 Hz was applied for another 5–10 minutes. The analgesic effect duration thus extended reaching its maximum of 5.5 hours (in 4 cases). Note to be made that a course embracing 5–10 sessions offered a more stable analgesic effect.

The use of medications led to a relief in the pain syndrome within 20–35 minutes and required repeated intake up to 2–3 times a day; in four cases (with severe pain syndrome) – up to 4 times a day.

Once the pain was relieved, a clinical lengthening of the tooth crown was performed via surgical treatment; the occlusal plane was leveled through orthodontic extrusion or intrusion of teeth. The interalveolar height was restored with an occlusal splint. The comprehensive treatment was completed with dental prosthetics and selective teeth grinding. During the orthodontic intervention, 6 cases revealed exacerbated pain syndrome, which required an additional course of electrical neurostimulation. After the prosthetics, a repeated course of treatment was carried out to fix the result. The electromyographic activity in masticatory and temporal muscles went up accordingly up to 594.62±11.78 μV and 433.86±9.42 μV, while in the suprahyoid muscles it went down to 394.48±6.54 μV.

An examination of the maxillofacial region in the groups allowed identifying functional disorders of the temporomandibular joint and masticatory muscles, which were accompanied with pain syndrome.

Dynamic electrical neurostimulation helped stop the pain syndrome at various degrees of dysfunction, at the same time recovering proper functioning in the masticatory muscles as well as in the temporomandibular joint, which facilitated orthodontic and orthopedic treatment. The recovery of the masticatory muscles functional status was confirmed both clinically (extended mouth opening) and via masticatory muscles electromyographic data.

During that, the electromyographic activity in the masticatory and temporal muscles increased to approach the normal values, while it revealed a decrease in the suprahyoid muscles. The muscles palpation produced no pain, which meant that the active trigger points and zones were ameliorated. For the highest and lasting effect, the treatment was delivered in a 5–10-procedure course. Each session lasted for 15–25 minutes. No adaptation was observed in case of long-term and multiple-course dynamic electrical neurostimulation. Moreover, a combination of frequencies added to the therapeutic effect, reducing the time prior to analgesia and prolonging the analgesic action, which is definitely important in case of long-term pain syndrome treatment.

In case of medication treatment, there was pain relief observed yet, given the huge range of side effects, multiple intakes and the drug burden, electrical neurostimulation appears much more preferable.

An electromyographic study revealed a decrease in the electromyographic activity of the masticatory and temporal muscles down to 554.75±14.37 μV and 405.86±8.12 μV, respectively, as well as an increase in suprahyoid muscles activity (up to 412.37±5.24 μV). At the lower jaw's relative physiological rest, the electromyograms revealed a spontaneous activity in the masticatory muscles, which reached 160 μV.

Through the treatment, the nature of occlusion contacts was changing as well. This was especially obvious through orthodontic preparation. At the beginning of treatment, the occlusiogram index was 69.54±1.05 conventional units, through the orthodontic treatment – 41.67±3.67 conventional units, after the prosthetic care – 71.30±1.87 conventional units ($p<0.05$). Changing the nature of occlusion interrelations through the orthodontic treatment could promote the pain syndrome exacerbation.

CONCLUSION.

The use of dynamic electrical neurostimulation relieves pain syndrome of varying severity and facilitates comprehensive treatment. Combining the frequencies will increase the therapeutic effect while shortening the time leading to the analgesic end-point and prolonging the effect itself. The drug burden and a huge range of side effects coming from medication therapy allow claiming the respective advantage that electrical neurostimulation can offer potentially.

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