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THE EFFECTIVENESS OF PHYSICAL FACTORS IN THE TREATMENT OF COMPRESSION-DISLOCATION DYSFUNCTION OF THE TEMPOROMANDIBULAR JOINT

Rybalov O., Yatsenko P., Moskalenko P., Yatsenko O., Lakhtin Yu.

Numerous medical and statistical research determined that the functional disorders of the rather complex anatomical formation as the temporomandibular joint (TMJ) among other diseases of joints are the most common. According to different sources, this figure varies from 20% to 80% [9,15,18].

In the modern classifications of TMJ diseases [4,15], there is such nosological form as its dysfunction. Today in practice of dentists the diagnose TMJ dysfunction is the most popular, but it does not reflect the true nature of the disease. In fact, dysfunction is a collective term [1,5]. However, among all kinds of dysfunctions the so-called painful dysfunction of TMJ is allocated, which has a number of names: jaw arthropathy, muscular-facial pain syndrome, pain dysfunction of the lower jaw, orofacial dyskinesia, mioarthrophy, chewing pain, temporomandibular joint arthralgia, chewing arthralgia and others [2,12,15,16]. According to experts [8] all these terms are not accurately determine the nature of the disease, because they do not fully and accurately reflect its pathogenesis, they reflect only the main clinical symptoms: pain in the face, tenderness of masseter muscles, limitation of mouth opening, clicking in the temporomandibular joint. Errors in diagnosis of TMJ disorders lead to irrational prolonged ineffective treatment, which can results in irreversible changes in the components of the joint [13,17].

For the relief of pain in the muscles and developing aseptic inflammation, reduce of the tone of the masseter muscles, improvement of the metabolic processes in them the non-steroidal anti-inflammatory drugs, muscle relaxants, anesthetic blockades, physiotherapy techniques are used [9,14]. However, in practice, in the treatment of TMJ dysfunction the physical and physiotherapy techniques are underused. These techniques contribute to the optimization of processes of restoration of muscle-articular imbalance and elimination of pain phenomena.

The aim of this study is the clinical and functional assessment of the effectiveness of physical factors in the treatment of patients with compression-dislocation dysfunction of temporomandibular joint.
Material and methods. Investigations were carried out on 33 patients (20 men, 13 women) aged 21-57 years, of which it was formed the index (22 pers.) and control (11 pers.) groups. The diagnosis compression-dislocation dysfunction of TMJ was determined on the basis of clinical and radiological (orthopantomography and zonography) survey data.

Radiological studies were performed on orthopantomograph OP300 Maxio (KaVo, Germany).

Bioelectric activity of the genuine masseter and temporal muscles was studied by electromyography (EMG) on myograph “Neuro-EMG-Micro” by company “Neurosoft” (Russia). The special skin electrodes placed in plastic were use that allows leaving the same electrode spacing during all repeated studies. The record of electromyograms was performed under the following mode: calibration signal - peace - lockjaw - peace - mastication - swallowing. To decode them it was used a computer program developed at the Department of Prosthetic Dentistry and Implantology, led by Professor V.V. Rubanenko [3]. We analyzed the value of the maximum and minimum amplitudes of the firing of bioelectrical activity of the muscle fibers (mKv), the phases of muscle activity and rest (ms), the ratio (C) of the duration of bioelectric activity (Ta) and the bioelectrical rest of the muscle fibers (Tr) [3]. EMG was performed before treatment and in 8 days.

The characterization of pain was evaluated in the Visual Analog Scale (VAS) according to the ten-point scale: 0 - no pain, 1-2 - a slight pain, 3-4 - moderate, 5-6 - strong, 7-8 - very strong, 9-10 – extremely strong, impossible [14].

All patients were undergone manually reposition of the joint heads of the lower jaw in the correct anatomical position.

The next day, a vibrating massage of all groups of the massetter muscles, tourmaline ceramic on the joint area with a painful symptom and a local exercise therapy were assigned for the patients from the index group.

For a vibrating massage a portable apparatus produced by the company “Bayer” (Germany) 35 W with two special heads was used. These procedures were carried out during 7 days.

The treatment with tourmaline ceramic was carried out using the tourmaline projector NM 200 (“Butterfly - Babochka”) produced by South Korean company "Nuga Medical" (Fig. 1), which applied to the zone of corresponding TMJ and massetter muscles. The procedure lasted 30-40 minutes at a temperature of instrument 50-55º C during 7 days.

For local physical therapy it was used isotonic, isometric and toning exercises for all groups of the massetter muscles.

On the next day after repositioning the patients of the control group were undergone only the blockade of the periarticular area of joint with a pain symptom with 2.0 ml of 2% lidocaine solution, 2 times a week.

Statistical processing was performed using the software package AtteStat 10.8.4 for MS Excel, which calculates the average value, the average error. The significance of differences between groups’ indicators before and after treatment was evaluated by the pairwise Wilcoxon test.

Results and discussion. In a study it was identified that all patients have one sided compression-dislocation dysfunction of TMJ with symptoms of pain syndrome and one sided subluxation of the articular head (Fig. 2,3).

On the day of the primary treatment in 6 patients of the index group the pain was characterized as moderate, 11 - strong, 4 - very strong, 1 – extremely strong (in average 5.542±0.32 points). 3 patients in the control group characterized the pain as moderate, 5 - strong, 2 - very strong, 1 – extremely strong (in average of 5.545±0.54 points). The significance of the differences in the assessment of pain between the two groups of patients was insignificant (p>0.05).

After manual repositioning of the lower jaw all patients even as early as the first day has the significant reduce of painful symptoms and discomfort in TMJ. The phenomenon of the deviation of the lower jaw was not observed.
Fig. 3. Zonogramm of both TMJ at the open mouth of the same patient. The narrowing of joint space on the left and the expressed offset of the right articular head forward over the top of the articular tubercle are marked.

After the complex of treatment and rehabilitation measures up to 8 day the pain intensity decreased significantly. Thus, according to V AS system in 17 (77%) patients of the index group the pain in the joint area and masseter muscles disappeared completely; 3 (13.6%) patients has insignificant pain; 2 (9%) has moderate, which averaged 0.50±0.13 points. In the control group 3 patients (27%) has no pain; 2 patients (18%) has insignificant pain; 3 patients (27%) has moderate, 3 patients (27%) has strong (in average 3.09±0.11 points), p<0.05. In addition, the pain symptom can only be removed for the duration of anesthesia (2-3 hours) in 4 patients.

Visual assessment of EMG of genuine masseter and temporal muscles in patients during primary examination on the first day revealed a pronounced asymmetry of their graphic presentation on the side of dysfunction and symmetrical side both in the frequency of filling and in the maximum and minimum parameters in the period of compression and mastication. In our view, this can be explained by a variety of expressions of pain symptoms. Proof of this are the electromyograms of the patients in the period of mastication, which were characterized by a greater degree of heterogeneity and the alternation of different sized bursts with varying activity with irregular periods of incomplete bioelectrical rest.

Analysis of EMG parameters during the compression of jaws and during mastication objectively evidences of functional impairment in the activities of genuine masseter and temporal muscles, both on the side with pain symptoms, and on symmetrical (Table 1). It should be noted that the functional abnormalities in the muscles are more pronounced on the side of TMJ dysfunction (p<0.05) in all patients, and the differences in parameters between the index and control group are of little significance (p>0.05).

Results of electromyography of masseter muscles on the side of pain dysfunction of TMJ, which is held on the 8th day after the treatment in the index group, evidence a gradual recovery of the function of muscular system (Table 2). These figures are close to the parameters of the bioelectrical activity of muscles that are typical for healthy individuals [7,13].

### Table 1. Results of EMG of genuine masseter and temporal muscles on the side of the dysfunction before treatment

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Side with dysfunction</th>
<th>Symmetrical side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index group</td>
<td>Control group</td>
</tr>
<tr>
<td></td>
<td>during the compression of the teeth</td>
<td></td>
</tr>
<tr>
<td>Frequency of filling (Hz)</td>
<td>301.51±7.27*</td>
<td>298.01±7.13*</td>
</tr>
<tr>
<td>Maximum value (mKV)</td>
<td>221.04±16.44*</td>
<td>238.08±13.23*</td>
</tr>
<tr>
<td>Minimum value (mKV)</td>
<td>-200.88±14.90*</td>
<td>-206.72±12.55*</td>
</tr>
<tr>
<td></td>
<td>during mastication</td>
<td></td>
</tr>
<tr>
<td>Time of activity (ms)</td>
<td>564.42±23.88 *</td>
<td>488.80±22.55*</td>
</tr>
<tr>
<td>Rest time (ms)</td>
<td>328.34±9.36*</td>
<td>295.17±9.60*</td>
</tr>
<tr>
<td>Frequency of filling (Hz)</td>
<td>301.42±7.95*</td>
<td>274.00±7.08</td>
</tr>
<tr>
<td>Maximum value (mKV)</td>
<td>184.72±9.15*</td>
<td>264.14±12.49*</td>
</tr>
<tr>
<td>Minimum value (mKV)</td>
<td>-382.15±29.36</td>
<td>-372.11±30.16</td>
</tr>
<tr>
<td>Activity ratio</td>
<td>1.71±0.12</td>
<td>1.65±0.11</td>
</tr>
</tbody>
</table>

Note: * - significant differences on the side of the dysfunction and on symmetrical side, p<0.05
Table 2. Results of EMG of genuine masseter and temporal muscles on the side of the dysfunction in patients after treatment

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Index group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of filling (Hz)</td>
<td>during the compression of the teeth</td>
<td>245.57±14.31</td>
</tr>
<tr>
<td>Maximum value (mkV)</td>
<td></td>
<td>881.80±22.55</td>
</tr>
<tr>
<td>Minimum value (mkV)</td>
<td></td>
<td>-778.08±21.27</td>
</tr>
<tr>
<td>Time of activity (ms)</td>
<td>during mastication</td>
<td>320.89±9.70</td>
</tr>
<tr>
<td>Rest time (ms)</td>
<td></td>
<td>246.98±43.13</td>
</tr>
<tr>
<td>Frequency of filling (Hz)</td>
<td></td>
<td>230.04±11.41</td>
</tr>
<tr>
<td>Maximum value (mkV)</td>
<td></td>
<td>894.27±12.61</td>
</tr>
<tr>
<td>Minimum value (mkV)</td>
<td></td>
<td>-844.07±13.49</td>
</tr>
<tr>
<td>Activity ratio</td>
<td></td>
<td>1.3±0.14</td>
</tr>
</tbody>
</table>

note: * - in the index and control group, p<0.05

Among patients of the control group after treatment only 4 have EMGs that were close to normal. The average values of most parameters were significantly worse than the patients of the index group have (p<0.05), this indicates on incomplete functional recovery of muscles.

The proposed scheme of treatment is consistent with the concepts of the pathogenesis of compression-dislocation dysfunction of TMJ. In the development of this type of TMJ the following abnormalities have an essential importance: one sided dysfunction of the masseter muscles, discoordination of the lateral pterygoid, temporal and genuine masseter muscles. The asymmetric contraction of these muscles leads to the uncoordinated displacement of both joint heads in joint pits, which in turn causes the compression or pinching of intraarticular disc in the lateral-upper sections of the articular cavity of one of the joints, as well as a vast network of nerve fibers located here. This is accompanied by a pain symptom not only in the joints and masseter muscles, but also in ear and headaches. A characteristic feature is the position of the joint head. With an open mouth on the side with pain, it is “buried” in the joint cavity, and on the other side it is beyond the apex of the articular tubercle, that can be qualified as its subluxation or anatomical and functional instability of TMJ with fairly severe symptoms [8,10].

Muscle spasm is the basis for the development of dysfunctional syndrome and arises from excessive strain, contraction or fatigue of muscle. At the first stage in the muscle there is a residual stress, and then a stable local hypertension in which there are secondary disorders: cardiovascular, metabolic, inflammatory [2]. Tourmaline alloy emits infrared heat of narrow spectrum and magnetic waves, which in combination helps to relieve muscle tension, spasms and pain. Vibration massage and physiotherapy of the masseter muscles also contribute to the improvement of circulation and increase of the metabolic processes of the muscular-articular apparatus [6].

Conclusion

Thus, the complex treatment of muscular-joint compression-dislocation dysfunction of one of the TMJ, with includes physical therapy, helps to restore the disturbed ratio of its anatomical components. The restoration of bioelectric activity of masseter muscles due to early activation of the neuromuscular apparatus by the mechanical action of the vibration massage, the positive role of tourmaline ceramics and local physical therapy for all groups of facial muscles to relieve pain in the joint provides a positive effect in almost all patients.

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SUMMARY

THE EFFECTIVENESS OF PHYSICAL FACTORS IN THE TREATMENT OF COMPRESSION-DISLOCATION DYSFUNCTION OF THE TEMPOROMANDIBULAR JOINT

The aim of the study was clinical and functional assessment of the effectiveness of physical factors in the treatment of patients with compression-dislocation dysfunction of the temporomandibular joint.

We observed two groups of patients. All patients were undergone the repositioning of the joint heads of the lower jaw. Patients of the index group were assigned a vibrating massage of all masseter muscles, tourmaline ceramic on the joint area and a local physical therapy. Patients in the control group had only lidocaine blockade of periarticular area twice a week. Treatment efficacy was evaluated on the eighth day after the start of the treatment according to the bioelectric activity of the genuine masseter and temporal muscles, the intensity of pain according to in Visual Analog Scale, and according to the results of the clinical examination.

In most patients of the index group the electromyography data after treatment were approaching to norm, the phenomenon of dysfunction of the temporomandibular joints was reversed. In the control group the full restoration of the functional activity of muscle did not occur.

The addition to the complex of therapeutic measures a vibration massage, tourmaline ceramics and local physical therapy for patients with dysfunction of the temporomandibular joints allows to get a positive effect.

Keywords: temporomandibular joint, dysfunction of temporomandibular joint, dysfunction treatment, electromyography.
Целью исследования явилась клинико-функциональная оценка эффективности применения физических факторов в лечении больных компрессионно-дислокационной дисфункцией височно-нижнечелюстного сустава.

Под наблюдением находились две группы больных. Всем больным проводили репозицию суставных головок нижней челюсти. Пациентам основной группы назначали вибрационный массаж всех жевательных мышц, турманиевую керамику на область сустава и локальную лечебную физкультуру. Пациентам контрольной группы делали только лидокаиновую блокаду периартикулярной зоны 2 раза в неделю. Эффективность лечения оценивали на восьмые сутки после начала лечения по данным биоэлектрической активности собственных-жевательных и височных мышц, интенсивности боли в системе Visual Analog Scale, результатам клинического обследования. У большинства больных основной группы после лечения данные электромиографии приближались к норме, явления дисфункции височно-нижнечелюстных суставов были купированы. В контрольной группе полного восстановления функциональной активности мышц не наступало. Включение в комплекс лечебных мероприятий вибрационного массажа, турманиевой керамики и локальной лечебной физкультуры пациентам с дисфункцией височно-нижнечелюстных суставов обеспечивает положительный эффект.

РЕЗЮМЕ

ЭФФЕКТИВНОСТЬ ФИЗИЧЕСКИХ ФАКТОРОВ ПРИ ЛЕЧЕНИИ КОМПРЕССИОНО-ДИСЛОКАЦИОННОЙ ДИСФУНКЦИИ ВИСОЧНО-НИЖНЧЕЛЮСТНОГО СУСТАВА

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