POSTUROLOGICAL ASPECTS IN THE PREVENTION AND TREATMENT OF RECURRENT OCCURRENCE OF ABNORMALITIES OF OCCLUSION AND DENTITION DEFORMITIES

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Abstract

We analyzed the interrelation of occlusion and posture disorders, clinical manifestations of anomalies of occlusion of dentition and posture in a group of 175 patients aged 18 to 63 years, who underwent orthodontic treatment of occlusive disorders, followed by the study of long-term results for 5 years. Among all the examined patients 38 people showed signs of recurrence of occlusion abnormalities. The purpose of study: to predict the effectiveness of orthodontic and orthopedic treatment of occlusion disorders, combined with methods of manual diagnosis and therapy of dysfunction of the musculoskeletal system.

We identified the forms of dysfunctions of the locomotor apparatus forming the recurrence of occlusive disorders. The trajectory of movements of the lower jaw during the opening of the mouth in the position of functional or physiological rest of the spine, in the position of the functional load on the spine and in the position of the functional load on the spine and feet was studied. The evaluation of the effectiveness of dental intervention on the basis of diagnosis and treatment of dysfunction of the musculoskeletal system was conducted. The results of the study of the parameters of dysfunction of the musculoskeletal system and the influence of the spatial position of the body of patients in various functional states of the spine – on the deviation of the lower jaw can explain the failure of orthodontic treatment and recurrence of anomalies of occlusion and deformities of the dentition without taking into account.

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1. Introduction

The diagnosis of occlusion abnormalities and deformities of dentition in adults in the clinic of prosthetic dentistry, as a rule, does not cause difficulties for the dentist. However, the study of some of the immediate causes of these disorders leads to thinking about the stability and usefulness of the result of the planned treatment. A number of researchers proved the relationship of malocclusion and posture (Amig, 2017; Badreddin, Malanyin, 2007; Bugrovetskaya, 2003, 2006; Persin, 2016; Slavichek, 2008), Travell, Simmons, 2005; Tsimbalistova et al., 2004; Gelb, 1970, Winter, 1999). We investigated the clinical manifestations of abnormalities of occlusion and in patients with disorders of body position in space – posture (Bugrovetskaya et al., 2008; Kudryavtseva, 2010; Tsimbalistova et al., 2005, Gagey, Weber, 1995; Klineberg, Eckert, 2015). This fact can explain in some clinical cases the failure of orthodontic and orthopedic treatment, its duration, complications and recurrence of occlusion anomalies and deformities of the dentition.

2. Problem Statement

The fact is that patients in the clinic of prosthetic dentistry in the examination and treatment are in the dental chair (reclining position). In this case, the head is fixed by the headrest and the spine supports the back of the chair. Naturally, the conclusion is that the neck, back relaxed and human musculoskeletal system (HMS) does not support the balance of the body. When the patient sits down on a chair without the support of the back and head, and even more so – gets to his feet, the posturological factors of keeping the balance of the body come into effect. Dental interventions, in particular, dentures or fillings, aimed at the formation of the correct occlusal relations, as well as orthodontic treatment are carried out without taking into account posturologist aspects in the treatment of disorders of occlusion.

3. Research Questions

Dentist in the clinic of prosthetic dentistry is difficult to understand what are actually the causes of recurrence of occlusion disorders after dental treatment in patients with impaired posture. What forms of violations of the HMS form a recurrence of occlusive disorders? Can the biomechanics of the lower jaw movements change during the opening of the mouth in different functional states of the spine? How to evaluate the effectiveness of dental intervention on the basis of diagnosis and treatment of HMS disorders? What was the reason: structural changes in the cranial department, imbalance in the maxillofacial region, in particular - the function of the masticatory muscles, or disorders of the patient’s HMS?

4. Purpose of the Study

Prediction of the effectiveness of orthodontic and orthopedic treatment of occlusion disorders combined with methods of manual diagnosis and therapy of musculoskeletal dysfunction.

5. Research Methods

To study the problem we examined 175 patients aged 18 to 63 years, who for the period from 2008 to 2012 in the clinic of prosthetic dentistry of Irkutsk State Medical University (ISMU) was carried out orthodontic treatment of occlusive disorders, followed by the study of long-term results for five years. Among all examined patients, 38 patients (21.71%) showed signs of recurrence of occlusion abnormalities (table 1).
Table 1. The clinical characteristics of occlusive disorders of the patients before the start of orthodontic treatment and recurrence of occlusive disorders of the patients with follow-up of five years or more after orthodontic treatment

<table>
<thead>
<tr>
<th>The main directions</th>
<th>Anomaly shape</th>
<th>N = 175</th>
<th>N = 38</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GF</td>
<td>OD</td>
<td>AF</td>
</tr>
<tr>
<td>sagittal</td>
<td>8</td>
<td>24</td>
<td>65</td>
</tr>
<tr>
<td>transversal</td>
<td>12</td>
<td>16</td>
<td>38</td>
</tr>
<tr>
<td>vertical</td>
<td>3</td>
<td>-</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>40</td>
<td>112</td>
</tr>
</tbody>
</table>

Note: OD – occlusive disorders; GF – gnatic form; AF – articular form; DAF – dentoalveolar form.

The examination of the oral cavity included visual examination of occlusive contacts, occlusive interaction of teeth was studied in the position of central, anterior, lateral and dynamic occlusion. The lower jaw movements were evaluated in three mutually perpendicular directions. We grouped the identified recurrence of occlusion disorders as combined in the main directions: sagittal, transversal and vertical.

Estimation of the parameters of the function HMS was performed by the method involving the examination of the patient in the standing position when entering into the force of gravity – gravity that allows to evaluate the function of the postural system – education of posture (Chervotok, 2009). The location of anatomical landmarks of the head, body, legs and feet of patients was revealed relative to the reference line – the vertical axis of the body in the frontal (displacement), sagittal (displacement) and horizontal planes (rotation). We evaluated paired anatomical landmarks of the body connected by lines.

To analyze the causes leading to unsatisfactory results in the catamnesis of patients, at the suggestion of neurologists, we examined patients (38 people) with signs of recurrence of occlusive malocclusion during the functional load on the spine and foot. The examination of patients was carried out in three main positions: in the position of reclining with the support of the head and back in the dental chair, this position of the patient’s body we characterize as the position of functional or physiological rest of the spine; in the sitting position on a chair without back support and head – the position functional load on the spine, in the standing position – the position of the functional load on the spine and feet.

The one of the dynamic violation of the path of movement of the lower jaw when opening mouth – the deviation of the top of the chin away from the midline of the face is estimated in these three provisions. The evaluation of the data was carried out using statistical methods of variance and correlation analysis, determined the criteria of Fisher and Student.

6. Findings

To determine the effect of combinations of occlusion disorders in the main directions on the form of occlusive disorders, a dispersion analysis of their clinical characteristics was carried out in patients before treatment and in patients with poor catamnesis. We obtained the following results at the significance level of 5% due to the analyzing the obtained data and using the Fisher criterion.

The statistics showed no significant significance in the direction or form of occlusive disorders for patients examined prior to orthodontic treatment. Both of these indicators were statistically insignificant, the significance of p=0.258, (Abdullin, 2016). At the same time, for patients with unsatisfactory catamnesis, the statistical significance is determined by the form of occlusive disorders (gnatic and articular), the significance of p=0.034. Fisher’s criterion is 12.72 which is clearly greater than the critical point – 9.55. Thus, the hypothesis of insignificance of the influence of the shape factor of malocclusion is rejected with reliability of 95% can be argued about the importance of such factors as a form of malocclusion in people with poor catamnesis (Dzizinskaya, 2004) (figure 1).
Figure 1. Chart of the number of patients before orthodontic treatment (fig. 1a) and the number of patients with unsatisfactory (fig. 1b) follow-up.

Note: GF – gnatic form; AF – articular form; DAF – dentoalveolar form.

The pronounced combined disorders of the musculoskeletal system in the form of scoliosis of the spine, flat feet and skull deformation were revealed in 92.10% of persons with unsatisfactory catamnesis (38 persons) (table 2).

Table 2. The results of clinical examination of patients with catamnesis for five years or more

<table>
<thead>
<tr>
<th>The plane in which changes in the HMS are detected</th>
<th>Examine patients, N=175</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IC, N=38</td>
</tr>
<tr>
<td></td>
<td>SC, N=137</td>
</tr>
<tr>
<td></td>
<td>DBS</td>
</tr>
<tr>
<td>sagittal</td>
<td></td>
</tr>
<tr>
<td>SFD</td>
<td>14</td>
</tr>
<tr>
<td>UFD</td>
<td></td>
</tr>
<tr>
<td>frontal</td>
<td></td>
</tr>
<tr>
<td>SFD</td>
<td>15</td>
</tr>
<tr>
<td>UFD</td>
<td></td>
</tr>
<tr>
<td>horizontal</td>
<td></td>
</tr>
<tr>
<td>SFD</td>
<td>12</td>
</tr>
<tr>
<td>UFD</td>
<td></td>
</tr>
</tbody>
</table>

Note: IC – the number of patients with insufficient catamnesis; SC – the number of patients with satisfactory catamnesis; DBS – dysfunction of the bones of the skull; SC – scoliosis; DP – dysfunction of the pelvis; FF – flat feet; CFD – the combined form of dysfunction; SFD – severe form of dysfunction; UFD – unexpressed form of dysfunction.

Among those with satisfactory follow-up (137 persons) identified violations the following HMS: flat feet in 32 persons (18.28%); scoliosis 29 (16.57%); deformity of bones of the skull – 22 (12.57%). A graphical representation of the correlation of the clinical characteristics of HMS (figure 2) allows us to conclude that patients with satisfactory catamnesis (SC) the frequency of unexpressed form (NFD) higher dysfunctions of the musculoskeletal system, than patients with poor catamnesis so unexpressed dysfunction HMS from the UFD are more significant. Consequently, these violations were not combined and were less pronounced.
When comparing the revealed deviation of the mandible in patients with poor catamnesis in three functional states of patients (table 3), we found the following types of biomechanical features of the trajectory of its movement:

I. The deviation of the mandible did not change in the standing and sitting position, unlike the deviation detected initially in the dental chair – in 3 people (7.89%);

II. The deviation of the lower jaw increased or changed in the opposite direction in the standing position in contrast to the deviation detected initially in the dental chair – in 15 people (39.47%);

III. A more pronounced deviation of the lower jaw was noted in the sitting position on the chair, unlike the deviation initially detected in the dental chair – in 20 people (52.63%).

To study the clinical characteristics of HMS changes in the groups of the revealed deviation we used the correlation analysis and the Student’s criterion (Abdullin, 2016; Rogacheva, 2004), which allowed us to assess the dependence of the combination of different degrees of osteo dysfunction with changes in the trajectory of the lower jaw (deviation) in different groups of patients. Percentages of available data were investigated. Thus, group II included patients with skull bone dysfunction – 6 people out of 15 (40.00 % of patients), group III – patients with unexpressed flat feet – 5 people out of 20 (25.00 %), etc.

As a result of researches it was determined that in group II of patients revealed a high inverse correlation between the presence of dysfunction of the bones of the skull and pronounced flat feet (correlation coefficient is 0.9998), i.e. the more pronounced flat feet in humans, the less common dysfunction of the skull bones. In group III there was a high correlation between the effect of pelvic bone dysfunction and dysfunction in the bones of the skull (correlation coefficient is 0.998), i.e. the more often pronounced dysfunctions in the bones of the skull are detected in patients, the more often pronounced dysfunctions in the pelvic bones are detected. The high value of the
correlation coefficient indicates a significant relationship between the considered indicators, taking into account the student's criterion at 5.00% significance level (Rogacheva, 2004).

7. Conclusion

In the smallest group I of patients (3 persons) the revealed deviation of the mandible did not change in all listed functional states of the HMS. These patients showed signs of partial recurrence of occlusion abnormalities. The tendency of displacement of the lower jaw to the previous position is noted. It turned out that patients after orthodontic treatment stopped using retention devices early and did not visit an orthodontist. These patients underwent correction of occlusive ratios of dentition, recommendations on the use of retention orthodontic devices, as well as correction of posture in the clinic of manual therapy.

In group II 15 patients were found to have pronounced and asymmetric flat feet on both feet. It is known that the violation of the support function of the foot leads to a rising pathology of the musculoskeletal system, disruption of postural tone of the muscles of mastication and cranio-mandibular dysfunction (Bugrovetskaya, Yurov, 2003; Bugrovetskaya, 2006; Bugrovetskaya et al., 2008; Kudryavtsev, 2010; Tsimbalistova et al., 2004; Gelb, 1970). This, in turn, leads to a change in the biomechanics of the mandible movements, and consequently, changes the occlusion (Chervotok, 2009). Therefore, in such patients, the deviation of the lower jaw increased in the standing position with pronounced asymmetrical flat feet. We defined the named set of disorders found in this group of patients as ascending dysfunction.

Before the treatment of occlusive disorders of the patients of the second group recommended the production of individual insoles to correct the support function of the feet and restore postural equilibrium of the body. The patients were referred to osteopathic doctors to balance postural muscles after completion of orthodontic treatment.

In 20 patients of group III, pronounced dysfunction of the skull bones and pelvic dysfunction in the form of twisting of the pelvic bones were found. In this group of patients we determined descending ode dysfunction.

The primary changes were in the bones of the skull, with skull dysfunction manifested by external rotation of the temporal bone on the one hand and internal rotation of the temporal bone on the other hand, which led to scoliosis in the cervical and thoracic spine, and were accompanied by rotational dysfunction of the pelvic bones. In the sitting position, in the absence of support in the lumbar and thoracic spine, a person who as a result of scoliosis disturbed the balance of the deep muscles of the spinal column, is forced to constantly maintain the head. The muscles of the neck are strained – the belt muscle and the sternocleidomastoid muscle, which are antagonists of the temporal and masticatory muscles and the tone of these muscles changes. The altered tone of the masticatory muscles leads to a violation of dynamic occlusive relationships which ultimately leads to a relapse of the occlusion anomaly.

Before the beginning of orthodontic correction the group III patients underwent manual therapy of the cranial department with functional study of the muscles of the maxillofacial region, cervical, thoracic and pelvic spine. After the end of orthodontic and orthopedic dental activities the patients were again sent to the clinic of manual therapy to consolidate the obtained satisfactory results of complex treatment of occlusion anomalies and deformities of the dentition.

Summary:

1. There are conditions for the formation of recurrences of violations of occlusion of the dentition after orthodontic treatment when expressed and combined forms of disorders of the HMS.
2. It is necessary to take into account the dynamic signs of violations of the biomechanics of the movements of the lower jaw which allows to prevent the formation of relapses of occlusive malocclusion.
3. It is necessary to normalize the support function of the feet and postural balance before orthodontic treatment in the ascending form of ode dysfunction.
4. In case of descending ode dysfunction osteopathic effect on cranial part of the skull, maxillofacial area, cervical, thoracic and pelvic spine is necessary to achieve the highest and most stable result of treatment of occlusion anomalies and deformities of the dentition.

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