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Treatment of Temporomandibular Joint Dysfunction after Complication of Orthodontic Treatment

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Abstract
The high prevalence of DVNFS and the tendency to progression, mainly among young women, justify the need to develop new, more effective algorithms that provide an integrated approach to early diagnosis and treatment of the pathology. In this regard, the development of an integrated approach to early diagnosis remains an extremely urgent problem. The multifactorial structure of the etiology and pathogenesis of diseases of the temporomandibular joint, as well as the influence of external factors on the functioning of the masticatory apparatus determine the need for diagnosis of patients with TMJ diseases and require a multifunctional examination. The condition for the normal functioning of any anatomical system of the body is its harmony in morphological and functional relationships.

Keywords: orthognathic bite, occlusal contact, orthodontic treatment, anthropometry.

Introduction

The causes of TMJ dysfunction are diverse. There are a number of "classic" symptoms that suggest the presence of TMJ dysfunction in the patient. At the same time, pre-existing disorders of joint function may not have pronounced clinical symptoms [1,3,5,7,9,10]. Violation of occlusal contacts of the dentition leads to a change in the coordinated function of the masticatory muscles. The displacement of the lower jaw to a position convenient for chewing becomes fixed over time, forming a "forced", "habitual" occlusion and a new stereotype of neuromuscular balance in the maxillofacial region (CHLO)The plan for a comprehensive examination of patients with occlusal disorders, TMJ and masticatory muscle dysfunctions in modern conditions requires such studies as axiography, occlusiography, electromyography of the masticatory muscles,magnetic resonance imaging of the TMJ [2,4,6,8,11,12]. However, despite the high diagnostic value of each of these methods, the entire complex of diagnostic measures for each subject is rarely performed, there is no single algorithm for a comprehensive survey, and there is no single scheme for interpreting data obtained during the survey.The lack of an algorithm for diagnosing the TMJ state with an assessment of its static, dynamic, and morphological parameters and their

relationship to occlusion leads to a stereotyped understanding of TMJ dysfunction [13,15,17,19,20].

Treatment and rehabilitationof patients with TMJ dysfunctionis an even more difficult task. For the treatment of temporomandibular dysfunction, it is necessary to eliminate the causes of its occurrence, as well as eliminate or minimize concomitant factors affecting the development of the disease [18,20].An important problem is also the ability to manage the changes that occur in the masticatory apparatus during TMJ dysfunction [14,16,18,19]. Successful treatment requires a comprehensive approach and the participation of specialists of various profiles: dentists (orthodontist, orthopedist, therapist), chiropractor, psychologist or neurologist. Practical recommendations do not always offer clear algorithms for dental care for patients with TMJ dysfunction associated with dental anomalies, and treatment measures are not specified or systematized in relation to various clinical situations [5,12,16,20]

Purpose of the Study:

To improve methods of comprehensive diagnosis, treatment and rehabilitation of patients with temporomandibular joint dysfunction associated with dental anomalies

Materials and Methods of Research

In accordance with the purpose of the work, a comprehensive examination and treatment of 250 patients aged 18 to 32 years (average age was 23.5 years), who applied for orthodontic care for dental anomalies (DFA) at the Department of Orthopedic Dentistry and Orthodontics of the Belarusian State Medical UniversityAn open, prospective, controlled clinical and experimental ophthalmic study was conducted. Criteria for inclusion of patients in the study: intact dentition rows, dentoalveolar anomaly in the sagittal plane had a tooth-alveolar or not sharply pronounced gnatic character (\y115-number from -10 mm to +10 mm, ANV angle from -6° to +6°, a disparity in the size of the jawbones no more than 6 mm)- the camouflage of the anomaly did not require performing orthognathic operations. Exclusion criteria: primary or secondary adentia, the presence of secondary deformities of the dentition, organic damage to the TMJ elements. Patients were followed up after treatment for 3 years.Preparation of a treatment plan was carried out after a comprehensive examination, including basic and additional methods, including X-ray, functional and photometric.

Patients undergoing treatment for AFwere divided into four groups. The first three groups were formed according to the dental alveolar class:

- Group 1 - patients with neutral closure of molars in the sagittal plane (n=64);
- Group 2 - patients with distal closure of molars from the sagittal plane (n=59);

Group 3 - - patients with mesial closure of molars from the sagittal plane (n=40).

Groups 1, 2, and 3 were divided into subgroup A-patients with TMJ dysfunction and subgroup B-patients with normal TMJ function. This distribution made it possible to consider persons without TMJ dysfunction as comparable in age and nosological form with those in the comparison group.

Group 4 (n=15) consisted of patients with TMJ dysfunction associated with lateral displacement of the lower jaw and neutral closure of molars in the sagittal plane.

To perform a fragment of the work devoted to preclinical diagnosis of TMJ dysfunction, a comprehensive examination and treatment of 72 individuals aged 17 to 35 years (mean age 23.5 years) was performed, including 36 patients with dentition anomalies and TMJ dysfunction (1st observation group) and 36 patients with dentition anomalies with normal TMJ function (N-th observation group). A comprehensive examination of 21 people with physiological dentition occlusion and normal TMJ function was also performed.

Assessment of the quality of life of patients with TMJ dysfunction combined with dental anomalies in the dynamics of treatment was carried out using the questionnaire "Dental health impact profile 0H1R-14-Ki", translated and adapted by the Central Research Institute of Dental Medicine for orthodontic treatment [2,5,8]. The calculation of the index assumed a scale-by-scale and total summation of points (from 0 to 56). Before and after orthodontic treatment, all patients included in the study underwent analysis of TRG-grams of the head in the lateral projection and profile photos, OPTG examination, ultrasound doiplerography (USDG) of periarticular tissues and blood vessels supplying the masticatory muscles.

To achieve optimal treatment results, algorithms for the treatment of patients with dysfunction have been proposed and tested. Each algorithm consists of several blocks of motivation for orthodontic treatment;

- justification and preparationof treatment tactics, determination ofprotective measures for TMJ;
- protocol of the active period of orthodontic correction, including measures to affect the muscles and TMJ;
- management of patients in the retention period.

Active orthodontictreatment of patientswas performed using fixed orthodontic devices (edgewise techniques). Preference was given to ligature-free braces systems-Damon (Ormco), In ovation R (GAC, Roth prescription, slot 0.022"), in rare cases, at the urgent request of patients, Micro arch ligature systems were used (GAC, Roth prescription, slot 0.022"), Inspire Ice (Ormco, Roth prescription, slot 0.022").

In order to predict changes in muscle tone in cases of maxillary anomalies combined with TMJ dysfunction, the "restoration" of the ZO-model was applied by modeling a low-poly grid based on the main characteristics of a harmoniously developed maxillofacial complex and using "reference" TRG-grams of the head in lateral and direct projections.

Statistical processing of the material was carried out using the BioStat 2008 software package (AnalystSoft Inc.). When describing quantitative traits, the mean value (M) and the standard error of the mean (t) were used. To compare two independent groups by quantitative trait, the Mann-Whitney U-test was used, and the comparison of the sample relative frequency with the population was carried out using 2x2 conjugacy tables with the calculation of the % distribution . The Wilcoxon test was used to compare two dependent groups on a quantitative basis. During the analysis of variance,the factorial andrandom statistical effects of the factors under study were taken into account, and the Fisher angular transformation criterion f was used to determine the strength of the influence and ranking of factors. Statistical hypotheses were tested by comparing the obtained significance level (p) with a threshold level of 0.05. At $p<0.05$, the null hypothesis of No about the absence of differences between the indicators was rejected and the alternative hypothesis of H] was accepted.Modeling of three-dimensional objects, their modification and parameterization were performed using the programs "Autodesk 3ds Max 2012" (Autodesk Inc., official student version) and "AutoCAD 2012" (Autodesk Inc., official student version). The other graphical part of the work was performed using the Microsoft Excel 2007 package.

Conclusions

1. Analysis of changes in the maxillary system in patients with temporomandibular joint dysfunction associated with maxillary anomalies showed that depending on the leading anomaly of occlusion, one or another characteristic set of facial, cranio - and gnatometric signs can be observed:

- with neutral closure of molars in the sagittal plane - compensation of anomalies in skeletal class II both at the level of the position of the jawbones and the profile characteristics of the face;
- in case of distal closure of molars-dentoalveolar forms of distal occlusion, facial profile corresponding to skeletal forms of class II;
- with mesial closure of molars — anteinclination of the lower jaw and a hyperdivergent type of correlation of the jaw bases, a facial profile corresponding to a significant disparity in the position of the jaws according to skeletal class III;
- lateral displacement of the lower jaw at the level of the jawbones mimicked skeletal class III, similar were changes in the face profile and progressive facial asymmetry.

2. In individuals with temporomandibular joint dysfunction associated with dental anomalies, signs of impaired communication and physiological functions, psychological disability are determined. The completed orthodontic treatment had a positive effect on the dental quality of life indicators of patients, which was expressed in a significant change in the integral and scale values of the 0HIP-14-RU index ("improvement" in the quality of life by 33.47%, and OHIP-14-RU=0.72).

3. Preclinical markersof temporomandibularjoint dysfunction in individuals with dentoalveolar abnormalities were:
- "occlusal signs": asymmetric and distal closure of the lateral group of teeth, absence of occlusal contact in the frontal part and trapezoidal shape of the dentition;
- "radiological signs": an increase in the parameters of the upper and lower occlusal angles, a tendency to anteinclination of the incisors of the lower jaw with a reduced value of the incisor angle;
- "functional signs": increased excursion of the lower jaw in the vertical plane, pain and discomfort in the area of the masticatory muscles, dysfunction of peripheral blood flow to the tissues surrounding the temporomandibular joint.

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