Diagnosis and combined treatment of temporomandibular joint

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ABSTRACT

Special attention is paid to the formation of students' skills of anamnesis collection, examination and differential diagnosis of maxillo-facial area (MFA) diseases with various clinical course and their complications, modern approaches to diagnostics, principles of treatment and prophylaxis on the basis of evidence-based medicine and urgent conditions are studied in practical surgical dentistry. Students participate in the diagnostic and treatment process of outpatient, inpatient patients under the guidance of assistants and associate professors of the department. There is also an introduction to the treatment-and-prophylactic measures that are most commonly used in orthodontic dental practice.

Introduction

The modern stage of dentistry is characterized by the development of aesthetic dentistry, which consists in the increased attention of people to their health in combination with beauty. One of the main aesthetic needs of a person is the desire to have a pleasant appearance that meets the aesthetic norms formed in society.

Only officially in 71.8% of patients, on the basis of a study of the state of TMJ occlusion in 110 patients aged 23-25 years, evidence was obtained of the relationship between the violation of the area ratio at the contact zones of the first, second and third order and TMJ pathology. The module developed for the analysis of biometric parameters of occlusal contacts and contact zones of antagonizing teeth should be considered relevant. Today everyone understands that good teeth are a healthy gastrointestinal tract, a beautiful smile and self-confidence. Individual features of the structure of the jaws and the entire facial part of the head may be due to their deformation with dentofacial anomalies.

Anomalies of the maxillary system are accompanied by anatomical and functional disorders on the part of many body systems and negatively affect the psychoemotional state of patients (KhoroshilkinaF.Ya., 1971, 1982, 1999, 2004, MalyginYu.M., 1970, 1982, 1991, 2007, Persia L.S., 1989, ObraztsovYu.L., 2003; GioevaYu.A., 2005: Zhulev E.H., 2005; Kolganova S.I., 2005). Anomalies of development, growth and formation of the maxillary system occupy one of the first places among the pathologies of the maxillofacial complex, which often leads to aesthetic disorders of the face. The cause of the development of anomalies of the maxillary system, as a rule, are complex disorders of the growth and formation of the skull as a whole and its parts, leading to its deformations, violation of proportions and proportionality of parts of the face, the clinical manifestations of which worsen with age (Grigorieva L.P., 1980; Arutyunov S.D., 2001; Gaivoronsky I.V., 2002; Shweitzer M., 2001; Stromeyer E. L., 2002; Miethke R., 2003; Janson G., 2004; AltugZ., 2006).

The aesthetics of the face partly depends on the severity of the anomaly of the teeth, dentition, bones of the facial skull and the thickness of the soft tissues of the face. According to many scientists, sagittal malocclusion is the most common anomaly of the maxillary system. A number of researchers propose diagnostic methods that take into account aesthetic disorders of the facial part of the skull. Undoubtedly, an urgent problem is the choice of effective methods with which to obtain the most informative quantitative indicators of the state of the facial part of the head, taking into account aesthetic norms.

Within the framework of this problem in orthodontics, little studied issues remain: correlation of bite aesthetics and facial harmony, study of soft tissues and facial aesthetics in patients with sagittal malocclusion. When diagnosing the dental system, the condition of soft tissues is not always taken into account. This is due to a number of reasons:
- the radiometric dimensions of the face in profile in patients with sagittal malocclusion have not been sufficiently studied;
- there is little data on changes in the profile of the soft tissues of the face occurring during orthodontic treatment;
- there are no sufficiently reliable criteria for evaluating the aesthetics of the bite and the harmony of the face.

Material and method:
The relevance of studying the size and proportions of the face in children and adults, research in the field of aesthetics and beauty of the human face and body is beyond doubt.

The proportions of the human face – both in men and women – are not only strictly individual, but also extremely stable. Changes in the proportions of the face occur continuously: in newborns, the head size in height is ¼ of the entire body length, in a child aged 7 years, the head occupies a smaller part of the body length – 1/6, in an adult with an average head height of 22.5 cm, its share is 13% of the body length. Since changes in the proportion of the face affect all its departments, the harmony of relations does not change.

If the proportions of different parts of our body coincide with the formula of the golden ratio, then the appearance or body of a person is considered perfectly folded. Examples of the golden section in the structure of the human body are: the distance from the tip of the chin to the tip of the upper lip and from the tip of the upper lip to the nostrils, the distance from the tip of the chin to the upper eyebrow line and from the upper eyebrow line to the crown, etc. The shape, which is based on a combination of symmetry and the golden section, contributes to the best visual perception and the appearance of a sense of beauty and harmony. At the same time, it should be remembered that many faces are attractive, despite some asymmetry of their features. When it comes to the attractiveness of a face, there must be universal characteristics of the perception of the shape and outline of a face that is recognized as attractive. A large number of methods have been proposed and used for the clinical evaluation of attractiveness, but all of them are impractical for daily use, since the evaluation system is directly affected by the age and social status of people. The visual expression of the attractiveness of the face is manifested precisely in the proportionality of the face, because proportionality is subject to objective laws that are most quantifiable. Proportionality indices allow you to compare the faces of people of different ages, gender and ethnicity, regardless of their absolute size.

In the course of complex diagnostics and orthodontic treatment of patients, the following research methods are carried out:
1. Assessment of anthropometric parameters on 3D models of dentition before and after orthodontic treatment.
2. Comparative analysis of anthropometric calculation of plaster models before and after orthodontic treatment.
3. Comparative analysis of telerentgenograms of the head in lateral projection before and after orthodontic treatment.
4. Analysis of cone-beam computed tomograms of the head before and after treatment.

5. Estimation of the degree of error when comparing 3D models of dentition before and after orthodontic treatment.

6. Statistical methods of data processing are applied.

All patients underwent orthodontic treatment using non-removable equipment.

1. A comparative analysis of the anthropometric parameters of 3D models of dentition and TRG parameters in the lateral projection reveals that the obtained data of differences between these two measurement methods are statistically significant ($P<0.05$).

2. A comparative analysis of the anthropometric parameters of 3D models of dentition and plaster models of dentition reveals that the values of The differences are not statistically significant ($P>0.05$).

3. Comparative analysis of the TRG data in the lateral projection and anthropometric analysis of plaster models of dentition, it is revealed that these differences are significant ($P<0.05$).

This technique is not able to fully reflect all the movements of the teeth, and it is also impossible to accurately assess in which direction a particular group of teeth moved relative to the median sagittal plane. The obtained average values of anthropometric calculations of patients allow only an approximate assessment of the nature of changes occurring during orthodontic treatment.

During the study of telerentgenograms of the head in the lateral projection before and after orthodontic treatment, it was revealed that due to the overlap of the left and right sides of the TRG, it is impossible to adequately assess the changes in the dental area. In the process of comparing the data of radiographs, the image is distorted by a large number of overlays of anatomical landmarks, which makes it difficult to assess the real picture of the changes taking place. Also an important factor that casts doubt on the measurements is the choice of points on the telerentgenograms. The inability to adequately set the points due to the different position of the incisors and molars before treatment does not allow for the most accurate assessment of the changes.

Research Results and Their Discussion

Adaptive changes determine the choice of the method of orthodontic treatment, which in some cases does not completely optimize the condition of the dental complex. The main, most significant features of the jaws that limit the possibilities of orthodontic treatment in all patients with gnatic form of sagittal anomaly of occlusion of the dentition are: disproportion of the size of the jaw bones and the length of the anterior portion of the base of the skull, pronounced violations of the inclination of the jaws to the anterior base of the skull, a high degree of mineralization of the median palatine suture (stages D, E). The main dentoalveolar factors limiting the orthodontic movement of teeth are: a thin cortical plate of the alveolar bone, a close arrangement of the roots, a pronounced inclination of the teeth, the vestibular position of the tops of their roots, the location of the teeth outside the dental alveolar arch, the palatal position of the lateral incisors, the vestibular position of the canines of the HF and LF, a thin gum phenotype. In the case of DOSR, the limiting conditions for orthodontic movement of teeth are the close location of the roots and the vestibular inclination of the incisors, and the anterior position of the tops of their roots, in the case of MOSR – the palatal position of the lateral incisors, protrusion of the upper and adaptive retrusion of the lower front teeth.

Comparative analysis of various methods for assessing the degree of change in the position of teeth obtained during orthodontic treatment. The following indicators of the reliability of differences are revealed:

Despite improvements in indicators after treatment, some indicators at the significance level $p<0.005$ statistically significantly differ from the norm both BEFORE and AFTER treatment, some signs of skeletal forms of pathology persisted, since only dental alveolar compensation was performed without bone reconstructive operations on the jaws. For all indicators, AFTER treatment, there were highly statistically significant changes at the significance level of $p<0.005$ compared to the values BEFORE treatment.

For the treatment of patients with skeletal forms of sagittal anomalies of occlusion of dentition, the algorithm of combined orthodonto-surgical treatment should be compiled individually. The use of computer modeling allows you to plan orthodontic treatment step by step and predict its result, which, of course, increases its effectiveness. If the shortcomings of the proposed orthodontic anomaly correction tactics are identified, it is possible to carry out the necessary correction of the treatment plan before its implementation. The use of 3D data for cephalometry makes it possible to obtain more accurate measurement results, which means to make a more adequate treatment plan for patients with gnatic forms of sagittal anomalies of dentition occlusion.

Conclusions

1. An integrated approach to the diagnosis of patients with distal occlusion caused by anomalies of the jaw bones in the orthodontics clinic should contain an assessment of the structure and aesthetics of the face (photometric, anthropometric methods), morphometric characteristics of teeth, dentition, bones and soft tissues of the facial skull (anthropometric, radiation methods), and - if indicated - and analysis structures of the temporomandibular joints (magnetic resonance imaging), examination of the muscles of the maxillofacial region and periodontal (functional methods).

2. The assessment of anthropometric parameters when comparing 3Dmodels of dentition makes it possible to determine the degree of changes occurring in the process of orthodontic treatment in one direction or another. The algorithm for comparing 3D images at different stages of orthodontic treatment allows you to assess in which direction, in which direction and by how much certain changes in the position of the teeth have occurred.

3. According to statistical analysis, it was revealed that the differences between measurements of 3D models of dentition and measurements on plaster models are insignificant (P>0.05). The differences in the calculations of 3D models of dentition and telerentgenograms in the lateral projection are statistically significant (P<0.05). The data of differences between the calculations of plaster models of dentition and telerentgenograms in the lateral projection are significant (P<0.05).

4. Methodological recommendations have been developed and proposed to improve the effectiveness of complex treatment of patients with distal occlusion with individual morphometric features of the maxillofacial region using the proposed step-by-step recommendation standard.

5. The maximum efficiency of the devices is determined: in the younger age group – plate expansion devices, in the older – distractor and Spring Jet I. The rate of expansion of the upper dentition using removable plate devices with a screw in patients aged 6-7 years is 1.8 – 2 times higher than in patients aged 8-10 years. On the lower dentition, the rate of expansion in the molar region is also higher in patients aged 6-7 years (by 1.7 times), but in the premolar region, on the contrary, in patients aged 6-7 years, expansion was 1.7 times slower than in patients 8-10 years.

A significant decrease in the indicators of the angle of convexity of the lower part of the face, a decrease in the nasolabial, interdubial, and labial angles in patients with maxillary retrognathia after treatment led to an improvement facial aesthetics due to the positive stimulation of the growth of the upper jaw.

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