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STANDARD OF ORTHODONTIC ASSISTANCE FOR CLASS III ANGLE OBSTRUCTION PATHOLOGY ACCORDING TO CLINICAL CASE DESCRIPTION

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Mesial occlusion due to mandibular hyperplasia and maxillary hypoplasia most significantly disrupts the aesthetic parameters of the face, reduces chewing efficiency, and disrupts the function of the temporomandibular joint. We present a standard of orthodontic care based on a description of a clinical case of a patient with mesial occlusion, taking into account individual age, clinical and anatomical features of the skull structure, as well as dental and bone age indicators and the stage of maturity of the palatal suture. The above example confirms the need for a comprehensive examination of orthodontic patients, which enables the objective determination of the morpho-functional state of the dento-maxillary area in cases of occlusion pathology and the development of a rational treatment plan for a particular patient.

Key words: Angle III, mesial occlusion, diagnostics, orthodontic treatment.

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СТАНДАРТ ОРТОДОНТИЧНОЇ ДОПОМОГИ ПРИ ПАТОЛОГІЇ ПРИКУСУ ІІІ КЛАСУ ЗА ЕНГЛЕМ ЗА ОПИСОМ КЛІНІЧНОГО ВИПАДКУ

Мезіальна оклюзія внаслідок нижньощелепної гіперплазії та верхньощелепної гіпоплазії найбільш суттєво порушує естетичні параметри обличчя, знижує ефективність жування, порушує функцію скронево-нижньощелепного суглоба. Нами представлений стандарт ортодонтичної допомоги за описом клінічного випадку пацієнта із мезіальною оклюзією в залежності від індивідуальних вікових, клініко-анатомічних особливостей будови черепа, із врахуванням покажчиків зубного, кісткового віку та стадії зрілості піднебінного шва. Наведений приклад підтверджує необхідність комплексного обстеження ортодонтичних пацієнтів, що дає можливість об'єктивно визначити морфо-функціональний стан зубощелепної ділянки при патології прикусу і скласти раціональний комплекс лікувальної допомоги для конкретного пацієнта.

Ключові слова: ІІІ за Енглем, мезіальна оклюзія, діагностика, ортодонтичне лікування.

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Mesial occlusion is a pathology of occlusion in the sagittal plane, in which the lower dentition is located mesially relative to the upper dentition, with an Angle Class III malocclusion (the mesial cusp of the upper first permanent molar is located behind the transverse fissure of the lower tooth of the same name). This relationship can be recorded at the functional, dento-alveolar, or skeletal levels [2, 3].

All dentoalveolar forms of mesial occlusion manifest at the level of the dentition and alveolar processes. Gnathic (skeletal) forms are associated with a violation of the size and position of one or both jaws relative to the anterior base of the skull. Mesial occlusion is often combined with vertical and transverse deficits. Sometimes, functional adaptive displacement of the lower jaw may be observed due to a mismatch in the sizes of the dental arches (pseudo class III) [3, 13].

In Ukraine, as in other European countries, mesial occlusion is less common than distal occlusion. The prevalence of mesial occlusion among Ukrainian children aged 6 to 17 years is 3.42% [4]. However, this malocclusion, resulting from mandibular hyperplasia and maxillary hypoplasia, most significantly disrupts the aesthetic parameters of the face, reduces chewing efficiency, affects the function of the temporomandibular joint (TMJ), causes periodontal disease, and leads to premature tooth loss [6].

New modern digital technologies significantly expand the possibilities of orthodontic treatment. However, the issues of an individualized approach in the diagnosis, prevention, and comprehensive rehabilitation of patients with mesial occlusion remain relevant and insufficiently resolved.

The purpose of the study was to establish a standard of orthodontic care for patients with mesial occlusion, taking into account individual age, clinical and anatomical features of the skull structure, as well as dental and bone age indicators and the stage of maturity of the palatal suture.

Materials and methods. A study of the medical records of patient P. with mesial occlusion was conducted. Orthodontic treatment began at the age of 15. A comprehensive study was conducted over three

years of treatment, including a detailed collection of complaints and anamnesis, a general examination, extraoral and intraoral examinations, and radiological and photometric examinations. A general examination revealed typical postural abnormalities: forward head position, cervical and lumbar lordosis, hypotonia of the omohyoid muscle, hypotonia of the hypoglossal muscle group, and hypertonus of the occipital muscles.

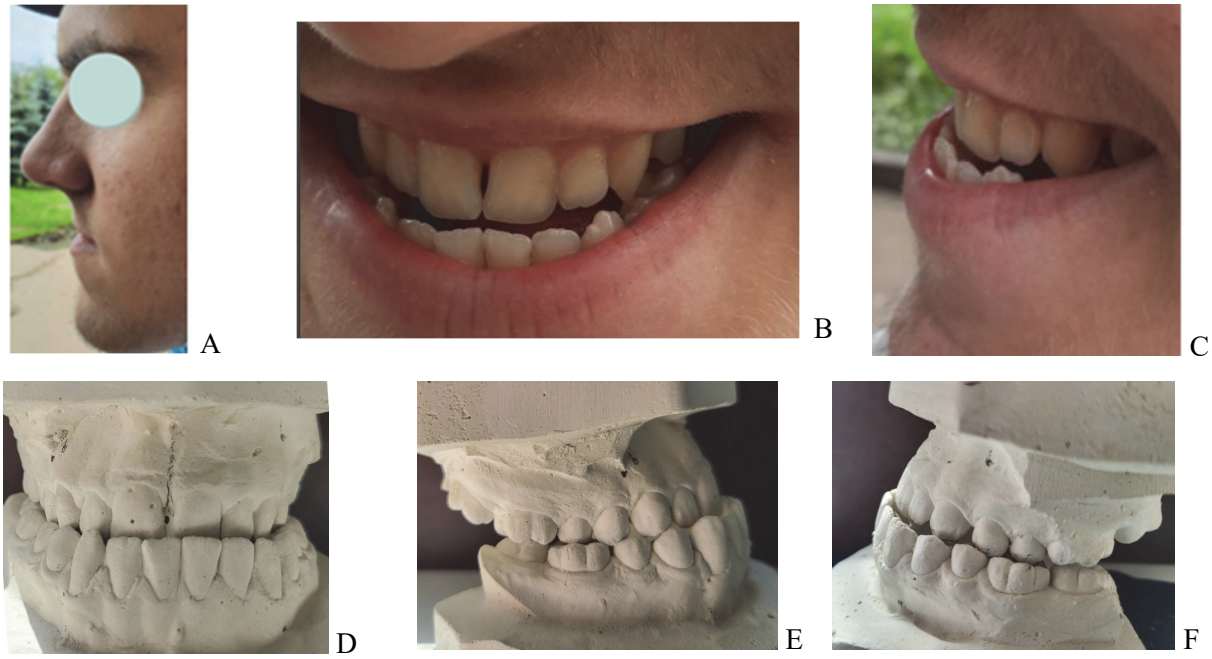


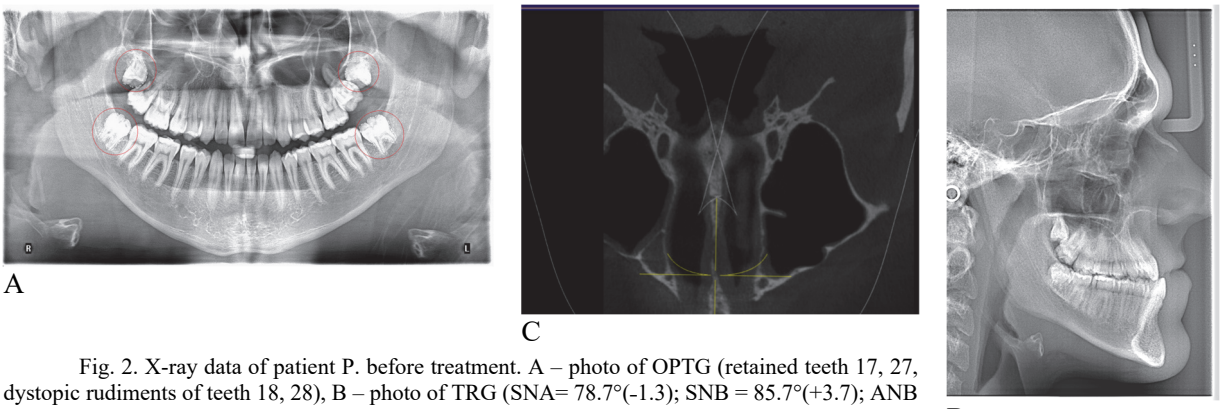
Fig. 1. Facial photo and CDM photo of patient P., 15 years old (ambulance card No. B-25). A, B, C – characteristic facial signs of pathology: A – side view: concave facial profile, chin protrudes forward; B – frontal view of a smile; C – side view of a smile; D, E, F, G – photos of the CDM (mesial ratio on molars and canines): D – frontal view; E – right; F – left; G – dental arches.

A general facial examination was performed to determine the shape, proportionality, symmetry, harmony of soft tissues, and the condition of the perioral and masticatory muscles. The condition of the TMJ, masticatory, and facial muscles was assessed, as well as the presence of any parafunctions of the dento-maxillary region (DMR) in the patient. The intraoral examination was performed to assess the condition of the hard and soft tissues of the oral cavity (including the periodontium), the position of the teeth, dentition, and the morpho-functional state of the patient's bite in the sagittal, vertical, and transverse planes. Intraoral and extraoral photo protocols were created from the obtained digital or video images. Radiological examination was performed: orthopantomography (OPTG), telradiography (TRG), cone beam computed tomography (CBCT) with a focus on the maturity of the palatal suture [1]. Anthropometric measurements of control and diagnostic models (CDM) of teeth were performed to assess the intermaxillary ratio, determine the length, width, and symmetry of the dental arches, and evaluate the proportionality of the teeth (according to Pont, Korghaus, Tonn, and Bolton, H. G. Snagina). Skeletal maturity was studied by the size and shape of the second (C2), third (C3), and fourth (C4) cervical vertebrae [9, 12].

Results of the study and their discussion. During the initial examination, complaints of an unattractive smile and forward displacement of the lower jaw were noted. The history revealed that the patient has been professionally involved in judo since the age of 8. No hereditary factor of pathology was found in the family history. Facial aesthetics were impaired, characterized by an open mouth, lengthening of the lower third of the face, a concave profile, and a protruding chin. A study of anthropometric indicators was conducted using control and diagnostic models. The width of the upper dentition in the lateral sections was determined by the Pont method. Sagittal parameters of the dentition were assessed using the Körghaus method. The measurement data showed the following: narrowing of the upper dentition in the area of premolars by 2.1 mm, first molars by 4.1 mm; widening of the lower dentition in the area of premolars by 2.9 mm; first molars by 9 mm; shortening of the upper dentition by 2.8 mm; lengthening of the lower dentition by 1.4 mm (Fig. 1).

Changes in the magnitude of transversal and sagittal parameters during treatment determined the effectiveness of therapy, and the comparison of the distances between bone and dental points during treatment reflected the relationship between the bone and dentoalveolar component.

On OPTG before treatment, retained teeth 17, 27, dystopic rudiments of teeth 18, 28 at the VI stage of formation, according to T.A. Tochilina, were detected. The data of the TRG analysis according to the Schwarz and Steiner methods showed a retro face with a forwardly displaced chin, micrognathia of the upper jaw, a decrease in the total length of the upper jaw, and an increase in the total length of the lower jaw and the length of its base. In particular, according to the sizes of Gn-Cd and Go-Pog, the vertical type of growth of the facial skeleton, according to the sizes and shape of the second (C2), third (C3) and fourth (C4) cervical vertebrae – CS-5 stage of bone age. On CBCT, the ossification of the palatine suture corresponded to class D according to Angelieri et al. (2013) [5] (Fig. 2).



A C B

Fig. 2. X-ray data of patient P. before treatment. A – photo of OPTG (retained teeth 17, 27, dystopic rudiments of teeth 18, 28), B – photo of TRG (SNA= 78.7°(-1.3); SNB = 85.7°(+3.7); ANB = -7°(-9); hyperplasia of the lower jaw, hypoplasia of the upper jaw), C – photo of CBCT scan of the palatal suture.

For differential diagnostics, the algorithm Storozhenko K.V., 2017) [4] was used (Fig. 3).

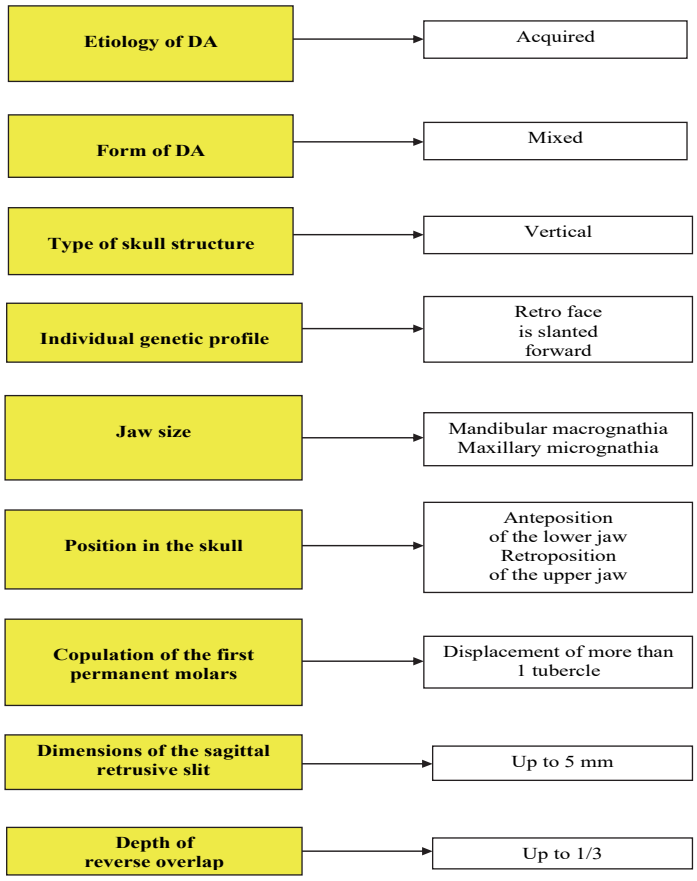


Fig. 3. Algorithm for differential diagnosis of progenic occlusion forms (the symptoms present in the studied patient are highlighted).

Final diagnosis: skeletal Angle Class III (mixed form), mesial occlusion of the dentition, bilateral crossbite laterogenic; expansion and lengthening of the lower dentoalveolar arch; narrowing and shortening of the upper dentoalveolar arch, retention of teeth 17, 27, violation of the position of the tongue during functions, bad habit of mouth-type breathing, forward head position, cervical and lumbar lordosis.

Based on the examination results and differential diagnosis, a treatment plan was developed and agreed upon with the patient and family members, comprising the preparatory stage, active orthodontic treatment, and retention. According to the patient's diagnosis, he was shown treatment with orthognathic surgery techniques, but the patient refused this plan and agreed only to a camouflage correction method. Before the start of active orthodontic treatment, preparatory measures were carried out, which included: elimination of etiopathogenetic factors of the pathology; psychotherapeutic counseling taking into account the patient's motivation for orthodontic treatment, his physical and mental development; sanitation of the oral cavity; teaching the patient the features of care for orthodontic structures and oral hygiene. Exercises were prescribed

to normalize posture, nasal breathing, and correct functional disorders using myogymnastics for the orbicularis oculi muscle and tongue muscles. The surgical method involved removing the rudiments of teeth 18, 28, 38, and 48 and opening access to the crowns of impacted teeth 17 and 27.

The orthodontic method is aimed at creating dentoalveolar compensation, which included normalizing the shape of the dentition of the upper and lower jaws using a fixed orthodontic device (bracket system); restraining the growth of the lower jaw in the sagittal direction using a chin sling; normalizing the intermaxillary relationships through the use of intermaxillary elastic rods; control of occlusal relationships in the transverse, vertical and horizontal planes, achieving adequate interincisal relationships and vertical control over the development of the upper jaw in the frontal and lateral areas, creating tight interdental contacts; achieving myodynamic balance, adapting treatment results. Dentoalveolar compensation (orthodontic camouflage) involved correction of the position of teeth and dentition, some improvement of facial aesthetics, and control of functional occlusion (Fig. 4). Provided that optimal morpho-functional occlusion was achieved, stabilization and retention of the results were performed.

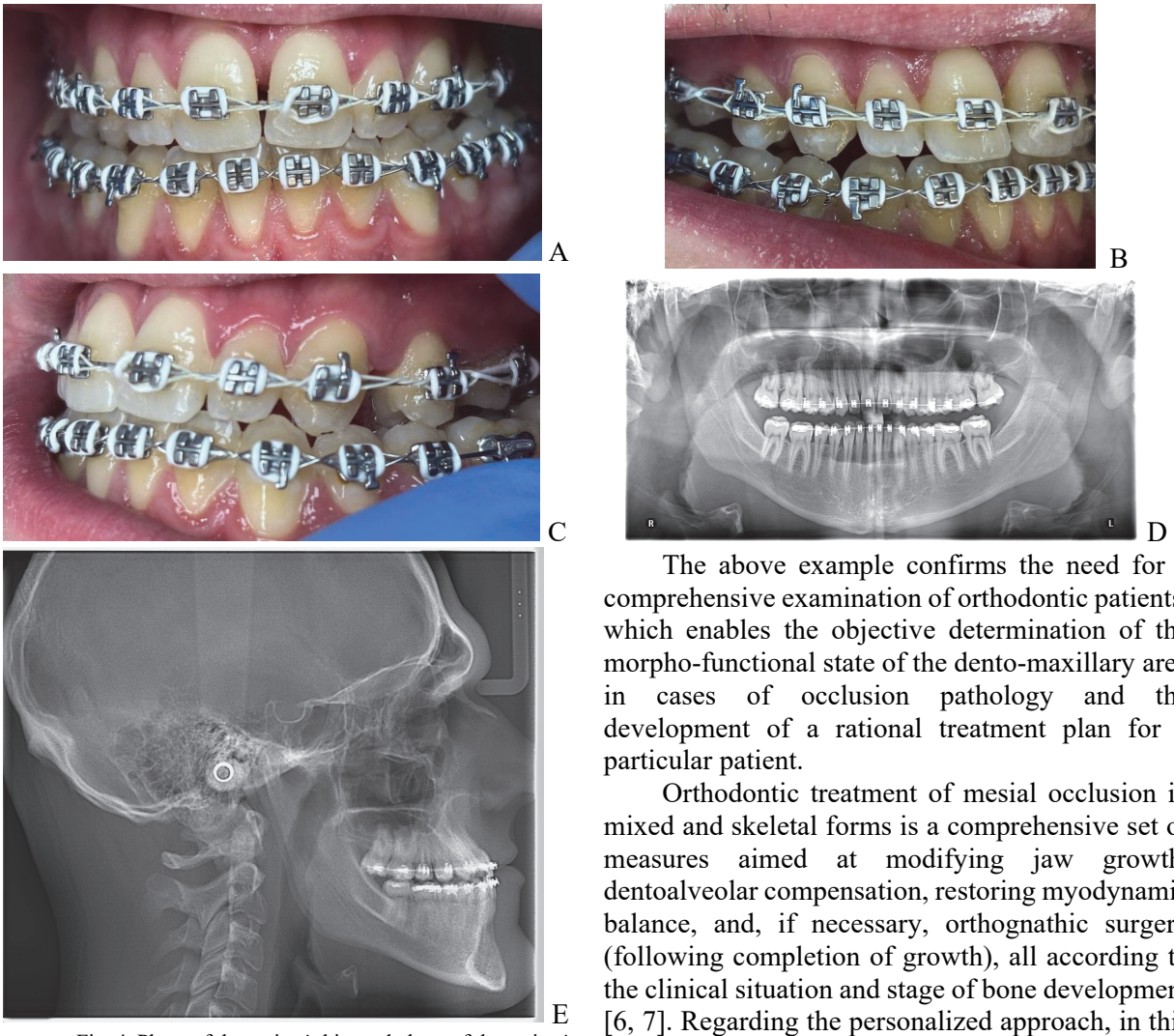


Fig. 4. Photo of the patient's bite and photo of the patient's OPTG and TRG at various stages of treatment. A, B, C – photos of the patient's teeth, dentition, and bite after three years of treatment: A – front view; B – right; C – left, D – photo of OPTG after two years of treatment, E – photo of TRG after three years of treatment.

The above example confirms the need for a comprehensive examination of orthodontic patients, which enables the objective determination of the morpho-functional state of the dento-maxillary area in cases of occlusion pathology and the development of a rational treatment plan for a particular patient.

Orthodontic treatment of mesial occlusion in mixed and skeletal forms is a comprehensive set of measures aimed at modifying jaw growth, dentoalveolar compensation, restoring myodynamic balance, and, if necessary, orthognathic surgery (following completion of growth), all according to the clinical situation and stage of bone development [6, 7]. Regarding the personalized approach, in this particular case we performed correction of myofunctional disorders, normalization of respiratory function and other functions of the dentofacial apparatus (swallowing, chewing, speech), postural adaptation, normalization of the shape and size of the dental arches of the upper and lower jaws, stimulation of the growth of the upper and restraining the development of the lower jaws, correction of the vertical parameters of the jaws.

Active orthodontic treatment of mesial occlusion of the dentition (Angle Class III of occlusion pathology) aims to: eliminate factors that stimulate the growth of the upper jaw and restrain the growth of the lower jaw or force the lower jaw to move forward due to the mismatch of occlusal contacts, depending on the diagnosed form; ensure optimal growth and development of the upper jaw, if necessary, restrain the growth of the lower jaw. At all stages, correction of vertical overlap in the frontal area, vertical relationships

in the molar region, control of rotation of occlusal planes, and relationships along the transversal are carried out [8, 10, 11].

Conclusion

Successful treatment of mesial occlusion requires a personalized approach to each patient, taking into account their wishes. The orthodontist and surgeon must consider all factors that may affect the treatment outcome and take into account the individual characteristics of each specific case. Early diagnosis of mesial occlusion and its timely treatment prevent the formation of persistent facial disorders and changes, as well as general somatic disorders of the body.

The leading clinical, morphological and functional criteria for determining the method of treatment of mesial occlusion: etiological factor, degree of disproportion of the sizes of the upper and lower jaws and the shape of the dentoalveolar arches, nature of the disproportion of the sizes of the teeth, nature of functional disorders, dental age, stage of bone maturity.

Prospects for further research. Further research aims to investigate the causes of patient dissatisfaction during orthodontic treatment and prevent the development of complications.

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