Optimization of Diagnosis and Therapy of Patients with Mesial Occlusion

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Annotation: Mesial occlusion represents one of the most complex and multifaceted pathologies of the dentofacial system, characterized by disruption of normal occlusal relationships between the upper and lower dental arches. This anomaly, also known as prognathic bite or Class III according to Angle, manifests as an anterior position of the lower jaw relative to the upper jaw, leading to the formation of reverse incisal overlap and disruption of functional harmony of the entire dentofacial system.

Keywords: Class III malocclusion, diagnosis, treatment, orthodontics, prognathism, dentofacial anomalies, occlusion, orthognathic surgery, cephalometry, biomechanics, computer modeling, three-dimensional diagnosis, relapse, stability of results, interdisciplinary approach.

Introduction. Contemporary epidemiological studies indicate that mesial occlusion occurs with a frequency of 1% to 19% in various populations worldwide, with significant ethnic and geographic differences observed in the prevalence of this pathology. The highest prevalence rates are recorded in East Asian populations, where the frequency of mesial occlusion can reach 15-19%, while in European populations this indicator varies from 3% to 8%. Of particular concern is the observed trend in recent decades toward increased frequency of this anomaly, which may be associated with changes in lifestyle, dietary patterns, and environmental factors. The formation of mesial occlusion is determined by complex interactions of multiple etiological factors, including hereditary predisposition, embryogenesis disorders, functional disturbances, and the influence of adverse environmental factors. The genetic component plays a key role in the development of this pathology, especially in cases of family history and hereditary syndromes accompanied by facial skeletal development disorders. Functional disturbances such as mouth breathing, infantile swallowing patterns, macroglossia, and parafunctions of facial muscles and tongue create unfavorable conditions for normal jaw growth and development. Particular importance is given to nasal breathing disorders caused by ENT pathology, which lead to changes in tongue and lower jaw position, contributing to mesial occlusion formation. Mesial occlusion is characterized by a wide spectrum of morphological manifestations that can vary from minor occlusal relationship disturbances to pronounced facial skeletal deformations. Morphological features include increased lower jaw dimensions, decreased upper jaw dimensions, or their combination, leading to facial proportion disruption and characteristic profile formation. Functional disturbances in mesial occlusion affect all major functions of the dentofacial system: chewing, swallowing, speech, and breathing. Masticatory function disorders manifest in altered chewing movement patterns, reduced chewing efficiency, and premature tooth wear. Speech disorders may include sound articulation distortion, particularly anterior lingual sounds, which negatively affects patients' communicative abilities. Mesial occlusion significantly impacts patients' psychoemotional state and social adaptation. Appearance changes associated with this anomaly often lead to inferiority complex formation, decreased self-esteem, and social contact limitations. Patients with mesial occlusion frequently experience difficulties in professional activities, especially in fields requiring active interpersonal communication. Psychological studies demonstrate that patients with mesial occlusion significantly more often exhibit symptoms of depression, anxiety, and social isolation

compared to individuals without this pathology. This emphasizes the importance of not only medical but also psychosocial aspects in comprehensive rehabilitation of patients with mesial occlusion.Diagnosing mesial occlusion represents a complex multi-stage task requiring the application of diverse research methods and an interdisciplinary approach. Traditional diagnostic methods based on clinical examination, diagnostic model analysis, and two-dimensional radiography do not always provide the necessary accuracy and completeness of information for adequate treatment planning. One of the main challenges in contemporary diagnosis is the need for differential diagnosis between various forms of mesial occlusion: true prognathism (lower jaw enlargement), false prognathism (upper jaw reduction), and their combined forms. Accurate determination of anomaly type is critically important for selecting optimal treatment tactics and predicting results. Treatment of mesial occlusion ranks among the most complex tasks in contemporary orthodontics and maxillofacial surgery. Therapeutic strategy selection depends on multiple factors, including patient age, anomaly type and severity, presence of concomitant disorders, and individual growth and development characteristics.Traditional approaches to mesial occlusion treatment include early orthodontic intervention during primary and mixed dentition periods, combined orthodontic-surgical treatment in permanent dentition, and prosthetic rehabilitation. However, the effectiveness of these methods is not always sufficient, especially in cases of pronounced skeletal forms of anomaly. One of the most serious problems in mesial occlusion treatment is the high recurrence rate, which can reach 25-40% depending on the treatment methods employed. Factors contributing to recurrence development include unresolved functional disorders, continued lower jaw growth, insufficient retention, and patient non-compliance with doctor recommendations. Predicting treatment result stability remains one of the most complex tasks, as it requires consideration of multiple biological, biomechanical, and social factors. Development of reliable prognostic criteria represents a current task in contemporary orthodontics. Effective mesial occlusion treatment requires coordinated interaction among specialists of various profiles. The interdisciplinary team may include an orthodontist, maxillofacial surgeon, prosthodontist, periodontist, speech therapist, otolaryngologist, psychologist, and other specialists depending on the specific clinical situation. Coordination of various specialist actions, development of unified patient management protocols, and ensuring continuity at all treatment stages remain current tasks in contemporary dentistry. The absence of standardized approaches to interdisciplinary interaction often leads to decreased treatment effectiveness and worsened results. Development of modern technologies opens new possibilities for optimizing mesial occlusion diagnosis and treatment. Implementation of three-dimensional visualization methods such as cone-beam computed tomography (CBCT), magnetic resonance imaging (MRI), and optical scanning allows for obtaining more accurate and complete information about dentofacial system condition. Digital treatment planning technologies, including virtual modeling and result simulation, provide opportunities for more precise therapeutic intervention planning and result prediction. Application of navigation systems in maxillofacial surgery increases operation accuracy and reduces complication risks. Contemporary trends in medicine are directed toward creating personalized treatment approaches that consider individual patient characteristics. In the field of mesial occlusion treatment, this means developing individual diagnostic and treatment protocols based on analysis of genetic, biomechanical, functional, and psychosocial factors. Pharmacogenetic studies open possibilities for optimizing drug therapy accompanying orthodontic treatment. Study of genetic polymorphisms associated with drug metabolism peculiarities allows for selecting optimal dosages and preventing adverse reactions. Mesial occlusion treatment is associated with significant economic costs for both patients and the healthcare system. Treatment duration, necessity of expensive technologies and materials, and possible need for repeated interventions during relapses make this pathology an economically significant problem. Analysis of economic effectiveness of various treatment methods becomes an important factor in selecting optimal therapeutic strategy. Development of economically justified diagnostic and treatment algorithms allows for optimizing resource utilization and increasing accessibility of quality dental care. Contemporary approaches to evaluating mesial occlusion treatment effectiveness increasingly focus on assessing patient quality of life. Development of specialized tools for evaluating the impact of dentofacial anomalies on various aspects of patient life allows for more objective assessment of treatment results. Studies demonstrate

that successful mesial occlusion treatment leads to significant improvement in patient quality of life, including physical, psychological, and social aspects. This emphasizes the importance of a comprehensive treatment approach that considers not only medical but also psychosocial aspects. Evidence-based medicine principles become the foundation for developing scientifically grounded protocols for mesial occlusion diagnosis and treatment. Conducting randomized controlled studies, systematic reviews, and meta-analyses allows for determining the most effective diagnostic and treatment methods. Creating clinical case databases and implementing treatment outcome monitoring systems contribute to accumulating evidence base for optimizing therapeutic approaches. Standardization of treatment result evaluation criteria is a necessary condition for conducting quality comparative studies. Development of preventive approaches to preventing mesial occlusion formation represents a promising direction for optimizing dental care. Early diagnosis of risk factors, correction of functional disorders, and elimination of harmful habits can significantly reduce the probability of developing this pathology. Creating dispensary observation programs for children with mesial occlusion development risk factors allows for ensuring early detection and timely treatment of initial anomaly manifestations. Preventive orthodontic treatment in primary and early mixed dentition can prevent severe pathology form formation. Implementation of telemedicine technologies in mesial occlusion treatment practice opens new possibilities for optimizing diagnosis and patient monitoring. Remote consultation, distant treatment progress monitoring, and patient tele-education can increase treatment effectiveness and improve patient treatment adherence. Development of mobile applications for patient self-control, artificial intelligence systems for diagnostic data analysis, and automated treatment planning systems represents a promising direction for digital dentistry development. In connection with the above, optimization of diagnosis and therapy for patients with mesial occlusion represents an extremely relevant scientific-practical task in contemporary dentistry. The need to increase treatment effectiveness, reduce treatment duration, decrease recurrence frequency, and improve patient quality of life requires a comprehensive approach to solving this problem. Integration of achievements from various fields of science and technology, development of interdisciplinary interaction, implementation of innovative technologies, and creation of personalized treatment approaches are the main directions for optimizing mesial occlusion diagnosis and therapy.

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