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## ROLE OF ORTHODONTIC PATHOLOGY IN THE FORMATION OF DYSPHAGIA

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**Abstract.** Orthodontic care for the population can be considered much more broadly than just bite correction. Malocclusion in some cases are accompanied by severe conditions such as dysphagia. When assessing the orthodontic status, this group of subjects has a distal jaw ratio, maxillary macrognathia, and deocclusion in the frontal area. These disorders can be either isolated or combined. A decrease in the volume of the upper respiratory tract is determined, which is associated with the distal position of the lower jaw. There are difficulties in pronouncing sounds. When providing care to such patients, an integrated approach is needed with the definition of a phased orthodontic treatment plan with a gradual transition from simple orthodontic devices to more complex ones in their design. A special place in the treatment and rehabilitation of such patients is played by functional correction devices, which simultaneously normalize the work of the muscles of the maxillofacial region and correct the bite. Early diagnosis helps to reduce the severity of pathology in patients starting from childhood. Treatment plans are offered, taking into account concomitant disorders. The use of orthodontic devices for muscle correction at the first stages allows you to gradually switch to treatment using non-removable equipment. Such a multi-level approach in the appointment of orthodontic devices makes it easier for the patient to adapt to the equipment, gradually complicating the design of the devices. It is not always possible to get the desired result, but there is always success in reducing the severity of the pathology. By correcting disorders, orthodontists, together with other clinicians, qualitatively change the patient's lifestyle and general health.

**Keywords:** malocclusion, distal deep bite, open bite, dysphagia, violation of the volume of the upper respiratory tract

## РОЛЬ ОРТОДОНТИЧЕСКОЙ ПАТОЛОГИИ В ФОРМИРОВАНИИ ДИСФАГИИ

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**Резюме.** Ортодонтическая помощь населению может рассматриваться гораздо шире, чем только исправление прикуса. Аномалии окклюзии в некоторых случаях сопровождаются такими тяжелыми состояниями,

как дисфагия. При оценке ортодонтического статуса у этой группы обследуемых присутствует дистальное соотношение челюстей, макрогнатия верхней челюсти, дезокклюзия во фронтальном участке. Эти нарушения могут носить как изолированный, так и сочетанный характер. Определяется уменьшение объема верхних дыхательных путей, что связано с дистальным положением нижней челюсти. Имеются трудности в произношении звуков. При оказании помощи таким пациентам необходим комплексный подход с определением поэтапного плана ортодонтического лечения при постепенном переходе от простых ортодонтических аппаратов к более сложным по своей конструкции. Особую роль в лечении и реабилитации таких пациентов играют функциональные аппараты-корректоры, которые одновременно нормализуют работу мышц челюстно-лицевой области и исправляют прикус. Ранняя диагностика позволяет снизить тяжесть патологии у пациентов, начиная с детского возраста. Предлагаются планы лечения с учетом сопутствующих нарушений. Применение на первых этапах ортодонтических аппаратов коррекции работы мышц позволяет постепенно переходить на лечение с применением несъемной техники. Такой многоуровневый подход в назначении ортодонтических аппаратов позволяет пациенту легче адаптироваться к аппаратуре, постепенно усложняя конструкцию аппаратов. Не во всех случаях возможно получить желаемый результат, однако всегда есть успех на пути снижения тяжести патологии. Проводя коррекцию нарушений, врачи-ортодонты вместе с другими клиницистами качественно меняют образ жизни пациента и его общее состояние здоровья.

**Ключевые слова:** аномалия прикуса, дистальный глубокий прикус, открытый прикус, дисфагия, нарушение объема верхних дыхательных путей

## ROLE OF ORTHODONTIC CARE IN DENTISTRY

Nowadays, the section of orthodontic care plays a special role in a modern dentistry. A few years ago, the study of this specialty took place at departments of orthopedics, surgical dentistry and pediatric dentistry, with separate sections on orthodontic care. After some time, particular departments of orthodontic care began to be formed. Due to the fact that there were new devices and protocols for treatment of anomalies of dentition, different structure for the organization of educational and treatment processes was required. The former connection with other sections of dentistry allowed orthodontic care to be enriched with the experience of joint management of patients. Undoubtedly, it had a positive impact on deeper understanding of the etiology of many diseases and on preparation of comprehensive treatment plans for patients of different ages with concomitant diseases. Nowadays, orthodontists are the ones who develop a general treatment plan for each patient, determine not only disorders of stomatognathic system (SS), but also establish cause-and-effect relationships between severe bite disorders and changes occurring in swallowing, breathing, and musculoskeletal system.

Oral cavity is the beginning of digestive system, so pathological changes occurring there affect the health of all the humans body. It is established that diseases of hard dental tissues, periodontal tissues and SS primarily affect the work of a gastrointestinal tract, and also have a con-

nection with other life-supporting systems of the body.

In children, detected disorders of SS allow an orthodontist to assess the degree of dental status of an oral cavity as a whole, to determine the reduction in the volume of oral cavity, position of the tongue at rest and during movements, and to identify a violation of the swallowing mechanism (Figs. 1, 2). As a rule, such patients have pronounced facial features, reduced height of the lower third of face; a lower jaw occupies posterior position, which, in addition to swallowing disorders, gradually leads to persistent formation of a decrease in the volume of upper respiratory tract. If there is no assistance in correcting the bite and normalization of other functions in early childhood, these disorders acquire the status of independent diseases when child grows up, and correction of the bite does not lead to correct functions of other systems.

During examination of oral cavity, doctors determine the presence of carious and non-carious lesions in the hard dental tissues. In such cases, if there is a bite pathology, patients are unable to bite food, chew and swallow it. Diseases of periodontal tissues, which are often diagnosed in adult patients, are manifested by a decrease in the level and density of bone tissue, bleeding gums, mobility of teeth and presence of mucosal traction. It leads to a change in the quality of food in consistency and composition, to decrease in chewing efficiency and with significant destruction of the ligamentous apparatus of tooth — loss of teeth,



Fig. 1. The clinical situation in the oral cavity and the appearance of a patient with malocclusion. OB, OD with protrusion of incisors. There are irregularities in the position of individual teeth, narrowing of the jaws, and a change in their shape. There is no contact between the incisors, the swallowing pattern is disrupted due to a change in the position of the tongue and improper operation of the muscles of the maxillofacial region. The supramental fold is pronounced, the wings of the nose are not developed

Рис. 1. Клиническая ситуация в полости рта и внешний вид пациента с аномалией прикуса. Глубокий, травмирующий дистальный прикус с протрузией резцов. Имеются нарушения в положении отдельных зубов, сужение челюстей, изменение их формы. Отсутствует контакт между резцами, нарушен паттерн глотания за счет изменения позиции языка и неправильной работы мышц челюстно-лицевой области. Выражена супраментальная складка, крылья носа не развиты

which gives rise to secondary deformities of SS and face. The presence of skeletal anomalies of the bite with jaw deformity and malposition of teeth, violation of functions at early age, leads to more serious changes in the body of adult patients and failure in the work of many systems. Even if such bite anomalies are treated with orthodontic or combined methods, disorders that occurred during the period of exposure of this anomaly to the body are often isolated in an independent clinical form, and its treatment is not always successful after the correction of bite pathology.

Pathology of SS, namely bite disorders at the skeletal level, also affect breathing, swallowing and musculoskeletal system in general. If a person has some bite anomalies with disturbed relationship of the jaws, there is a shift in the center of gravity of the head, changes in the cervical spine. Posterior position of the lower jaw, narrowing of

the upper jaw lead to a decrease in the volume of the oral cavity, violation of position of a tongue at rest and while moving. Such problem changes the swallowing pattern and leads to a decrease in the volume of upper airway [4]. That is why in orthodontic care, bite correction leads to significant improvement, normalization in the function of other organs and systems. Involvement of allied specialists in their profile issues is undoubtedly necessary to provide quality care to patients at any age.

#### **NORMAL SWALLOWING AND MANIFESTATION OF DYSPHAGIA**

Normally, swallowing is accompanied by closed lips and there is no tension of the muscles of the face and neck. Approximately the swallowing itself takes place within 0.2–0.6 s and performs about 600 times during the day [2]. In oral cavity, teeth



Fig. 2. The clinical situation in the oral cavity and the appearance of a patient with malocclusion. OB, OD with pronounced crowding of incisors. There is a pronounced crowding of teeth in the upper jaw, narrowing of the jaws, elongation of the anterior segment of the dental arch in the upper jaw and flattening on the lower. There is no contact between the incisors, the swallowing pattern is disrupted due to a change in the position of the tongue and improper operation of the muscles of the maxillofacial region. The supramental fold is pronounced, the lips close with tension, the wings of the nose are not developed

Рис. 2. Клиническая ситуация в полости рта и внешний вид пациента с аномалией прикуса. Глубокий, травмирующий дистальный прикус с резко выраженной скученностью резцов. Имеются резко выраженная скученность зубов на верхней челюсти, сужение челюстей, удлинение переднего отрезка зубной дуги на верхней челюсти и уплощение на нижней. Отсутствует контакт между резцами, нарушен паттерн глотания за счет изменения позиции языка и неправильной работы мышц челюстно-лицевой области. Выражена супраментальная складка, губы смыкаются с напряжением, крылья носа не развиты

are closed, and a total time of swallowing can take about 30–40 minutes for the entire temporal diurnal period. It has been found that during swallowing, potential of bioelectrical activity of the masseters and anterior fascicle of temporal muscles increases [1]. When the swallowing pattern is violated, depending on the degree of violation, the work of facial muscles becomes visible externally, mimic muscles are involved, changes in the tone of neck and back muscles occur. It is possible to change the posture of the body and appearance of head tilt. At the same time, the teeth may not close, tongue begins to contact the lips and cheeks [3]. Since the process takes not physiological but pathological way, there is a violation of stereotypes of muscles function of the maxillofacial region.

The "thimble symptom" is well known in children and characterized by disorders of muscles

tone of perioral region if a child has an incorrect distal bite with transversal narrowing of the jaws and decrease in interalveolar height during swallowing. The pathological process of swallowing is carried out through laying a tongue between front teeth, which are not closed. As the result, positive pressure in the oral cavity appears and muscles both of perioral region and floor of the mouth, which are not characteristic for participation in this process, are included in the performance. They create tension in facial expressions when swallowing. As a rule, this bite abnormality does not allow the patient to bite food well, chew it, limits the movements of the tongue and forces it to take a wrong position at rest and disrupts the swallowing. This gradually leads to disturbances in function of many organs and systems, sometimes directly unrelated to the oral cavity. Consequent-

ly, in the long term, bite problems, accompanied by pronounced deformity of the jaw bones, lead to the development of both oropharyngeal ("high") and esophageal ("low") swallowing disorders, known as dysphagia. Two key mechanisms are known in the pathogenesis of dysphagia: obstruction and dysregulation. Methods such as pharyngeal examination, esophagography, esophagogastroscope, and determination of a hydrogen index are used in the diagnosis of dysphagia. However, scientific articles almost never describe the state of the SS and its muscles.

In patients with diagnosed dysphagia, which is a persistent disorder, the act of swallowing itself is impaired. This is a secondary pathological process that develops against the background of other diseases and persistent changes, which include bite disorders. According to various literary sources, the prevalence of dysphagia is about 13%. It is detected in all age groups and tends to increase with age.

#### **DYSPHAGIA AS COMMON SYMPTOM OF OROFACIAL MYOFUNCTIONAL DISORDERS**

Orofacial myofunctional disorders (OMDs) are manifested by impaired muscle function and function of the facial region of the oral cavity.

OMDs can directly or indirectly affect breastfeeding, skeletal growth and facial development, chewing, swallowing, speech, occlusion, temporomandibular joint movement, oral hygiene, orthodontic treatment stability, facial aesthetics, and more.

Most OMDs occur due to inadequate nasal breathing with oral type of breathing and can manifest as dysphagia. OMDs can affect the treatment outcome of orthodontists, dentists, hygienists, speech therapists, and other professionals who work in the maxillofacial region.

OMDs can also be an etiologic factor in cross-bite and bad habits: in some severe cases, it can cause sleep apnea (Fig. 3).

A study on how oral dysfunction can develop into malocclusion, acquired craniofacial disorder, and contribute to generational dysfunction, leading to disease, was conducted. Basic orthodontic consultations are usually recommended from the age of seven. However, the dysmorphic changes that lead to malocclusion often manifest much earlier. Similarly, after orthodontic treatment, patients require permanent fixation of the result when the bite is unstable, and without such retention, the malocclusion may return. The study provides an overview of the symptoms of OMDs and describes the oral functional areas that influence occlusal and facial development: breastfeeding, airway obstruction, soft tissue constriction, mouth breathing, oral position at rest, specific oral habits (swallowing, chewing). Aspects of the combined effects of OMD on the dentoalveolar complex over time and maternal disease on the developing fetus were also considered. As a result of the study, malocclusion and acquired craniofacial dysmorphism result from chronic oral dysfunction and OMD. Understanding the etiology and pathogenesis of the pathology, including open bite and impaired hard palate formation, is critical to achieve long-term stability.

The neurobiological study of swallowing and the dysfunction defined as dysphagia has been studied for two centuries, beginning with electrical stimulation applied directly to the central nervous system and then followed by systematic studies using specific interventions: transcranial magnetic stimulation, magnetoencephalography and functional magnetic resonance imaging. The field has evolved from mapping central neural pathways and peripheral nerves to identifying



Fig. 3. Manifestations of orofacial myofunctional disorders in the form of malocclusion, bad habits, sleep disorders (Source: <https://ya.ru/images/>)

Рис. 3. Проявления орофациальных миофункциональных расстройств в виде нарушения прикуса, вредной привычки, нарушения сна (Источник: <https://ya.ru/images/>)

the importance of specific regions of the lower brainstem in terms of interneurons that provide sequential control of multiple muscles in the most complex reflex evoked by the nervous system, the pharyngeal phase of swallowing. Nowadays, there is an emerging understanding of how higher cortical areas interact with this brainstem control, providing a broader perspective on the process of functioning of the intact nervous system to control the three phases of swallowing (i.e., oral, pharyngeal, and esophageal).

### RELATIONSHIP BETWEEN DYSPHAGIA AND BITE ANOMALIES

In the clinical picture, we see a combination of severe skeletal forms of dentofacial anomalies with disturbances in the function of muscles of the maxillofacial region, swallowing and breathing. The prerequisites for such disorders appears in childhood. Disturbances in muscle function, formation of malocclusion, and improper swallowing occur due to the influence of various etiological factors. At the age of four years, the first contact of small patient with an orthodontist may take place, and then a doctor can determine amount of orthodontic care required in order to eliminate or prevent existing disorders (Fig. 4, 5).

At this stage, orthodontic functional removable appliances are used — OT-correctors. It allows to simultaneously normalize the pressure of the muscles in perioral area and muscles of the oral cavity, moving the lower jaw forward, providing it with the necessary genetically determined growth potential, and normalizing the swallowing (Fig. 6). The process of using such devices is quite simple. Children use them throughout the day under adult supervision. It takes 4–6 months to normalize functions. If there are associated problems, such as strands of the mucous membrane, short frenulum, correction is planned at an older age.

When patients come with the same problems, but already in the period of dentition, it is very important to help because this is one of the fastest and strongest periods of growth of the SS. If we cannot cover the full range of abnormalities that need to be treated further, our functional treatment will not be as effective and short in time. As a rule, patients have an occlusal anomaly in sagittal vertical line and jaw narrowing (Fig. 7). In the presence of bad habits of dysphagia, upper incisors are in protrusion. The use of various types of OT-correctors [6] can achieve results not only in the position of teeth and jaws, but also normalize function (Fig. 8).



Fig. 4. 4-year-old patient with malocclusion in height, OD, muscle dysfunction and dysphagia

Рис. 4. Пациентка 4 лет с нарушениями прикуса по высоте, щелью по сагиттали, нарушением работы мышц и дисфагией



Fig. 5. A patient after orthodontic treatment. All violations have been eliminated

Рис. 5. Пациентка после ортодонтического лечения. Все нарушения устранены

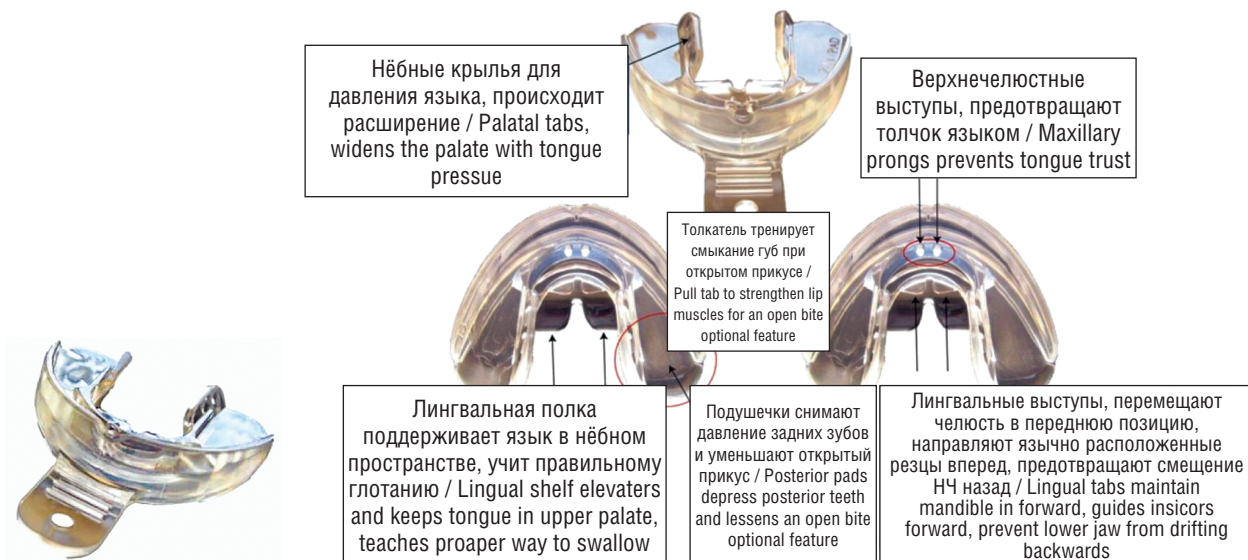


Fig. 6. The appearance — OT-corrector (in this case for patients with malocclusion and improper swallowing) with a description of its design features

Рис. 6. Внешний вид аппарата — ОТ-корректора вредных привычек (в данном случае для пациентов с аномалий прикуса и неправильным глотанием) с описанием его конструктивных особенностей



Fig. 7. Malocclusion complicated by dysphagia. The result of using OT-correctors throughout the year

Рис. 7. Нарушение прикуса, осложненное дисфагией. Результат применения ОТ-корректоров в течение года

Of course, the treatment protocol for such patients is complex and depends on the clinical situation and severity of the disorders.

In literary sources, there was a study that included children, adolescents and adult patients with a clinical diagnosis of “atypical swallowing” [5]. An association has been established between distal malocclusion, macrognathia, open bite and swallowing disorders. At the same time, some patients also had a posterior cross-bite, and it was caused by a narrowing of the upper jaw along the transversal. Authors of the study concluded that “atypical swallowing” was associated with malocclusion.

Another study also focused on the causal relationship between an open bite in the frontal region and atypical swallowing [8]. These two frequently associated conditions are currently not fully understood and often accompanied by speech impairment, and present a problem for both young and adult untreated patients. It is noted that therapy for these complex cases may be orthodontic, speech therapy, or a combination. Different treatments were compared to determine effectiveness in improving skeletal health, normalization of muscle activity, and stability over time. Only clinical situations in the studied patients at the stage of dentition, i.e.,



Fig. 8. Various types of OT-correctors: corrector of bad habits (a), Nite-Guide corrector (b), Occlus-O-Guide corrector (c), which are used to normalize bite and treat dysphagia during the period of replacement bite

Рис. 8. Различные виды ОТ-корректоров: корректор вредных привычек (а), Nite-Guide корректор (б), Occlus-O-Guide корректор (в), которые применяются для нормализации прикуса и лечения дисфагии в период сменного прикуса

with deciduous or mixed dentition, with an anterior open bite related to the type of swallowing with the tongue positioned between the dental arches, were included. Patients underwent three different types of treatment: orthodontic only; myofunctional/logopedic only; combined). A combination of traditional orthodontic and myofunctional therapy was found to be the most effective treatment for anterior open bite associated with atypical swallowing. It was recognized that further research in this area is needed.

Thus, it is clear that there is a relationship between malocclusion, including open gnathic bite, which is always accompanied by a narrowing of the jaws, especially the upper jaw, and the position of the tongue, which affects swallowing. One of the ways to influence the correction of open bite in such cases is the expansion of the upper jaw. The study performed in 2023 evaluated swallowing in relation to oropharyngeal dysphagia (OD) in adolescents with maxillary transversal insufficiency and posterior crossbite with high palatal vault before and after rapid maxillary expansion (RME) [9]. Twenty patients (mean age  $13.0 \pm 3.1$  years) with bilateral posterior crossbite and high vaulted palate (RME group: RMEG) and 20 controls (mean age  $13.4 \pm 2.6$  years) with class I teeth crowding without posterior crossbite or high vaulted palate (control group: CG) were examined. Signs and symptoms of overdose were assessed using the Eating Assessment Tool-10 (EAT-10) questionnaire, patient complaints, and physical examination of swallowing before (T1) and 7 months after (T2) RME. Additionally, fiberoptic endoscopic evaluation of swallowing (FES) was performed. The prevalence of signs and symptoms of overdose based on patient

complaints and physical examination of swallowing were low (5–15%). The investigators found no improvement in swallowing in patients with RME, which is apparently due to insufficient time for complete remodeling of the swallowing pattern.

The studies show a relationship of dysphagia and one of the most complex bite disorders, open in the frontal region, with a combination of crossbite in the lateral. Doctors have used methods to correct this skeletal disorder, but it had not fully cured dysphagia.

In the period of permanent bite, only functional therapy cannot help in achieving the desired goals, because the long-term deformation, which occurs under the influence of various etiological factors, leads to a persistent bite disorder in all planes. And disturbed swallowing, articulation functions only consolidate this pathology and make its treatment quite difficult. The lack of space for erupting teeth, which causes crowding, should be added. And the narrowing of the jaws fixes the distal position of the lower jaw, which aggravates the problem and affects facial features. A narrowing of the upper airway volume may occur (Fig. 9).

We observed a group of 12 patients (10–12 years old) with the diagnosis of "deep traumatic bite, distal bite, sharp narrowing of the tooth rows, severe crowding of incisors". Accompanying disorders were: dysphagia, respiratory disorders. In accordance with the treatment plan, they were fabricated appliances due to RME technique. This made it possible to expand the upper dentition in a relatively short period of time, eliminate crowding of teeth, allow the lower jaw to move forward, thus normalizing the volume of the oral cavity and swallowing.





a/a



b/b

Fig. 9. Normal (a) and narrowed (b) airways

Рис. 9. Нормальные (а) и суженные (б) дыхательные пути

### MULTIDISCIPLINARY APPROACH IN TREATMENT OF DYSPHAGIA IN ORTHODONTIC CARE

Atypical swallowing is a myofunctional problem consisting of a change in the position of the tongue during swallowing. Its high prevalence in population, multifactorial etiology and recurrent association with the presence of malocclusion have made it a subject of great interest and discussion in science. Scientists not only studied the possible association between atypical swallowing and malocclusion, but also looked for a solution to the problem: what type of therapy should be used in such cases? [7]. The review was conducted on the Medline database. Documents from 1990 onwards were examined, except cases with syndromes of central nervous system. A causal relationship between two problems was established, so, it was found that the habit of mouth breathing occurs as a mechanism to compensate for pre-existing malocclusion (especially in cases of open bite) and tends to aggravate cases of malocclusion. It has also been shown that tongue parafunction can adversely affect the course of orthodontic treatment. Thus, the best therapeutic approach seems to be a multidisciplinary one: in addition to orthodontics, which is necessary to correct the malocclusion, it is important to perform a myofunctional rehabilitation procedure to correct the oral breathing habit, which provides long-term permanent results. There was

evidence of a significant difference between the results obtained with patients in the deciduous and shift bite. There was also evidence of a significant difference between results obtained with early (deciduous or primary mixed bite) or later treatment. A causal relationship between atypical swallowing and malocclusion has been established. Early diagnosis and surgical intervention have a significant positive effect on the outcome of therapy.

Another study shows the effect of early orthodontic treatment and myofunctional treatment in children with erupting teeth on the correction of anterior open bite, as well as on the normalization of breathing, swallowing, and tongue position [10]. Interventions used to correct anterior open bite and other muscle functions such as breathing/swallowing and tongue position were compared. Quality assessment was based on the Cochran method for assessing the risk of displacement. Random-effects meta-analyses were performed to assess treatment effects. In 265 initial search results, 15 articles were included in the review. Eight were randomized controlled trials (RCTs) and 7 were controlled clinical trials. Treatment outcomes included skeletal and dentoalveolar changes recorded cephalometrically, normalization of mouth position and lip closure, improvement in tongue positioning at rest/pressure and modification of swallowing patterns. There was no evidence to support the use of lingual stop



Fig. 10. Stages of treatment of a patient with orofacial myofunctional disorders, malocclusion, dysphagia

Рис. 10. Этапы лечения пациента с орофациальными миофункциональными расстройствами, аномалией прикуса, дисфагией

appliances instead of fixed appliances for correction of anterior open bite in children with a shift bite (SMD  $-0.03$ ; 95% CI 0.81–0.74;  $p=0.94$ ). It was concluded that early orthodontic and myofunctional treatment in children in the dentition and shift dentition appears to be a promising approach, but no proven single treatment method has been established.

According to our clinical data, if a patient with OMD bite anomalies, including dysphagia, needs treatment from an orthodontist as an adult, we see a complex pathology that, in addition to traditional orthodontic treatment, requires myofunctional therapy. According to our clinical observations, the most complex group of patients is the one with a combination of vertical discrepancy,



Fig. 11. The relationship of the occlusion anomaly with disorders of other important body processes

Рис. 11. Взаимосвязь аномалии окклюзии с нарушениями других важнейших процессов организма

namely open bite with vertical growth type and dysphagia (Fig. 10). The orthodontic treatment plan involves a compromise variant with improvement of bite parameters and changes in muscle tone. This combination of fixed appliances and myofunctional therapy helps to reduce the severity of pathology with unchanged facial features.

Thus, a multidisciplinary approach, combined orthodontic and myofunctional treatment, is suggested in patients with OMD, severe dysphagia, and bite anomalies (Fig. 11). Only in this case the position and function of the tongue is improved, effect on the bite towards its normalization and thus eliminating some of the causes contributing to dysphagia. However, no clear answer with treatment protocols has yet been developed, although all studies confirm that treatment should be started as early as possible.

## CONCLUSION

Manifestation of dysphagia is always present in bite anomalies such as deep distal bite and most pronounced in open bite in the frontal region. These are skeletal abnormalities with lateral narrowing of the maxilla and posterior positioning of the mandible. In this case, there is a violation of the position of tongue at rest and in movement, violation of articulation and the work of the muscles of maxillofacial region, narrowing of the upper airways. In general therapy it is necessary to

expand the upper jaw, thereby increasing the volume of the oral cavity and changing the position of the tongue. At the same time, it is recognized that better works integrated approach, aimed not only at correcting the bite, but also to normalize the work of muscles of the dento-mandibular-facial region. These therapeutic measures are more successful at an early age with the use of elastomeric correctors. They allow to simultaneously work on the correction of the bite and normalization of the tongue position, which leads to elimination of dysphagia. In the period of replacement bite, RME appliances have proved to be a good solution at the first stage of treatment. Thereafter, the use of fixed appliances and elastomers is also justified. Adult patients have the least potential to benefit from correctors, as they have persistent pathological disorders. The use of fixed appliances can partially solve the issues of bite correction. There is a need for further clinical research on this topic in all age groups.

## ADDITIONAL INFORMATION

**Author contribution.** Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

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