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Maxillofacial Area of Children with Cerebral Palsy before Correction with Various Dental Correctors and Compare to the Data of Healthy Children, Taking Into Account the Sex of the Children

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Abstract: The most significant criterion for the violation of children's health is disability. The concept of a "disabled child" is a big social problem and mental distress in the family (Sologubov E. G. et al., 2001). According to WHO experts (2001), in the coming years the number of children with disabilities will reach several tens of millions

The main criterion for determining disability is not the disease itself, but their consequences, manifested in a violation of the functions or structures of the body, restriction of vital activity and social insufficiency (Shvyrev A.P. et al., 2004). Among the diseases of the nervous system that lead to disability since childhood, cerebral palsy (cerebral palsy) occupies a leading place, accounting for 56% (Lilin E.T., 2000; Taktarov V.G., 2000). Cerebral palsy, first described more than 150 years ago by the English doctor Little, occupies one of the leading places in the structure of diseases of the nervous system in children children leading to disability (Droz D. 2008). The specific symptom complex in this disease leads to difficulty in carrying out comprehensive rehabilitation and social adaptation of this contingent of patients into society. Researchers have found that 70% of children with cerebral palsy (cerebral palsy) are characterized by oral breathing, which leads to impaired activity of the facial muscles, the circular muscles of the mouth, tongue and to the development of dentoalveolar abnormalities. Violations of the muscular-dynamic balance are observed between the buccal, masticatory, temporal and sublingual muscles, and this balance can also be disturbed between the circular muscle of the mouth, chin and the muscles of the floor of the oral cavity. In case of impaired respiratory function, the activity of the circular muscle of the mouth increases several times compared to the norm, and its endurance decreases significantly. The method of orthodontic bite correction using individually sized myofunctional regulators of a new generation is obvious. Unfortunately, such problems as root resorption, decalcification of tooth enamel, gingival margin recession, gingivitis and other complications that occur during treatment with non-removable equipment are well known to orthodontists. On the other hand, constant oral breathing, reverse swallowing, as well as harmful myopic habits often lead to narrowing of the dental arches and make the results of expensive orthodontic treatment unstable. That is why the appearance of devices that allow combining mechanical expansion of dentition with myofunctional correction is so important - a system of silicone elastopositioners of myofunctional regulators of the dental system. The functional state of the muscles involved in the act of swallowing also plays an important role in the occurrence of AF. From birth to the eruption of baby teeth, children have an infantile type of swallowing. If the infantile type of swallowing persists even after complete eruption of baby teeth,

then the tip of the child's tongue slips between the teeth with each swallowing movement and as a result, the function of the chin muscle begins to prevail, which is often observed in children with cerebral palsy until the end of their lives (Andrasova I.E., Tsarieva T.T., 2004; Diettich A., 2004). A change in the functional state of the chewing and temporal muscles leads to an increase in the period of chewing and the number of chewing movements performed by the child. However, a wide range of issues related to the provision of orthodontic care to this contingent of patients has so far remained insufficiently studied. In this regard, there is a need to analyze the possibilities of providing modern orthodontic care to children suffering from cerebral palsy, which still does not provide these patients with the necessary volumes. A clinical examination was conducted with children with cerebral palsy with spastic diplegia (patients with spastic diplegia, the most common form of cerebral palsy, it affects about 50% of patients with cerebral palsy) who were treated at the Republican Children's Neuropsychiatric Dispensary and at the Bukhara Regional Neuropsychiatric Hospital (439 children, of whom 215 boys and 224 girls). This study did not include children with other forms of cerebral palsy who had severe mental abnormalities. These children were not able to work, since even conducting a clinical examination of the maxillofacial region caused great difficulties. Studies of children with cerebral palsy were conducted in the admission department of hospitals. Studies of kindergarten students and school students were conducted in the medical center of these institutions. The age periodization of the examined children was carried out according to the age periodization adopted at the 7th scientific conference on age morphology, physiology and biochemistry (Moscow, 1965): the first period of childhood was from 3 to 7 years old, the second period of childhood was girls 8-11 years old, boys 8-12 years old. In the process of conducting research, based on the Helsinki Declaration of the World Medical Association of 1964 (the last revision was adopted at the 59th General Assembly of the World Medical Association in Seoul in 2008), all ethical principles of human involvement in medical research were strictly observed. In the course of the work, a clinical examination of patients suffering from cerebral palsy was carried out. Children and their parents most often complained about the incorrect position of the teeth and the lack of contact between the upper and lower incisors. But in most cases, the patients themselves did not make any complaints about the state of the ESR. The parents of the examined patients, as a rule, were concerned about the incorrect position of the teeth in children, the "sluggish" slow type of chewing, difficulty swallowing. At the same time, only 4% of children during the period of milk bite, 7% during the period of tooth change and 9% during the period of permanent teeth bite have ever visited an orthodontist. From the anamnesis, they learned about the state of the mother's health during pregnancy, about the presence of hereditary burden, about the course of childbirth, about past illnesses and other factors that could affect the development of ESRD. The timing of the eruption of baby teeth and the beginning of the change of baby teeth to permanent ones were also clarified [1.3.5.7.9.11.13.15.17.19].

Special attention was paid to the feeding of the child when collecting the medical history. 70% of children received artificial feeding from the first days of life, 25% were naturally fed up to 3 months. At the same time, parents of children who are both on natural and artificial feeding noted that the child cannot suck for a long time, gets tired quickly, and often chokes on milk. In 80% of cases, parents confirmed the presence of bad habits in their children in the form of sucking fingers, putting their tongue between their teeth, biting their lower lip. In 100% of children during the period of biting baby teeth, we found sucking habits (sucking fingers, sucking and biting lips, cheeks, tongue). During the period of tooth change, this habit was detected in 94% of children and during the period of permanent teeth bite - in 78%. Two or more so-called bad habits were detected in 86% of children during the bite of baby teeth, during the change of teeth - 73% and during the bite of permanent teeth - 61%. During the examination of the oral cavity, the topography of the frenules of the tongue, upper and lower lips, buccal and other cords, and the depth of the transitional fold of the oral mucosa were determined. Describing the anomalies of teeth, dentition and jaws, the modern classification of dental anomalies developed at the Department of Orthodontics and Pediatric Prosthetics of the Moscow State Medical University (MMSI) under the guidance of corresponding member of the Russian Academy of Medical Sciences, Professor L.C. Persin (1990) was used to diagnose these conditions. The study of the size of the gap between the upper and lower incisors in the sagittal and

vertical directions with incisor dysocclusion and the depth of incisor overlap, the severity of sagittal incisor dysocclusion was measured in a straight line extending from the lowest contact point of the upper central incisors from the palatine side to the vestibular surface of the lower central incisors. In the case of diastema of the upper and/ or lower dentition, a conditional line was drawn connecting the cutting edges of the central incisors and a straight line was drawn from the middle of this line to the vestibular surface of the central incisors of the opposite jaw.

The severity of vertical incisor dysocclusion was measured from the contact point of the central incisors of the upper jaw from the cutting edges to the contact point of the central incisors of the lower jaw from the vestibular side or to one of the central incisors with a displacement of the central line between the upper and lower central incisors. In the case of diastema of the upper and/or lower dentition, measurements were carried out in the same way as when determining the magnitude of sagittal incisor dysocclusion. The depth of the incisor overlap was measured vertically down from the cutting edge of the central incisors of the lower jaw to the projection on the lower incisors of the cutting edge of the eponymous teeth of the upper jaw. In the case of a combination of vertical and sagittal incisor dysocclusion, the measurement was carried out using a special ruler with a division price of 1 mm, located in two mutually perpendicular directions for simultaneous measurement of vertical and sagittal inconsistency. At the same time, the diagnosis of a combination of vertical and sagittal incisor dysocclusion was made if the upper incisors did not overlap the lower ones by 1 / 3rd in the milk bite and 1/3 in the permanent bite, and there was no contact between them sagittally, respectively. Intraoral contact radiographs were performed using dental radiological devices of various designs. Intraoral contact radiographs were performed to: clarify the presence and position of the rudiments of milk and permanent teeth; determine the degree of development of the rudiments of teeth; determine the degree of formation and resorption of the roots of teeth; determine the position and number of supercomplete teeth; study teeth with an abnormal shape; clarify the position of retented teeth; determine the location of the fibers of the frenulum of the upper lip if they are suspected of interweaving into median palatine suture; determining the direction of the teething axis. Anthropometric studies of children were carried out by the method of Shomirzaev N.H., Ten S.A., Tukhtanazarova S.I. (1998). The following anthropometric parameters of the head were studied:

the circumference of the head – the tape is superimposed horizontally, in front it should pass through the glabella, from behind through the external occipital protuberance;

head length (longitudinal head size) – the distance between the supra-nose and the external occipital protuberance, measured using a tasometer;

the width of the head (the transverse size of the head) is the distance between the most prominent parietal bumps, also measured using a tasometer;

The vertical size or height is between the junction points of the frontal bone and both parietal bones (at the level of the tragus of the ear and the hyoid bone). It was measured using a tasometer.

The length and width of the base of the skull, zygomatic and mandibular diameter, morphological and physiological height of the face were measured using a tasometer.

Bioelectric activity was studied in both masticatory muscles (musculus masseter), temporal muscles (musculus temporalis) and the circular muscle of the mouth (musculus orbiculalis) in a state of physiological rest. This group of muscles was chosen for the study because they participate in the chewing act, during conversation, during the development of the upper and lower jaw, when lifting and releasing the lower jaw, or in a word, with all kinds of movements of the lower jaw in relation to the upper jaw. 52 sick children aged 7-12 years with diplegic cerebral palsy were selected for electromyographic examination. The control group consisted of 36 practically healthy children with normal bite.

Bioelectric activity was studied in both masticatory muscles (m.masseter), temporal muscles (m.temporalis) and the circular muscle of the mouth (m.orbiculalis) in a state of physiological rest. A four-channel electromyograph from the company "Medicor" (VNR) was used at speeds of 50 and 100 mm/s. Bipolar, round electrodes with an area of 5 mm2 enclosed in plastic were used to register

biopotentials. The distance between the two electrodes was 10 mm. Before applying the electrodes, the skin was treated with alcohol. Electrodes on adhesive tape were fixed in the center of the motor points of the temporal and chewing muscles proper. The duration of the excitation defect, muscle sensitivity, as well as the frequency and amplitude of sensitivity of the above muscles were studied bilaterally.

Special research methods were performed in children with a combination of vertical and sagittal incisor dysocclusion and distal occlusion.

The patients underwent orthopantomograms according to the standard procedure, the description of which is widely presented in the Russian literature. Orthopantomograms were performed for visual control and determination of the quantitative composition of teeth, the presence of rudiments of the third molars and their position in the alveolar process, the degree of formation of crowns and roots of teeth, the degree of resorption of the roots of baby teeth and their ratio to the rudiments of permanent teeth [2.4.6.8.10.12.14.16.18.20].

Telerentgenograms of the head in a lateral projection were performed on an Orthoceph-U device from Siemens (Germany).

To determine the dental health of this category of children, a dental examination of sick children was conducted, as a result of which the dental status of each patient was studied and analyzed. The definition of dental status was described in detail in chapter II of this dissertation, and therefore we considered it inappropriate to cite this technique.

The functional insufficiency of the circular muscle of the mouth in children with cerebral palsy has been studied, which can cause an increase in the length of the upper dentition, especially the frontal segment, and contribute to distal deep bite (Fig. 1). It is noted that such an identified bite is determined in most of the examined children, unlike patients in healthy children, such a distal deep bite is practically not detected.

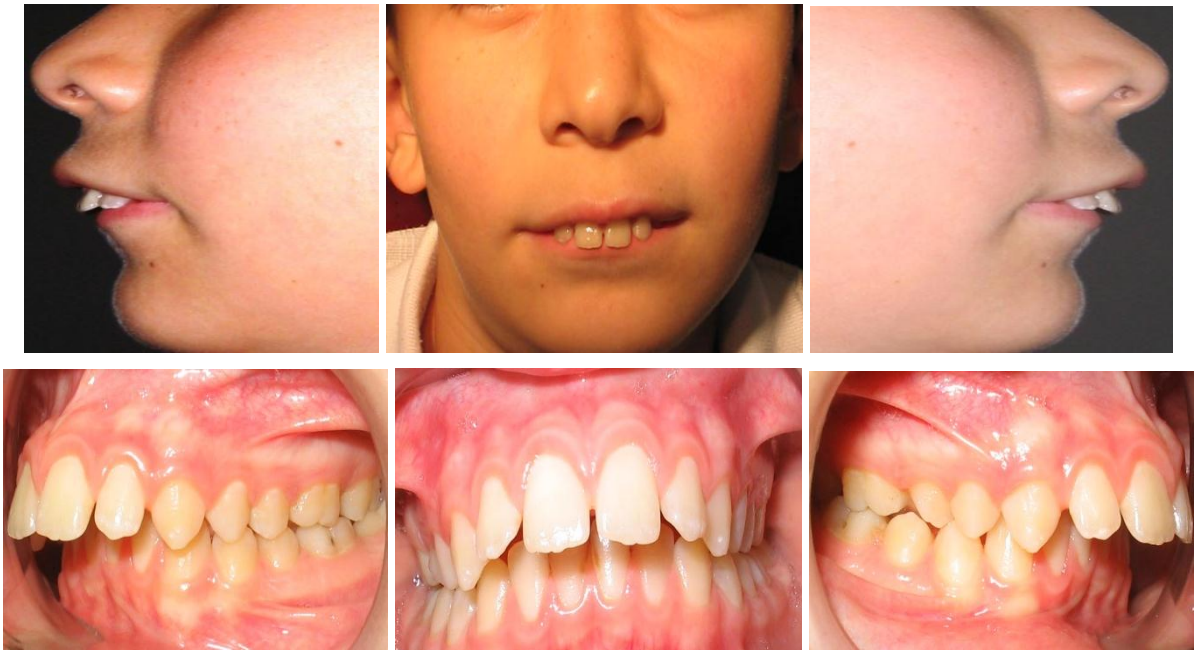

Fig. 1. Increased length of the upper dentition, especially the frontal segment, which contributed to the appearance of distal deep bite (patient A., 9 years old).

It was found that this occurs as a result of the weakening of the pressure of the circular muscle of the mouth on the upper incisors from the outside, the pressure of the tongue on the frontal sector of the upper dental arch from the inside begins to prevail. In this case, the incisors move in the labial direction, increasing the length of the dentition and the size of the sagittal gap.

The distal position of the mandible in children with cerebral palsy contributes to a change in the position of the lower lip, that is, coming into contact with the palatinal surface of the protruding

upper incisors, it promotes their further protraction, which externally manifests itself in the form of a characteristic deep supramental fold (Fig. 2).

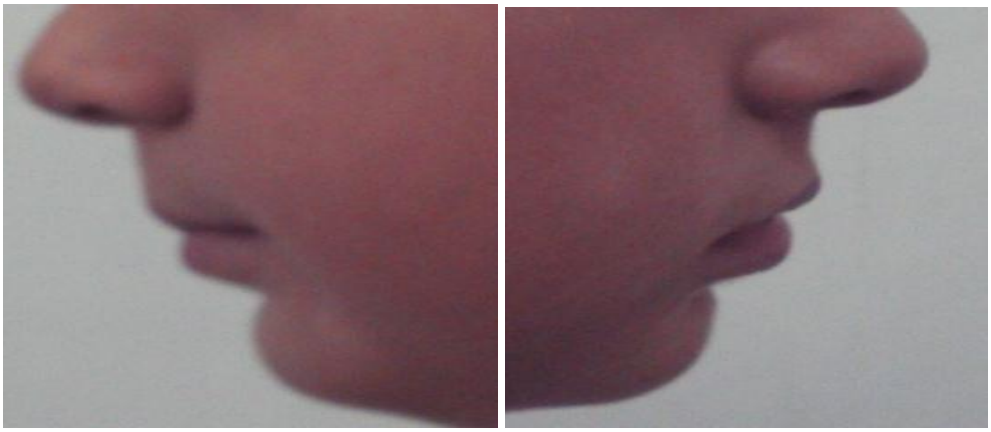

Fig. 2. Deep supramental fold in patients with cerebral palsy (patient S., 12 years old).

During oral breathing, the child puts his tongue between the rows of teeth, which contributes to the protrusion of the upper incisors. This position of the tongue against the background of oral breathing can also lead to the formation of a mesial or open bite. Especially in children with cerebral palsy, this pattern becomes more pronounced (Fig. 3).

Fig. 3. Protrusion of the upper incisors and mesial occlusion formed when laying the tongue between the dentitions of a child with cerebral palsy (patient B., 8 years old).

Normally, from birth to teething, children have an infantile type of swallowing. If this type of swallowing persists even after the complete eruption of baby teeth, then the tip of the child's tongue slips between the teeth with each swallowing movement and as a result, the function of the chin muscle begins to prevail, which can often be observed in children with cerebral palsy (Fig. 4).

In such children, there is a dental alveolar shortening of the frontal part of the lower jaw and a dental alveolar elongation in the upper jaw in the lateral areas. In addition, changes in the functional state of the chewing and temporal muscles of a sick child leads to an increase in the period of chewing and the number of chewing movements produced by the child. Orthodontists call this type of chewing dysfunction observed in sick children the habit of "lazy" chewing.

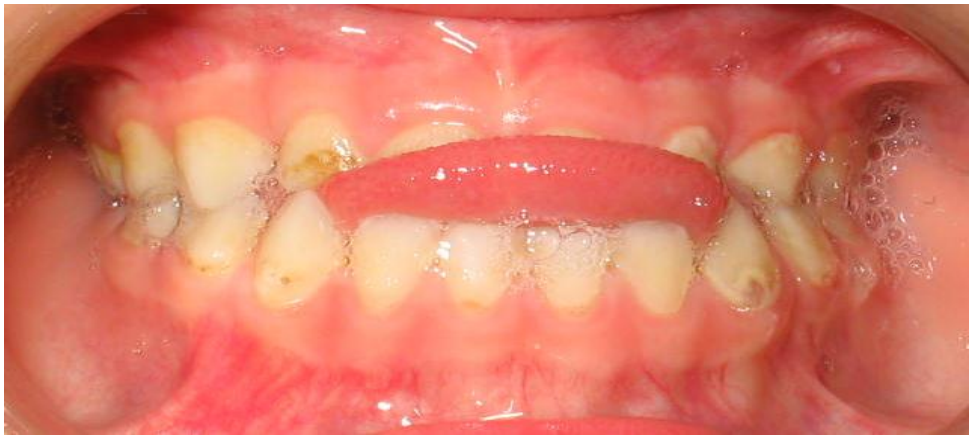

Fig. 4. The predominance of the function of the chin muscle, which is observed in children with cerebral palsy, under the influence of tongue slipping between teeth during swallowing (patient R., 10 years old).

Against the background of all the above-mentioned muscular and functional abnormalities, 88.6% of children had impaired speech development. In 44.5% of children, abnormalities of the soft tissues of the oral cavity were detected. In 97.5% of cases, there were various forms of emerging and formed HPV. In 96.6% of children, violations of the basic functions of the maxillary system (swallowing, chewing, breathing, drinking drinks) developed as a result of dysarthria (spasticity, hypotension, limited mobility of articulatory muscles, tongue and lip muscles) were noted.

The hygienic level of the oral cavity in patients with cerebral palsy was assessed as unsatisfactory or poor. When studying the incidence of periodontal disease, their high prevalence was revealed (97.3%). We believe that the low level of hygiene and the high prevalence of periodontitis in children with cerebral palsy is associated with an increase in the number of dental anomalies.

Thus, based on the literature data concerning the study of musculoskeletal and functional changes in the dental apparatus, as well as their own orthodontic studies of children with cerebral palsy, it should be noted that the participation of an orthodontist in the general plan of dispensary monitoring of patients with cerebral palsy from the first days of their lives is necessary. In order to stimulate the normal function of the muscles of the maxillofacial system, indirect and non-indirect orthodontic myotherapy of the neuromuscular complex of the maxillofacial and thoracoservical systems is more widely used. Targeted and regular myotherapy and preventive measures can normalize the harmonious development of the maxillary-facial system and reduce the frequency of maxillary anomalies and deformities among children with cerebral palsy.

Evaluation of electromyographic parameters of masticatory muscles in children with cerebral palsy.

26 sick children aged 6-12 years with diplegic cerebral palsy were selected for electromyographic examination. The control group consisted of 17 practically healthy children with normal bite.

Bioelectric activity was studied in both masticatory muscles (musculus masseter), temporal muscles (musculus temporalis) and the circular muscle of the mouth (musculus orbiculalis) in a state of physiological rest.

This group of muscles was chosen for the study because they participate in the chewing act, during conversation, during the development of the upper and lower jaw, when lifting and releasing the lower jaw, or in a word, with all kinds of movements of the lower jaw in relation to the upper jaw.

Electromyographic studies have shown that in children of the control group (healthy children, without cerebral palsy) in all three studied muscles (musculus masseter, musculus temporalis, musculus orbiculalis), the excitation threshold values were significantly higher than in patients with cerebral palsy.

In the spastic form of cerebral palsy, despite the fact that the process spreads equally bilaterally, the parameters of the excitation threshold have a large interval of difference between the compared groups of examined children (Fig. 4.5). The study of the tone of the chewing muscles showed pronounced and ambiguous deviations from normal parameters in all groups of subjects.

With spastic diplegia, children aged 6 years and 12 years have an increased tone of the masticatory muscles in the phase of relative physiological rest of the lower jaw, which indicates their excessive and constant tension. The preservation of increased tone in the phase of relative physiological rest of the lower jaw in children during the bite of permanent teeth indicates the absence or insufficient improvement of the function of muscle relaxation during the formation of the dental system.

Thus, all subjects are characterized by a significant decrease in the difference in the tone of contracted and relaxed muscles and, accordingly, the coefficient of contraction, which indicates a reduced ability of the neuromuscular apparatus to excitability and conduction and is a consequence of damage to the motor cortex in cerebral palsy. The indices of the difference in contractile and plastic muscle tone in 6-year-olds were higher than in 12-year-olds, indicating a decrease in the contractility of the chewing muscles with age.

At the next stage of the research, the effectiveness of muscle-functional preorthodontic trainers from Myofunctional ResearchCo (MRC, Australia) on the condition of chewing muscles in children with cerebral palsy was studied.

The examined children were divided into 2 groups:

the first group was the control group (n=26), children with cerebral palsy who did not wear MRC elastoprostheses;

The second group is the main group (n=30), children with cerebral palsy who wore MRC elastoprostheses for 6 months.

Bioelectric potentials (activity) of the masticatory muscles of the studied children with cerebral palsy were measured on the first day of the study, after 3 and 6 months.

Bioelectric activity was studied in the same muscles indicated above in a state of physiological rest and with a four-channel electromyograph from the company "Medicor" at speeds of 50 and 100 mm/s. The duration of the excitation threshold, muscle sensitivity, as well as the frequency and amplitude of sensitivity of the above muscles from two sides (right and left) were studied.

The study of the tone of the masticatory muscles showed that the tone of the masticatory muscles in the first (control) group in the phase of relative physiological rest of the mandible was always elevated, indicating their excessive and constant tension. The preservation of increased tone in the phase of relative physiological rest of the lower jaw in children during the bite of permanent teeth indicates the absence or insufficient improvement of the function of muscle relaxation during the formation of the dental system. In the second group, the tone of the chewing muscles is much lower compared to the first group, especially with 6 months of wearing an elastoprosthesis.

After 3 months of treatment using the Myobrace elastoprosthesis, 50% of children with crowded dentition had a significant improvement in occlusion due to passive expansion of the upper and lower dentition.

After 6 months, there was an expansion of the upper and lower dentition, nasal breathing was normalized, and the act of swallowing improved.

Conclusion. Thus, it has been proven that the use of the Myobrace electroprosthesis has a positive effect on the tone of the chewing muscles and thereby increases the threshold of arousal. The use of such electrical prostheses reduces the asymmetry of the tone of the chewing muscles. A decrease in the tone of the chewing muscles, which leads to an expansion of the dentition.

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