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Features of Morphometric Characteristic of Craniofascial Area of Children with Congenital Cleft Lip and Palate

Kambarova Shakhnoza Alikhuseinovna

Assistant of Surgical Dentistry Department, Bukhara State Medical Institute, Uzbekistan

ABSTRACT

For the effective comprehensive treatment of children with congenital cleft lip and palate (CCLP), it is necessary to periodically study the dynamics of growth of mandible segments. The development and growth of the nasal and maxillary complex in patients with CCLP is a widely discussed topic in any surgical procedure. The study of the growth, development and condition of the child's facial skeleton can be a theoretical and methodological basis for the development and improvement of anthropometric methods of diagnosis and reconstruction in medicine, the substantiation of new principles for the prevention and treatment of dental abnormalities. Accounting for facial proportions is important in surgical, orthodontic dentistry. In this regard, specialists in surgical dentistry are interested in measuring individual facial dimensions.

KEYWORDS: *craniofacial region, congenital cleft lip and palate*

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Actual. Congenital cleft of the lip and palate (CCLP) is one of the common anomalies of the development of maxillofacial region. According to statistical studies, the prevalence of congenital cleft of the upper lip and (or) palate (CCLP) in newborns remains high (1-2 cases per 1,000 newborns) [1].

A family history can be found in about 40% of cases, although the actual genetic factors of cleft lip and palate are extremely complex. Commonly cited statistics say that the risk of unaffected parents having a second child with an anomaly is about 1 in 20. Etiology of multiple factor cleft anomalies. Some environmental factors, such as phenytoin taken during pregnancy, increase the risk of cleft lip and palate, and other medications (e.g. retinoids), folic acid deficiency, and fetal alcohol syndrome also increase morbidity. It has been shown that taking folic acid reduces the incidence.

It is believed that the cleavage mechanism is associated with impaired fusion of the embryological processes that make up the upper lip at the sixth week of intrauterine life. A hard and soft palate is formed by another mechanism. The described process is the "reversal" of palatine tissue from a vertical position to a horizontal position, followed by merging, to form a secondary palate at about the eighth week of intrauterine development. Lack of growth, disruption of the coup process or destruction of the overlying epithelium, allowing the flow of the mesenchyma to create a strong structure, can lead to cleavage of the palate.

Cleft lips and palates are more common in boys than in girls, and more often affect the left side. Cleft is often more serious if it occurs in a less common version (that is, in the girl and on the right side). Statistics on the prevalence of cleft lip and palate vary widely, both geographically and among different racial groups (Asian population - about 1 in 425 live births; African-Caribbean population - 1 per 3,000 live births).

One suggestion that explains why isolated cleft palate is more common in girls than in boys is that since the process of rearranging palatine tissues occurs later in the female fetus than in the male fetus, there is a greater potential for environmental exposure. [2]

Study methodology: Modern scientific literature was used as material.

Results and discussion: "A healthy mother is a healthy child," the State program "Year of a healthy child" is carrying out large-scale work aimed at further strengthening the reproductive health of the population, strengthening the material and technical base and personnel capacity of medical institutions providing medical assistance in the field of maternal and child health care, and introducing modern methods for the diagnosis, treatment and prevention of diseases of women, children and adolescents. [3] CCLP occurs as a result of impaired morphogenesis [4].

At the end of week 4 of intrauterine development, a deepening of the ectoderm, called the mouth bay (fossa), which is the primary oral cavity, occurs in the area of the head end of the embryo. Around the same time, 5 pairs of gill pockets form on the lateral walls of the pharyngeal part of the primary intestine. Between the gill pockets are gill (visceral) arcs. The first pair of gill arches is called jaw due to the fact that in the future it is divided into maxillary and mandible processes. At first, the oral bay is represented by a narrow slit, from above it is limited by the frontal process, and from below and from the sides by the maxillary and mandible processes. At 5-6 weeks of intrauterine development, olfactory pits appear on the frontal process. The frontal process wedges between the maxillary processes and forms the medial and lateral nasal processes. External nose, nasal septum and primary palate are formed from nasal processes. The primary sky has the shape of a triangle, in the following; the front part of the solid sky is formed from it, which includes an alveolar process containing four upper incisors. At week 6 of embryogenesis, the maxillary and nasal processes fuse together as a result of their intense growth, forming the lateral part of the upper jaw and upper lip. As a result of the merger of the medial nasal processes, the middle part of the upper jaw and upper lip (filtrum) is formed. Maxillary elevation cells are mixed with mesenchymal cells of the intercellular segment, at which time all segments of the upper lip merge. From mesenchymal cells, connective and muscle tissues are further formed. In the embryonic period of development, the cleft of the upper lip almost always accompanies the cleft of the primary palate. However, more often the congenital cleft of the upper lip and alveolar process is formed as a result of disruption of the fusion of the medial nasal and maxillary processes. By week 8-9, the development of the primary sky ends and the development of the secondary sky begin. The secondary palate is formed from palatine processes located on the medial surfaces of the maxillary processes. As they approach each other, they move the tongue forward and downward. Subsequently, the palatine processes merge between each other and the lower edge of the nasal septum. Thus, by week 10, the bone part of the premaxilla of the upper jaw and palate is formed. By week 12 of embryogenesis, the development of the soft palate and palatine tongue is completed as a result of the proliferation of mesenchymal cells in the posterior parts of the palatine processes. Thus, when the fusion of palatine processes is disturbed, a congenital cleft of the palate is formed [5].

Foreign literature describes a work in which a group of scientists autopsied 6 stillborn children with a one-sided through cleft of the upper lip and palate. The object of their interests was the cartilage of the nose. Autopsy results showed that in all cases there was asymmetry of the cartilaginous wings of the nose, deformation was noted on the cleft side, and also in all children a shift of the nasal septum was detected in the healthy side. In addition to comparing the shape and size of the cartilage of the two nasal halves, they evaluated and compared the weight of the wing cartilages. There was no reliable data for the difference in the weight of the cartilage wing of the nose on the healthy side and on the cleft side, this served as a reason to argue that the asymmetry of the nose wings in children with CCLP is the result of cartilage deformation, and not their hypoplasia [6].

Children with CCLP have hypertrophy of the lower nasals. With a unilateral cleft of the sky, the process is one-sided. The severity of hypertrophy directly depends on the degree of cleft palate, so in children with partial cleavage of the palate there is hypertrophy only of the posterior ends of the lower nasal shells. According to the literature with this congenital pathology, changes in the motor and respiratory function of the atrial epithelium of the nasal mucosa are noted [7].

During the X-ray examination of children (radiography, computed tomography of paranasal sinuses), some of the patients examined showed asymmetry of the maxillary sinuses. In children with a unilateral through cleft of the upper lip and palate, the sinus volume was larger on the side of the lesion. Asymmetry of maxillary sinuses in this case was explained by violation of sinus pneumatization as a result of nasal mucosa inflammation and nasal septum curvature preventing adequate sinus ventilation [8].

Analysis of head computed tomography data shows that size of nasopharynx in children with CCLP is smaller than in healthy children, decreased size of

skull base in middle cranial fossa area and height of wedge-shaped bone body was observed [9].

It was found that in patients with CCLP, the angle between the attachment of muscles m. tensor veli palatini, the lateral plate of the palate and the auditory tube are smaller than normal, which makes opening the auditory tube less effective. Tubular pharyngeal part m. palatopharingeus, which reveals the mouth of the auditory tube, is also involved in the pathological process. It is usually hypoplasized, as a result of which the mouth of the auditory tube is smaller than in healthy children or is not identified at all. In addition to the incorrect attachment of muscles, there are other anatomical and histological features that negatively affect the function of the auditory tube. It was revealed that lateral and medial cartilaginous plates of auditory tube have lower elasticity (due to low density of elastin) and dimensions, which leads to reduction of curvature of lumen of eustachian tube [10].

A small cleft of the soft palate is a relatively simple surgical problem with extremely good long-term prognosis in most cases, while a wide full cleft of the palate can be closed with difficulty, especially at the junction of hard palate and soft palate, and this can lead to significant speech difficulty and long-term jaw growth impairment caused by scarring. Eurocleft studies conducted for multiple interventions in children with cleft anomalies, which were conducted in an incoherent and inconsistent manner, combined with observations of adequate growth patterns in individuals with undecided cleft, revealed the following. These are fears that in some cases postoperative distortions resulting from scarring and improperly calculated or performed operations created defects that could compete with the crevices themselves. [2].

For effective integrated treatment of children with CCLP, it is necessary to periodically study dynamics of growth of jaw segments [11].

The development and growth of the nasal and maxillary complex in patients with CCLP is a widely discussed topic in any surgical procedure. The Graber studies report three-dimensional changes in the upper jaw in patients with complete lip and palate defects, as well as in patients after surgery. In patients, a tendency was found to shift the bite, cross the anterior and posterior bites, and defects in the midline of the face. Two factors have been shown to cause abnormal facial morphology in patients with CCLP undergoing surgery: internal defect development and iatrogenic factors resulting from treatment [12].

Bishara reported that maxillary deformation in patients with CCLP was caused by internal factors, but most authors noted that internal jaw factors were secondary to surgical interventions [13]. If the deformation of the maxillae is a complication of surgery, it is important to determine the optimal duration and conditions of treatment in order to close the defects of the lip and palate [14, 15]. Determining the cause of stunting in patients with CCLP has been the subject of a large number of studies, and the initial consensus now is that the iatrogenic effect of surgery is a relatively important factor.

In patients with CCLP before surgery, a slight increase in the upper jaw was observed, which led to more attention to the study of iatrogenic factors [16]. According to some authors, the main factor in stunting is the operation carried out in the palate. In patients with palate defects, the mean value is usually taken into account in the criteria for assessing growth, and then correlated with other patients with palate and palate defects or with a normal population [17]. It is important to indicate the mean value of treatment outcomes, but assessing individual variability is relatively difficult. Changes in development have been noted by many authors [18, 19]. These changes may depend on the type of crack and its complexity. To date, it has not been established whether the surgery really limits the growth of maxillae and mandible. Therefore, to assess the effectiveness of surgical interventions for cranial and facial growth in lip and palate defects, we conducted a study in patients with CCLP [20, 21].

Studies conducted by Stepina S.V. (2006) showed that during the period of the formed milk bite in children with congenital bilateral cleft of the upper lip and palate there is an underdevelopment of maxillae in height, an increase in the base of maxillae in length, an increase in the angle of inclination of mandible in front of the base of the skull, deployment of the lower jaw angle in the period of the early replacement bite [22]. As the child grows, the degree of anatomical disorders is determined by the adequacy of surgical and orthodontic treatment. In some cases, despite the observance of all the principles of complex treatment, it is not possible to completely eliminate the deformation of the maxillofacial region [23]. Numerous studies have detailed the severity of anatomical and functional disorders in children with congenital bilateral cleft of the upper lip and palate. The complexity of the vice necessitates further study of the problem.

When examining patients with congenital bilateral cleft of the upper lip and palate during the bite of milk teeth, clinical, radiological, graphic,

anthropometric and other special methods for diagnosing the pathology of the maxillofacial region (ultrasound, functional diagnostic methods) are used [24]. Clinical methods of examination include external examination of the face, assessment of upper lip symmetry, and presence of nasal deformation, mouth opening functions, oral mucosa condition, degree of protrusion of the intermaxillary bone, degree of its mobility, and degree of deformation of lateral fragments of maxillae alveolar process [25]. When making anthropometric measurements, faces use photographic pictures in straight and lateral projections. Height of face, height of nasal part of face, nose, gnatic part of face, width in area of zygomatic bones, nose, etc. are determined [26].

Shulzhenko V.I. et al. (2016) in children with congenital bilateral cleft lip and palate, diagnostic models were studied by Silman method, comparing dental alveolar arches of children with orthognatic bite [27].**I-24**

An external examination assessed the configuration of the face, the state of the skin, the red border of the lips, the severity of external anatomical landmarks, etc. The patient's face was photographed. Photometric examination was carried out to assess symmetry relative to the median sagittal line, the cosmetic center of the face, and the cosmetic center of the upper dentition. This made it possible to detect deviations of the incisional line of the upper dentition relative to the midline of the face in one direction or another. Measurements were carried out by an electronic ruler. When examining the oral cavity, the patient was evaluated: the presence of morphological disorders of the upper jaw and the dentate system as a whole, the presence of super-complete incisors from the cleft side and the absence of complete incisors, both from the cleft side and from the opposite side.

Measurements of jaw models of children with CCLP aged 1 to 6 months were carried out before lip reconstruction. For measurement, a longitudinal line was drawn passing through the middle of the wedge-shaped part of the ploughshare, since its front part, connected to the intercellular bone, deviates in the transversal plane. The apex of the upper lip bridle and the apex of the anterior segment of the small fragment of the alveolar process were determined, measurements were taken from the longitudinal axis to the indicated points, and the obtained value corresponds to the displacement of the processes from the transversal plane. The projection distance of these points on the longitudinal axis was also taken into account; this value indicates the displacement of fragments in the sagittal plane [28].

In addition, today, despite a large number of domestic and foreign studies, the problem of optimal timing for surgical operations on the lip and palate is widely discussed. The criteria for completion of early preoperative orthopedic therapy are not defined, and diagnostic methods in the early stages of treatment are not systematized. To assess the harmony of the nasolabial triangle, photometry of the child's face was carried out. The photography was carried out in a position when the subject was sitting straight; the look was directed towards the lens. Photography was carried out using a photo system (Canon D450 Kit mirror camera; lens EF 24 - 85mm f/3.5-4.5). Photography was carried out after obtaining informed voluntary consent of parents to examine their children in accordance with ethical and legal standards. Photographs of the subject's face are calculated according to the developed methodology for analyzing the harmony of the nasolabial triangle (certificate for rationalization proposal №. 2771 of 28.08.2018). To do this, the following points are placed: points of the corners of the mouth on the right and left; points on the top of the Cupid arch on the right and left; bottom point; base points of the nose wings on the right and left; points on the top of the nostrils on the right and left. Then, corners of mouth, tray point and points of Cupid's arch are connected with straight lines, framing filter, tray point with points on nostril tops and base of nose wings, the latter are connected with corners of mouth. A line passing through the middle of the filter is also carried out. Dental components of the overall quality of life parameter of children with CCLP were evaluated in the dynamics of treatment in children at 2 years and at 4 years using the proxy-report approach (assessment of the quality of life of children by parents). To do this, the Russian-language version of the ECOHIS questionnaire (Early Childhood Oral Health Impact Scale) was used, since it is used in children of this age category. In addition, it is easy to use, and its questions are understandable to parents. 108 parent-child couples took part in assessing the quality of life. The parents' questionnaire was carried out individually, after familiarizing them with the instructions for completing the questionnaire [29].

Early orthodontic treatment of patients with bilateral crevices of a bay and sky by means of "The obturator dental for orthodontic treatment of children with a congenital full bilateral cleft lip and palate" contributes to normalization of the situation of an intermaxillary bone and vomer, brings together an intermaxillary bone, fragments of front department of maxillae, reduce a tension of tissues of upper lip after a cheiloplasty and also is prevention of secondary deformation of wings and a tip of a nose [30].

The effectiveness of orthodontic treatment was evaluated 12 months after the start of therapy based on the results of morphometric examination of children's facial parameters, biometric measurement of jaw models. The criteria for the effectiveness of treatment were considered: achieving optimal functional occlusion, reducing the amount of protrusion of the intercellular process of the maxillae, reducing the degree of deviation of the intercellular process of maxillae, expanding the lateral parts of the upper dentition. Comparative analysis of data from morphometric studies of children's facial parameters and biometric measurements of jaw models after orthodontic treatment was carried out, both between the observation groups and in comparison with the data of children with physiological occlusion. After primary cheiloplasty in all children, the nasal deformation in the form of shortening the columella and flattening the wings of the nose was determined with varying degrees of severity. After cycling and uranoplasty, good results of surgery were noted in 34 (77.2%) children. A satisfactory treatment outcome was determined in 10 (22.7%) children. Thus, children with congenital bilateral complete cleft of the upper lip and palate, after completing the main surgical stages of treatment (cheilo-, velo- and uranoplasty), were characterized by a violation of face harmony and occlusion [31].

Based on the axiography, the shape and inclination of the articular pathway were studied, trajectory quality, quantity characteristics. Movements, shape, symmetry, coincidence of curves during various movements of mandible, characterizing the functional state temparo-mandibular joint (TMJ) and intra-articular disk. Rust-retrusion tests were tvaluated movements of the mandible heads in the sagittal, transversal and frontal planes, mediotrusion, opening and closing of the mouth. A characteristic point for all patients was the absence of active complaints from TMJ, despite the presence in many cases of pronounced functional joint disorders, such as clicking when opening and closing the mouth, as well as deviation during lower movement jaws. More significant disorders noted in the group of patients with unilateral cleft lip and palate compared to the group of patients with a bilateral full cleft of the upper lip, alveolar process, hard and soft skies. Functional on the cleft side revealed joint head movement disturbances, and structural disturbances of joint head and TMJ disc motion path, hypermobility ligament apparatus [32]. All the methods of cheiloplasty carried out allowed: to form the upper lip, to create all its anatomical parameters, to compare muscles in the position of myodynamic equilibrium, to form the upper vault of the vestibule of the mouth. Corrections of the skin-cartilage of the nose are postponed up to 12-16 years [33].

According to Sharopov S.G. (2019), the goal of early operations is to reduce the period of maladaptation of the child. The purpose of using sparing versions of uranoplasty is to reduce the conditions for the formation of multiple scarring, which contributes to the development of secondary deformations of maxillae. Trauma of bone structures of palate during operation restrains further development of jaw bones and exacerbates secondary deformities of jaws, dental rows and whole middle zone of face [34].

Conclusion: Thus, the morphogenesis of the upper lip and palate is a complex process associated with a tightly regulated interaction between mesenchymal and epithelial cells, requiring further research.

Analysis of the studied scientific and medical literature showed that in published sources the morphometric characteristic of the craniofacial region of children of the I and II childhood period with congenital cleft lips and palate is not presented in sufficient volume. With the help of this article, a number of tasks can be solved: to determine the morphometric parameters of the craniofacial region in children of the I and II childhood period in healthy children taking into account gender (boys and girls), to assess the correspondence of these parameters to the "golden section principle"; identify features of changes in the parameters of the dentate system during the period of tooth change in children with congenital cleft labia and palate in a comparative aspect; determine the state of bite in children with congenital cleft labia and palate depending on age, as well as determine the optimal timing of surgical treatment.

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