

Examination Of The Dental Status Of Children With Congenital Cleft Lip And Palate In Karakalpakstan

Makhkamov M.E., Artykbayev M.B. - Rchmmc, Makhkamova M.M.,
Muratbayev A.B. – KMI

Abstract:

Usually, children with congenital cleft lip and palate (CCLP) are born viable and, if optimal conditions are created for them, they develop almost the same as their healthy peers, but, compared to them, these children are more susceptible to various environmental factors. For example, they are 3-4 times more likely to have a lesion of tooth enamel. Changes in the factors of general local and nonspecific protection of the oral cavity serve as pathogenetic prerequisites for an increase in the number of dental diseases in children. It was found that among the concomitant pathology that occurs after birth, the incidence of dental caries is especially high in carriers of CCLP.

Keywords: *congenital cleft lip and palate, dental caries, dental diseases.*

Date of Submission: 13-11-2023

Date of Acceptance: 23-11-2023

CCLP is a malformation that occurs due to impaired fetal morphogenesis as a result of exposure to various exogenous and endogenous factors at an early stage of development - 4-7-9 weeks. This is what determines the interrelation of numerous clinical manifestations on the part of the middle face organs, which, as is known, is not always eliminated in primary surgery of the upper lip and palate and, along with the possibility of developing postoperative deformities and defects, limits the use of some elements of primary treatment. [15, 19, 23]

Being at the interface with the external environment, the enamel is constantly exposed to the strong influence of various factors. Preservation of its properties and structure is possible only in conditions of maintenance of constant dynamic equilibrium of enamel with saliva as a result of physico-chemical exchange of its components with this biological liquid that is convincingly proved by experiments with radioactive isotopes. The maintenance of this equilibrium is the result of two processes, enamel solubility and its mineralization. Under normal conditions, these two differently directed and dialectically connected processes cause a constant dynamic equilibrium of tooth enamel with the washing their vehicle - saliva [3, 14, 17, 22].

Under natural conditions, there is a process of demineralization or solubility and the process of remineralization. At the same time, various enamel ingredients, especially mineral components, pass into saliva and are replaced by calcium, phosphorus, and other chemical elements from saliva. The constant maintenance of this balance under other equal conditions of the biological environment of the body and provide resistance of enamel to external irritating actions, including caries resistance of the tooth. Thus, the processes of remineralization and demineralization provide continuous renewal of the mineral components of tooth enamel, mainly its surface layer. Changes of some properties of enamel depending on the composition of saliva, the features of mineral metabolism in the body, nutritional factors are associated with this. On the other hand, this circumstance opens the prospect of directed influence on enamel of teeth with the purpose of prevention and treatment of pathological processes in it. [1, 6, 10, 15, 18, 24, 26]

The problem of preventing dental caries is closely related to the problem of forming full-fledged enamel. In this regard, the period of setting and maturation of the tooth in the oral cavity after its eruption is important. Tooth enamel maturation is a term widespread in the foreign literature and less so in the native literature. [2, 4, 11, 21]

Enamel maturation means an increase in the content of calcium, phosphorus, fluorine and other components and improvement of the enamel structure in the near future after teething. [5, 9, 12, 13]

It is proved that permanent dynamic changes occur already in the formed erupted tooth with the direct participation of local as well as general factors mediated by tooth pulp and saliva. The average content of Ca in the enamel of human teeth ranges from 33-39%, phosphorus 16-18%, the value of Ca /P (molar) coefficient 1.48-1.67; Ca /P (weight) coefficient 1,92-2,17. [10, 11, 15]

Researchers have found that when enamel is affected by caries, the permeability of the hard tissues of the teeth to Ca, P and other elements increases, the high level of enamel permeability at caries causes the

possibility of reverse entry of mineral ions into it that contributes to suspension of pathological process [7, 8, 14, 15, 16, 20, 25].

If all of the above is considered through the prism of congenital malformation of the face and jaws, especially the process of tooth maturation in the oral cavity after its eruption, then we have not found data on such studies in the available literature. Based on this, we decided to study the dental status of children with CCLP. In this regard, we have set the following task: "To study the relationship of the development of the cariesogenic situation from the forms of CCLP and the dynamics of its change after cheiloplasty."

The work was based on the results of comprehensive examination and treatment of 203 patients with congenital single and bilateral cleft upper lip and palate and with isolated cleft lip and palate. The patients were distributed by age as follows: from 3 to 12 years, 191 children, from 13-15 years - 8 and from 16 and more than 4 people. All patients were on outpatient dynamic observation at the dental polyclinic of the CMI.

The following methods were used to study the dental status:

1. determination of hygiene index (HI)
2. determination of the papillary-marginal-alveolar index (PMA)
3. determination of the intensity of dental caries - cf, CFR+cf, CFR
4. determination of calcium and phosphorus in mixed saliva
5. Determination of calcium and inorganic phosphorus content in enamel biopsy

The control group consisted of the data of 30 somatically healthy children whose indices coincided with the data of O.S. Yuldashkhanova (1996).

The patients who underwent these studies, in contrast to the study of dental status, were distributed as follows, which is reflected in Table 1.

Table 1
Distribution of patients by age and pathology

Age	Control	I	II		III			IV	Total
			a	b	A	b	C		
3-6	4	9	5	5	3	2	1	1	26
7-12	3	8	3	6	3	3	3		26
Older than 12	3	2	1					9	2
Total	10	19	9	11	6	5	4	10	54

I - patients with congenital isolated cleft palate

II - patients with congenital unilateral cleft upper lip and palate:

a - before cheiloplasty

b - before uranoplasty

III - with congenital bilateral cleft upper lip and palate:

a - before primary cheiloplasty (one side)

b - before cheiloplasty (on the second side)

c - before uranoplasty (second side)

IV - patients who underwent corrective surgeries.

When examining patients with CCLP, the study of the dental status was carried out, consisting of the following clinical and laboratory examinations:

- **The examination of dental status** was performed using a set of dental instruments under natural light. The condition of hard tissues of teeth, periodontium, oral mucosa was taken into account, attention was paid to the extent to which the patient owns and how he performs individual hygienic care of the oral cavity;

- **Assessment of oral cavity HI** was carried out according to the method of Yu.A. Fedorov and V.V. Volodkina (1984): Determining by the intensity of color of the vestibular surface of six frontal teeth with Schiller-Pisarev solution. In this case the plaque turns dark brown. Hygienic condition of the oral cavity is assessed according to a five-point system: staining of the entire surface of the tooth crown - 5 points, % of the surface - 4 points, 1/4 surface - 3 points, 1/2 surface - 2 points and absence of staining of the surface of the tooth crown - 1 point.

- Periodontal tissue damage was determined using the **papillary-marginal-alveolar index (PMA)** recommended by T.F. Vinogradova (1987). PMA index is used to establish the localization of inflammation and its intensity. The technique consists of smearing the gingival margin (papillary, marginal and alveolar gingiva) with iodine-containing solution.

- **Intensity of dental damage with caries** was determined with the help of cf for deciduous teeth, CFR+cf for replaceable teeth and CFR for permanent teeth, where index cf is the sum of carious (c), filled (f) deciduous teeth; index CFR is the sum of carious (K), filled (P) and removed (R) teeth in one examined person.

Based on the examination of dental status in 120 patients with congenital cleft upper lip and palate, we found that the prevalence of dental caries was $91.5 \pm 0.1\%$, that is, much more often than in practically healthy children. In the control group the caries prevalence was $86,3 \pm 0,12\%$.

The increase of dental caries intensity depending on the type and level of congenital malformation was also revealed (Table 2).

In children with CCLP, the intensity of dental caries damage averaged 4.05 ± 0.85 , which differed sharply from the control indicators (1.95 ± 0.12), from the first (1.95 ± 0.2) and second groups (2.82 ± 0.6). In children of the third and fourth groups, these indices practically did not differ (4.05 ± 0.4 and 4.05 ± 0.85 , relevant), which can be explained by the similarity of anatomical disorders, the difference of which lies only in the amount of damage.

Table 2
Relationship between the intensity of dental caries damage depending on the level of congenital malformation

Intensity of dental caries	Type of congenital cleft lip and palate				Control group n=30
	Isolated cleft lip n=18	Isolated cleft palate n=54	unilateral through cleft lip and palate n=38	Bilateral through cleft lip and palate n=28	
CF	$2,57 \pm 0,7$	-	$3,75 \pm 0,9$	-	
CFR+	$2,5 \pm 0,4$	$2,1 \pm 0,2$	$3,9 \pm 0,5$	$4,8 \pm 0,8$	
CEP	$3,4 \pm 0,7$	$1,8 \pm 0,13$	$4,5 \pm 0,5$	$3,3 \pm 0,9$	
Average value	$2,82 \pm 0,6$	$1,95 \pm 0,2$	$4,05 \pm 0,4$	$4,05 \pm 0,85$	$1,95 \pm 0,12$

Thus, the obtained data indicate a significant increase in the cariesogenic situation in children with CCLP, which increases depending on the severity of congenital underdevelopment of the upper lip and palate. The tendency to an increase in the intensity of dental damage with caries is noted starting with the indicators of the second group, which is caused by violation of the tightness of the oral cavity, deterioration of the teeth washing with saliva and a general decrease in the hygienic state of the oral cavity.

The study of oral hygiene in children with CCLP showed that the highest rates were noted in children in groups I and II aged 10 years and older (3.5 ± 0.14 and 3.4 ± 0.3 , relevant) (Table 3).

In children with CCLP, periodontal tissue pathology in the form of various gingivitis forms is observed significantly more frequently (20.4 ± 1.8) than in healthy children (12.5 ± 2.3). This indicator worsens sharply after orthodontic treatment. From clinical observations it was noted that prolonged wearing of orthodontic apparatus has a negative effect on periodontal tissues both mechanically and chemically. Thus, we found that the older the age and more complex the malformation, the more pronounced the periodontal pathology compared to the control group.

Table 3
The indicator of the hygienic index in children with CCLP

Group	Pathology	Age		
		Under 3 years old n=25	From 3 to 7 years old n=24	8 and older n=26
I	Isolated cleft upper lip	$2,2 \pm 0,13$	$2,8 \pm 0,4$	-
II	Isolated cleft palate	$2,3 \pm 0,1$	$2,5 \pm 0,08$	$3,1 \pm 0,7$
III	Unilateral congenital cleft lip and palate	$2,7 \pm 0,17$	$2,8 \pm 0,11$	$3,4 \pm 0,3$
IV	Bilateral congenital cleft lip and palate	$2,7 \pm 0,17$	$2,6 \pm 0,16$	$3,5 \pm 0,14$

With poor and very poor oral hygiene, the PMA index increases significantly in all groups of examined children with CCLP. Thus, if at good hygienic state PMA was equal to $15.2 \pm 1.1\%$, then at satisfied hygienic state of oral cavity PMA value increased to $19.7 \pm 1.2\%$, and at unsatisfied state, respectively, it was $25.6 \pm 2.4\%$.

Thus, it was found that in children with congenital malformations of the upper lip and palate, due to the lack of hermeticity in the oral cavity, the teeth are under direct influence of the external environment, are not completely washed by saliva, and the oral cavity is polluted by the contents of the nasal cavity. All this combined with the lack of adequate oral care leads to a significant decrease in HI and deterioration of periodontal tissues.

Considering that the negative influence of the external environment in complex with endogenous factors leads to decrease in resistance of tooth enamel and, first of all, to its focal demineralization (as evidenced by reliably high indices of CFR+cf), in this connection we have studied the results of the conducted CAERR-test. It should be noted that this test allows determining not only the structural and functional resistance of enamel, but also the remineralizing ability of saliva.

The study of the CAERR test showed that the rate of enamel demineralization in children with CCLP directly depends on the type and severity of the congenital malformation (Table 4).

The analysis of the obtained data showed that the highest CAERR indicators were noted in patients with congenital isolated cleft palate, because their tooth washing with saliva remained complete (3.85 ± 0.3 days). Children with congenital bilateral through cleft of the upper lip and palate had the lowest CAERR (6.4 ± 0.5 days), whereas in the control group it was 3.2 ± 0.15 days.

The obtained data once again indicate the need for early restoration of the anatomical and functional integrity of the upper lip and the tightness of the oral cavity as a whole. This will ensure a uniform washing of the enamel of all teeth with saliva, therefore, contributes to the timely connection of local protective anti-carious mechanisms.

Table 4
The rate of enamel demineralization in children with CCLP

Group	Type of congenital cleft lip and palate	Age, years	
		1-4 years n=32	5 years and older n=45
I	Isolated cleft lip	$6,2 \pm 0,3^*$	$4,8 \pm 0,1$
II	Isolated cleft palate	$4,45 \pm 0,2$	$3,6 \pm 0,16$
III	Unilateral (Unilateral) cleft through the lip and palate	$3,77 \pm 0,3$	$5,3 \pm 0,25^*$
IV	Bilateral cleft lip and cleft palate	$5,3 \pm 0,45^*$	$6,4 \pm 0,77^*$
Practically healthy children		$3,2 \pm 0,15$	

As a result of dental examination of 120 patients with CCLP, we found that the average rate of caries intensity in children with isolated cleft lip (cf + CFR) was 1.95 ± 0.2 , with unilateral through cleft lip and palate - 3.90 ± 0.4 , with bilateral through cleft lip and palate - 3.7 ± 0.25 ; whereas, according to A. S. Yuldoshkhanova (1996) in practically healthy children this index does not exceed - 1.95 ± 0.12 . The intensity of dental caries in children with CCLP increased with the severity of congenital malformation of the upper lip and palate ($P < 0.05$). When comparing the intensity of dental caries in children with isolated cleft lip and healthy children, it turned out that they practically did not differ from each other ($P > 0.05$). This is due to the fact that in this category of sick children the anatomical and functional integrity of the upper lip is restored at an early age (up to 1 year), which contributes to the creation of a favorable environment for normal mineralization of tooth enamel. This demonstrates once again the advisability of early cheiloplasty, veloplasty, and also anterior palate plasty (during the first 2-3 years of a child's life). Oral HI in children with CCLP averaged 2.2 ± 0.13 and ranged from 1.9 ± 0.5 to 3.4 ± 0.3 , which we assessed as unsatisfied and poor. Comparative data showed that the severity of congenital pathology directly proportionally changed the hygiene index scores ($P < 0.05$).

It has been revealed that children with CCLP, especially children from remote regions of the republic, do not adhere to and do not know the rules of oral care. These data indicate poor organization of preventive dental care for children with CCLP as part of their dispensary observation.

Children with CCLP before cheiloplasty have an increased cariesogenic situation due to saliva contamination with the contents of the nasal cavity and unclean air, a significant decrease in Ca content with a sharp increase in the amount of zinc in the elemental composition of the tooth and deterioration of oral hygiene status. All these changes are directly dependent on the severity of the defect and the duration of surgical treatment.

The pediatric dentists, taking into account that children with CCLP have an increased cariesogenic situation in the oral cavity should sanitize them more frequently (3-4 times a year). Especially while wearing orthodontic appliances: Using modern means of hygiene and caries prevention, teaching children and their parents the rules of hygiene.

References

- [1]. Balandina E.A., Simanovskaya ELO, Zaitseva N.V. Voprosi Medicinskogo I Social'nogo Zdorov'ya Detey Permskogo Regiona. (Issues Of Medical And Social Health Of Children In The Perm Region). // In: Congenital And Hereditary Pathology Of The Face And Neck Of Children. Moscow, 2002. Pp. 19-23.
- [2]. Benkovskaya S.G. Vliyaniye Nes'emnix Metallicheskix Protezov I Ortodonticheskix Apparatov Na Sostoyaniye Organov I Tkani Polosti Rta. (Influence Of Fixed Metal Prosthesis And Orthodontic Appliance On The State Of Oral Cavity Organs And Tissues)// Main Scientific Works Of Department Of Pediatric Dentistry.-Omsk, 2000.-P.289-301.
- [3]. Sovremennie Metodi Profilaktiki I Lecheniya Zabolevaniy Parodonta» (Modern Methods Of Prevention And Treatment Of Periodontal Diseases"), 2004.-P.251-252.
- [4]. Borodulina I.I., Ermoliev S.N. Osobennosti Gemodinamiki Tkaney Parodonta U Lic S Melkim Preddveriem Polosti Rta. (Peculiarities Of Hemodynamics Of Periodontal Tissues In Persons With A Shallow Vestibule Of The Mouth)// Russian Journal Of Dentistry. №1.-2004.-C. 19-21.

- [5]. Borovaya M.L. Profilaktika Kariessa Zubov U Detey Doshkol'nogo Vozrasta S Vrojdennimi Rasshelinami Verxney Gubi I Neba: (Prevention Of Dental Caries In Preschool Children With Congenital Cleft Upper Lip And Palate): Author's Thesis Of Candidate Of Medical Sciences - Miisk, 2000.-18p.
- [6]. Vasina S.A. Kliniko-Laboratorpoe Obosnovanie Primeneniya Nekotorykh Sredstv I Metodov Gigieny Polosti Rta Dlya Profilaktiki Kariessa I Gingivitov U Shkol'nikov (Clinical And Laboratory Substantiation Of Application Of Some Means And Methods Of Oral Hygiene For Prevention Of Caries And Gingivitis In Schoolchildren) // Author's Thesis. Can. M. Sc. - M. 1984.-21p.
- [7]. Gavrilova O.A. Stomatologicheskii Status I Osobennosti Gomeostaza Polosti Rta U Pacientov S VRGN. (Dental Status And Features Of Oral Homeostasis In Patients With CCLP). // Dental Diseases In Children: Epidemiology, Prevention, Treatment. Coll. Of Scientific Works.-M., 2000.-P.53-60.
- [8]. Davydov B.N., Gavrilova O.A., Maximova V.V., Zerpov A.B. Sostoyanie Polosti Rta I Kompleksnoe Lechenie Bol'nix S Rasshelinami Lica. (State Of The Oral Cavity And Complex Treatment Of Patients With Facial Clefts) // Pediatric Dentistry.-No.1-2 (3,4)-2000.-Ps.53-56.
- [9]. Demner L.M., Dubiko S.A., Smolentseva N.V. Vzaimosvyaz' Mejdju Kariesom Zubov I Zcha Karies Zuba I Ego Oslojneniya (The Relationship Between Dental Caries And MND Of Tooth Caries And Its Complications). Coll. Art. Kazan. 1974.-T.40.P.28.
- [10]. Yuldashkhanova A.S., Daminova Sh.B. Effektivnost' Primeneniya Elektroaktivirovannykh Rastvorov U Kariesrezistentnykh I Kariesvospriimchivykh Detey (Efficiency Of Application Of Electroactivated Solutions In Caries-Resistant And Caries-Prone Children) // Russian Journal Of Dentistry. - 2002. - №5. - C.31-34.
- [11]. Yuldashkhanova A.S., Sultanova G.S. Prognozirovanie, Profilaktika I Lechenie Kariessa Zubov U Detey (Prediction, Prevention And Treatment Of Dental Caries In Children) // Russian Journal Of Dentistry. - 2002. - № 4. - C.34-36.
- [12]. Kulesh T.A. Rol' Sanitarno-Prosvetitel'skoy Raboty V Profilaktike Kariessa. (The Role Of Sanitary-Educational Work In Prevention Of Caries). // Clinical Dentistry.-2000. №3.September.-P. 18-20.
- [13]. Lysenkova I.I. Osobennosti Primeneniya Atravmaticheskogo Vosstanovitel'nogo Metoda Lecheniya Kariessa Zubov U Detey. (Peculiarities Of Atraumatic Restorative Method Of Dental Caries Treatment At Children). // Forum Stomatolopsh.-2004.-#1.-P.35-38.
- [14]. Makhkamov M.E., Amanulaev P.A., Marufkhopov H.P., Makhkamova N.E. Surfaktantnaya Sistema Legkix U Detey S Vrojdennoy Rasshelinoy Gubi I Neba (Lung Surfactant System In Children With Congenital Cleft Lip And Palate) // Dentistry Of Childhood And Prevention.-2001.-#3.-P.59-62.
- [15]. Makhkamov M.E. Differentsial'naya Lechebno-Profilakticheskaya Taktika Pri Lechenii Detey S Vrojdennoy Rasshelinoy Gubi I Neba: (Differential Therapeutic And Prophylactic Tactics In Treatment Of Children With Congenital Cleft Lip And Palate): Diss. Doc. Med. Sc.: Moscow, 2002. 197 C.
- [16]. Mamedov Ad. A. Algoritm Reabilitatsii Detey S VRP1. // V Kn: Vrojdennaya Patologiya Golovy, Lica I Shei U Detey. (The Algorithm Of Rehabilitation Of Children With Cleft Lip And Palate) // In The Book: Congenital Pathology Of The Head, Face And Neck Of Children. M, 2002. PP.158-159.
- [17]. Morozova L.V., Vasmanova E.V., Lomagin V.V., Khromenkova K.V. Osobennosti Podkhodov K Individual'noy Profilaktike Stomatologicheskix Zabolevaniy U Detey (Features Of Approaches To Individual Prevention Of Dental Diseases In Children) // Pediatric Dentistry And Prevention. -2002.- №3-4.-C.82-84.
- [18]. Nabatova T.A. Rol' Stomatologicheskogo Prosvesheniya Roditeley V Profilaktike Kariessa Zubov U Detey : (The Role Of Dental Education Of Parents In The Prevention Of Dental Caries In Children): Diss. Of D.M.S. Moscow, 2000. -118 P.
- [19]. Sviridov I.I. Epidemiologicheskaya Situatsiya I Struktura Zabolevaemosti U Detey S Vrojdennoy Nasledstvennoy Chelyustno-Licevoy Patologiy V Saratovskoy Oblasti: (The Epidemiological Situation And The Structure Of Morbidity In Children With Congenital Hereditary Maxillofacial Pathology In The Saratov Region): Abstract Of Doctoral Dissertation Of Medical Sciences-M.-2003.-22p.
- [20]. Ulitovsky S.B. Individual'naya Gigiena Polosti Rta Pri Sostoyaniyax Posle Xirurgicheskix Vmeshatel'stv V Polosti Rta (Individual Oral Hygiene In Conditions After Surgical Interventions In The Oral Cavity) // New In Dentistry. 2002. №4, P. 44-53.
- [21]. Yurieva L.I. Profilaktika Osnovnykh Stomatologicheskix Zabolevaniy U Detey S Vrojdennoy Chelyustno-Licevoy Patologiy V Sisteme Semeynoy Dispanserizatsii: (The Prevention Of Basic Dental Diseases In Children With Congenital Maxillofacial Pathology In The System Of Family Dispensaries): Abs. Diss. D. Med. Sc. Ekaterinburg.-2000.-19p.
- [22]. Ahluwalia M., S.R. Brailsford, E. Tarelli, S.C. Gilbert, D.T. Dark, D. Beigston Dental Caries, Oral Hygiene, And Oral Clirence In Children With Craniofacial Disorders // J. Dent Res 83(2) 2004.-P.175-179.
- [23]. Bastos Lagos E. M., Marocs B., Pordeus I.A. Oral Health Of Individuals With Cleft Lip, Cleft Palate, Or Both // Cleft Palate Craniofac J. 2004.-V.41.-P.59-63.
- [24]. Brenan P.A., Willy P., Anand R., Markus A.F. Colonization Of The Cleft Nasal Floor By Anaerobic Oral Flora In Patients With Oronasal Fistulae// . Cleft Palate Craniofac J. 2003. -V40.-P.431-432.
- [25]. Chappie JR, Nunn JH. The Oral Health Of Children With Clefts Of The Lip, Palate, Or Both // Cleft Palate Craniofac J. 2001 Sep;38(5):525-8 Dental Hospital, Newcastle Upon Tyne, NE2 4BW, United Kingdom.
- [26]. Hewson AR, Mcnamara CM, Foley TF, Sandy JR. Dental Experience Of Cleft Affected Children In The West Of Ireland. // Int Dent. J. 2001 Apr;51(2): 73-6.