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Evaluation of the Diagnostic Value of Osteocalcin Level and Alkaline Phosphatase Activity in the Early Diagnosis of Erosion of Hard Tissues of Teeth in Children

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Relevance. In many studies conducted by domestic and foreign scientists on the diagnosis, treatment and prevention of non-carious diseases of the hard tissues of teeth in children, factors such as diseases of the gastrointestinal tract, endocrine disorders, carbonated drinks with an acidic environment, increased juice intake, chewing vitamins and other drugs (vitamin C and aspirin), decreased salivation and low buffer capacity of saliva, unfavorable environmental environment were identified as the causes of erosive damage to the hard tissues of teeth (Novikov V.S., 2006; Pihur O.L., 2016; Kiselnikova L.P., 2015; Maslyak E.E., 2015). According to the authors, a comprehensive method of remineralizing therapy with the introduction of phosphorus-calcium and fluoride-containing drugs into tissues using local application and electrophoresis is proposed for the treatment of tooth enamel erosion, emphasizing the predominance of demineralization processes in enamel, dentin and root cement against the background of deep destructive changes (Mitronin A.V., 2015; Hara A.T., 2014).

The purpose of the study. It consists in clinical and biochemical substantiation of methods of treatment of erosion of hard tissues of teeth in children and improvement of pathogenetic treatment.

Despite the fact that numerous studies have been conducted in this area, there is insufficient data to study the role of pathogenetic mechanisms of metabolic disorders in various body systems in non-carious diseases of hard dental tissues, especially in the progression of tooth erosion, which indicates the need for detailed clinical and laboratory studies. The discovery of contradictory data in foreign and domestic sources about the causes of the progression of erosion of hard tissues of teeth was the reason for this study. In this scientific work, the effectiveness of complex treatment of erosion of hard tissues of teeth in children using effective and leading methods of early diagnosis in medicine is widely described.

The introduction substantiates the relevance, goals and objectives of the study, describes the object and topic of the study. The relevance of the research is described in accordance with the priorities of the development of science and technology of the republic, the scientific novelty and practical results of the research, the scientific and practical significance of the results is revealed. There is information about the application of the results of the study in medical practice, published works and information about the structure of the work.

Scientific research was carried out in the following areas: initial (basic) assessment of erosive lesions (according to the BEWE index); determination of the hygienic index of the oral cavity by the Fedorov-Volodkina method (1971); determination of the degree of mineralization of hard tissues of teeth (TER-test) (Okushko V.R., Kosareva L.I., Lutskaya I.K., 1983); clinical assessment of the rate of enamel remineralization (KOSRE) (T.L. Redinova et al., 1988), CPU+cp index, assessment of the clinical condition of fillings by the method. G. Ryuge (1998) as modified by E.V. Zainullina (2008).

Each patient received individual treatment, including local and general measures. The examination of patients was carried out by generally accepted clinical methods: questionnaires, dental

examination, the use of general and specialized examination methods. During the examination of the oral cavity, special attention was paid to the condition of the bite, teeth and dentition.

During biochemical studies, the levels of calcium-regulating hormones, biochemical markers of bone metabolism, calcium and phosphorus levels in oral fluid, as well as the analysis of free amino acids in blood serum and oral fluid were studied. In addition, the rate of salivation and the pH of the medium were studied.

In the conducted studies, the level of PTH was determined using a set of reagents "I-PTH ELISA" (DSL, USA), the content of vitamin D – set "25-Hydroxy Vitamin D ELISA" (Immundiagnostic, Germany), the content of calcium and phosphorus in saliva was carried out using ready-made kits of the company "Human". The activity of osteocalcin in oral fluid was studied by enzyme immunoassay (IFA method) using the "N-MID Osteocalcin" kit (Nordic Bioscience Diagnostics A/S, Canada).

The analysis of amino acid derivatives of FTC (phenylthiocarbomyl) was carried out using HPLC (high-performance liquid chromatography). Synthesis of free amino acid derivatives of FTC was carried out by the method of Steven A., Cohen Daviel. Identification of FTC amino acids was carried out on a Discovery HS C18 75x4.6 mm column on an Agilent Technologies 1200 chromatograph. The rate of natural, unstimulated salivation (salivation rate, ml/min) was studied - an indicator of the function of cleaning, protection and saliva mineralization. The pH level of the oral fluid was determined using a pH meter "BFRL-220" (China).

The criteria for participation in the study and exclusion from the study were taken into account: written consent of parents, the presence of obstructive conditions of the body for participation in the study (somatic pathologies), cases of rejection of the planned study. The assessment of erosion in the 1st direction was carried out according to the BEWE index. For this assessment, the oral cavity is divided into six separate areas. To determine the degree of mineralization of hard tooth tissues (electrical conductivity of tooth tissues), an ELOZ-1 type device was used, which is listed in the state register [2.4.6.8.10].

The method of clinical evaluation of fillings is based on the ability of tooth tissues to conduct electricity at different voltages, depending on the width of the microfracture at the tooth - seal boundary. In this assessment, "Alpha" - 1 point, "Bravo" - 2 points, "Charlie" - 3 points and "Delta" - 4 points. In addition, an electrometric method is used to study the permeability of the seal boundaries. The condition of the fillings and the permeability of their boundaries were determined 10 minutes, 6 months and 12 months after the tooth filling.

In the studies in the 2nd direction, the content of calcium, phosphorus, calciferol, osteocalcin, parathyroid hormone, alkaline phosphatase, pH of saliva, quantitative and qualitative composition of amino acids in oral fluid and blood serum were studied. The degree of significance of indicators of thyroid status, the level of calcium-regulating hormones, biochemical markers of bone metabolism and free amino acids in the level of mineralization of hard tissues of teeth and the state of the erosive process was assessed.

In the study, 41 patients with erosion of hard dental tissues were randomly selected and divided into the main group and the comparison group. When developing a dental erosion treatment plan, the depth of damage to the hard tissues of the tooth was taken into account - the damage was assessed only in the enamel border, enamel-dentine border and dentine damage. In the main group of patients, therapeutic procedures were carried out with the division of patients into 3 groups according to the depth of the erosive process. For the purpose of remineralizing therapy in group 1, fluorolac was applied to the enamel of teeth and electrophoresis with calcium gluconate was performed. Calcium glycerophosphate is prescribed for 1 tablet and "Adoamin" syrup for 15 ml. per day for 3 months. In addition, filling with liquid composite "Revolution", final processing and polishing of the seal were carried out. In addition to the therapeutic procedures of group 1, in group 2, taking into account that the process was deepened to the depth of the enamel-dentine border, instead of filling with a liquid composite "Revolution", the enamel surface was prepared up to 3-4 mm., 5-second treatment with 37% orthophosphate acid and filling was carried out using the sandwich method (light-cured microgibrid composite "Dyract XP"). In group 3, in addition to group 2, a therapeutic "Dycal" gasket

was used, taking into account the damage to the dentin. The patients of the comparison group were filled according to the depth of the erosive process [1.3.5.7.9].

For complex treatment, Adoamine syrup 200 ml N1 (bottle) containing vitamins and amino acids was used in a dose of 15 ml once a day. The data obtained were calculated using statistical functions, such as arithmetic mean (M), average standard error (m), relative value (frequency, %), probability of error (P), developed by EXCEL on a personal computer. To assess the reliability of the differences between the average values of the studied indicators, the reliability coefficient "t" (Student's indicator) was used.The values were considered statistically significant when the difference in the mean values was $p<0.05$. At the same time, the existing recommendations on statistical processing of the results of clinical and laboratory studies were observed (Zeitsev V.M. et al., 2003).

The results showed that the presence of cracks and violation of the integrity of the restoration were more observed in glass ionomer cement and compomer than in composite (36.7% and 56.8%, respectively). Discomfort and temperature sensitivity were noted more often when using glass ionomer cement and compomeric materials than when using composite (86.7%, 70.3%, respectively). Satisfaction with aesthetic results was observed during restoration with composite materials (88.1%) than with glass ionomer cements and compomers, while the opposite was observed in the case of glass ionomer cement and compomer (26.7% and 32.4%, respectively). The results of a questionnaire survey of children showed that children with erosion of hard tissues of teeth consumed significantly more acidic foods (19.67 ± 5.1%), among patients with erosive pathology, the incidence of hyperthyroidism, vitamin and amino acid deficiency was high (20,96±5,9%; 21,16±5,8% accordingly), and bruxism turned out to be the least factor in the development of erosion (0.55%).

The predominance of horizontal movements of the toothbrush (90.5 ± 6.4%) was observed when brushing teeth in children with erosion. In addition, gastrointestinal diseases were detected in children with erosion of hard tissues of teeth - 1.16%, eating disorders (anorexia and bulimia) - 8.85%, low salivation and low buffer volume of saliva - 19%, cleaning with a hard brush or paste with a high RDA index - 8.65% of cases. When analyzing the indicator reflecting the hygienic condition of the oral cavity of the examined (see Table. 3), it was found that the Fedorov-Volodkina index in children with erosion is 1.10 ± 0.13 points. In our study, we studied the amino acid composition of serum and oral fluid in children aged 2 to 6 years with erosion of hard tooth tissues, which is necessary to study the organic components of enamel. Since it is proteins that are the matrix of the mineralization process and its active participants. Growth, regeneration and other properties of hard tissues are associated with proteins. A decrease in protein synthesis leads to a violation of the mineralization process [11.13.15.17.19].

The results of the study show that essential (glycine, valine, proline) and replaceable (histidine, lysine, arginine) amino acids are significantly reduced in the oral fluid. The study found that in children with erosion of tooth enamel, the level of individual amino acids present in the free state in the enamel increased by 1.5-2 times, and the number of amino acids involved in the formation of connective tissue decreased. These are free amino acids and amino acids included in proteins that are not related to minerals.

The electrical conductivity of the hard tissues of the teeth significantly decreased in the dynamics of observation after carrying out therapeutic and preventive measures. In children with erosion of the hard tissues of the teeth, the electrometric indicators were high, while a year after the start of the use of therapeutic and preventive measures, they approached the normal level. Thus, the data of the conducted therapeutic and preventive measures showed high efficiency, contributing to a significant increase in the level of mineralization of the hard tissues of the tooth. An increase in the mineralization of the hard tissues of the teeth helps to stop the erosive process in the teeth, as well as to improve the adhesion of the restorative material and increase its service life [12.14.16.18].

Conclusions

Among diseases of the hard tissues of the teeth, the incidence of erosion was 18.3% for the study region, and it was found that it was observed in many cases due to the intake of acidic (acidic) products, diseases of the endocrine system (hyperthyroidism), lack of vitamins and amino acids, high abrasiveness of toothpastes and the use of a toothbrush made of hard fibers.

1. The erosion of the hard tissues of the teeth observed in dynamics after restoration with the help of filling materials - the presence of cracks, violation of the integrity of the restoration, discomfort, sensitivity to temperature, aesthetic results, as well as clinical and functional indicators of electrical conductivity (observation of a difference from 2.3 to 4 times) in the hard tissues of the teeth confirmed that glass ionomer cements and compomeric filling materials related to composite filling materials do not meet the requirements and cannot be an indication for erosive lesions.
2. Compared with the control group in the oral fluid of children with erosion of hard tissues of teeth, an increase in the amount of parathyroid hormone by 3.2 times, a decrease in the amount of osteocalcin by 55.3% indicates hypocalcemia and demineralization of hard tissues, insufficient synthesis of calcium-binding proteins and inhibition of mineralization processes in the body.
3. The decrease in amino acids in the blood serum of the examined patients: histidine - 24.6%; glycine - 34.9%; glutamine - 7.42%; phenylalanine - 8.56%; leucine - 19.8% and lysine - 25.8% compared with the control group is reflected in the violation of protein synthesis and mineralization, which leads to the development of erosive lesions of solid tooth tissues.
4. Effective results of complex treatment of children with erosion of hard tissues of teeth were expressed in positive changes in clinical, morphological, functional and biochemical parameters of oral fluid and blood serum during dental restoration with composite filling materials in the dynamics of observations over the period after general therapeutic measures.

Used Literature

1. Гаффоров С.А., Ахмедов А.Б. Тиш қаттиқ тўқимасининг кариес бўлмаган жароҳатлари этиологияси, даволаш ва профилактикаси // Доктор ахборотномаси №2, 2019, С. 148-153. (14.00.21; №13)
2. Гаффоров С.А., Ахмедов А.Б. Научные взгляды на этиопатогенез, лечение и профилактику некариозных поражений тканей зубов (обзор литературы) // Stomatologiya №2, 2019, С. 79-82. (14.00.21; №12)
3. Гаффоров С.А., Ахмадалиев Н.Н., Ахмедов А.Б. Роль гормонального фона организма на рост и развитие тканей полости рта // Вестник ТМА №4, 2019, С. 21-24. (14.00.21; №8)
4. Ишанова М.К., Ахмедов А.Б. Перспективы применения новых подходов в диагностике и комплексном лечении эрозий и некрозов эмали зубов у детей // Ўзбекистон тиббиёт журнали №2, 2019, С. 38-40. (14.00.21; №5)
5. Гаффоров С.А., Ахмедов А.Б., Ишанова М.К., Гаффорова С.С. Болаларда сут тишлари эрозияси тарқалганлиги, профилактикаси ва даволаш тамойиллари // Вестник ТМА №5, 2019, С. 73-76. (14.00.21; №8)
6. Akhmedov A.B., Ishanova M.K., Qodirova M.T., Dosmukhamedov E.Kh., Utesheva I.Z. Prevalence, prophylaxis and treatment principles of primary teeth erosion in children // International Journal of Psychosocial Rehabilitation, 2020, Vol. 24, Issue 04, pp. 2073-2078. (Scopus)
7. Ishanova M.K., Akhmedov A.B., Kodirova M.T., Dusmukhamedov E.KH., Utesheva I.Z., Yakubova F.KH. Estimation of the diagnostic value of amino acid composition of oral fluid and blood serum in children with dental erosion and their effectiveness of pathogenetic treatment // International Journal of Pharmaceutical Research. 2021. – Vol 13. Issue 1. pp. 3155-3161. (Scopus)

8. Ахмедов А.Б. Болаларда тиш қаттиқ тўқимаси эрозиясини комплекс даволаш усули // Методические рекомендации. - Ташкент, 2021. 23 с.
9. Ахмедов А.Б. Болаларда тиш қаттиқ тўқимаси эрозиясини ташхислашда суюқлик хроматографияси усули (қон зардоби ва оғиз суюқлиги аминокислота мисолида) // Методические рекомендации. - Ташкент, 2021. 21 с.
10. Ахмедов А.Б., Мусаев Ш.Ш. Взаимосвязь функциональности щитовидной железы и развития эрозии и некроза твердых тканей зубов у детей города Бухары // Биология ва тиббиёт муаммолари Халқаро илмий журнал №2,1 (101), 2018, С. 80-84.
11. Ахмедов А.Б., Мусаев Ш.Ш. Болалар ёшида эмал эрозияси ва некрози ривожланишида клинико-биохимик таҳлиллар кўрсаткичлари // Биология ва Тиббиет муаммолари Халкаро илмий журнал №2,1 (101), 2018, С. 96-97.
12. Ахмедов А.Б. Проблемы профилактики и лечения некариозных поражений зубов в детском возрасте // «Профилактика стоматологических заболеваний» сборник материалов республиканской научно-практической конференция. Ташкент 23-24 март 2018 г. С.11-12.
13. Ахмедов А.Б., Ишанова М.К. Оценка эффективности диагностики и подхода к комплексному лечению эрозий и некроза эмали зубов у детей // «Профилактика стоматологических заболеваний» сборник материалов республиканской научно-практической конференция. Ташкент 23-24 март 2018 г. С.36-37.
14. Ахмедов А.Б. Гиперфункция щитовидной железы как фактор риска развития эрозии и некроза эмали зубов у детей // Сборник научно-практической международного конгресса «Актуалные проблемы стоматологии и челюстно-лицевой области» Тошкент 3-4май 2018 г. С.9-10.
15. Ахмедов А.Б. Изучение взаимосвязи функциональности щитовидной железы и развития эрозии и некроза твердых тканей зубов у детей Бухарской области // Сборник статей международной научно-практической конференции «Актуальные вопросы стоматологии», г. Уфа 1-2 июня 2018 г. С.61-62.
16. Akhmedov A.B. Amino acid composition of blood in children with tooth erosion erosion // SCIENCE, RESEARCH, DEVELOPMENT #26/8, Berlin 15.03.2020. pp. 22-23.
17. Ахмедов А.Б. Диагностическая ценность аминокислотного состава крови у детей с эрозиями твердых тканей зубов // «Тиббиётда инновациялар: йўналишлар ва истиқболлар» I Ҳалқаро илмий-амалий анжуман, Ташкент 27-28 марта 2020 г. С. 160-161.
18. Akhmedov A.B. Influence of complex treatment on amino acid composition of saliva in children with erosion of dental tissues // 3rd Global congress on Contemporary science and advancements. Newyork, USA, april 6-7, 2021. pp. 217-218.
19. Akhmedov A.B. Diagnostic value of amino acid composition of blood in children with erosion of dental tissues // International confedrence on social and humanitarian research. Cologne, Germany, april 25-26, 2021. pp. 257-258.