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COCA-COLA TOOTH SYNDROME. PATHOGENESIS, CLINICAL MANIFESTATIONS, DIAGNOSTIC CRITERIA, TREATMENT, AND PREVENTION

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Abstract

The purpose of this review study is to provide an in-depth analysis of the “Coca-cola tooth” syndrome as a specific variant of one of the forms of acid-erosive damage to hard tooth tissues caused by the constant exposure to acidic beverages.In this work, we will summarize and structure clinically relevant information about this syndrome for practicing dentists,including aspects of pathogenesis,explaining the characteristics of enamel degradation,describing the clinical presentation,and highlighting objective diagnostic criteria, and confirming these findings using instrumental methods.In addition,the goal is to present modern therapeutic strategies, methods of remineralizing therapy, minimally invasive intervention protocols, and preventive recommendations aimed at preventing the progression of the disease .

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The relevance of the topic of studying the “Coca-cola tooth” syndrome is due to the significant increase in the prevalence of non-carious lesions of hard dental tissue associated with the regular consumption of carbonated beverages with a low pH. In the context of changing dietary habits among the modern population,especially adolescents and young adults,the percentage of acid-erosive damage to enamel is increasing,which often goes undiagnosed in the early stages.This syndrome is a characteristic variant of the erosive process,accompanied by demineralization,thinning,and increased sensitivity of the enamel,leading to functional and aesthetic impairment. The lack to timely diagnosis and adequate treatment contributes to the rapid progression of the lesion, a decrease in the quality of life,and the need for subsequent expensive dental interventions.Therefore,the study of pathogenesis,clinical manifestations,diagnostic methods,therapy, and prevention is an important aspect of modern dentistry.

The pathogenesis of the syndrome is a sequential complex of chemical,biological,and morphological processes. The key trigger factor is the regular and prolonged consumption of carbonated sweet drinks with a low pH. These drinks contain phosphoric, carbonic, and, in some cases, citric acid. The acidic effect leads to a sharp decrease in the pH level in the oral cavity to bellow the critical value (pH 5.5), which triggers the dissolution oh hydroxyapatite crystals. At this stage , acids dissolve the surface layer of hydroxyapatite and reduce the saturation of saliva with calcium and phosphates, which blocks the natural process of remineralization. In patients with hyposalivation or impaired saliva quality, the erosion process progresses more rapidly. Frequent “dousing” of the teeth with beverages,which is typical for adolescent and young adults,leads to repeated acid episodes throughout the day, leaving little time for the restoration of the enamel’s mineral composition. These changes are accompanied by increased sensitivity to thermal and chemical stimuli. Over time , the thinning of enamel leads to the dentin, the opening of the dentinal tubules, and pronounced

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hyperesthesia. The surface of the teeth becomes vulnerable to external influences, their color changes, and structural damage becomes visible. Long-term progression of the process is accompanied by profound morphological changes: a significant decrease in the microhardness of enamel and dentin, loss of the incisal edge, smoothing of the ridges, and the possible formation of non-carious defects, especially when erosion is combined with abrasive factors such as improper brushing techniques or bruxism

The clinical picture of the “Coca-cola tooth” syndrome is characterized by a typical combination of erosive and carious lesions of the hard tissues of the teeth. The earliest clinical manifestation is the loss of the natural shine of the enamel and its diffuse dullness, which reflects the initial processes of superficial demineralization. Smooth areas of increased transparency and thinning gradually form on the vestibular surface of the upper incisors and canines, corresponding to the initial form of erosion. As the pathological process progresses, the enamel defects become more pronounced: there is significant thinning of the enamel, and oval or rounded erosive pits are formed, often with areas of exposed dentin. The latter gives the teeth a characteristic yellowish tint, and there is pronounced hyperesthesia which manifests itself as sensitivity to temperature, chemical, and mechanical stimuli. The lesions are usually multiple. Not only the anterior teeth are affected, but also the premolars and molars, which develop cup-shaped erosive defects on their chewing surfaces. Chronic exposure to sugar-containing beverages further contributes to the development of multiple caries, especially cervical and circumoral caries, which significantly exacerbates the overall clinical picture. Over time, this condition leads to shortened clinical crowns,increased hard tissue erosion,abnormal dental arch contours, and impaired occlusion. In addition, some patients experience decreased salivation or impaired salivary buffering, which can exacerbate the severity of erosive damage. The diagnostic criterion is the identification of a typical behavioral habit: regular and prolonged consumption of carbonated sweet drinks with low pH, especially

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in the form of frequent small sips throughout the day. This habit leads to multiple and prolonged episodes of low pH in the oral cavity, which creates favorable conditions for the development of erosive changes. Patients often report poor oral hygiene after consuming these drinks, as well as complaints of dry mouth, which indirectly indicates a decrease in the buffering capacity of saliva. X-ray examination reveals enamel thinning and reduced radio-dentistry without signs of pulp inflammation. Quantitative mineralization assessment methods, such as laser fluorescence or QLF, confirm a decrease in mineral content in the affected areas. This syndrome is characterized by a specific localization of lesions, the absence of palatal erosions typical of GERD, and a clean link between clinical manifestation and the consumption of acid carbonated beverages.

In treatment begins with the elimination of the main factor-the complete rejection of sugary carbonated drinks and the normalization of eating behavior. Remineralizing agents are used in the early stages.:fluorinated lacquers, gel, calcium preparations, as well as CPP-ACP product for restoring the mineral composition of enamel. To reduce sensitivity, desensitizers and drugs that block dentinal tubules are used. In the presence of pronounced defects, composite restoration or veneers are installed, and in severe cases orthopedic correction in performed. It also recommended to improve salivation, ensure adequate hydration, and maintain good oral hygiene.

Prevention is based on avoiding exposure to acidic beverages and strengthening the hard tissues of the teeth. The main measures include limiting or avoiding sugary carbonated drinks, drinking water regularly after consuming acidic foods, practicing proper oral hygiene,using fluoride-containing toothpastes and remineralizing agents. Regular visits to the dentist for professional cleaning and enamel monitoring are recommended, as well as stimulating salivation by chewing sugar-free gum to enhance the buffering capacity of saliva.

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Conclusion

"Coca-Cola tooth" syndrome is a form of acid-erosive damage to the hard tissues of teeth caused by regular and prolonged consumption of carbonated beverages with a low pH. The clinical picture is characterized by multiple erosive defects, and diagnosis is based on a combination of anamnestic, clinical, and instrumental signs. A comprehensive approach to treatment and prevention allows to preserve the functionality and aesthetic characteristics of teeth, improve the quality of life of patients, and reduce the risk of further complications.

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