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Interrelationship between Oral Cavity and Other Organs of Human Being

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Oral cavity health is a significant part of patients' overall health. Caring for the oral cavity has a significant impact not only on a person's well-being but also on their self-esteem. The mouth is the "entrance gate" to the body, therefore, changes in the organs and tissues of the oral cavity can be the first signals of a patient's general health disorder.

Lesions of the oral mucosa can be the first symptoms of HIV infection, aphthous stomatitis is associated with digestive system diseases, mucosal cyanosis or, conversely, bleeding of the gums can be a marker of blood diseases, loss of bone tissue in the jaw bones can indicate the onset of skeletal osteoporosis. The presence of such compounds as alcohol, nicotine, opiates, drugs, hormones, poisons in the body can be detected in saliva. Periodontal diseases are associated with numerous general somatic diseases.

The condition of the oral cavity affects the health of the body as a whole. Decreased immunity can lead to oral bacteria becoming the cause of infection in other body organs (e.g., infectious endocarditis). At the same time, diseases of organs and systems of the body and their treatment can affect the condition of the oral cavity, for example, change the microbial balance or disrupt the rate and volume of saliva secretion [1]. It has been proven that caries is related to the overall health of children in their first year of life. D'Oliveira et al. (2005) showed that low-weight children, babies born through cesarean section, are susceptible to caries [2]. A correlation was found between the infection of the middle ear and respiratory tract during the first year of a child's life and the development of ECD. According to S.M. Alaki et al. (2009), taking antibiotics in the first year of a child's life leads to a sharp increase in the risk of caries development. Examination of children older than 12 months showed that the risk of caries development increases in infants who take antibiotics with

The oral cavity is the ideal environment for microorganisms: an optimal temperature of 37 °C, sufficient humidity, nutrient supply, and a variety of surfaces for microbial attachment. More than 1,000 strains of microbes colonize in the mouth. It has been calculated that each individual has at least 200-300 strains of microorganisms in their oral cavity. They can colonize in saliva, mucous membrane, dental plaque above and below the gums. It is known that 1 mg of a microbial plaque can contain up to 1011 microorganisms.

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Streptococcus mutans (SM) are oral microorganisms that are the primary cause of dental caries initiation and development. However, after invasive dental treatment or active flossing, SMs can enter the bloodstream, where immune system cells usually destroy them, but occasionally, usually with decreased immunity, SMs enter the heart muscle tissue and colonize them (especially the heart valves), causing endocarditis. Infectious endocarditis (IE) is an inflammatory disease.

The University's Center for Oral Biology team conducted a study of a collagen-bound protein known as CNM, which allows Streptococcus mutans to "attach" to heart tissues. Laboratory experiments have shown that CNM-containing microbial strains can colonize heart muscle tissues, while strains without CNM cannot affect heart tissues. Thus, CNM protein can serve as a biomarker for the most virulent SM strains, especially in people with chronic heart diseases [7].

Streptococcus mutans can cause bacteremia both during treatment of oral organs, due to epithelial damage and bacterial penetration into the bloodstream, and in cases of unsanitary oral cavity. Therefore, maintaining oral health is an important component in preventing heart disease.

For the timely prevention of diseases of organs and systems of the body, it is necessary to know the risk factors for the development of oral cavity diseases and associated general diseases of the body. Risk factors include:

- disruption of nutrition (risk of developing dental caries, diabetes, obesity, heart disease, stroke);
- smoking (risk of developing periodontal diseases, oncological diseases, respiratory, cardiovascular diseases, diabetes);
- alcohol consumption (risk of developing oral cancer, heart disease, liver cirrhosis, injuries, etc.);
- stress factor (risk of developing periodontal diseases, cardiovascular diseases);
- socio-economic factor (independent factor that emphasizes the negative impact of other risk factors);
- low level of oral hygiene (risk of developing periodontal diseases, cardiovascular diseases, and other bacterial diseases) [8].

Numerous studies have proven that poor oral hygiene is a risk factor for cardiovascular disease (CVD). One of the first prospective cohort studies published in 1993 (n = 1000) showed that patients with dental hard tissue diseases had a 25% higher risk of developing cardiovascular diseases, while men over 50 years old suffered more from cardiovascular diseases [9].

Not only cariogenic microorganisms, but also an infection in the oral cavity that causes periodontal diseases can lead to the development of general diseases of the body. Ebersole et al. found that in patients with periodontal disease, the level of C-reactive protein (a marker of inflammation) is higher than in adults with healthy periodontitis. Thus, the study of blood plasma for the presence of C-reactive protein in 1,043 practically healthy men made it possible to predict the possible development of heart attack and stroke. After treatment of periodontitis, the level of C-reactive protein in the examined patients decreased by 6 months.

Scannapieco et al.'s study showed that people with respiratory diseases (n = 41) had a lower level of oral hygiene compared to patients without diseases of the laryngeal organs (n = 193; p = 0.044). Moreover, people with the highest oral hygiene index were 4.5 times more likely to suffer from chronic respiratory diseases than patients with a hygiene index of 0 [11]. A study by Loesche et al., involving 350 adults prone to aspiration pneumonia, showed that patients diagnosed with pneumonia during the study suffered from periodontal diseases 3.3 times more frequently (95% CI = 1.06 to 10.3; p = 0.05), compared to those without confirmed aspiration pneumonia [12].

Thus, for maintaining a healthy lifestyle, the prevention of oral diseases plays an important role. Daily dental care is the most accessible and common method for preventing diseases of the oral cavity organs and the body as a whole. Patients should be recommended to brush their teeth at least

twice a day with fluoride-containing toothpastes (except for people living in areas with high fluoride content in water), use fluoride-containing rinsers, dental floss (from 8 years old, once a day in the evening after brushing teeth), and additional caries prevention agents such as chewing gum, sodium fluoride tablets, toothpicks, etc. For more thorough oral hygiene, in order to maintain the balance of microorganisms in the microbial film, patients should be recommended to use arginine-containing toothpastes (for example, toothpaste based on the sugar acid neutralizer technology), which can neutralize the acids of dental plaque, "healing" the microbial film [13, 14].

Consequently, understanding that oral health and the overall health of the body are closely interconnected is crucial for developing preventive programs at the individual and mass levels. Reducing the cariogenicity of dental plaque will prevent microbial bacteremia and prevent the development of diseases that threaten the health and life of patients.

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