

Modern Aspects of the Etiopathogenesis of Generalized Periodontitis

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Abstract The article provides general information about a large amount of literature on studies describing pathological changes in periodontal tissues against the background of somatic diseases. Periodontal tissue diseases are polyetiological diseases, the most common of which is chronic generalized periodontitis. The incidence rate among the population of our country and the whole world is growing from year to year. The main indicator of the disease is observed against the background of somatic diseases. We have reviewed many publications devoted to improving the effectiveness of periodontitis treatment, which is accompanied by somatic diseases. The result of our research has shown that no research method has achieved full effect in the treatment of periodontitis, which is accompanied by somatic diseases.

Keywords General periodontitis, Somatic diseases, Cortisol, Metabolic syndrome

1. Introduction

The relevance of research. Periodontal pathology, being very common, progresses with age, and by the age of 40, almost 100% of the population suffers from it. Periodontal diseases are often asymptomatic, therefore, for their early diagnosis and prevention, a comprehensive examination and characteristics of the state of protective factors of the oral cavity in patients are necessary [4,7,9].

Periodontal disease refers to inflammatory infectious periodontal diseases of a non-specific nature. The frequency of relapses and the activity of the chronic form of periodontitis depend on the patient's state of health [1,4,8,9,19].

Despite a significant number of annual studies devoted to the problem of periodontal diseases, both in our republic and abroad, many aspects of pathogenesis, clinical variants of complications, its timely diagnosis and effective prevention remain unclear, controversial and poorly studied. One of the insufficiently studied issues of the problem is the clinic, diagnosis and prevention of generalized periodontitis in people suffering from background diseases and especially their association. Meanwhile, in the last decade there has been a tendency to a significant increase in the combined forms of somatic pathology in patients with periodontitis [11,15,17,20].

In recent years, due to the rapid development of clinical immunochemistry and immunology, the immunological and biochemical aspects of periodontal diseases have attracted

the attention of researchers, especially when combined with somatic diseases [5,10,14].

Information published in recent years in the scientific literature on the problem under consideration indicates the association of chronic inflammatory diseases of the digestive system with damage to organs and tissues of the oral cavity and periodontal itself. According to the authors, in diseases of the digestive system, conditions are created for the occurrence of inflammation in the periodontium, as there is a violation of a number of regulatory mechanisms: immune and endocrine imbalance, endotoxieties, impaired microcirculation, neurohumoral regulation, psychosomatic relationships, changes in the metabolism of connective tissue, mineral metabolism, vitamin deficiency. All this leads to a weakening of the body's resistance and, in combination with external factors (microbial colonization of dental plaque), to the development of gingivitis and periodontitis [16,17,18,19].

In the literature known to us, there is evidence according to which the high prevalence of periodontal diseases is associated with the nutritional characteristics of the population. Among the nutritional factors, vitamin deficiency plays a certain role [20,21].

Among the variety of causal factors contributing to the occurrence of periodontal diseases, significant importance is attached to occupational hazards.

Workers of industrial enterprises are exposed to the combined action of many unfavorable factors of the production environment, which cause a decrease in body resistance and an increase in the frequency of periodontal tissue pathology [1,3,14].

Generalized periodontitis, regardless of the severity of the course, is accompanied by shifts in microbial symbiosis,

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the manifestation of which is a decrease in the aerobic link, an increase in total anaerobic contamination, the seeding of enterobacteria from periodontal pockets, dysbiosis with deficiency or complete elimination of *L.acidophilicus*. *Lactobacillus* deficiency plays a major role in the realization of the pathogenic action of opportunistic representatives [12,17].

2. Materials and Methods

The prevalence of periodontitis in the population, difficulties in the prevention and treatment of the disease, ambiguity in the interpretation of the main pathogenetic mechanisms (interdependent inflammatory, immune and metabolic) makes this problem extremely relevant in medicine. It is known that inflammatory diseases of the periodontal complex are widespread among patients with metabolic disorders (metabolic syndrome, diabetes, gout, systemic lupus erythematosus) [2,5,7,13,21].

Periodontal pathology is mainly inflammatory in nature and can develop under the influence of both local causes and the combined action of general (endogenous) and local factors against the background of changes in the reactivity of the body, the organization of the immune response. The immune system, designed to ensure the genetic constancy of the internal environment of the body, the protection of the macroorganism from all kinds of exogenous and endogenous pathogens, due to various reasons, can be the basis for the formation of a chronic inflammatory process and metabolic disorders [8,17,19,21].

Such disorders underlie the mechanism of development of many pathological processes, such as hypertension, coronary heart disease, obesity, gout, etc. The organs and tissues of the oral cavity, in particular the periodontium, are also involved in the pathological process. At the same time, inflammatory and dystrophic changes in periodontitis are directly dependent on factors such as the age of patients, the severity of diseases, and the therapy performed. Recent studies in the field of metabolic syndrome have revealed that a number of forms of insulin, proinsulin, and insulin growth factors have the same immune characteristics and are defined as immunoreactive insulin. The composition of immunoreactive insulin includes several forms, such as proinsulin, insulin growth factors, C-peptide, free, as well as protein-bound insulin, etc. The ratio of these forms can be different, which is very important because they have different biological and proliferative activity. The predominance of one or another form of insulin and proinsulin will determine the direction of the pathological process, including in periodontitis [7,15,16].

The author noted that periodontal infection can adversely affect glucose levels in diabetes. Treatment of periodontitis, which reduces bacterial exposure and, consequently, the inflammatory destruction of periodontitis, helps to reduce the amount of glucose in the blood of diabetic patients. According to Zvigintseva M.A. (1998), there are several

mechanisms by which diabetes adversely affects periodontal tissues:

- vascular changes;
- the connection of glucose with tissue proteins;
- changes in collagen metabolism;
- increased activity of matrix metalloproteinases (collagenases);
- increased glucose content in the gingival fluid, which leads to impaired function of periodontal cells, decalcification of teeth and carious tooth decay;
- violation of the immune response, as a result of which the function of neutrophils is weakened and a hyperreactive monocytic response occurs, as a result of which periodontal tissues are destroyed [17].

In the past, some literature sources mentioned data on the effect of diabetes on the occurrence and course of the destructive process in periodontitis. However, modern observations confirm the fact that periodontitis can significantly worsen the prognosis of diabetes [16,20]. Various epidemiological studies state that diabetes increases the risk of periodontitis by 2-3 times, and also significantly affects the intensity and degree of destruction of periodontitis [3,8].

Microorganisms vegetating in the subgingival plaque include more than 30 species of pathogenic anaerobic gram-negative microorganisms, among which the main role belongs to *Porphyromonas gingivalis*, *Prevotella intermedia*, *Actinobacillus actinomycetemcomitans*, *Bacteroides forsythus*, *Treponema denticola*. [12,17,19]. The authors proved the etiological role of these microorganisms in the occurrence of periodontitis, their relationship with the severity of the lesion, and established quantitative levels of anaerobic microflora at different depths of the lesion [1,3,5,9,12].

3. Result and Discussion

Most authors consider the microflora of dental plaque to be the most important etiological factor in gingivitis and periodontitis [16,18]. Pathogenic and conditionally pathogenic oral microflora is recognized as one of the leading factors in the etiology of inflammatory periodontal diseases [4,5,7,11]. The results of bacteriological studies and the study of subgingival plaque indicate the complex composition of the microflora in periodontal diseases. Among the microorganisms there are various types of streptococci, hemolytic staphylococcus, trichomonas, fusobacteria, actinomycetes, protozoa, etc. In addition, specific gram-negative bacteria are found in periodontal pockets, such as *Porphyromonas gingivalis*, *Prevotella intermedia*, *Actinobacillus actinomycetemcomitans*, *Capnocytophaga*, *Bacteroides forsythus*, *Treponema denticola*, *Veillonella* recta. Up to 85% of all microbes are anaerobes, of which 10 to 15 bacteria have pathogenic properties. These microbes, forming a group of periodontopathogenic species, have highly adhesive, invasive and toxic properties and, moving under the gingival margin, damage the epithelium of the

dentoalveolar groove [17,18]. Important virulence factors of these microbes are endotoxins, which are lipopolysaccharides in their chemical composition, which interact with immunoglobulins A, G and M and various complement components.

The state of local and general systems of protection and maintenance of homeostasis plays an important role in the triggering mechanisms of inflammatory and inflammatory-destructive processes in periodontitis. Changes in indicators of nonspecific reactivity in periodontitis have been found by many researchers. In patients, depending on the severity of the pathological process, the complement titer and the amount of serum properdin, serum lysozyme level, phagocytic activity of blood leukocytes decreased [13,14].

Among the variety of causal factors contributing to the occurrence of periodontal diseases, significant importance is attached to occupational hazards [13,15,17,21].

Workers of industrial enterprises are exposed to the combined action of many unfavorable factors of the production environment, which cause a decrease in body resistance and an increase in the frequency of pathology of periodontal tissues [10,15,20].

Many researchers recognize the state of the vascular bed and the microcirculatory system of the periodontium as one of the factors in the pathogenesis of periodontal diseases that trigger the pathological process, which is primarily facilitated by the features of the periodontal circulatory system [7,12,14,18,21].

In periodontitis, regulatory mechanisms in the periodontal microcirculation system are suppressed, the degree of disorder of which depends on the severity of the disease and this leads to a decrease in the lability of microvessels [3,6,8,18]. With a mild degree of periodontitis, inflammatory changes occur against the background of spasm of the precapillary links of the microcirculatory bed and increased permeability of the wall of postcapillary venules, accompanied by initial rheological changes in blood, stagnation in microvessels and increased reactivity of the endothelial layer in venules [1,2,17,20].

The prevalence of periodontitis in the population, difficulties in the prevention and treatment of the disease, ambiguity in the interpretations of the main pathogenetic mechanisms (interdependent inflammatory, immune and metabolic) makes this problem extremely relevant in medicine. It is known that inflammatory diseases of the periodontal complex are widespread among patients with metabolic disorders (metabolic syndrome, diabetes, gout, systemic lupus erythematosus).

In the past, some literature sources mentioned data on the effect of diabetes on the occurrence and course of the destructive process in periodontitis. However, modern observations confirm the fact that periodontitis can significantly worsen the prognosis of diabetes [17,20,21].

Analyzing the results obtained and based on the literature data, the author makes a number of statements explaining the

relationship between the development of an inflammatory reaction and changes in lipid metabolism, and also tries to give a pathogenetic assessment of these connections [6,8,15].

When considering the pathogenesis of periodontitis, there is a significant lack of knowledge about the genesis and mechanisms of development of tissue lesions. The treatment and rehabilitation of periodontitis patients is a significant difficulty. To date, scientists in many countries are developing a concept according to which inflammation in general, and subclinical inflammation in particular, are considered as the general pathophysiological basis of modern pathology, closing the pathogenetic circles of nosological forms of diseases of civilization. Thus, inflammation as one of the oldest problems of medicine, as well as related issues of reactivity and changes in various components of homeostasis, including a complex of metabolic changes, has not only not lost its importance, but, as the changed structure of morbidity shows, it is becoming even more relevant today.

It is known that psychoemotional disorders, stress, neuroendocrine disorders, insufficiency of antioxidant protection, oxidation of free radicals, microcirculation disorders play an important role in the pathogenesis of chronic generalized periodontitis [11,17,19,21].

In this connection, along with conventional mechanical and antimicrobial therapy, pharmacological drugs and agents, the choice of which is pathogenetically justified by their pharmacological properties, are widely included in the complex treatment of inflammatory and destructive periodontal diseases.

These drugs are mainly from related branches of medicine, which opens up new prospects in the treatment of periodontal patients. Antiseptics, antimicrobial and antiparasitic drugs, enzyme and anti-inflammatory drugs, antioxidants, anticoagulants, local anesthetic and antihistamines, metabolic stimulants, vitamins, aminocaproic acid, angioprotectors, antispasmodics, immunomodulators and drugs that prevent the formation of tartar are widely used [4,7].

A comprehensive treatment plan for inflammatory periodontal diseases includes the use of antibacterial therapy as a stage. Among the wide range of modern antibacterial drugs, tetracycline derivatives (doxycycline) occupy one of the leading places in the treatment of periodontitis. In the studies of Lyanova D.K., Daurova F.Yu. (2005), doxycycline is considered from the position of not only an effective antibacterial drug, but also an immunomodulator [20].

The optimal sequence of anti-inflammatory and antibacterial drugs is a prerequisite for effective treatment [1,3,11,18,21].

Due to the fact that periodontal damage leads to chronic inflammation of the bone and soft tissues of the jaw, it is advisable to include nonsteroidal anti-inflammatory drugs (NSAIDs) in complex pathogenetic treatment [13,16]. Of these drugs, drugs that are derivatives of phenyl-containing acids (orthophene, voltaren) are highly effective. Dicloferanac has been found to be less toxic and better tolerated by patients compared with indomethacin ointment [5,7,13].

4. Conclusions

Today, antioxidants are confidently gaining their right to be used as the main component of the complex therapy of periodontal diseases. Basically, natural substances act as antioxidants: vitamins (retinol, tocopherol), plant extracts (bioflavonoids-proanthocyanidins), trace elements (zinc, selenium), which are part of antioxidant enzymes (superoxide dismutases). The creation of synthetic antioxidants, superior in their properties to natural ones, opens up truly limitless possibilities for their use in various fields of medicine, in particular dentistry.

Thus, in complex therapy, drugs of a certain pharmacological orientation are used, affecting individual links in the pathogenesis of inflammatory, inflammatory-destructive, microcirculatory and other periodontal lesions. The relief of microcirculatory disorders is possible both with the use of drugs that purposefully affect the microcirculation and rheological properties of blood, and with the inclusion of antioxidants, lipid-lowering and anti-inflammatory drugs, physiotherapy of nitric oxide, laser irradiation, etc. in complex therapy.

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