



Association of Chronic Generalised Periodontitis with Cardiovascular Disease

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Abstrak. Chronic generalised periodontitis (CGP) is one of the most common chronic inflammatory diseases, and growing evidence links it with cardiovascular disease (CVD). The aim of this article is to analyse and summarise current scientific data on the relationship between CGP and CVD, the pathogenetic mechanisms underlying this association, and the resulting implications for the prevention and treatment of periodontal disease in patients with CVD. The study is based on an analytical review of foreign and Russian-language publications from 2002–2021. The analysis shows that the association between CGP and CVD is mediated by recurrent bacteraemia, chronic systemic inflammation with elevated circulating cytokines, damage to the vascular endothelium, disturbances of lipid metabolism, and reduced salivary function. It is concluded that patients with CVD require targeted periodontal examination and treatment, and that the development of combined treatment algorithms, prepared in cooperation with cardiologists, is a priority.

Keywords: chronic generalised periodontitis; cardiovascular disease; arterial hypertension; atherosclerosis; systemic inflammation; bacteraemia; endothelium

1. Introduction

For a long time, periodontal diseases were regarded as a local infectious process with rare systemic consequences. In recent decades, however, research on the effects of periodontal disease on general health has expanded rapidly, and it has been suggested that this association may act in both directions. Over the past 20 years, clinicians and researchers have sought to explain the relationship between periodontitis and cardiovascular disease, diabetes mellitus, metabolic disorders and other conditions.

Periodontal diseases are common in both developed and developing countries, affecting an estimated 20–50% of the world's population, and their high prevalence among adolescents, adults and older people makes them a public health problem. Smoking, poor oral hygiene, diabetes, medication use, age, heredity and stress are recognised risk factors. Periodontal disease is associated with CVD, diabetes and adverse pregnancy outcomes: it has been reported to increase the risk of CVD by 19%, with the relative risk reaching 44% in people aged 65 years and older, while people with type 2 diabetes and severe periodontitis have a 3.2-fold higher risk of death than those without periodontitis or with its mild form [1].

Traditional methods of treating inflammatory periodontal diseases do not sufficiently increase the resistance of periodontal tissues to pathogenic factors, and the treatment of chronic periodontitis accompanied by CVD remains an unresolved problem. The relationship between the severity of periodontitis, oral hygiene status, age and the presence of CVD, as well as the features and prevalence of the clinical course of periodontitis in patients with CVD, have not been sufficiently studied. The microbiological status of the oral cavity in chronic periodontitis developing against the background of CVD has also not been described, and methods of treatment



and prevention adapted to age, sex and the level of oral hygiene remain to be developed.

The aim of this article is to analyse and summarise current scientific data on the relationship between chronic generalised periodontitis and cardiovascular disease, to describe the pathogenetic mechanisms of this association, and to identify the resulting priorities for the treatment and prevention of periodontal disease in patients with CVD.

2. Materials and Methods

The study was conducted as an analytical review of the scientific literature. The material comprised foreign and Russian-language publications from 2002–2021 on the epidemiology of periodontal disease and its association with systemic diseases, the detection of periodontal pathogens in vascular tissue, the molecular mechanisms of periodontal inflammation and bone destruction, the relationship between serum lipids and periodontal status, and salivary function in older adults. The methods of comparative analysis, generalisation and systematisation of scientific data were used. The findings were grouped into three areas: epidemiological evidence, pathogenetic mechanisms, and the role of cardiovascular pathology itself.

3. Results

Epidemiological evidence

The analysed data show that periodontal disease affects a large proportion of the population and is consistently associated with systemic diseases, above all CVD. The increase in cardiovascular risk associated with periodontal disease is most pronounced in older age groups, in whom the prevalence of both conditions is highest. The literature also increasingly reports a link between chronic generalised periodontitis and diabetes mellitus, chronic obstructive pulmonary disease and other systemic conditions.

Pathogenetic mechanisms of the association

The high frequency of CVD in patients with periodontitis is explained by the “common susceptibility” hypothesis, according to which direct bacterial invasion of blood vessels or a systemic inflammatory response increases circulating cytokines and damages the vascular endothelium. The inflammatory-destructive process in the periodontal complex promotes the translocation of bacteria into the bloodstream, that is, bacteraemia, which provides an atherogenic stimulus; DNA of the key periodontal pathogen *Porphyromonas gingivalis* has been detected directly in aortic tissue [2].

Systemic inflammation is accompanied by increased levels of circulating mediators, including C-reactive protein (CRP), interleukin-1 (IL-1), interleukin-6 (IL-6), tumour necrosis factor- α (TNF- α) and prostaglandin E2. Periodontal bacteria and the host inflammatory response together drive the destruction of alveolar bone [3]. *P. gingivalis* accelerates periodontal disease through activation of the NLRP3 inflammasome [4], while suppression of NF- κ B activation has been shown to reduce periodontal inflammation [5]. These inflammatory pathways overlap with those involved in vascular damage, which supports the biological plausibility of the association between the two diseases. Atherosclerosis, formerly regarded mainly as a disorder of lipid metabolism, is now considered an inflammatory disease, which allows a causal link between periodontitis and atherosclerosis to be discussed.

Metabolic factors also contribute: a relationship has been demonstrated between blood serum lipids and periodontal condition [6]. In addition, hyposalivation and xerostomia are frequent in older dentate adults [7]; reduced salivary flow impairs the natural cleansing of the oral cavity and favours plaque accumulation, which is particularly relevant for patients with CVD who are often older and take long-term medication.

The role of cardiovascular pathology

Arterial hypertension develops with functional changes in the sympathetic nervous system, the kidneys and the renin–angiotensin system, as well as under the influence of humoral factors. In arterial hypertension, structural changes occur that lead to increased sensitivity to vasoconstrictor stimuli and to changes in the cardiovascular system, including the vascular



endothelium. Endothelial dysfunction is thus a point at which the systemic effects of periodontal inflammation and the pathogenesis of CVD converge.

4. Discussion

The analysed data confirm that the association between chronic generalised periodontitis and CVD is not coincidental but is based on shared inflammatory mechanisms: recurrent bacteraemia, persistent elevation of circulating cytokines, and damage to the vascular endothelium. This is consistent with reviews of the relationship between periodontitis and coronary heart disease [8] and between periodontal disease and general health [9]. At the same time, both diseases share common risk factors such as age, smoking and metabolic disorders, so the existing evidence demonstrates an association, and a strict causal relationship requires confirmation in prospective clinical studies.

For practice, this means that periodontal inflammation in patients with CVD should be regarded not only as a local dental problem but also as a potential source of systemic inflammatory load. Strategies to prevent oral diseases should therefore be integrated into the prevention of chronic systemic diseases, which can reduce both the burden of associated diseases and the financial impact on the health system. Physicians, dentists and other health professionals need to be aware of the perio-systemic link and refer patients for specialised periodontal care.

Given the insufficient effectiveness of traditional treatment, the use of agents with antioxidant, antihypoxic and anti-inflammatory properties in the complex treatment of periodontitis in patients with CVD is a promising direction. These include the local use of dexpantenol-containing ointment (Bepanthen) and, in consultation with a cardiologist, systemic levocarnitine. A comparative evaluation of such regimens against traditional treatment, with the development of an algorithm for their use, is a priority for further clinical research.

5. Conclusion

Chronic generalised periodontitis is associated with cardiovascular disease through recurrent bacteraemia, chronic systemic inflammation, endothelial damage, lipid metabolism disorders and reduced salivary function, and this association is most pronounced in older patients. Patients with cardiovascular disease therefore require regular periodontal examination and treatment in close cooperation between dentists and cardiologists. Further clinical studies are needed to establish the relationship between the severity of periodontitis, oral hygiene status, age and the presence of cardiovascular disease, and to develop combined treatment and prevention algorithms for this group of patients.

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