



Review article

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PERIODONTITIS AS A RISK FACTOR FOR GENERAL DISORDERS

SUMMARY

Focal infection can be defined as infections occurring in different locations of the human body and which are caused by microorganisms (or their products) inhabiting the oral cavity. The oral cavity is the site of many infectious and inflammatory diseases, which has recently been associated with systemic diseases.

Dental procedures (tooth extraction, endodontic treatment, root polishing, etc), including periodontal therapy, can provoke the entrance of oral microorganisms of dental plaque into the blood flow and lymphatic system. This bacteriemia is short-term but in the conditions of weakened defense mechanisms, the risk of these bacteria is increased. In these cases, bacterial attacks on tissues and organs, after a while, lead to their multiplications and the origin of oral focal infections.

Some diseases, such as infective endocarditis, infections of head and neck, respiratory infections, diseases of gastrointestinal tract, skin diseases, bone diseases and premature birth, occur as the consequence of the transmission of microbes from dental foci.

Many recent researches also list a periodontal disease as a risk factor. Chronic periodontitis is probably the most prevalent and potentially has the strongest epidemiological and plausible mechanistic associations with these systemic diseases.

Key words: periodontitis, oral focus, general disorders

INTRODUCTION

The term „focal infection“ originates from the beginning of the last century and is defined as an infection that arises from a focus. It is known today that these foci are in fast chronic infections that persist for a long time hidden in an organism. These chronic infections can lead to numerous diseases of remote organs and systems, which are labelled as consecutive diseases (1,2). In order for a chronic infection to behave as a source for the origin of consecutive diseases, it has to meet certain demands. First of all, it has to be: chronic, latent and cryptogenic. According to a classic definition, a

focus of infection is a limited part of tissue infected by microbes that can be anywhere in an organism, but the most examined ones are oral foci, i.e. oral infections. Oral infections, bad oral hygiene and various dental interventions can provoke the entrance of microorganisms in the blood or lymphatic system, thus leading to bacteriemia. The consequence of the union and multiplication of these bacteria on tissue and organs could be diseases of many remote organs and systems (3). Oral bacteria can cause consecutive diseases in various ways:

1. remote infections caused by translocation of bacteria,
2. metastatic (remote) damages resulting

from released bacterial toxins that spread by blood flow and

3. remote inflammations as a result of immune damages resulting from the reactions of bacteria and their toxins with circulating specific antibodies from blood, forming macromolecular complexes (4).

The most frequently mentioned oral foci are tonsil and dentogen foci. The most frequent dentogen foci are periapical changes, but there can be other changes in the alveolar bone, such as:

- lagging ostitic processes
- necrotic inflammations
- hypercementosis
- root resorption
- lagging roots
- insufficiently filled canals
- foreign bodies in the alveolar bone
- jaw cysts
- impacted teeth
- bad oral hygiene
- deep suprabone and infrabone periodontal

pockets, etc (1).

Various recent epidemiological studies speak about the conception of oral infection, pointing to the link between certain dental states, including periodontitis, and several very frequent medical conditions (5).

Bacterial responsibility for the most common oral infections, periodontitis and dental caries, is much better known today. Dental caries is, via numerous microorganisms (streptococci, lactobacteria, actinomycetae) that exist at the focus of infection, linked to inflammatory disease in adults (6). It is defined as a result of unspecific inflammatory reaction to the increased mass of bacteria, G-, anaerob, and in the case of gingivitis G+ bacteria. It is known that these bacteria possess various virulent factors (adhesines, lypopolysaccharides, hemolysines, proteinases and outer membrane vesicules (7). Based on frequent isolations in subgingival lesions, actinoacillus actinomycetemcomitans is today considered as the key etiological factor of given periodontitis (8). This bacterium is also joined by Porphiromonas gingivalis, Bacteroides forsythus, Fusobacterium nucleatum, Prevotella intermedia and Treponema denticola, which are linked to the periodontitis in adults (5). The disturbance of bacteriological proportion in the oral cavity can lead to disbalance in the host, in several ways:

1. by modification of the state of the environment (pH, oxidoreductional potential, nutritive factors, etc) at the spot of damage by bacteriological interaction or accumulation of dental plaque.

2. by reducing the number of useful bacteria (ex. those that produce inhibitory substance caused

by bacterial interaction or by use antibiotics) and

3. by reducing the efficiency of the host's immune response (9).

Dental procedures (tooth extraction, endodontic treatment, root polishing etc), including periodontal therapy can provoke the entrance of oral microorganisms of dental plaque into the blood flow and lymphatic system (10). This bacteriemia is short-term but in the conditions of weakened defense mechanisms, the risk of these bacteria is increased. In these cases, bacterial attacks on tissues and organs, after a while, lead to their multiplications and the origin of oral focal infections (11).

The other possibility is for the infective agents to remain at the primary oral spot, and for the bacterial toxins to transfer to the organs and tissues via blood flow and cause remote damages. The importance of endotoxines, i.e., lypopolysaccharides created by G- bacteria, is prominent here (8).

Finally, the third option is that the remote inflammation could be the result of an immune damage caused by oral microbes and soluble antigens that enter the blood flow and react with specific antibodies. In some cases, the antibodies against oral bacteria can react with the host's tissue receptors leading to immune damage (i.e. S.mutans and the heart tissue)(4).

Focal oral infection of the heart

Infective endocarditis is the most common heart condition resulting from the dispersion of oral microbes, wherein they inhabit endocardium (12). Heart malformations and the presence of vascular prosthesis represent risk factors for the origin of endocarditis because they facilitate the unison and growth of oral bacteria. What causes endocarditis is not exactly known. About 50% of cases of bacterial endocarditis are caused by Streptococcus viridans, and a lesser number by S.sanguis and S.mutans (13). By producing polysaccharide glucane, these bacteria are tied to the surface of the heart or of the fibrin-connected trombocytes. Different laboratory analyses have confirmed the identification of streptococci isolated from the oral cavity with the streptococci from the blood of the patients with endocarditis. This is a clear confirmation of the concept that the microorganisms from the oral cavity can migrate through blood flow and cause infective endocarditis (14). Thus, if it is for any reason necessary to apply any dental procedure that can cause hemorrhage in these patients, the dentist has to consult the patient's doctor about the necessary antibiotic prophylaxis.

More recent researches have confirmed the hypothesis that periodontitis as a chronic inflammatory disease can be a risk factor, i.e. can

behave as a focal point for the origin of arteriosclerosis and thrombi embolism and heart attack (15). The mechanism for these diseases is also explained through the action of endotoxines (lypopolysaccharides) and inflammatory cytokines (Il-1 β), prostaglandyne and tumor necrosis factor (TNF- α)(16).

Of all microbes, *Streptococcus sanguis* shows thrombogenic effects when it enters the blood stream. Migration of bacteria from periodontal pockets during their mechanical processing can also be linked to cardiovascular pathology (17).

Focal oral infections of head and neck

Infections of head and neck (brain abscess, encephalitis, chronic meningitis, chronic marginal sinusitis, uveitis, head trauma, chronic conjunctivitis) can result as a consequence of transient bacteriemia of oral microbes that follows dental treatment or oral infections (18). Most bacteria from the oral cavity are localized in the frontal and temporal lobe. Thus, it is considered today that periodontitis, periapical processes and carious lesions also play an important part in causing head and neck infections.

Focal infections of respiratory system

Dentogen and other oral and extraoral foci can play a part in the creation of respiratory infections that are manifested as sinusitis, tonsillitis, pneumonias, bronchial asthma, lung abscess etc. These diseases can be caused by the microorganisms from the dental cavity, following a direct inhalation from saliva and dental plaque, or by blood dissemination (19,20). There have also been numerous other descriptions of the mechanism where oral bacteria have been included in the pathogenesis of respiratory infections, i.e. *P.gingivalis* and *A.a.* which can aspire into the lungs and cause infection; then the host's and bacterial enzymes from the saliva can dissolve saliva pellicula on pathogens and allow them to adhere to the surface of mucous membrane; and also cytokines derived from the periodontal tissue can damage the respiratory epithelium by causing an infection via respiratory pathogens (4).

Focal infections of gastrointestinal tract

Most diseases of gastrointestinal tract occur by the acting of agents from dentogen foci (gastritis, colitis, enteritis, appendicitis etc.). The presence of *Helicobacter pylori*, the bacterium that causes chronic gastritis and peptic ulcer disease, has been proven in the samples of saliva and dental plaque in gastritic patients, but also in people without gastritic

infections (11). It has also been found in the dental plaque in dyspeptic patients after antibiotics treatment, so it can be concluded that the oral cavity is the source of the transmission but also of re-infection after the appropriate treatment.

Diabetes mellitus

One of the common general diseases is diabetes mellitus, which is characterized by parodontium disease, as a frequent complication. Parodontium disease, as a chronic infection, may influence the control of diabetes (21-25).

Focal infections of skin and soft tissues

Skin diseases which most frequently occur as the consequence of transmission of microbes from dental foci are allergic diseases (urticaria, eczema etc.), Lichen planus, Alopecia areata, Acne vulgaris, Erythema exudativum multiforme, Dermatitis herpetiformis Durhing etc. Oral microorganisms can be responsible for skin infection through a direct inoculation through human bite, and also for the release of histamine from mastocytes or creation of circulating immune complex after a tooth extraction (26,27).

Focal infection and prosthetic implants

A prosthetic implant, more precisely the very line of merging of the prosthetic with the mucous membrane, can represent a predilection spot for the accumulation of the bacteria from the oral cavity (28), which has been confirmed by various testing of the patients with the heart pacemaker implant, who have also had a severe form of periodontitis, periapical infection or caries. These data state that there is a transient bacteriemia linked to the prosthetic infection (14). This is why a prophylactic antibiotic treatment of these patients is necessary.

Laboratory testing of the blood of these patients has proven the presence of the bacteria that have also been isolated from the oral cavity of the patients.

Focal oral infections and bone diseases

Recently, bone diseases have also been linked to the dental foci. In osteomyelitis, the presence of oral microbes (*A.a.*, *P.micrus* and *Eikenella corrodens*) has been proven (29). Lately, periodontitis has been linked to the rheumatoid arthritis because rheumatic patients experience the loss of an increasing number of teeth, the loss of alveolar bone (30) and the increase in general serum

immunoglobulin G (31). Prophylactic measures are the prevention and the reduction of the damage of periodontal tissue in the patients with rheumatoid arthritis.

Spontaneous premature birth

Many risk factors, such as smoking, alcohol consumption, drug abuse, infections etc, can lead to premature birth. Many recent researches also list a periodontal disease as a risk factor (32,33). It has been found that future mothers who suffer from periodontitis have a 7.5 times greater risk of premature birth or delivering babies with smaller birth weight than pregnant women with healthy gums (34,35). This condition is explained by the existence in pregnant women of „chronic“ source of lipopolysaccharides stimulating the production of $IL-1\beta$ and prostaglandine E₂ that are linked to the premature birth (36). The presence of *F.nucleatum* in the amniotic fluid of women who have had premature births has also been confirmed, but further studies are necessary to confirm this bacterium of oral origin and its possible paths of action.

CONCLUSION

Starting from the known facts, one can conclude that the microorganisms can get from their foci via blood stream to the remote tissues and organs and cause pathological changes. Newer literary data state that even bad oral hygiene and oral infections, especially the periodontal disease, can lead to bacteriemia and thus cause various system diseases.

Since oral foci are of infective nature as they are caused by the microorganisms of the dental plaque, the basic step in their prevention is the fight against oral infection. The primary roles in that fight are played by maintenance of oral hygiene and regular medical controls. There is also the obligatory treatment of teeth destroyed by caries, but also the reduction of periodontal disease by adequate therapeutic procedures. Basically, all preventive measures applied in the prevention of caries, but also the prevention of periodontitis, can lead to a significant improvement of oral health.

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PARODONTOPATIJA KAO RIZIČNI FAKTOR ZA OPŠTA OBOLJENJA

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SAŽETAK

Fokalne infekcije mogu se definisati kao infekcije koje se javljaju na različitim lokalizacijama u organizmu izazvane mikroorganizmima (ili njihovim produktima) usne duplje.

Usna duplja može biti mesto pojavljivanja mnogih infektivnih i inflamatornih oboljenja koja se odnedavno povezuju sa sistemskim bolestima. Dentalne procedure (ekstrakcija zuba, endodontsko lečenje i dr. među kojima je i parodontalna terapija, mogu da provociraju prodor oralnih mikroorganizama dentalnog plaka u krvni tok i limfni sistem. Kod ovakvih slučajeva bakterijskog delovanja na tkiva i organe, posle izvesnog vremena, dolazi do njihovog multipliciranja i nastanka oralnih fokalnih infekcija.

Neka oboljenja, kao što su infektivni endokarditis, infekcija glave i vrata, respiratorne infekcije, oboljenja digestivnog trakta, kožna oboljenja, koštana oboljenja i prevremeni porođaj, javljaju se kao posledica transmisije bakterija iz dentalnog žarišta.

Novija istraživanja, kao rizični faktor, navode i parodontalno oboljenje. Hronična parodontopatija potencijalno ima najjaču epidemiološku i moguću mehaničku udruženost sa ovim sistemskim oboljenjima.

***Ključne reči:* parodontopatija, oralni fokus, opšta oboljenja**