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Periodontal treatment as a preventive tool against secondary infections in chronic patients

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Abstract

Objectives: The main objective of this article is the establishment of a follow-up preservation of periodontal compromised patients, establishing criteria of returns based on the presence or absence of comorbidities that alter their periodontal and systemic stability.

As a secondary objective, to provide information to the multidisciplinary team that accompanies these individuals, a greater range of information from the dental team, relating odontogenic infections of periodontal origin that may have systemic, debilitating complicating potential, often can be fatal.

Keywords: Periodontal treatment preventive tool chronic patients establishment

Introduction

Periodontal disease has affected humans since the Neanderthals, observations made in studies in antiquity, where by Hippocrates of Cos (460-337 BC) has been described as an inflammatory manifestation of the gums in the face of the accumulation of "pituite", or calculus with gingival hemorrhage. There are some of Herbology and medicine of the ancient East, which discussed the first forms of treatment with infusions began [41]. The main characteristic described was the verification of its most striking trait, the loss of tissue insertion and the bone support adjacent to the teeth. There was a remarkable bone loss in mummies skeletons, where some rudimentary dental prostheses were found, as an attempt to replace the lost teeth and reestablish the mechanical and aesthetic function of the dental elements. All cases studied showed the indelible mark of bone destruction of large extensions [50]. The theory that diseases had a fluidic or spiritual origin was the most accepted until in the 18th century when the first correlations with agents considered foreign to the human body began.

1. Discussion

The main issue to be addressed in the connection between periodontal disease and its relationship with systemic diseases, is its potential to alter vascular metabolism throughout the body, not only local, through the activation of an entire sequence of immunological reactions, especially in the production of cytokines that cause potentially disastrous effects on the general health of patients already compromised in their chronicities.

1.1. What are systemic chronic diseases

To understand systemic chronic diseases, it is necessary to understand the criteria that classify these diseases. In public health, such a group of diseases is classified according to epidemiological criteria of risk, incidence, prevalence, morbidity, mortality [22].

In incidence, it evaluates the number of cases of the disease in a given location and period of time. It will measure how often a disease reaches the population at target site of observation.

Risk according to epidemiology is the probability of the occurrence of a disease, injury or death or health-related condition whether recovery, cure or even death, in a certain period of time.

Prevalence assesses and measures that disease factor that continues to affect the finished group of people and remains for a certain period of time.

Morbidity is what measures the number of individuals affected by a disease at a given time.

And mortality will be the record of the number of deaths in a group of people whether by the disease or not. Usually the mortality coefficient is the index calculated to determine the number of deaths from a disease. It differs from lethality which is exactly the indicator of death caused by a given disease in a given observation period.

In all the classification criteria described above, chronic diseases of greater importance in public health are related, and with the highest percentage of affected individuals worldwide. They are medical conditions such as cardiovascular diseases (heart diseases, hypertension, ischemic and circulatory diseases, diabetes (type 1 and type 2), liver diseases (hepatitis, cirrhosis, liver failure), respiratory diseases (asthma, pneumonia, chronic obstructive pulmonary disease, emphysema), orthopedic diseases (osteoporosis, arthritis, rheumatism) and mental disorders (anxiety disorder, bipolar disorder, depression, schizophrenia, drug addicts and psychoactive substances).

The present article is aimed at controlling the manifestations of these systemic diseases in the oral cavity, as well as performing the early diagnosis of infections of oral origin with the potential to negatively affect the medical control of these diseases. In this regard are all periodontal diseases.

1.2. Definition periodontal disease and its mechanism

A periodontal disease according to its broadest definition is a multifactorial inflammatory infectious disease that affects the gingival tissues, periodontal ligaments, bone support, and soft tissues around dental elements. The mechanisms of action that alter and compromise the immunological defenses of the individual, periodontal diseases affect about 35% of the world population, and 50% are adults.

The main clinical sign of disease is gingival bleeding, which corresponds to the first stage of the disease, the gingivitis, is characterized by swelling, bleeding and mild pain.

Gingivitis is considered the reversible phase of the disease, an inflammatory reaction of the gums to chemical aggression is observed by the formation of dental biofilm, and there is no destruction or loss of supporting tissues of the dental element. After changes in hygiene habits and professional intervention with prophylaxis, scaling and root planing, and responses are positive with regression of the inflammatory condition until it disappears completely. Its incidence is quite common during the childhood since the first dentition, and can be recurrent throughout the life of the individual. However, it can cause no significant damage to general health.

As structural changes in gingival tissue are observed, such as misalignment and increased volume, the loss of bone tissue adjacent to dental structures is also radiographically identified. At this stage a more advanced and irreversible picture is found: periodontitis. It is exactly at this stage, due to bone loss, that the so-called periodontal pockets are formed, which are the structures responsible for maintaining viable bacteria with greater virulence and greater aggressiveness against the host, the anaerobic bacteria.

Once it is a multifactorial disease, it is observed that periodontitis, has as a principle, the presence of anaerobic bacteria (which do not need oxygen to survive) and therefore form a group of microorganisms of medical importance, due to the absence of techniques and medications capable of making them innocuous in the medium and long term with effective perpetuance.

The action of this group of bacteria, mostly Gram negative, exacerbate the immune response of the host, which cause the migration of defense cells from the organism, cause bone loss,

which is the most evident characteristic of the disease. Through the production of bacterial cytokines are attracted to the surface of gingival tissue, neutrophils (mostly PMNs) attracted by the chemotaxis of il-8, leucotrienes, and the complement system C5a, which then promote the attraction of also cytokines pro-inflammation causing the characteristic edema of gingivitis. Over time, the antimicrobial action of lymphocytes and neutrophils and fibroblasts lose strength, probably due to an apoptosis, an increase of a leukocyte infiltrate is observed. From this stage clinical changes can be seen, which can vary in intensity and duration according to the individual responsiveness of the host. It is expected that continued plaque deposition in the biofilm, there will also be an increase in the amount of leukocytes near the margin of the gingival sulcus and an increase in exudate, observing that the areas of collagen destruction become more extensive and gradually there will be a distancing of the gingival tissues and dental wall that would previously be made by collagen insertion fibers. Here, there is an increase in cellular migration of defense coming out of the vessels to the tissues, generating local congestion, which could facilitate the entry of bacteria present at the site for the light of the endothelium in the affected region, opening doors for bacterial invasion of the circulatory system^[17, 23].

The periodontal pockets go deeper and the epithelium expands towards the apical region of the teeth, along with the growth of the plaque that follows in the same direction creates the environment conducive to the colonization of anaerobic bacteria. According to the evolution of bacteremia, the host response will be to increase the area compromised by the infiltration of PMNs, and approaching B and T cells that will be in place will also assist in the immune barrier, while the PMNs will phagocyte the invading cells by opsonization^[17]. Acting together with the complement system, lymphocytes are attracted that will work to prevent the fixation of microorganisms in tissues. There are some theories that suggest the presence of plasmocytes in this region would be a difficulty or inability of the individual to an adequate immune response in combating the process of immediate or long-term bone loss. Some variations in the Fc molecules of activation of the complement C5a would also explain the variations in susceptibility of each person. We can then think that the joint action of antibodies and their functionalities generate a more effective response and that determines how resistant the individual would be to periodontal diseases^[17, 22, 23].

1.3. The Vascular diseases

In vascular diseases, this process of inflammatory modulation governed by the reactions of chemotaxis of cells of the immune system shoots the patient with high rates of cholesterol and triglycerides, a response of the walls of the endothelium that facilitate the detachment of thrombi, which are rich in collagen and calcium². Before adhering to vessel walls, this phenomenon ends up considerably elevating embolythic thrombus events, such as myocardial infarctions and STROK^[2, 10, 11, 12].

Interleukin 1 (IL-1), Interleukin 6 (IL-6) and Tumor Necrosis Factor- α (TNF- α) formation triggered by the inflammatory reaction that happens in periodontal diseases, have an intimate relationship with the loss of elasticity and tonicity of the endothelium that surrounds the arteries. In addition, they also pave the way for bacteremia itself to circulate in the bloodstream, and by its flow, to have access to certain areas of the patient's organism, which would previously be preserved^[3]. In case of bacterial invasion, a powerful enemy

is faced when we advocate in the treatment of patients with cardiovascular and diabetic diseases, without taking into account that many of them have an association of several other comorbidities related to themselves [10, 11, 12, 23].

In many cases, the association of comorbidities such as heart disease and hypertension is present in middle-aged adults with a history of infarction and detection of periodontal pockets greater than 3.5 mm [12, 24]. Greater attention should be given by the healthcare providers in monitoring the conditions of individuals, since only periodontal treatment of support punctually does not offer the necessary safety without a change in the patient's hygiene habits concomitantly [11, 12, 23].

The most common infections of the circulatory system, which include the cardiovascular system and cerebral vasculature, occur in 15% of susceptible patients, and about 5% of them are unaware of their risk condition [7, 10, 11, 12]. The procedure of greatest infectious risk is tooth extraction followed by the treatment of dental foci such as carious cavities or endodontic treatments. Inflammations and chronic gingival infections usually occupy the third position and are usually the most neglected since patients live with their symptoms and reflexes for long periods of time, often confused with transient cases of inflammation [12, 22].

1.4. The type 1 and 2 diabetes

Regarding the evaluation of diabetic patients, attention is due to the point where diabetes is a trigger of periodontal disease and vice versa [14, 15, 16]. These statements refer us to the diabetic patient and his natural or acquired inability to metabolize lipids, proteins and carbohydrates and when they are unbalanced (decompensated) they become the predisposing factor to the increase of inflammatory markers that trigger an immune response to bone resorption in the dental arch [3]. In this regard, the prevalence of anaerobic bacteria (*Porphyromona gingivalis* and *Prevotella intermedia*) tends to rise, providing an contamination of heart valves (prosthetic or bioprosthetic), thrombus colonization in brain abscesses, and orthopedic prostheses [31, 32, 34]. In several studies, biochemical signaling of positive results was evidenced by a significant decrease in Hb1a (Glycated Hemoglobin) indices [14, 15, 16, 19, 20].

The main tool in the infectious control of diabetic patients is basic periodontal treatment involving professional prophylaxis, scaling and root planning, accompanied by oral hygiene instruction to maintain hygiene habits compatible with the individual needs of each patient [8, 9, 14, 18, 32, 34]. New technologies for the association of photo biomodulation with periodontal supportive treatment are equally effective in the control of local bacteremia [18, 19, 43, 43].

1.5. The liver diseases

During the evaluation of diseased liver patients, generalized alteration of several periodontal indices was identified in a group of patients being treated for liver cirrhosis. In addition, a reduction in mortality due to the disease associated with the treated group of periodontitis was also pointed out when compared to an untreated group of the same dental condition. In several other studies, other oral manifestations of different diseases such as candidiasis, petechiae, ulcerations and angular cheilitis have been demonstrated [36]. Furthermore to mucosal problems, cases of xerostomia related to the treatment of cirrhosis also arose. Bacteria are also present in the citations of postoperative infections in patients undergoing liver transplantation, as mentioned in the case of *Streptococcus viridans* in dental extractions indicating these

patients the infection prior to transplantation [35, 36].

We should also mention *Epstein-barr* (Ep-B) and *cytomegalovirus* (CMV-2) viruses are directly related to plaque of peri-implant regions, and therefore may in future studies demonstrate that peri-implantitis represents a possible reservoir of these two pathogens in the oral environment, and could systemically affect liver function [35, 37].

1.6. The pulmonary diseases

As aggressive as viral diseases, light is shed on the fact that pulmonary pathologies are among the most responsible for hospitalizations or critical care in ICUs around the world. The participation of important oral microbiota bacteria, such as *Porphyromona gingivalis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* [21, 30], have already been reported as agents of severe lower respiratory tract infections and worsening of chronicities such as COPDs and causing aspiration pneumonia [21, 25, 30]. The most affected patients are the elderly and bedridden patients [28, 29], which facilitate the development of respiratory disorders, and because they are naturally immunologically weakened [15, 28, 30, 44]. Periodontal pockets with depths above 3 mm have been considered important adjuvants in cases of recurrent pneumonia [25], due to the chronic inflammatory character perpetuated by periodontitis.

Studies indicate that 48 hours after ICU admission, patients already have gram-negative periodontal bacteria in the oropharynx region, and many of those who have undergone mechanical ventilation have facilitated the passage of these microorganisms to the lower respiratory tract. Very important to warn that between 50 and 70% of nosocomial pneumonias are fatal. All this can be controlled when there is systematic surveillance of the oral hygiene condition of patients, and oral health maintenance protocols that include photobiomodulation [43] (use of brushes, dental floss and hygiene accessories indicated in each case), being monitored by dentists trained for the critical profile of the hospital environment [1, 15, 44, 45, 48].

1.7. The rheumatic and orthopedic diseases

In the group of orthopedic diseases, our comments focus on autoimmune diseases with important systemic repercussions such as rheumatoid arthritis and ankylosing spondylitis. Arthritis are autoimmune diseases that shares biochemical and immunological characteristics with periodontal diseases, where the activity of inflammatory cytokines such as TNF- α , act on the processes of bone resorption characteristic in both diseases [17]. For ankylosing spondylitis, which shares similar symptoms with other diseases such as psoriasis and inflammatory bowel disease, a high prevalence of periodontal disease was observed, combined with the presence of *Porphyromona gingivalis* [31]. With the use of indices for rheumatologic diagnosis (BASDAIS) and (ASDAS) in addition to PCR and Elisa [42] tests, rheumatic activity can be mapped before and after periodontal treatment. In addition to the reduction of symptoms such as joint pain and swelling, bleeding rates and periodontal pocket depth are decreased with completed therapy, and periodically controlled [31, 32, 42].

1.8. The mental disorders

The last group proposed as a chronic disease in our discussion, comprises the clinical reality of several disorders that are among the most growing in the world: mental disorders.

The advance in therapeutic strategies and medications with

better results and reduced adverse effects are the focus of the medical vanguard and in the classification for the treatment of the various mental conditions that require professional attention [52]. Among the greatest challenges in the clinical control of these patients are the challenge of stability for patient cooperation and adherence to the varied nuances of their individual needs. Of all the symptoms, the most critical control is undoubtedly xerostomia and the loss of enamel structure caused by adverse muscle effects by the use of medications. The decrease in salivary flow by the action of cholinergics can induce not only the increase in the formation of cavities, but also the propensity to mucosal injuries, and in more advanced cases, the appearance of malignant tumors (squamous cell carcinoma). The low quality of oral hygiene, associated with halitosis and the development of periodontitis also alter the already delicate immune balance and in critical phases, also increase of cortisol and adrenaline dramatically raise the destructive potential of periodontal diseases [54]. Nutritional, drug and oral hygiene follow-up allow us an earlier detection of any negative events, facilitating a quick and efficient approach in the short term.

From a strategic point of view, there are some gaps to be filled in the multidisciplinary team that should receive greater attention. Studies on oral hygiene and inflammatory screening in hospital admissions show the resident team has neither training nor knowledge of examination techniques related to dentistry and its premises. The evaluation criteria in preoperative admission, critical care in the ICU and palliative care in hospitalization were evaluated through research, and all the steps performed by a nursing team [38]. Statistics results presented reflected the impressions and personal experiences of each professional, and there was no scientific basis in decision-making or care strategies. In 43% of the cases, the most severe inflammatory processes were identified late, while in 23% of the institutions that maintained a dental department, this event was only observed in 17% of the records [39].

2. Conclusion

In clinical practice there is a great need for the insertion of the dental professional in the interdisciplinary teams, helping the diagnosis of infections being early and offering opportunities for the best approach can be taken according to the individual condition of the patient.

In addition to all biochemical and imaging tests, an oral screening that includes visual inspection and palpation of oral and perioral structures, verification of plaque indexes and probing by bag depth, as well as tongue coverage plate. The presence of caries foci should also be taken into account, as well as prosthetic and corrective parts, whether fixed removable and their conditions of use and hygiene. Remembering the motricity and quality of individual hygiene can often be one of the morbidities of the main disease of the individual, an important part to be observed.

During periodontal evaluation, the identification of critical and risk points should consider the plaque index according to the time and area criteria in which the biofilm accumulates, also the presence of dental calculus. The completion of a periodontal chart would be the best way to register initial, since using 6 probing points, a technique that generates reliability, being easy to reproduce at the time of a future reassessment. It is also necessary to emphasize the quality of the information reproduced by the periodontal chart, which indicates the presence of periodontal pockets with a depth greater than 3mm, and its areas of eminent risk for an

infectious process.

Supportive periodontal therapies such as professional prophylaxis, hygiene instruction and their particularities in each case increase the chances of periodontal scaling and removal of retention factors work as preventive tools of high reliability and easy applicability [8, 9, 14, 32, 34]. Allied with processes of mechanical removal of biofilm and calculus, we should also remember that chlorhexidine solutions 0.12% and 0.2% are extremely efficient as antimicrobials and there is an extensive literature that demonstrates the safety of its use systematically.

It is important to note many cases of salivary flow reduction, the dosing schedule and the drugs of choice for the treatment of the main disease and its comorbidities influence the buffering action of saliva, which not only facilitates the accumulation of biofilm, but also reduces local immunity, creating new points of fragility also for soft tissues [1, 10].

Nowadays, there is a great commitment to develop new approaches to infections and the increasing difficulty in finding treatments that are effective and have less impact on patients' health. Furthermore, prevention has been neglected not only due to the lack of criteria and routines in healthcare, but also by the gap left in the assessments of the oral health condition of patients. In regard to this, it is essential the collaboration among healthcare professionals, working their techniques and knowledge, whatever they are in, outpatient or hospital. Healthcare should be a set of tools Science based which encompasses the individual as a whole, and Periodontics has been a neglected area of dentistry in the integral care of patients.

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