

EUROPEAN INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY
RESEARCH AND MANAGEMENT STUDIES

VOLUME04 ISSUE04

DOI: <https://doi.org/10.55640/eijmrms-04-04-15>

Pages: 99-107

TREATMENT OF PERIODONTAL DISEASES USING LOW-INTENSITY MAGNETIC LASER
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ABOUT ARTICLE

Key words: Qualitatively, the severity of dental pathological processes increases, the effectiveness of dental treatment decreases, the predisposition to disease relapse increases.

Received: 14.04.2024**Accepted:** 19.04.2024**Published:** 24.04.2024

Abstract: The major dental diseases, dental caries and chronic inflammatory periodontal disease, belong to infectious diseases in their pathogenesis, and their development and progression are due to a disruption of the host-microbe system balance. There is much evidence that when the normal composition of the oral microbiota is compromised and the content of conditioned or conditionally pathogenic microorganisms increases quantitatively or qualitatively, the severity of dental pathological processes increases, the effectiveness of dental treatment decreases, and the predisposition to disease relapse increases.

INTRODUCTION

The major dental diseases, dental caries and chronic inflammatory periodontal disease, belong to infectious diseases in their pathogenesis, and their development and progression are due to a disruption of the host-microbe system balance. There is much evidence that when the normal composition of the oral microbiota is compromised and the content of conditioned or conditionally pathogenic microorganisms increases quantitatively or qualitatively, the severity of dental pathological processes increases, the effectiveness of dental treatment decreases, and the predisposition to disease relapse increases. Compared to healthy individuals, patients with more pronounced clinical manifestations of major dental diseases have been demonstrated to have persistent violations in the composition of the oral microflora and dental plaque. Thus, against a background of caries activity, the content of acid-resistant streptococci in plaque increases, and inflammatory disease activity in periodontal tissues is characterized by an increase in the number and species diversity of

Gram-negative anaerobic rods in plaque above and below the gingiva [1-2]. All of the above indicates that hygiene measures play an important role in the complex treatment of inflammatory periodontal disease and dental caries. Authentic personal oral hygiene is an integral part of the prevention and treatment plan for all major dental diseases at various stages. The main task of personal oral hygiene is the mechanical removal of non-mineralized plaque. However, mechanical cleaning alone may not be sufficient to normalize the microbial ecosystem of the oral cavity and reduce the pathogenicity of microbial biofilms. The concept of "directional control (or modification) of the microbial ecosystem of dental plaque," first proposed in the 1990s, is a microbial ecosystem characteristic of healthy oral organs and tissues to restore and maintain the activity of pathogenic pathogens and their impact on the microbial composition of dental plaque [3]. The main methods to orient the composition and properties of dental plaque are: - normalization of the natural antimicrobial defense mechanisms of the oral cavity - violation of microbial homeostasis and limitation of conditions that contribute to the selective growth of pathogenic bacterial flora - use of antimicrobial agents acting on the pathogens of dental diseases caused by infection. Among the methods that influence the composition and properties of dental plaque, topical antiseptics with antimicrobial and anti-adhesive properties occupy an important place. Topical antimicrobials must meet a number of requirements, including high antimicrobial efficacy, broad efficacy against representatives of the conditioned pathogenic microflora in the oral cavity, absence of microbial resistance to the drug, and marked side effects [4]. A method of application of topical antiseptics with proven efficacy is their inclusion in the composition of personal oral hygiene products. Currently, topical antiseptics are widely used in toothpastes and mouthwashes. Chlorhexidine bigluconate and triclosan are the most popular antimicrobial ingredients used by leading toothpaste manufacturers. Besides hygiene products, these preservatives are used in many other hygiene and cosmetic products. Chlorhexidine bigluconate (a compound belonging to the cationic biguanide class) has been widely used in the medical field for decades. Chlorhexidine's antibacterial spectrum includes a wide range of bacteria, including those of plant origin, many fungi, and shell viruses. Bactericidal concentrations of this drug lead to disruption of cell membranes. Chlorhexidine, due to its long-term bacteriostatic action, prevents microbial growth for at least 6 hours after drug administration. However, it should be kept in mind that the extent and nature of chlorhexidine's antimicrobial action (bactericidal or bacteriostatic) is dose-dependent. Chlorhexidine bigluconate exhibits the broadest antibacterial spectrum at high concentrations (>0.2%). Trizolone is traditionally used as the primary hygienic carrier for chlorhexidine. Its formulation can provide the required therapeutic concentration, and the inclusion of stabilizing additives in the composition significantly improves the stability and bioavailability of the drug [5-6]. Numerous clinical studies have confirmed the high efficacy of

chlorhexidine-containing rinses as anti-inflammatory and decongestant agents. The introduction of chlorhexidine into toothpastes has long been problematic. The reason is that anions (both inorganic and organic) are incompatible with chlorhexidine, which has cationic properties. Abrasives traditionally used on dentures interact with chlorhexidine, and chlorhexidine is rapidly deactivated during storage. Recently, a unique abrasive system has been proposed that allows chlorhexidine to be incorporated into dentifrices. However, the clinical efficacy of chlorhexidine-containing dentifrices has not been well studied. In the only paper evaluating the anti-inflammatory and anti-plaque effects of chlorhexidine-containing dentifrices, the authors concluded that the additional therapeutic and preventive effects compared to conventional fluoride-containing dentifrices were not clinically significant [7]. There is also the question of whether the remineralizing properties of the new abrasive-containing dentifrices are fully preserved. The ultimate answer to this question can only be obtained by long-term clinical studies on the anti-caries effects of these dentifrices. In addition to limitations in hygiene product selection, topical use of chlorhexidine in individual oral hygiene programs may be limited by a number of undesirable side effects. The main side effects of chlorhexidine are described in the literature as follows: - staining of teeth and other surfaces of the oral cavity - increased tartar formation - temporary reversible changes in taste perception. The new generation of agents used to combat plaque deposition and pathogenicity are non-cationic antimicrobial agents. Triclosan is a representative of this group. Triclosan belongs to a group of antimicrobial agents with a broad antimicrobial spectrum and high efficacy, confirmed by over 40 years of experience in use. Triclosan is found in hundreds of cosmetics and hygiene products [8]. The rationale for triclosan use in dentistry is its broad-spectrum antimicrobial activity against opportunistic oral microflora [9]. Triclosan is compatible with other components of hygiene products, which was an important condition for the widespread use of triclosan as an alternative to chlorhexidine. The success of its clinical use as a topical antiseptic is due to the unique combination of the following properties of triclosan: - High efficiency even at very low concentrations - Fast acting and resistant to all types of bacteria - Safe for human consumption - Very low allergenicity and non-toxicity - Acts on antibiotic-resistant bacteria Acts on antibiotic-resistant bacteria. - The clinical success of triclosan in infectious inflammation may have been facilitated by its properties of direct anti-inflammatory action by inhibiting the production of inflammatory mediators [10]. The safety of triclosan has been demonstrated in numerous studies, including long-term use. At the doses actually used, there are no toxic, allergic, mutagenic, or teratogenic effects of triclosan, and the drug does not accumulate in organs or tissues. In 1989, DeSalva et al. concluded, based on an analysis of published data on the pharmacological and toxicological properties of triclosan, that "triclosan is a safe drug and can be recommended for inclusion in oral

hygiene products." [11] Bagley DM, Lin YJ. 2002 found that 0.3% triclosan-based toothpaste for 12 weeks and found no cumulative effect of triclosan in the mode of brushing with 1.25 g of paste three times a day [12] In 2004, the FDA published a report on the results of daily use of toothpastes with high triclosan content. According to FDA experts, there are no cases in the scientific literature of complications associated with the use of triclosan-based toothpastes or mouthwashes. no evidence of clinical complications associated with the use of FDA-approved oral hygiene products containing triclosan has been detected by the FDA. the FDA has not found any cases of complications associated with the use of triclosan-based oral hygiene products, even though they are widely sold as over-the-counter drugs. concluded that the "margin of safety" for the use of this toothpaste, even when available, is adequate [13]. Results of clinical microbiology studies have shown that the use of triclosan in toothpastes and other oral hygiene products can reduce oral contamination by pathological microorganisms, given sufficient exposure time (3-5 minutes of brushing). Antimicrobial properties also account for the anti-mite effect of triclosan. Studies on the optimal concentration of triclosan in the composition of oral hygiene products have shown that a concentration of 0.3% most effectively reduces plaque accumulation. However, the effect of triclosan used alone in the composition of hygiene products (e.g., mouthwash) was significantly lower than that of therapeutic concentrations of chlorhexidine: 1) in combination with zinc citrate, which has been proven to destroy plaque adhesion and prevent tartar formation; 2) in combination with PVM/MA copolymer; and 3) in combination with PVM/MA copolymer. The PVM/MA copolymer has been proven to prevent adhesion and increase the residence time of triclosan in the oral cavity. The latter combination is the most widely used in daily practice. In vitro and clinical studies have confirmed that the antibacterial and anti-plaque effects of triclosan in toothpaste and mouthwash in combination with polyvinyl methyl ether PVM/MA maleate are comparable to those of chlorhexidine-based mouthwashes. Compared to other triclosan-based formulations, the composition of "0.3% triclosan/2% PVM/MA copolymer" inhibits soft plaque deposition much more effectively and prevents tartar formation [14]. The latter property distinguishes this composition favorably from chlorhexidine. Chlorhexidine, on the contrary, promotes the mineralization of microbial biofilms with the formation of supragingival tartar. The unique combination of properties - an anti-plaque effect on soft plaque similar to chlorhexidine and a marked inhibitory effect on tartar deposition not present in chlorhexidine - has determined the popularity of hygiene products based on triclosan-copolymer complexes. The triclosan-PVM/MA copolymer complex is patented under the trade name Gantlet* and is part of Colgate Total toothpaste. Colgate Total became the first triclosan-containing dentifrice to receive approval from the U.S. Food and Drug Administration (FDA). The following are the results of clinical studies on the main therapeutic and preventive effects

associated with the regular use of triclosan-copolymer complex-based hygiene products: clinically significant prevention of soft plaque and tartar formation, elimination of halitosis (bad breath), anti-inflammatory effects that help eliminate gingivitis, pathological processes of periodontitis Inhibition of. Effect of toothpaste containing triclosan-copolymer PVM/MA complex on the prevention of gingivitis and plaque formation Data from numerous long-term clinical studies now confirm the positive effect of Colgate Total toothpaste on the reduction of gingival inflammation and microbial plaque deposition compared to conventional fluoride-containing toothpastes observed. Observed reductions in plaque deposition (by the Quigley-Hein index) ranged from 12 to 59%; reductions in gingival inflammatory changes by the Silness-Loe gingivitis index ranged from 19 to 32% [15-24]. These data indicate that the effect of exposure is not limited to a reduction in the severity of gingivitis, but can also prevent the progressive development of inflammatory lesions throughout the periodontal tissue complex. Thus, in a 36-month long-term study, Rosling B et al. (1997) found that in patients with a high predisposition to periodontitis, the prevalence of deep periodontal pockets, progressive loss of depth of attachment, and the number of bone resorption sites were reduced with regular use of Corrugate Total toothpaste compared to controls The results also showed that the subgingival microflora There was also a significant quantitative and qualitative reduction in the content of opportunistic bacterial species in the subgingival microflora [25]. Ellwood RP et al. (1998) found that regular use of toothpaste containing triclosan polymer complex was associated with a significant reduction in tooth and gingival attachment in young adults aged 3 to 36 months . According to various researchers, use of "Corrupt Total" toothpaste statistically significantly reduces tartar deposition by 23-36% compared to conventional fluoridated toothpaste. Effect of Toothpaste Containing Triclosan-Copolymer PVM/MA Complex on Halitosis Prevention and Removal Halitosis prevention and removal are mainly related to the suppression of volatile sulfur compound-producing microorganisms and the prevention of the development and progression of inflammatory diseases in periodontal tissue Clinical Studies Sreenivasan P... , 2003 Data show that after 4 hours of brushing teeth with toothpaste containing triclosan copolymer, contamination by volatile microorganisms producing sulfur compounds was reduced by 52% and 72%, respectively, compared to brushing teeth with conventional fluoride-containing toothpaste. Long-term use of triclosan copolymer toothpaste reduced total bacterial contamination of saliva by 49%, including a 66% reduction in the content of bacteria causing halitosis, compared to the action of conventional fluoride-containing toothpaste [30]. Toothpaste containing triclosan copolymer complexes have been shown to effectively remove halitosis organically and prevent halitosis stagnation for at least 7-12 hours [31, 32]. Caries-preventive effect of toothbrushes containing triclosan-PVM/MA complexes Clinical evaluation of the caries-preventive effect of Colgate Total

toothbrushes has been conducted in a number of long-term clinical trials, and the use of antibacterial toothbrushes is fully comparable to the clinically proven effect of fluoride-containing toothbrushes, with a high reliability and preventive effect [33, 34]. The use of antimicrobial toothbrushes is fully comparable to the clinically proven carioprophylactic effect of fluoride-containing toothbrushes [33, 34]. Subsequently, the clinical efficacy of regular use of a corrugated total toothbrush for caries prevention was further demonstrated [35]. Mann J., et al. 2001, in a 2-year clinical follow-up study of a group of more than 3,300 individuals, compared with a conventional fluoride-containing brush, the use of this brush was found to have a 2 12.2% and 16.6% reduction in caries intensity after a two-year follow-up [36]. Given the widespread use of topical preservatives in everyday cosmetics and hygiene products, the potential risk of strains resistant to these products naturally became problematic. The rationale for such a hypothesis was based on data from laboratory studies on the basic potential for previously susceptible strains to acquire resistance in the presence of low concentrations of preservatives. Results from several in vitro studies were also presented, indicating that residual concentrations of disinfectants may be a factor in selecting for antibiotic-resistant bacteria. The similar "target of action" of biocides and antibiotics also indicates the possibility of cross-resistance.

CONCLUSIONS

The incorporation of methods to improve the oral microflora in complex treatment and prevention measures improves the effectiveness of prevention and treatment of major dental diseases and contributes to the stability of results achieved by favorable changes in the microbial composition of subgingival marginal plaque. The use of oral hygiene products containing antiseptic ingredients is an effective way to treat infectious dental diseases: a corrugated total toothpaste containing 0.3% triclosan and 2.0% PVM/MA copolymer (based on 0.32% sodium fluoride/pyrogenic silicon oxide) forms dental plaque and tartar. It inhibits this process, preventing the development of gingivitis and reducing its severity. The clinical efficacy of Colgate Total Antimicrobial Toothpaste is significantly higher than conventional fluoridated toothpastes. Dynamic studies of the oral microbiota have shown that long-term use of corrugated total dentifrice (up to 1 year) does not cause detrimental changes in the oral microbiota toward the growth of opportunistic and pathogenic flora and helps to reduce the quantitative and qualitative content of pathogenic microbes in saliva and dental plaque. A better understanding of the pathogenic factors of periodontal disease and their complex effects on the microbial system would be a promising direction for improving prevention and treatment methods in dentistry.

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