

Short Communication

The Impact of Gingivitis Control on the Management of Periodontitis

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Abstract

The supragingival plaque control need has been sustained by the concept of the periodontal disease as an opportunistic infection. This concept relies on the fact that the supragingival biofilm has been proven to be essential for the establishment of the subgingival biofilm, this opportunity arising through a retro-feeding process between the supragingival biofilm formation and maturation and the inflammatory response. Since decades, the impact of the supragingival plaque control has been recognized as an important factor to modulate the subgingival response, regarding clinical, microbiological, and immunological indicators. These studies collectively underscore the supragingival control as essential not only for prevention of periodontal disease and maintenance of therapy results but also for the treatment of periodontitis, favoring subgingival inflammation reduction as well as the stability of attachment levels. Thus, it can be concluded that an adequate supragingival control is essential for the quality of periodontal therapy, migrating from a second-plan intervention to a unique unquestionable importance.

ABBREVIATIONS

PPD: Periodontal Probing Depth; PFZ: Plaque Free Zone; SPG: Supragingival Biofilm Control; BOP: Bleeding on Probing; SRP: Scaling and Root Planning; CAL: Clinical Attachment Loss; PMP: Periodontal Maintenance Period; PRA: Periodontal Risk Assessment

INTRODUCTION

Since the classic experimental study by Loe et al., in 1965 [1], evaluating the consequences of the establishment and control of the supragingival biofilm over the marginal soft-tissue inflammation, gingivitis has gained attention. These observations collectively with the comprehension that gingivitis precedes periodontitis consolidated the supragingival conditions as central in the periodontal field [2,3]. This subject became renowned due to a series of publications from the 11^o European Workshop in Periodontology, when gingivitis was consolidated as important in not only the prevention and maintenance of therapeutic results but also for the treatment of periodontitis [4]. Since decades, different authors have carried out studies that pointed out to the same direction [5-12].

In particular, the relevance of the supragingival environment over the subgingival one is supported by the understanding of the influence it has on the formation and modulation of the subgingival microbiota [13,14]. Accordingly, supragingival biofilm accumulation causes an initial marginal inflammatory response that increases the gingival revicular fluid flow, local edema, and marginal bleeding. Besides providing host-defenses components, those alterations propitiate metabolic substrates and important growth factors for anaerobic and proteolytic

bacteria. While an increase in the periodontal probing depth (PPD) occurs due to edema, the depletion of oxygen and production of carbon/hydrogen dioxides by bacteria maintain an anaerobic environment. Additionally, bacterial metabolism promotes reduced pH and temperature elevations that are essential for competitiveness and aggressiveness of some species. As consequence, a simultaneous shift to a biofilm with anaerobic, proteolytic, and Gram-negative species occurs, while an increase in the total bacterial load is also observed [14,15]. Consequently, there is a greater challenge to the host, that responds by increasing the inflammatory response, retro-feeding the process [13,16]. To a certain extent the studies on plaque free zone (PFZ) [17-22] encompass this subject. The first publication from Weidlich et al. [19], showed that after a period of supragingival biofilm formation (96 h), a plaque free zone disappears while an increase in inflammatory response is seen, propitiating the so-called ideal conditions for subgingival biofilm establishment, growth, and maturation. These observations are in accordance with the concept of periodontal disease as an opportunist infection [13,14], which emphasizes the beginning of the supragingival biofilm accumulation with a domain of Gram-positive aerobic saccharolytic bacteria, which evolves with time, to that dominated by Gram-negative, anaerobic, and asaccharolytic species, this shift being simultaneous to the inflammatory process and vice-versa. Under this comprehension, considering the role of the retro-feeding process between bacteria and inflammatory conditions, a series of studies was developed in order to better understand and to confirm the relevance of the gingivitis control [10-12,23-25].

RESULTS AND DISCUSSION

In 2007, a single-arm clinical trial was performed including 50 participants [10]. For a time period of 180 days, moderate-to-severe periodontitis patients received weekly appointments for supragingival biofilm control (SPG) and oral health instructions. The results showed that the SPG alone was able to significantly reduce the percentage of sites containing the presence of supragingival biofilm and gingivitis, as expected; it also reduced the percentage of sites that revealed bleeding on probing (BOP) and the PPD mean values. Interestingly, it was observed that no participant lost periodontal attachment during the entire period. Nevertheless, the study published in 2014 [12] corroborated those results. Over a split-mouth clinical trial design, 25 patients with chronic periodontitis received, per quadrant, one of the following treatment protocols: 1) only SPG (1 quadrant); 2) SPG, scaling and root planing (SRP), simultaneously (2 quadrants); and 3) SPG at day 0 and SRP (1 quadrant) 30 days after. The study was conducted over 450 days, during which the patients were reevaluated and administered oral hygiene orientations without subgingival approach (2.2 ± 1.64 months interval). The authors observed that the three treatment protocols propitiated significant changes on supragingival biofilm and gingivitis levels, as well as reductions in PPD, BOP, and clinical attachment loss (CAL). As presumed, greater reductions in subgingival indicators occurred on quadrants that received subgingival interventions. Alternatively, the authors highlighted that considering the need of subgingival intervention as a result of the presence of CAL plus BOP, the need of subgingival intervention was reduced by almost 50% in Group 3. These findings are interesting, in particular, because during 450 days of evaluation, none of the therapy groups showed CAL. Thus, it can be proclaimed that the supragingival control favors the stability of the subgingival area, reinforcing its importance. Nevertheless, this subject was also evaluated in patients with mucositis [24]. In this study, it was observed that the supramucosal biofilm control determines reductions in PPD, BOP, and stability of CAL as does the SPG, in the same patients, when comparing implants and teeth in a split-mouth design.

A recent study [26] showed the impact of the SPG during the periodontal maintenance period (PMP). In a randomized clinical trial, 62 patients with moderate-to-severe periodontitis, were treated and allocated to receive: 1) only SPG, or 2) SPG plus subgingival scaling. During 2 years of PMP it was observed that all clinical indicators (plaque and gingivitis indexes, PPD, BOP, and CAL) presented improvements or stability, with no intergroup differences. These results, corroborating those by Jenkins et al. [8], and Heasman et al. [27], suggest that the SPG is essential to maintain periodontal health during the PMP and also interrogate the need of subgingival interventions.

Microbiological and immunological analyses were also performed with the sample from Gomes et al., 2007 [10]. The microbiological investigation used the real-time polymerase chain reaction technique to evaluate the behavior of subgingival bacteria species during the 6-months-supragingival control in periodontitis patients [11]. It was observed that a significant decrease of total bacteria (Eubacteria domain) and subgingival species were commonly associated to periodontitis: *Porphyromonas gingivalis* [28-30], *Parvimonas micra* [29,30],

Dialister pneumosintes [29,31-33], and *Aggregatibacter actinomycetemcomitans* [34,35]. The immunological analysis, exploring only interleukin 1- β from gingival crevicular fluid, showed that SPG was able to promote significant reductions of this inflammatory indicator over time [23]. In a PhD thesis [36], the subgingival microbiological behavior during the first year of the PMP [26] was investigated. The results showed no intergroup differences in total bacterial counts (Eubacteria domain), as well as in the counts of the red complex bacteria (*Porphyromonas gingivalis*, *Tannerella forsythia*, and *Treponema denticola*); the mean counts of all target species remained at low levels ($\leq 10^3$) throughout the study [36].

One of the biggest challenges to the periodontists is to establish the maintenance routines, and essentially, to detect or decide about the time interval needed by each patient in order to maintain therapy results. Lang and Tonetti [37], when proposing the periodontal risk assessment (PRA), worked on this important subject. The PRA gives information about the level of "risk" of the progression of periodontitis, based on clinical, systemic, and behavioral individual characteristics of the patient. A publication from Butze et al., 2015 [25], uncovered other important issue on supragingival studies. Using the PRA, and under the hypothesis that the SPG is an important instrument to modulate the subgingival environment, the authors showed that while changing the subgingival inflammatory pattern, the supragingival control alters the risk estimation for progression of periodontal destruction. Even though the PRA is not an instrument for such investigation, that is, during therapy, the results from Butze et al. [25], also revealed the impact that the SPG has on the management of a periodontal patient, whether during or after therapy.

CONCLUSION

Collectively, these results with the those stated by other authors [6,7,38-40], including epidemiological data on prevalence of gingivitis [41-43], reinforce the need of a good SPG performed both by dentists, in time-interval appointments, and patients, under professional orientation, in a daily practice. The combination of these supragingival control interventions are comprehended as essential in all steps of periodontal care, from prevention to periodontal maintenance, passing over the concept of the supragingival control as a simple and second-plan step of periodontal interventions.

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