Group B
Reactor Report
Non-surgical periodontal therapy: mechanical debridement, antimicrobial agents and other modalities

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Introduction

The Initiator Paper for this discussion group by Feres *et al.* (2015), is a well balanced and objective review of most of the non-surgical treatment modalities suggested in the recent decade either as adjunct or supplemental measures to mechanical debridement.

Periodontal diseases are opportunistic infections caused by a proliferation of putative periodontal pathogens in a susceptible host and in an ecologic environment conducive to the colonization of periodontal niches with strict anaerobic bacteria. Consequently, the treatment of periodontitis must be anti-infective in nature and address both the composition of the bacterial colonization as well as the environmental factors that made it possible for pathogenic microorganisms to establish and proliferate. Hence, treatment of periodontitis is not only aimed at the eradication of the pathogenic microbiota, or at least the significant reduction of it, but also at influencing the environment to the extent that a health-associated instead of a strictly anaerobic microbiota may be established in periodontally diseased sites. This, in turn, means that physico-chemical conditions with a high partial pressure of oxygen (pO_2), a high redox potential (Rh) and a neutral or low pH are promoted through the therapeutic measures.

Probably the most effective therapy to achieve these goals is the mechanical debridement of the diseased sites by scaling and root planing. While the always improved clinical outcomes are undisputed, residual pocket environments may occasionally lead to conditions for re-infection or recolonization of the sites with residual pockets. Hence, it is imperative to treat the oral cavity as one ecological system rather than addressing only single sites for therapy.

The necessity of mechanical debridement as the gold standard of care has been clearly demonstrated (Feres *et al.,* 2012). Moreover, it becomes clear that mechanical debridement is not only a treatment modality, but an essential treatment for all periodontitis sites, and, hence, the outcomes of additional or supplemental measures will have to be compared to this gold standard. Because mechanical debridement is associated with some loss of tooth substance and repeated instrumentations may, therefore, result in considerable damage to the hard structures, additional measures of non-surgically eliminating biofilm may help to minimize such undesired side-effects of the very effective mechanical debridement, especially in patients in periodontal supportive therapy.

Photodynamic therapy (PDT) and lasers

The use of photodynamic therapy (PDT) may provide welcome supplemental measures in order to reduce the loss of tooth substance usually encountered with conventional repeated mechanical debridement. Moreover, clearly improved clinical outcomes in residual pockets were demonstrated in a study of patients in supportive periodontal therapy (SPT) and multiple applications of PDT, while the regular maintenance debridement failed to demonstrate improvements in both pocket depth (PD) and clinical attachment level (CAL) in the residual pockets (Lulic *et al.* 2009). Therefore, further randomized clinical trials (RCTs) ought to elucidate positive outcomes of PDT in combination with scaling and root planing (SRP) in maintenance patients.

Regarding the use of other lasers, it may be stated that the investment in expensive machines neither facilitates the debridement procedure nor improves the clinical outcomes of debridement. Many more well-controlled studies have to be performed before lasers can be recommended to the clinician for routine periodontal therapy.

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Full mouth disinfection and full mouth scaling and root planing

Commonly, non-surgical periodontal therapy is performed in stages in weekly to biweekly intervals. In order to avoid the hypothetical spread of bacteria from not yet treated sites to the freshly treated sites, the concept of full mouth disinfection or full mouth scaling and root planing within 24 to 36 hours has been advocated and promoted as being a superior way of delivering care than by the staged approach. Numerous studies and two systematic reviews have, indeed, revealed that differences in clinical outcomes, if admittedly present in certain locations and root configurations, are minimal and clinically of limited relevance. Consequently, it may be stated that all debridement protocols may be effective irrespective of their modality of delivery, and, hence, the clinician may choose the protocol most suitable for the practice and the patients' needs.

Use of antiseptics adjunctive to mechanical debridement

Ever since the introduction of antiseptics as adjuncts for the prevention of biofilm formation and the development of gingivitis (Löe and Schiøtt, 1970), the use of antiseptics has been advocated as an adjunct to mechanical biofilm control in various situations and indications. Antiseptics have to be recognized according to their substantivity as first and second generation antiseptics. While first generation antiseptics yield high substantivity, and, consequently, are released from the reservoirs within the oral cavity over longer periods of time (8-24 hours), second generation antiseptics may only be active for short periods owing to limited substantivity. Only the bis-biguanides (chlorhexidine) have been recognized as first generation antiseptics and result in optimal clinical outcomes, while all other antiseptics may have limited preventive effects even if they yield antibacterial activity *in vitro*. The biofilm preventive effect of antiseptics is most reliably tested by applying the experimental gingivitis model, in which during a three-week period of abolished oral hygiene procedures, a placebo control would result in a generalized gingivitis owing to biofilm accumulation. Test solutions of antiseptics may prevent biofilm formation to various degrees (usually 20-30%), while chlorhexidine has proven to reduce biofilm formation by 80-100% owing to its high substantivity. Consequently, gingivitis is prevented by applying this antiseptic drug. It has to be realized that the significant preventive effect of the antiseptics is aimed at the control of the supragingival plaque reservoir, and, hence, may affect the development of gingivitis. However, in periodontitis patients, the microbiota in the deep pockets is not effectively attacked. Rinsing or irrigating pockets is, therefore, a non-substantiated regime of limited clinical value. Nevertheless, when the supragingival plaque reservoir is to be depleted, first generation antiseptics are welcome adjuncts to mechanical debridement.

Unfortunately, effective antiseptics have side effects that affect their selection for long-term routine use. These are the development of discolorations, especially on teeth and prostheses, and a short lasting taste impairment for the salty taste modality. Recently, industry has promoted chlorhexidine rinsing with the addition of an anti-discoloration system (ADS). However, in testing the microbiological effects of these products using the Zurich biofilm *in vitro* model (Hofer *et al.*, 2011), the test solution was able to reduce biofilm formation by 3 log steps compared with a negative (water) control. However, this was significantly less effective than the positive control (standard chlorhexidine solutions) which reduced viable counts by 6 log steps. Both the test and control solutions exhibited staining on all surfaces. A subsequent *in vivo* study applying the experimental gingivitis model (Li *et al.*, 2014) clearly demonstrated that the combination of a chlorhexidine solution with an ADS was ineffective in preventing biofilm formation and was unable to prevent gingivitis from developing over the three weeks.

Local antimicrobial delivery

When using local antimicrobial agents for the treatment of residual pockets, it has to be realized that the release kinetics of the carrier system of the drug are extremely important. In order to be effective in attacking the microbiota in the pocket, the antimicrobial agent must be released over a long enough time (at least 7-10 days) in a high enough concentration that corresponds to at least 100x the minimal inhibitory concentration (MIC) of *in vitro* activity against the biofilm bacteria. Very few release systems present with such kinetics, and, hence, very few products can be recommended for controlled release of local antibiotics. However, with appropriate kinetics the application of controlled release local antibiotics has been demonstrated to be very effective, yielding good clinical outcomes. They are best used as adjuncts to a systematic mechanical debridement at single residual pockets or for the treatment of reinfected sites during supportive periodontal therapy. Moreover, they are welcome adjuncts in the treatment of peri-implant diseases.

Systemic antibiotics as part of periodontal therapy

The key question to be answered regarding the adjunctive use of systemic antibiotics is, indeed, what is the role and what are the priorities of the administration of antibiotics in the treatment concepts of chronic periodontitis. While there is clear evidence to incorporate an antibiotic regime in the treatment of aggressive

periodontitis, chronic periodontitis is generally successfully treated without the use of antibiotics. For aggressive periodontitis, the eradication of pathogens such as *Aggregatibacter actinomycetemcomitans* requires the use of a combination of amoxicillin and metronidazole, owing to the fact that *A. actinomycetemcomitans* is not strictly anaerobic, but rather a facultative anaerobic bacteria. This organism seems to penetrate into the tissues and should be eradicated to avoid re-infection. Obviously, mechanical debridement does not eradicate *A. actinomycetemcomitans*, while other major presumptive pathogens are usually present below detection levels following mechanical debridement.

For chronic periodontitis, however, there is no need for the use of antibiotics owing to the effectiveness of the mechanical debridement process. However, in recent years well conducted studies demonstrated that the administration of the amoxicillin/metronidazole regime for 7 to 14 days in addition to full mouth scaling and root planing may result in fewer residual pockets needing additional therapy when compared to a placebo group (Cionca *et al.*, 2009; Silva *et al.*, 2011; Feres *et al.*, 2012, Goodson *et al.*, 2012). These studies have opened the debate concerning the priority of the use of antibiotics in the treatment of chronic periodontitis. At present, there is not enough evidence to routinely recommend antibiotics as adjunct to mechanical debridement. Similar to the application of controlled release devices, systemic antibiotics should be reserved for specific indications. Never should they be given to compensate for poor biofilm control or in place of adequate mechanical debridement.

Concluding remarks

Even though various treatment regimes and protocols have been suggested in recent years, the undisputed concept of mechanical debridement has priority over all other modalities in the treatment of chronic periodontitis. The cost-benefit analysis is an often times neglected issue when new approaches are evaluated. Hence, patient-centered outcomes have to be studied in relation to the clinical benefits and in the light of environmental factors.

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