One-Stage, Full-Mouth Disinfection: Fiction or Reality?

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Recent research indicated that periopathogens colonize, besides the pockets, also other niches within the oral cavity including: the soft tissues, the saliva, the tongue, and even the tonsils. Since the supragingival plaque and the bacteria in these niches have a major impact on the subgingival plaque colonisation but especially on the recolonation after debridement, it seems reasonable to expect that a one-stage, full-mouth disinfection protocol, involving the bacteria over the entire oro-pharyngeal area, has a significantly better outcome when compared to a more staged approach (e.g. with treatments per quadrant). Since several review papers recently discussed the benefits of a one-stage, full-mouth disinfection protocol, pointing to some shortcomings in the our research protocol or with an attempt to compare the data of the new approach with other studies (with unfortunately non comparable approaches), this review paper aims to clarify some of the confusion concerning the benefits of a one-stage, full-mouth disinfection approach.

Key words: periodontal breakdown; periodontopathogens; mouth disinfection

INTRODUCTION

Periodontal breakdown primarily develops when the microbial load within a periodontal pocket overrules the local and systemic host defence mechanisms. Such an imbalance occurs in different situations, including an aspecific increase in the total amount of bacteria, an outgrowth/overgrowth of pathogenic species above a certain threshold level and/or a reduction in the efficiency of the immune response. Actinobacillus actinomycetemcomitans, Tanneralla forsythensis and Porphyromonas gingivalis are still considered key periopathogens, but species such as Prevotella intermedia, Campylobacter rectus, Peptostreptococcus micros, Fusobacterium nucleatum, Eubacterium nodatum, Streptococcus intermedius and spirochetes are also linked with periodontal destruction (American Academy of Periodontology, 1996; Slots and Rams, 1991; Socransky and Haffajee, 1992; Wolff et al, 1994). The efficiency of the host defence is partially hereditary (Kinane and Hart, 2003) but environmental factors such as bad oral hygiene, smoking, immunosuppressive medication, stress and so on can further impair the immune defence mechanism.

Since, so far, the susceptibility of the host cannot be modulated at a clinical level, with the exception of anti-inflammatory medications, periodontal therapy is focused on the reduction/elimination of periodontopathogens in combination with the re-establishment, often by surgical pocket elimination, of a more suitable environment (less anaerobic) for beneficial microbiota. Several studies indeed indicate that the presence of the above-mentioned periodontopathogens (persisting or re-established after treatment) was associated with a negative clinical outcome of perio-

dontal treatment (Cugini et al, 2000; Haffajee et al, 1997; Renvert et al, 1996; Renvert et al, 1998; Socransky et al, 1998).
After mechanical debridement the subgingival microbial load drops to 0.1% (Goodson et al, 1991; Maiden et al, 1991). However, one week later the periodontal pocket is already re-colonized by the initial number of bacteria, fortunately with a less pathogenic composition (Harper and Robinson: 1987; Wade et al, 1992). The origin of these bacteria is still a matter of debate. The multiplication of remaining bacteria within the pocket (Petersilka et al, 2002), or within either the junctional or pocketepithelium (Lamont and Yilmaz, 2002) and/or the dentinal dentine tubuli (Adriaens et al, 1988; Giuliana et al, 1997) is often considered the major cause for this subgingival re-colonization.
The impact of the supragingival area on this early subgingival re-colonization was considered negligible. The availability of two-stage implants allows investigation into how a sterile abutment surface inserted in a gingival wound created above an endosseous implant is colonized. A recent study revealed that these "pristine" pockets showed a mature microbial flora within one week with a composition nearly identical to the one in the existing neighbouring periodontal pockets (Quirynen et al, 2005). This indicates that, even when only a supragingival origin is allowed, a fast subgingival colonization still occurs. The role of the supragingival microbiota on the subgingival (re)colonization was so far underrated.
In this perspective, the one-stage, full-mouth disinfection was proposed by the Leuven team (Quirynen et al, 1995) as a new treatment strategy. It aims at eradicate, or at least suppress, all periodontopathogens in a very short time span, and this not only from the periodontal pockets but from all oro-pharyngeal habitats (mucous membranes, tongue, tonsils, saliva). As such, the re-colonization of the treated pockets by bacteria from untreated sites (called cross-contamination or intra-oral translocation) could indeed be delayed until a better healing of the pockets could be achieved. A series of prospective studies confirmed the original data (Bollen et al, 1996; Bollen et al, 1998; De Soete et al, 2001; Mongardini et al, 1999; Quirynen et al, 1995; Quirynen et al, 1999; Quirynen et al, 2000; Vandekerckhove et al, 1996).

The one-stage full-mouth disinfection concept consists of a combination of therapeutic efforts:

- A full mouth scaling and root planing (the entire dentition in two visits within 24 hours (i.e. two consecutive days) to reduce the number of subgingival pathogenic organisms (Loos et al, 1988; Mousques et al, 1980),
- An additional subgingival irrigation (three times repeated within 10 minutes) of all pockets with a 1% chlorhexidine gel in order to suppress the remaining bacteria (Oosterwaal et al, 1991),
- Tongue brushing with a 1 % chlorhexidine gel for one minute to suppress the bacteria in this niche (Quirynen et al, 1999),
- Mouth rinsing with a 0.2 % chlorhexidine solution for two minutes to reduce the bacteria in the saliva (Schiott et al, 1976) and in the pharynx, including the tonsils (by gargling).
- Optimal oral hygiene, supported during the first two months by a 0.2 % chlorhexidine mouth rinse (Magnusson et al, 1984) to retard the re-colonisation of the pockets.

Our abovementioned studies were designed as "proof of principle" experiments. In the control groups a fast re-colonization of the treated pockets could occur during the long time-intervals before completion of the debridement of all quadrants (in total six weeks). Furthermore, only patients with severe periodontitis (pockets ≥ 7mm) and with a lot of supra and subgingival plaque and calculus were selected. Finally, patients were instructed to follow the oral hygiene instructions only for the treated quadrants, leaving the other quadrants with a poor plaque control. In the test group, on the other hand, a thorough reduction of the bacterial load within the oropharynx was achieved within one day. This did not only consist of debridement of all periodontal pockets within two consecutive days, but also included an extensive use of chlorhexidine in all niches for periopathogens (including the tongue). These aspects of the test and control groups have to be considered when the outcome of the Leuven studies is compared with those of other papers.

REFLECTIONS IN RELATION TO REVIEW PAPERS

In 2004 no less than four review papers (Barteczko and Eberhard, 2004; Eberhard, 2004; Greenstein, 2004; Koshy et al, 2004) were published on the one-stage, full-mouth disinfection strategy. The data of the Leuven studies were often incorrectly quoted or interpreted for aspects highlighted and discussed in this paragraph.

- An often reappearing remark is the fact that in our studies the baseline probing depths and attachment levels were measured immediately after scaling and rootplaning. This was unavoidable since the patients enrolled in the studies showed significant amounts of supra and subgingival calculus, a factor that renders pocket probing prior to scaling unreliable (Clerehugh et al, 1996). However, since this method had been applied in both test and control groups, it cannot contribute to differences between both treatment strategies. It only renders a comparison with other clinical trials less obvious.
- The results in the control group have been considered to be below what one can expect from a thorough mechanical debridement. One should take into consideration that these patients did not receive any additional periodontal therapy over the entire eight months period. Due to the lack of oral hygienists in Belgium, the overall degree of plaque control obtained was sometimes not optimal, since it would have implied too frequent recall sessions at the University Hospital. Moreover, the longer the interval up to the completion of the last quadrant (six weeks), the more opportunity for bacterial translocation, especially since the compliance with optimal oral hygiene reduces with time. Nevertheless, the data reported in the large scale study (Mongardini et al, 1999) seems reasonable when compared to the review of the literature (Cobb, 1996; Cobb, 2002). The single and multi-rooted teeth with pockets ≥ 7mm (mean 7.5mm) showed a reduction of 1.9 and 1.6mm for chronic adult periodontitis patients, and 2.2 and 1.9mm for early onset periodontitis patients (mean initial depth 8.0mm), respectively, observations which are in line with the 2.2mm reported by Cobb, especially when the range of data within his review are considered (for ≥ 7mm pockets: 1.7 – 2.2mm).
- Even more convincing is the significance of the microbial improvements with the one-stage, full-mouth disinfection approach when compared to the standard therapy. This is generally neglected, although this superiority was clearly illustrated in several papers (De Soete et al, 2001; Quirynen et al, 1999). The microbiologists involved, using culture techniques or DNA-DNA hybridization, were always masked for the performed therapy. Thus these observations deserve even more attention.
- The role of chlorhexidine in the full-mouth disinfection protocol can be questioned. We only analysed this in one pilot study (Quirynen et al, 2000). In this trial a third group (one-stage, full-mouth scaling and root planing without further disinfection with an antiseptic) was added to an already running study. The design of this pilot study is not optimal and bias of the examiners cannot be excluded. A large-scale study is recommended in order to verify these findings, as mentioned in the paper itself. This does not impair the validity of the concept.

REFLECTIONS IN RELATION TO SIMILAR PAPERS WITH SIMILAR TREATMENT STRATEGIES

Another paper questioned the outcome of our studies (Apatzidou and Kinane, 2004). Considering their study, one must, however, keep the following aspects in mind:

- The patients in the latter study were only suffering from moderate periodontitis.
- A one-stage, full-mouth disinfection was not performed since no antiseptics had been applied.
- The full-mouth scaling and root planing was completed within one session so that a Schwartzman reaction, which is related to the second bacteraemia (24 hours after the first session), could not occur.

The authors admit that "The analysis of deep pockets showed a significantly greater relative gain in attachment level for the full-mouth scaling and root, planing group compared to the quadrant scaling and root planing group between baseline and R2 (= 25 weeks after therapy). Nevertheless, we have to take into consideration the low number of sites with deep pockets" (Apatzidou and Kinane, 2004).

In a paper by the group of Sanz, comparing four different treatment strategies with five patients in each group, the one-stage, full-mouth disinfection protocol confirmed its superiority (probing depth reduction and gain in attachment) towards a quadrant by quadrant strategy. The small number of subjects rendered the finding of statistical significance difficult (Casas et al, 2005).

CANDIDATES FOR A ONE-STAGE, FULL-MOUTH DISINFECTION APPROACH

Since the one-stage, full-mouth concept especially envisages the prevention of an intra-oral cross contamination, the approach will offer the largest benefits in specific clinical conditions.

- Severe Periodontitis
  Since the salivary levels of periopathogens increase significantly with increasing severity of periodontitis (Dahan et al, 2004; von Troil-Linden et al, 1995) the chance for cross contamination will be higher in these patients. Indeed, two recent studies clearly illustrated that the microbial load in the saliva is significantly reduced in periodontitis patients after therapy. This reduction was responsible for a reduced rate of de novo, supragingival, plaque formation (Dahan et al, 2004; Rowshani et al, 2004). Thus in patients with severe periodontitis a one-stage, full-mouth approach will result in an immediate reduction of the microbial load and as such in a delayed de novo plaque formation (Sekino et al, 2004) which implies a delayed subgingival re-colonization.
- Ample Plaque and Calculus Accumulation
  Since the supragingival plaque contains both viable aerobic and anaerobic bacteria (Tan et al, 2004), especially patients with high levels of supragingival plaque and calculus are candidates for cross contamination. They will benefit most from a one-stage, full-mouth approach. Supragingival plaque control indeed is of major importance in lowering the risk of bacterial translocation (Socransky et al, 2002; Socransky and Haffajee, 2002).

RISK FACTORS AND PATIENTS' APPRECIATION

It is of course correct to state that before new treatment methods can be introduced into daily "dental" practice, it is indispensable to compare the new therapeutic approaches with existing and proven treatment methods (Barteczko and Eberhard, 2004). In the one-stage, full-mouth disinfection protocol there are no risks, neither for the patient's health nor for bacterial resistance. These aspects are to be considered, especially when systemic antibiotics are envisaged by some. Eventually, the patient can be allergic to chlorhexidine, but this incidence is extremely low - around 50 anaphylaxis cases world-wide over the past 10 years (Beaudouin et al, 2004).

ECONOMIC ASPECTS

Both for the patient as well as for the clinician economic advantages can be mentioned. Most patients indeed seem to prefer this strategy (Mongardini et al, 1999) because of an easier practical organisation (two instead of four appointments, thus less transportation, and a better understandings by all other infectious diseases that the patient had so far had been treated in one global approach. The clinician can work for two hours with the same patient, limiting intervals between patients. The chair time becomes more efficient and there is no need for replacement of instruments and other material. In our clinic better compliance with the appointments was observed.

CONCLUSIONS

Tradition is always powerful. If some authors question the validity of our observations because they could not confirm them it is due to the limited number of patients with advanced periodontitis and/or ample plaque accumulation. If these two key factors for bacterial translocation are minimal or absent it is understandable that the superiority of a one-stage, full-mouth disinfection may not clearly appear. Whether the use of an antiseptic is crucial needs further investigation.

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