New Methods In Conservative Periodontitis Treatment

The following case study illustrates the effectiveness of a treatment concept for the decontamination of root surfaces colonized with subgingival biofilm using low-abrasive powder jet technology. The aim of this case study was to evaluate the clinical and microbiological results during conservative periodontitis therapy using a low-abrasion subgingival air polishing system (AIR-N-GO PERIO®).

By Prof. Dr. Wolf-Dieter Grimm

Periodontal diseases, as established by the growth of invasive microorganisms, represent infectious diseases of the periodontium, which is characterized by destruction of the periodontal tissues, including the periodontal ligament, the root cementum, the alveolar bone and the gingiva (see Fig. 1). Marginal periodontitis is an opportunistic infection (Fig. 2) which is caused by a gram negative, anaerobic, range of bacteria and is resulting in a chronic inflammation of the periodontal tissues (Socransky and Haf- faz 1992).

The progressive loss of periodontal tissues and attachment can be observed in the majority of the population. Based on epidemiological studies (Fig. 3) a prevalence of chronic marginal periodontal disease in the population over the age of 35 in Germany is approx. 40-45%, while approx. 35% of this age group suffers from a moderate (approx. 25%) to severe form of periodontitis. It has also been possible, however, to observe moderately severe (approx. 13%) and severe (approx. 5%) forms of periodontal diseases in individuals.

In the case of other people (seniors), almost one in two exhibits inflammatory-destructive changes (moderately severe/severe) of the periodontium (DMS, 2006).

Conservative therapy can prevent the disease from progressing (Sauter et al. 2004). Therefore the mechanical supragingival and subgingival removal of calculus and plaque is the primary objective of conservative periodontal therapy which is achieved by a two- to three-time plaque control, prophylactic curettage and root planing. Manual or ul- trasonic scaling instruments are employed (Drilke 1998, Sauter et al. 2009). Caries and for the investigations, the use of mechanical scaling systems has become estab- lished because they make cleaning of the root surfaces easier, causing less fatigue and using more efficient for the dental treatment teams (Drilke et al. 1995, Oda et al. 2004).

In addition to the decontamination processes already described, the in- tention in this case study is to illustrate the effectiveness of an innovative method for biofilm removal – low- abrasion air polishing technology – as part of a cutting-edge conservative periodontitis therapy. Air polishing instruments have been successfully used for a long time, particularly in the hands of restorative and professional tooth cleaning. Expansi- on of their use include subgingival surfaces loaded with biofilm has been associated with significant disadvan- tages as there were no suitable instru- ment attachments available and only one perform- ance points according to Slots (1986).

The paper point was inserted down to the base of the pocket; then after ten seconds, then removed without blunting and placed im- mediately in the test tube provided for the test. The evaluation was carried out for the patients examined. The test tube contained a buffer which pre- served the amino acids of the bacteria during the transport time. Molecular biology tests, such as the LIA PicoTest 4+® of the Institute for Applied Im- munoassay (IAL, Switzerland) used in our investigations, employ small syn- thetic DNAs complementary to the ribosomal RNAs in order to analyze bacteria (such as A. actino- myctecencomitans/Aa, T. forsythien- sis/TV, P. gingivalis/T. denticola/Td). Furthermore, the total bacterial load (LEP) was measured as a mar- ker for periodontal infection. For pa- tient testing, we additionally used the classical microbiological methods (cf. Third and Fourth Fig. 2) developed by the Institute for Applied Im- munoassay (IAL, Switzerland). Statistical methods, the periodontal pockets were classified into five types based on the various clinical and applica- tion patterns.

The advantage of this type of the periodontal pockets is that it records the complexity of the clinical and microbiological examination results using a single classification code thus making it easier to identify their clinical significance.

Statistical evaluation
When the investigations were com- plete, the values of the variables: clinical attachment level (CAL), bleeding on probing, calculus and probing depth (PD) and gingival recession (GR), were determined and evaluated descriptively. The Wilcoxon signed- rank test was used to compare the original data with findings after application of the low-abrasion, so- matically assisted air-polishing system. The statistical tests were carried out using the SPSS statistics program.

Results
Demographic data
All the patients of the institute in the inves- tigation (n = 15) remained in the study for the entire observation period of three months; there was no change in the number of patients recruited. 56.6% of the patients recruited were female and 43.4% were male. The recruitment of the patients in the study was 37.5%. All the patients were examined in agreement with the study protocol.

Clinical parameters
The AIR-N-GO PERIO group showed an average gain in clinical attachment six weeks post-operatively of 0.30 ± 0.04 mm for all the periodon- tia treated (mean reduction in the probing depth of 0.30 ± 0.02 mm) and for areas on the microbiological study tooth a gain of 0.67 ± 0.01 mm (mean reduction in the probing depth of 1.85 ± 0.58 mm). After three months, there was a change in the microbiological study of 1.85 ± 0.58 mm in 15 patients who had baseline chronic periodontitis even on 15-year old ado- lescents, almost one in two exhibits biological parameters were recorded before starting, immediately after intervention (microbiological investigations only), after six weeks and after three months (Tab. 1). After the preparative treatment had been carried out successfully and the patients had received a verbal and written explanation, those included in the study signed an informed consent and written declaration in accordance with the Helsinki Decla- ration (following amendment of the 4th World Medical Assembly, Hong Kong, September 1989).

Preparative treatment
All patients were involved in prepara- tive treatment following the initial ex- amination. The patients received oral hygiene instruction and professional supragingival debridement as neces- sary. The first phase of the preparative treatment covered a period of at least three and at most five weeks (three to five approximately depending on the patient). The patients should have had a P of approximately 1 within this time period. The preparative treatment included supragingival scaling and polishing of tooth surfaces with the AIR-N-GO SUPRA (Fig. 4). The six polishing wands with a mixed jet of air, water, and at a cleaning powder that has been specially developed to be minimally traumatic to deplete mucosal tissue. The powder’s mineral microstruc- ture and the fineness of the calcium carbonate-based micro-beads protect the tooth enamel, reduce stable and effective cleaning of the tooth surfaces. The tool also reaches difficult areas such as tight interpro- natal spaces.

Clinical parameters
The clinical attachment level (CAL), bleeding on probing (ROP), probing depth (PD) and gingival recession (GR) were determined and evaluated descriptively. The Wilcoxon signed- rank test was used to compare the original data with findings after application of the low-abrasion, soma- tically assisted air-polishing system. The statistical tests were carried out using the SPSS statistics program.

Results
Influence of the AIR-N-GO system on bacterial prevalence

Tab. 1

<table>
<thead>
<tr>
<th>STUDY TOOTH</th>
<th>BASE LINE (BL)</th>
<th>AFTER INTERVENTION (AFTERI)</th>
<th>BASE LINE (BL)</th>
<th>AFTER INTERVENTION (AFTERI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL CAL</td>
<td>6.00 ± 0.93</td>
<td>3.73 ± 0.97</td>
<td>6.00 ± 0.93</td>
<td>3.73 ± 0.97</td>
</tr>
<tr>
<td>ALL PPD</td>
<td>3.73 ± 0.97</td>
<td>2.59 ± 0.97</td>
<td>3.73 ± 0.97</td>
<td>2.59 ± 0.97</td>
</tr>
<tr>
<td>ALL GR</td>
<td>6.00 ± 0.93</td>
<td>3.73 ± 0.97</td>
<td>6.00 ± 0.93</td>
<td>3.73 ± 0.97</td>
</tr>
<tr>
<td>ALL BOP</td>
<td>3.73 ± 0.97</td>
<td>2.59 ± 0.97</td>
<td>3.73 ± 0.97</td>
<td>2.59 ± 0.97</td>
</tr>
</tbody>
</table>

Fig. 1 Development of the moderately severe and periodontal diseases in 35 patients of adults between 1993 and 2007 in percent (3rd and Fourth German Dental Health Study (DMS, 2006). The Institute of German Dentists (IAG) on behalf of the German Dental Association and the Federal Association for Public Dental Health (BZK 2005).

Microbiology
The microbiological investigations (Grimm et al. 1990 and 2005) took place prior to the examinations. The patients were treated immediately after therapeutic inter- vention, six weeks and three months after the conservative periodontal therapy, by selectively detecting the periodontal pathogenic microorganism, supragingival scaling (Fig. 5) described using the

Tab. 2 Mean value and standard deviation of the PD and CAL values for the base line study six weeks and three months post-operatively for all periodontia recorded and for the microbiological study tooth.

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>BASE LINE</th>
<th>AFTER 3 WEEKS</th>
<th>AFTER 6 WEEKS</th>
<th>AFTER 3 MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD</td>
<td>BASE LINE</td>
<td>6.00 ± 0.93</td>
<td>3.73 ± 0.97</td>
<td>2.59 ± 0.97</td>
</tr>
<tr>
<td>CAL</td>
<td>BASE LINE</td>
<td>6.00 ± 0.93</td>
<td>3.73 ± 0.97</td>
<td>2.59 ± 0.97</td>
</tr>
</tbody>
</table>

Fig. 2 REM diagram of the root surface with illustration of the boundary lines of the microscopic examination, the corrective tissue attachment and the intra- alveolar attachment (Gassmann and Grimm, 2008).

Fig. 3 REM diagram of the root surface with illustration of the boundary lines of the microscopic examination, the corrective tissue attachment and the intra- alveolar attachment (Gassmann and Grimm, 2008).

Fig. 4 REM diagram of the root surface with illustration of the boundary lines of the microscopic examination, the corrective tissue attachment and the intra- alveolar attachment (Gassmann and Grimm, 2008).

Fig. 5 REM diagram of the root surface with illustration of the boundary lines of the microscopic examination, the corrective tissue attachment and the intra- alveolar attachment (Gassmann and Grimm, 2008).

Fig. 6 REM diagram of the root surface with illustration of the boundary lines of the microscopic examination, the corrective tissue attachment and the intra- alveolar attachment (Gassmann and Grimm, 2008).
Dental sealants have been recognized as an effective means of caries prevention, particularly in pits and fissure cavities in primary and permanent molars. Children are placed to prevent early childhood caries initiation and to arrest caries progression by providing a physical barrier that inhibits microorganisms and food particles from collecting in pits and fissures. It is generally accepted that the effectiveness of sealants for caries prevention depends on their long-term retention.

Which technique of cleaning the surfaces prior to sealant application, contributes better to the sealant retention rate? It has been long known that remova l of organic and other elements from pit and fissure cavities is essential prior to etching in order to allow bonding of the sealant. The classic technique for removing of the debris prior to sealing is prophylaxis with a non-fluoride toothpaste, however have emerged, such as air-purging, abrasive technics. Air-purging technique with sodium bicarbonate is a non-invasive removal of organic and other elements from pit and fissure cavities, but the depth of the sealant penetration and when combined with acidic etching produce higher mean bond strength. Although it is recommended, never used the standard for sealant application procedure due to equipment cost and complexity of the procedure. Air abrasion with aluminum oxide particles is another alternative for cleaning of the fissures, and also produces roughening of the enamel surface. However, is not a substitute to acidic etching and appears to be inferior to the acid-etch technique for use in public health settings.

When both techniques of air abrasion and air-purging are used, simultaneous bond strengths have been found greater than when enamel is only air-abraded, and thus adhesive dental composites and enameloplasty or reshaping of enamel, is indicated in deep fissures and narrow fissure penetrations, to increase the fissure width and surface area available for etching and bonding.

To increase the fissure width and to данный width and melt, is indicated in deep and narrow pits and fissures. It is generally accepted that enamel is only etched when, initially examined, that 37% of the samples presented with As, 83% P, 51% P, 91% T and 86% T. The proportion of contaminated pits decreased immediately after treatment and increased again after six weeks, and in the third month, but without returning to the original values. Pg exhibited the greatest prevalence of all the species of bacteria at each point; the bacterium was detected in 40% of pits after treatment and in 20% of pockets immediately after therapeutic intervention, in 33.3% after six weeks and in 66.6% in the third month after the AIR-N-GO PERIO treatment.

Til occurred in 60% of all pockets at the initial examination. Postoperatively, the species was only found in 30% (immediately after intervention), 60% (in the sixth week) and 66.7% of pockets after three months.

The similarly high percentages of pg in the categories of the species of the "red complex" (Fig. 1, Til were detected and Pg. 14 were not) belong to a coagulated 77.2% of all pockets prior to treatment, the presence of this complex became lower immediately after intervention (33.3%) and rose moderately after therapeutic intervention and after six weeks irrespective of the form of therapy used. The proportion of pits with only one species of bacteria increased in the third month.

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Current Research on Improving Sealants

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Fig. 4 A. AIR-N-GO SUPER air polisher for connection to the air turbine.

Fig. 5 A partially restored pit, by removing the superficial plaque contaminated layer, acid etching, replacing the sealant material and light curing.

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Fig. 4 Subgingival sampling was carried out using sterile paper points according to Socransky (1984).

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