Periopathological disease, as evidenced by the ground-breaking studies of Lee et al. and Page,8,9 refers to a group of infectious diseases of the periodontium, which are characterised by the destruction of the periodontal tissue, including the periodontal ligament, root cementum, alveolar bone and gingiva (Fig. 1). Marginal periodontitis is an opportunistic infection (Fig. 2) that is caused by a Gram-negative anaerobic range of bacteria and results in chronic inflammation of the periodontal tissue.10

The progressive loss of periodontal tissue and attachment is observed as a consequence of the persistent inflammation. Based on epidemiological studies (Fig. 2), the prevalence of chronic marginal periodontitis in the population over the age of 35 in Germany is approximately 40–45%. Approximately 55% of this age group suffers from a moderately severe and approximately 21% from a severe form of periodontitis.11 Moderately severe (approx. 15%) and severe (approx. 1%) forms of periodontitis have been observed even in 15-year-old adolescents. In the case of elderly people, almost in two exhibit inflammatory and destructive changes (moderate/severe/severe) to the periodontium.12

Causative therapy can prevent the progression of the disease. Therefore, the mechanical supragingival and subgingival removal of calculus and plaque is the primary objective of conservative periodontal therapy, which is aimed at destroying the subgingival biofilm and minimising the periodontal pathogenic bacteria.13 Bacterial biofilms and endotoxins can be removed from the root surfaces effectively by scaling and root planing, for which manual, sonic, or ultrasonic scaling instruments are employed.13–15 According to research, the use of mechanical scaling systems has become established because they make cleaning of the root surfaces easier, result in less fatigue and are more efficient for the dental treatment team.11,12

In addition to the decontamination processes already described, the intention in this case study is to illustrate the effectiveness of an innovative method for biofilm removal—low-abrasion air-polishing technology employed by systems such as the AIR-N-GO PERIO (Acteon Group) —as part of cutting-edge conservative periodontal therapy.

Air-polishing instruments have been used successfully for a long time, particularly in professional tooth cleaning. The expansion of their applications to subgingival surfaces covered with biofilm has been associated with significant disadvantages, as there were no suitable instrument attachments available and only sodium bicarbonate powder could be used as the abrasive agent. This resulted in an inadequate ability to clean root surfaces and the risk of causing surgical emphysema. The AIR-N-GO PERIO (Acteon Group) was performed prior to the basic examination, immediately after therapeutic intervention, and enabled gentle and effective cleaning of the tooth surfaces. Moreover, the spray reaches areas that are difficult to access, such as tight interproximal spaces.

The probing pocket depth (PPD), clinical attachment level (CAL), bleeding on probing (BOP) and gingival recession (GR) were selected as the clinical variabilities. Bacteriological analysis14,15 was performed prior to the initial examination. The study provided an informed consent and written declaration in accordance with the Declaration of Helsinki (following amendment by the 41st World Medical Assembly, Hong Kong, September 1990). All patients were involved in preparative treatment after the initial examination. They received oral hygiene instruction and professional supragingival debridement as necessary. Depending on the periodontal effect, the first phase of the preparative treatment covered a period of at least three and at most five weeks (three to five days). The preparations had to have a Pi score of approximately 1 within this period.

The preparative treatment included supragingival scaling and polishing of the tooth surfaces using the AIR-N-GO SUPRA (Fig. 4). This air polisher works with a mixed jet of air and water, added to which is a cleaning powder that has been specially developed to be minimally traumatic to delicate mucosal tissue. The powder's rounded microstructure and the fineness of the calcium carbonate-based micro-beads protect the tooth enamel, and enable gentle and effective cleaning of the tooth surfaces. Moreover, the spray reaches areas that are difficult to access, such as tight interproximal spaces.

The probing pocket depth (PPD), clinical attachment level (CAL), bleeding on probing (BOP) and gingival recession (GR) were selected as the clinical variabilities. Bacteriological analysis14,15 was performed prior to the basic examination, immediately after therapeutic intervention, and six weeks and three months after the conservative periodontal therapy, by selectively detecting the periodontal pathogenic marker bacteria using gene probe binding (hybridisation).

Subgingival sampling (Figs. 5a & b) was carried out using sterile paper points according to Slots.10 The paper point was inserted down to the base of the pocket, left there for 10 seconds, removed without initiating bleeding and then placed immediately in the tube provided for the test. The samples were
The PROTAPER you have been waiting for
analysed the complexity of periodontal pockets with respect to the study protocol.

Clinical parameters

The AIR-N-GO PERIO group (Table 2) showed an average gain in CAL six weeks post-treatment of 0.50 ± 0.04 mm for the periodontium treated (mean reduction in PPD of 0.50 ± 0.02 mm) and for areas on the microbiological study teeth a gain of 0.87 ± 0.01 mm (mean reduction in PPD of 1.85 ± 0.06 mm). After three months, the AIR-N-GO PERIO group showed an average gain in CAL for the periodontium treated of 2.15 ± 0.04 mm (mean reduction in PPD of 0.50 ± 0.05 mm) and for areas on the microbiological study teeth a gain of 2.13 ± 0.14 mm (mean reduction in PPD of 1.54 ± 0.05 mm).

Table 3: Effect of the AIR-N-GO PERIO system on bacterial reduction (in million pathogens/ml of sulcus fluid).

<table>
<thead>
<tr>
<th>Species</th>
<th>Baseline (x 10^6)</th>
<th>Immediately post-treatment (x 10^6)</th>
<th>After 6 weeks (x 10^6)</th>
<th>After 3 months (x 10^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pg</td>
<td>0.05</td>
<td>0.07</td>
<td>0</td>
<td>0.05</td>
</tr>
<tr>
<td>Tf</td>
<td>2.50</td>
<td>0.25</td>
<td>1.05</td>
<td>0.28</td>
</tr>
<tr>
<td>TBL</td>
<td>1.87</td>
<td>0.25</td>
<td>0.77</td>
<td>0.26</td>
</tr>
<tr>
<td>Td</td>
<td>1.92</td>
<td>0.20</td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td>Td</td>
<td>87.21</td>
<td>42.81</td>
<td>55.21</td>
<td>20.69</td>
</tr>
</tbody>
</table>

The microbiological results in Table 3 showed that the eradication of at least one species of bacteria was achieved. The proportion of sites where at least one species of bacteria was reduced to 0, and three months post-treatment it had almost reached the baseline values again (0.05 ± 0.08 x 10^6). The other species (Pg, Tf and Td) reached concentrations at this time of 0.28 x 10^6, 0.18 x 10^6, respectively. The microbiological situation three months post-treatment showed the colonization of all four bacteria to be at a lower level than at baseline. Pg and Td were at an even lower level at this time than immediately post-treatment. Only Pg showed rudimentary recolonisation at three months after treatment, with an increase to 0.03 x 10^6. Pg had reduced to 0.28 x 10^6 at three months, which signifies a mean elimination of 84 % compared with baseline. Tf exhibited a reduction to 0.20 x 10^6, which corresponds with a mean elimination of 59 % compared with baseline.

Microbiological profile

Microbiological analysis of the pooled samples, based on data not detailed here, after initial examination showed that 57 % of the samples contained 4a; 85 %, Pg; 51 %, Tf; 91 %, Td; and 80 %, Td. The proportion of contaminated pockets decreased immediately post-treatment and increased again after six weeks, but not reaching baseline values.

Pg exhibited the greatest prevalence of all the species of bacteria at each point. The bacterium was detected in 40 % of pockets at all time points immediately post-treatment, in 55.3 % after six weeks and in 6.6 % in the third month after AIR-N-GO PERIO treatment.

Tf occurred in 60 % of pockets at baseline. Post-treatment, the species was only found in 50 % of pockets immediately post-treatment, in 60 % in the sixth week and in 56.6 % after three months.

Td was detected in 65.75 % of all pockets pretreatment. Immediately after therapeutic intervention the prevalence of the species decreased (50 %), and in the sixth week post-treatment increased again only slightly (56.6 %). With an incidence of 60 % after three months, Td almost reached the baseline values and therefore almost complete recolonisation occurred in the periodontal pockets examined.

The similarly high percentage of pockets in which the species of the red complex (Pg, Tf and Td) were detected was striking. Pg, Tf and Td together colonised 77.27 % of all pockets prior to treatment. The prevalence of the complex became lower immediately post-treatment (57.5 %) and rose again in the third month post-treatment (47.2 %). At each point in time in the study, a combination of the four bacteria was found in most of the pockets (55.1 % of pockets at baseline, and 20.8 % and 28.8 % of pockets immediately post-treatment and after six weeks) irrespective of the form of therapy used. The proportion of pockets with only one species of bacteria increased in the third month.

Conclusion

The effect on obligate pathogenic bacteria such as Pg, Td, and Td, which are the most difficult to control in therapy, is very promising. However, it must be noted that this is a reduction in the marker bacteria, not the required elimination of the obligate pathogenic bacteria. Therere- sults indicate that a better long-term outcome can be achieved after classic periodontal therapy using the low-abrasion, sonically assisted air-polishing system.

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