Periodontal disease, as evidenced by the ground-breaking studies of Loe et al. and Page,4,5 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.6

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 form of periodontitis, which is aimed at destroying the root cementum, alveolar bone and surrounding soft tissue.7

Causative therapy can prevent the progression of the disease.8 Therefore, the mechanical subgingival and supragingival 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.9,10 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.11,12 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

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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 aerosols 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 covers supragingival surfaces covered with biofilm that 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 instrument, with its subgingival attachment and specially developed flow chamber (Figs. 3a & b) developed specifically for working directly in the periodontal pocket, is the result of cutting-edge technology in computational fluid dynamics. The adjacent anatomical structures are not endangered and thorough removal of the subgingival biofilm from the root surface reduces marginal inflammation. The initial results presented in this article are part of a clinically and microbiologically controlled and randomised long-term study of the comparative effectiveness of low-abrasion, sonically assisted air-polishing systems and ultrasonically assisted methods within the scope of conservative periodontal therapy.

Clinical study

Fifteen patients who had chronic marginal periodontitis at baseline were treated and re-examined over a period of three months. The clinical and microbiological parameters were recorded pretreatment, immediately after six weeks and after three months (Table 1).

Before the preparative treatment had been carried out successfully and the patients had received a verbal and written explanation, those included in 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 1989).11 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 patient, the first phase of the preparative treatment covered a period of at least three and at most five weeks (three to five appointments). 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 micro-structure 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 variables. Bacteriological analysis 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.13 The paper point was inserted down to the base of the pocket, left there for 10 seconds, removed without irritating bleeding and then placed immediately in the tube provided for the test. The samples were...

Fig. 1: Reflection electron microscope diagram of the root surface with illustration of the boundary lines of the epithelial attachment, the connective-tissue attachment and the intra-alveolar cementum. Further studies of Loe et al. and Page,1,2 refers to a group of inflammatory and destructive processes already described.1,2 It was demonstrated that the glycine powder exerts no adverse effects on the surrounding soft tissue during the air-polishing process. The AIR-N-GO PERIO instrument, with its subgingival attachment and specially developed flow chamber (Figs. 3a & b) was used.
The PROTAPER you have been waiting for
pooled for the patients examined. The test tube contained a buffer, which preserved the amino acids of the bacteria during the transport time.

Microbiological tests, such as the IAI PadsTest 4·5 of the Institute for Applied Immunology in Switzerland used in our study, employ small, synthetic DNA molecules complementary to the ribosomal RNA molecules as probes in order to analyse bacteria (such as Aggregatibacter actinomycetemcomitans (Aa), Tannerella forsythia (Tf), P. gingivalis (Pg), T. denticola (Td)). Furthermore, the total bacterial load (TBL) is a good indicator of periodontal infection. For patient typing, we used the classification system (cluster) also developed by the Institute for Applied Immunology. The periodontal pockets were classified into five types using statistical methods based on the various bacterial distribution patterns. The advantage of this typing of periodontal pockets is that it records the complexity of the microbiological results using a single classification code, thus making it easier to identify their clinical significance.

Once the examinations had been completed, the mean values of the variables—PPD, CAL, BOP and GR—were determined and evaluated descriptively. The Wilcoxon signed-rank test was used to compare the original data with the findings after application of the low-abrasion, sonically assisted air-polishing system. The statistical tests were performed in SPSS.

**Results**

Demographic data

All the participants (n = 15; 56.6% of the patients were female and 43.4% were male) remained in the study for the entire observation period of three months; there was no change in the number of teeth investigated. The proportion of smokers included in the study was 37.5%. All the patients were examined in accordance with the study protocol.

**Clinical parameters**

The AIR-N-GO PERIO group (Table 2) showed an average gain in CAL six weeks post-treatment of 0.30 ± 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).

**Microbiological results**

The results for the four periodontal marker bacteria—Aa, Tf, Pg, and Td—and the total number of marker bacteria (TBL) were recorded. The microbiological results are summarised in Table 4.

As exhibited the lowest concentration at baseline (0.05 x 10^6) of all the species investigated. Six weeks post-treatment the concentration of the bacteria had reduced to 0.28 x 10^6, with three months post-treatment it had almost reached the baseline value again (0.03 x 0.08 x 10^6). The three other species (Pg, Tf and Td) reached concentrations at this time of 0.28 x 0.26 x 0.18 x 10^6, respectively. The microbiological situation three months post-treatment showed the colonisation of all four bacteria to be at a lower level than at baseline.

**Conclusion**

The effect on obligate pathogenic bacteria such as Aa, Pg, 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. Therefore, it is advisable to use classic periodontal therapy using the low-abrasion, sonically assisted air-polishing system. **Table 3** shows the prevalence of all species of the red complex (Pg, Td, and Tf) and the percentage of areas on the microbiological study teeth. The proportion of contaminated pockets decreased immediately post-treatment and increased again after six weeks in the third month, but without returning to the baseline values.

**Table 3**: Mean value and standard deviation of the BOP and GR values at baseline, after six weeks and after three months for the periodontium and for areas on the microbiological study teeth.

<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>Aa</td>
<td>0.05 ± 0.52</td>
<td>0.02 ± 0.05</td>
<td>2.1 ± 0.91</td>
<td>2.19 ± 1.65</td>
</tr>
<tr>
<td>Tf</td>
<td>2.10 ± 0.25</td>
<td>0.0027 ± 0.07</td>
<td>2.07 ± 0.54</td>
<td>2.07 ± 0.57</td>
</tr>
<tr>
<td>Pg</td>
<td>1.92 ± 0.20</td>
<td>0.1727 ± 0.67</td>
<td>2.47 ± 1.49</td>
<td>2.53 ± 0.53</td>
</tr>
<tr>
<td>Td</td>
<td>87.21 ± 42.81</td>
<td>55.21 ± 29.08</td>
<td>55.21 ± 29.08</td>
<td>55.21 ± 29.08</td>
</tr>
</tbody>
</table>

**Table 4**: Effect of the AIR-N-GO PERIO system on bacterial prevalence (in million pathogens/ml of saliva fluid).

<table>
<thead>
<tr>
<th>Species</th>
<th>Baseline</th>
<th>Immediately post-treatment</th>
<th>After 6 weeks</th>
<th>After 3 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aa</td>
<td>0.005 ± 0.07</td>
<td>0.005 ± 0.07</td>
<td>0.005 ± 0.07</td>
<td>0.005 ± 0.07</td>
</tr>
<tr>
<td>Tf</td>
<td>1.03 ± 0.28</td>
<td>1.03 ± 0.28</td>
<td>1.03 ± 0.28</td>
<td>1.03 ± 0.28</td>
</tr>
<tr>
<td>Pg</td>
<td>0.32 ± 0.93</td>
<td>0.32 ± 0.93</td>
<td>0.32 ± 0.93</td>
<td>0.32 ± 0.93</td>
</tr>
<tr>
<td>Td</td>
<td>2.1 ± 0.65</td>
<td>2.1 ± 0.65</td>
<td>2.1 ± 0.65</td>
<td>2.1 ± 0.65</td>
</tr>
</tbody>
</table>

**Table 5**: Microbiological profiles of the pooled samples, based on data not detailed here, after initial examination showed that 57% of the samples contained Aa, 85%, Pg, 51%, Td, 89%, and 51%, and Tf.