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The primary goal of periodontal-therapeutic methods is to introduce a need-oriented individual oral hygiene and to enable and maintain perfect supra-gingival plaque control. After systematic sub-gingival instrumentation of the diseased periodontium, regular mechanical removal of the sub-gingival biofilm by a dentist or a dental hygienist is required. This combination is considered the ‘gold standard’ in periodontal treatment and with consistent application can maintain periodontal health over several decades.

A basic condition for the formation and progression of periodontal disease is an opportunistic infection that is mostly poly-microbial with pathogenic micro-organisms of the oral biofilm. Biofilm is an organised microbial accumulation on a humid surface (Fig. 1). This multi-layered structure protects bacteria from the immune system of their host and from anti-microbial agents, such as local and systemic antibiotics.

No scientifically proven alternatives to the mechanical removal of oral biofilm have been found to date. The organised bacteria do not only operate directly. Damage to the periodontium is inflicted, without bacterial invasion, in the corresponding compartments of the periodontal apparatus through the host’s immune reaction to the bacterial stimulus.

The progression of the disease, which varies from individual to individual, is determined by genetic, acquired and partly-modifiable risk factors. Invasiveness of the instrumentation

Currently, several established and new, innovative instruments are available for the removal of the sub-gingival biofilm, as well as the scaling and root planing of the diseased periodontium. In addition to the removal of biofilm, the establishment of a bio-compatible root surface (even, hard and decontaminated) is a priority during initial instrumentation. For this, hand instruments, such as gracey curettes (Fig. 2) and ultrasonic scalers with diamond tips, are indicated.

However, there can be several undesirable side effects with such a course of treatment. Patients often find the instrumentation of the diseased periodontium an unpleasant experience. Moreover, gingival recession may occur as a result of the treatment, which can lead to aesthetic impairment and dentine hypersensitivity. Long-term treatment of the root surface contributes substantially to the erosion of enamel, which can result in long brittle teeth.

During initial sub-gingival instrumentation, all concretions and calculi should be removed as far as possible. Supportive periodontal therapy (SPT) of the periodontium entails removal of the biofilm. Accordingly, minimally invasive and patient-friendly procedures like biofilm management are favoured in SPT (Fig. 5).

Air-abrasive polishers in periodontal therapy

In recent years, scientific interest has centered around the development of air-abrasive polishers for supra-gingival and sub-gingival application. These systems use a mixture of an abrasive powder and water blasted onto the surface of the tooth. Application angles vary depending on the type of unit.

Initial variants using sodium bicarbonate or aluminium oxide powder were not approved for sub-gingival instrumentation. The application of sodium bicarbonate with a grain size of 250 µm resulted in massive dentine and cementum damage. In addition, trauma of the gingiva was observed.

The high degree of abrasiveness of these materials required the development of

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**Sub-gingival biofilm:** A therapeutic challenge

Minimally invasive biofilm management in periodontal recalls

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**Fig. 1:** A microscopic picture of the sub-gingival biofilm, showing the enormous complexity of oral flora.

**Fig. 2:** Abrasion of enamel using a gracey curette.

**Fig. 3:** Instruments for mechanical periodontal therapy. Decreasing abrasivity – Gracey curettes > diamond-tip of an ultrasonic scaler > Perio-Flow nozzle.

**Fig. 4:** Increased effective range of the air-powder mixture is achieved through a special nozzle.

**Fig. 5:** The user-friendly touchpad of the Air-Flow Master, EMS.

**Fig. 6:** Open peri-implantitis treatment using an air polisher.
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new air-powder polishers, especially for sub-gingival application in periodontal therapy. The development of new air polishers focused on the reduction of the grain size and sub-gingival application through a special attachment.

The new generation of air-abrasive polishers

The recently launched glycine-based powder Air-Flow Powder Perio (EMS, Switzerland) with a grain size of approximately 25 µm (d 50) allows sub-gingival instrumentation without damage to the cementum or gingiva. The powder-air mixture and rinse water are introduced sub-gingivally with a fine, flexible attachment. The triple-injector system causes spinning at the application site, which extends the effective range (Fig. 4). A follow-up polish of the instrumented surfaces with rubber cups is often unnecessary, owing to this powder’s reduced abrasiveness. The nozzle is for single use only.

Options for supra-gingival and sub-gingival application have been combined into one single device (Air-Flow Master, EMS, Fig. 5). Based on indication and the required abrasion, users can select various powder grain sizes:

• A Sodium bicarbonate-based powder (Air-Flow Powder Classic) with a grain size of approximately 65 µm (d 50) and rounded particles with a smooth surface is recommended for the supragingival removal of stains as well as before bleaching fissure sealing sessions.

• A glycine-based powder (Air-Flow Powder Soft) with a grain size of approximately 65 µm (d 50) is recommended by the manufacturer for supra-gingival cleaning in cases of difficult access due to an orthodontic appliance.

Evidence and first personal experiences

A recently published clinical study has shown promising results regarding the efficiency of Air-Flow applications containing glycine in SPT. According to the results, gentle and quick removal of the sub-gingival biofilm is possible up to a pocket depth of 4 mm. Significant irritation of the marginal gingiva was not observed. Surprisingly, patients found the instrumentation using air abrasion a more pleasant experience than instrumentation using traditional methods.

The first clinical experiences in Basel confirmed a high acceptance rate amongst patients. The procedure with minimally abrasive glycine powder is especially recommended for patients diagnosed with periodontitis with minor dental calculus formation. Closed or open peri-implantitis therapy is a further indication for treatment (Fig. 6).

Before treatment, the patient should be protected with safety glasses, protective attire and a sufficient layer of Vaseline on the lips. A prudent suction of the aerosols by the dental assistant further protects the patient and facilitates treatment. Access to higher pocket depths is critical and could be improved with the introduction of a more gracile and rigid nozzle.

To summarise, it can be concluded that at present minimally abrasive powder-air mixtures are a good alternative for SPT, owing to their low damage potential for periodontal tissue and high patient acceptance rate.

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