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The Myth around Polishing in Prevention

Antoine de Saint-Exupéry once argued: "Language is the source of misunderstandings". With this in mind, the first question to be clarified is how polishing is defined, as well as where and how polishing is practiced in dentistry? The term polishing has different meanings in dentistry:

1. The general definition is (ChatGPT): "Polishing is a term generally used to describe a material used to smooth and polish a surface." Polishing, as defined in the general definition, may be necessary for dental restorations of all types. The surface of restorations is smoothed and polished with rotary instruments and abrasive tools. The quality of the surface is improved (1).

2. In prevention, the term polishing is often used incorrectly in terms of semantics. We talk about polishing, although we mean cleaning. Surface cleaning is defined (ChatGPT) as a process of removing dirt, dust, and other deposits from a surface. Professional mechanical plaque removal (PMPR), an essential component of all systematic prevention concepts, involves the mechanical removal (cleaning) of pathogenic soft dental deposits (biofilm/plaque) and discoloration.

3. The term polish (final polishing at the end of the treatment) is also used to describe the smoothing of enamel after mechanically cleaning it.

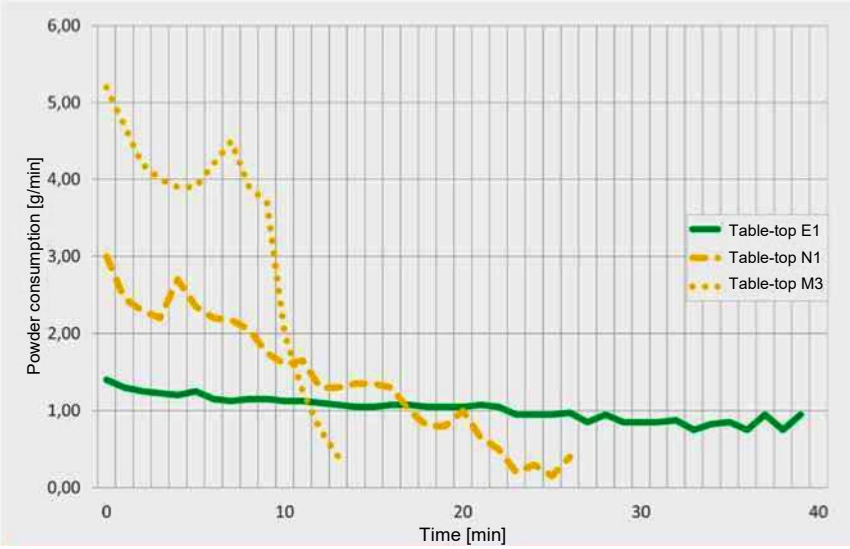

Fig. 1: Airpolishing (N2 and M3) versus Air-flowing (E1) (Source: Dr. Donnet, EMS Nyon, Switzerland)

This also involves an apparent improvement in the surface quality of enamel as defined under Point 1.

To summarize, polishing and surface cleaning are two different processes with different objectives. Following Antoine de Saint-Exupéry's line of thinking, this means that we should also apply the terms used correctly in dentistry. In restorative dentistry, we use the term according to the general definition (Point 1). In preventive dentistry, "polishing or surface polishing" is predominantly used as a term to describe the "cleaning" of tooth surfaces. Hence, the terms classic polishing / rubber cup polishing (RCP) and Air-Polishing (AP) are incorrect. Both preventive measures relate to cleaning.

Polishing (final polishing) after the mechanical cleaning of enamel cannot improve the surface quality. Human enamel is the hardest endogenous substance (Vickers hardness approx. 340 N/mm^2) and the surface quality of enamel cannot be improved by polishing.

To proceed correctly with regard to terminology, the terms Air-Polishing (AP) and Air-Flowing® (AF®) must be differentiated from each other: Both terms are based on the same principle (cleaning by means of air-powder-water-jet devices). AF® is the only system (AIR-FLOW® Prophylaxis Masters and AIR-FLOW®, PERIOFLOW® handpieces, minimally invasive erythritol-based AIR-FLOW® PLUS powder) that operates at a constant and regulated powder flow rate. Air-Flowing® is a technically, physically and chemically coordinated system (2) (Fig. 1).

Keywords: polishing, Air-Polishing, Air-Flowing

Fig. 2: AIRFLOW® MAX in action for removing biofilm (source: EMS Nyon, Switzerland)

Biofilm management

Biofilm is a microbially formed sessile community characterized by cells that are irreversibly attached to a surface, an interface, and/or to each other. They are embedded in a matrix of extracellular polymeric substances, which they produced, and exhibit an altered phenotype with respect to growth rate and gene expression compared to suspended (planktonic) living cells. Dental plaque is also a biofilm (3).

Today, the "Ecological plaque hypothesis according to Marsh" (4) is accepted worldwide as the etiology of the most important oral diseases. According to this hypothesis, vital sub- and supragingival dysbiotic biofilm is the main cause of the most important oral diseases (caries, gingivitis, periodontitis and peri-implant diseases.). An ecological shift from symbiosis to dysbiosis takes place in the biofilm. This shift leads to a disturbance of homeostasis. As we know the cause of most oral diseases, it is our mission and objective to maintain oral health throughout life.

This objective can be achieved by combining home and professional individual oral hygiene measures (5). Professional tooth cleaning (PTC) or better put, "Professional Mechanical Plaque Removal" (PMPR), is and remains a central component of prevention in the periodontal and cariological context, in addition to adequately performed biofilm control at home throughout a patient's lifetime.

Aids for biofilm management

Basically, we distinguish between home care and professional biofilm management at the dentist for which we have chemical and mechanical aids available for both home and professional biofilm management. This article focuses on mechanical professional biofilm management, namely professional mechanical plaque removal (PMPR). This can be performed with hand instruments (HI) such as scalers and curettes, with mechanical aids such as sonic scalers (AS) and ultrasonic scalers (US), as well as with air-powder-water jet devices (AP/AF®) (Fig. 2) and with "Rubber Cup Polishing" (RCP) (Fig. 3). The same objectives apply to all the aids used: effective and targeted removal of biofilm, modification of biofilm, substance protection, patient and practitioner comfort. The most suitable options for the supragingival removal of discoloration and biofilm are AP/AF® and RCP.

Fig. 3: Aids for classical polishing (RCP) (© Dr. K.-D. Bastendorf, Eislingen)

References:

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Effective supragingival biofilm removal

Groundbreaking in this context was a 2013 paper by CHETRUS et al. (6), aimed at determining the most effective and easiest way to diagnose and remove biofilm. The conclusion: the most effective and easiest way to visualize biofilm is by disclosure, as biofilm is difficult to see with the naked eye. Almost 100% of the supragingival biofilm can be removed with AP and only approx. 80% with RCP. The paper by BOTTI et al. from 2010 (7) already demonstrated that complete removal of supragingival biofilm in fissures is only possible with AP as compared to RCP. More recent literature demonstrates even more clearly that AF® is superior to all other aids in targeted, effective biofilm removal. The results in the paper by WOLGIN et al. 2021 (8) state: AF® achieves significantly better results in supragingival biofilm removal than RCP. This applies to both the anterior and posterior teeth. The advantages are particularly evident when it comes to removing supragingival biofilm in patients treated with fixed orthodontic appliances. Cleaning with AF® shows more effective and time efficient cleaning compared to RCP. This is particularly evident when cleaning underneath the braces, around the brackets and in the interdental spaces (9). AREFNIA et al. (10) summarized their results in the cleaning of enamel comparing hand instruments, piezoceramic ultrasound, AF®, RCP and the combinations of all aids as follows: "The best deep cleaning on enamel is achieved with AF® alone." In summary, supragingival biofilm removal is an essential component of all systematic preventive measures.

AF® is superior to classic polishing with rotary instruments, rubber cups, brushes and a polishing paste (RCP).

Effective subgingival biofilm removal

With RCP, only sulcular biofilm removal is possible, if at all. Subgingival biofilm removal is not possible. In contrast, the work of PETERSILKA et al. 2003 (11, 12) already demonstrated that the use of AP with a low-abrasive powder (glycine) in moderate pockets resulted in a significantly greater reduction in the amount of subgingival bacteria than with hand instruments. MÜLLER et al. 2014 (13) were able to demonstrate the advantages of Airflow/Perioflow technology versus ultrasonic technology for residual pockets ≥ 4 mm in maintenance therapy. The clinical parameters and bacterial counts were substantially identical. The values for Aggregatibacter actinomy-cetemcomitans were significantly lower when Airflow/Perioflow technology was applied. Pain was significantly less with the Airflow/Perioflow technology, so that patients preferred Airflow over ultrasound.

Summary: Professional subgingival biofilm removal forms an essential part of non-surgical periodontitis therapy. Subgingival biofilm management is not possible with RCP.

Polish after surface cleaning

The discussion about the necessity and appropriateness of polishing after surface cleaning has been controversial time and again in recent years. Already in early 2021, the author asked several European university professors to comment on the necessity of "final polishing". MOMBELLI, University of Geneva: "The biological benefit of an ultra-smooth surface resulting from hard tissue removal has not been proven." SCHLAGENHAUF, University of Würzburg: "I know of no controlled clinical study that has ever proven that additional polishing by means of a rubber cup and polishing paste is useful or necessary."

HAAS, University of Graz: "Why try to 'play God' and further improve healthy enamel? It is certainly not possible to create a smoother surface that way sustainably. If medication such as fluoride, zinc, arginine, etc. is to be applied to the enamel or root surface, this is certainly not performed with 'polishing pastes'. To me, these are recommendations to take time-honored methods to another level in order to uphold them. Doing away with unnecessary polishing takes readjustment, as well as some courage to do so."

Final polishing

Some evidence-based data on the topic of "final polishing": when comparing the different aids (HI, AF®, RCP and all combinations) in supragingival biofilm management (on enamel), the effects of all treatment methods on roughness were measurable but of limited clinical relevance (14). This was also evident in the work of AREFNIA et al. (10): AF® alone and/or with RCP does not cause any loss of enamel and demonstrates best roughness values. A recent study concluded that RCP after AF® or curette application had no effect on surface roughness and therefore offered no advantage in terms of reducing roughness as a final procedure (15). The paper by WOLGIN et al. (8) demonstrated less new plaque after the application of AF® than RCP when comparing AF® to RCP on the day following professional cleaning. NISHIO et al. (16) were able to demonstrate that in plane-polished enamel specimens, polishing increased roughness values and increased colonization with Str. mutans pathogens.

In summary, this means that a "final polishing" can be dispensed with, as the surface quality of enamel (Vickers hardness approx. 340 N/mm^2) cannot be improved.

In addition to enamel and dentin, RCP and AF® can cause surface abrasion and roughness on various restorative materials.

REINHART et al. (2022) have addressed this issue. Their conclusions are as follows: the application of RCP compared to AF® results in significantly higher abrasion on composite, ceramic and gold. Abrasion on glass ionomer cement was higher in the AF® group than in the RCP group (17).

Patient and practitioner comfort

The paper by MENSI et al. (2022) compared the application of RCP/piezon ultrasound with AF®/piezon ultrasound in patients with gingivitis. In addition to clinical parameters, patient and practitioner comfort were also investigated in this paper. The clinical parameters were significantly lower statistically for AF®/piezon-ultrasound versus RCP/piezon-ultrasound (bleeding on probing 8.7% vs. 11.6%, biofilm index 10.7% vs. 12.3%). Patient and practitioner comfort scores were also better for AF®/piezon ultrasound. On average, treatment duration was 9.2% shorter with AF®/piezon-ultrasound than with piezon-ultrasound/RCP. The values for patient comfort were even more conclusive. Patients preferred AF®/piezon ultrasound vs. piezon ultrasound/RCP with 73.2% vs. 17.1% (18). Similar results were obtained in the study by FU et al. (2021). A comparison of AF® vs. RCP with and without disclosure in patients with a biofilm index ≥ 60 was conducted. The results can be summarized as follows: disclosure improves the effectiveness of biofilm removal for both RCP and AF®. AF® is more effective than RCP, AF® is preferred by patients and practitioners (19). MUSCHOLL et al. (2022) also demonstrated that AF® is more effective and efficient in mechanical biofilm management than HI/RCP. In terms of patient and practitioner comfort, the results were significantly better for AF® than for HI/RCP (20).

Summary

The objective of cleaning the tooth structure, the clean tooth, has been established for a long time. KANTOROWICZ already postulated this objective in the last century: a clean tooth will not become diseased.

When we speak of polishing with medical benefits in professional prevention, we generally mean the thorough supragingival removal of soft deposits (biofilm/plaque) and discolorations. Polishing after thorough cleaning does not improve the roughness values on enamel (14, 15). There is no evidence in the literature to substantiate the statement that a final polish after cleaning the enamel leads to slower renewed formation of biofilm. Quite to the contrary: WOLGIN et al. 2021 (8) found that, after cleaning with RCP vs. AF®, less new biofilm was found on the following day after AF® without subsequent polishing. Additional supragingival polishing is counterproductive.

The comparison between the classical approach of biofilm management (RCP) versus modern biofilm management AF® is clearly in favor of AF®:

- AF® is more effective, time-saving and gentle on the tooth substance than RCP.
- Only AF® allows complete supragingival removal of biofilm in fissures, pits, interdental spaces, crowding, sulcus and fixed orthodontic treatments.
- Subgingival biofilm removal is not possible with RCP.
- Residues of polishing pastes can remain in the sulcus.
- In terms of patient and practitioner comfort, all the advantages lie with AF®.
- A variety of different aids are required for RCP, which places a burden on the practice organization (see Fig. 3).

The long-term success of prevention correlates strongly with long-term patient loyalty. This, in turn, depends largely on the quality of the treatment performed and the pain/well-being experienced. Here the advantages of modern aids have been particularly impressive. For the patient loyalty rate, it is important that the patient is treated painlessly, which increases compliance. Only satisfied patients like coming back! ***pi***

Conflict of interests

In the interests of transparency, Dr. Klaus-Dieter Bastendorf would like to declare that he is a member of the “Scientific Board” of EMS Electro Medical Systems S.A., 1260 Nyon - Switzerland. Furthermore, he is active as a speaker on behalf of EMS and receives fees for his services.

There is no conflict of interests for Dr. Nadine Strafela-Bastendorf.

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Quintessence

We should use the terms cleaning and polishing correctly in terms of language (semantics) in the context of professional mechanical prevention, i.e., we should speak of cleaning tooth structure when this relates to the thorough supragingival removal of soft deposits (biofilm/plaque) and discoloration with a medical benefit. The so-called "final polishing" after thorough cleaning does not provide any additional medical benefit.

AKTUELL

Mythos Politur in der Prophylaxe Literaturverzeichnis 3/23

The Myth around Polishing in Prevention Literature 3/23

Hier können Sie das Literaturverzeichnis einsehen, das mit der Prophylaxe Impuls 3/23, Seite 136 zum Beitrag von Dr. Nadine Strafela-Bastendorf und Dr. Klaus-Dieter Batendorf erschienen ist.

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