NON-SURGICAL TREATMENT OF DEEP PERIODONTAL POCKETS ACCORDING TO THE **CLEAN** & **SEAL** CONCEPT

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Summary

Despite intensive postoperative oral hygiene protocols, the risk of a persistent inflammatory reaction is high in deep periodontal pockets. The combination of mechanical debridement, supported by careful decontamination using a hypochlorite-based antimicrobial gel, provides an effective option for germ reduction & biofilm removal. Cross-linked hyaluronic acid is applied to support healing processes and "seal" the cleansed wound site from re-infection. This case report presents a typical protocol for the successful non-surgical treatment of deep periodontal pockets according to this "Clean & Seal" concept in the context subgingival scaling or supportive periodontal therapy.

Periodontal diseases of teeth are characterized by inflammatory reactions to bacterial infections. Initially, inflammation of the periodontal soft tissue occurs, followed by resorption of the periodontium.[1] In particular, deep pockets or furcations favour the formation of structured pathogenic biofilms and thus increase the risk of tooth loss. [2]

At the beginning of 2021, a new guideline for the treatment of periodontitis was published by the German Society of Periodontology. It represents the implementation of the S3 guideline "Treatment of Stage I-III Periodontitis" of the European Federation of Periodontology (EFP).
According to the diagnosis and the individual degree of severity, the guideline provides for a stepwise, sequential therapy concept. In addition to active periodontitis therapy, which is divided into 3 phases, supportive periodontitis therapy in particular has been given a long overdue boost.

If deep pockets with signs of inflammation persist in the APT after supragingival biofilm management and subgingival instrumentation, surgical treatment is planned. Guided tissue regeneration (GTR) and regenerative periodontal surgery are histologically and clinically proven treatment options to restore the lost periodontium. [3] However, these invasive treatment steps are technically complex and therefore often do not meet the interest of many patients for a treatment that is as atraumatic and cost-effective as possible. Furthermore, periodontal surgery requires a minimum of experience on the part of the practitioner.

For this reason, we are searching for effective adjunctive non-surgical protocols for subgingival treatment. Many adjuvant protocols have been established, but so far they do not offer a viable approach in terms of lasting clinical improvements in probing depth and attachment level changes.

Non-surgical subgingival treatment of deep periodontal pockets

The basic building block of a successful overall periodontal concept is the control and removal of the inflammatory biofilm. Thus, the new guideline advocates thorough mechanical subgingival treatment of the affected pockets with hand and/or ultrasonic instruments. Laser systems including photodynamic therapy or powder jet procedures are not recommended. However, in some particularly severe cases, concomitant systemic antibiotic administration may be indicated, or the use of local adjuvants may be considered. [2]

In our opinion, antimicrobial agents in particular, when used in combination with certain biologics, represent a promising and viable option for biofilm control and long-term stabilization of periodontal defects. On the one hand, they can be highly effective in supporting biofilm removal, and on the other hand, they can lead to accelerated healing processes in the periodontal pocket, in addition to contributing to cost-efficient application. [4,5]

In our department we apply the so-called "Clean & Seal" concept. This is based on thorough removal of the biofilm and calculus by mechanical cleaning in combination with adjuvant application of a cleaning gel made of hypochlorite (PERISOLV, REGEDENT GmbH) followed by sealing of the defect with cross-linked hyaluronic acid (hyaDENT BG, REGEDENT GmbH) to prevent re-infection of the pocket and to support healing processes at the cellular level.

Mechanical cleaning with adjuvant application of a NaOCl-based cleaning gel

The hypochlorite gel (PERISOLV, Regedent, Dettelbach) is a two-component preparation consisting of a 0.95 per cent sodium hypochlorite (NaOCl) solution and an amino acid solution. Both components are mixed with each other immediately before use (Fig. 3).
The in vitro results of the gel application showed positive antimicrobial properties, especially against a biofilm consisting of periodontal pathogens.[6] The NaOCl gel significantly reduces the vitality of gram-negative biofilms, which underlines its high potential as an adjuvant for mechanical therapy of periodontal diseases.

Furthermore, the hypochlorite gel supports the mechanical instrumentation of the defect area by its degranulating effect. It is known from medicine that these preparations are successfully used for the topical treatment of chronic diabetic wounds and skin ulcers.[7] Repeated treatment with this gel achieves effective debridement of the wound area, resulting in statistically significantly improved wound healing.

Furthermore, the subgingival application of sodium hypochlorite causes a controlled chemolysis of marginal epithelium without a significant effect on the surrounding tissue. [8]

In a study conducted at our department[9], the influence of the gel on the manual cleaning of the root surface was investigated in an in vitro set-up on extracted teeth. Pretreatment of the root surface with the product resulted in a median reduction in cleaning time from 47 seconds to 32 seconds, but the difference was not statistically significant due to the large standard deviation.

The clinical relevance of these properties was demonstrated in a recently published randomized controlled trial. Here, the effect of the adjunctive application of this cleansing gel for the treatment of deep periodontal pockets was investigated.[10] The adjuvant application of the NaOCl gel led to a statistically significant improvement in the periodontal measurement parameters. After 6 months, a statistically significant improvement in probing depth and clinical attachment was recorded in the NaOCl group compared with the control group. In addition, statistically significantly fewer pockets showed signs of inflammation (probing bleeding) in the NaOCl group after 6 months.

Sealing with cross-linked hyaluronic acid

Like other biologics (e.g. enamel matrix proteins), hyaluronic acid (HA) has promising cell-acting properties that can support the healing process, especially in compromised situations such as deep or inaccessible periodontal pockets. Due to its strong hygroscopic properties (1 g HA can absorb up to 6 liters of water), HA immediately [11]binds the occurring blood and accelerates the formation of the coagulum, thus providing immediate stabilization of the cleansed wound area. Hyaluronic acid has a bacteriostatic effect and can therefore reduce the risk of bacterial recolonisation of the wound site.[12,13] In addition, hyaluronic acid stimulates postoperative neoangiogenesis when applied surgically and leads to a significant improvement as well as shortening of wound healing.[14,15] The treatment of chronically inflamed wounds particularly benefits from HA due to its modulating effect. Several studies have shown that HA improves the healing of diabetic wounds. [16]In an animal study of diabetic rats, HA treatment of implanted foreign collagen significantly reduced collagen degradation, presumably due to HA-induced downregulation of macrophage activity. This is more pronounced in diabetics than in healthy patients and may lead to uncontrolled resorption. [17]

When applied surgically, HA leads to true periodontal regeneration and not to connective tissue filling of the pocket. In a comparative animal study, the combination of flap surgery (open flap debridement OFD) with HA (hyaDENT BG) showed statistically significantly higher attachment gain values after 2 months. With regard to the formation of new root cementum, which was in contact with newly formed bone due to inserting collagen fibers, the value of 2.43 ± 1.25 mm was significantly higher than the 0.55 ± 0.99 mm achieved by flap surgery alone. [18]

The application of hyaluronic acid after mechanical instrumentation (SRP) can improve periodontal parameters compared with SRP treatment alone. [19,20]This was confirmed by a systematic review with meta-analysis, which positively evaluated the potential additional benefit of the application of hyaluronic acid (HA) on clinical outcomes after non-surgical or surgical periodontal therapy. [21]

Compared to SRP alone, adjuvant administration of HA resulted in an improvement in both clinical attachment (CAL: -0.73 mm) and probing depth (PD - 0.36mm) in the weighted mean difference of all evaluated studies.

Furthermore, HA also improved local inflammatory parameters. Thus, SRP/HA combination therapy reduced exploratory bleeding by 15% in the weighted mean difference compared to SRP alone.

Case presentation 1

The patient, born in 1970, presented to the Department of Periodontology for therapy of advanced periodontitis in stage 3 and a grade C according to the new classification. The attachment loss on individual teeth extended to the apex of the affected teeth 16, 27, 47. The patient is a non-smoker and has no general medical problems. Systematic periodontal therapy was 6 years ago at the time of his initial presentation.

The closed treatment was carried out completely, endodontic measures were taken on teeth 16, 27, 47 because a paro-endo involvement was obvious. Teeth 17, 16 and 27 had to be removed during the subsequent UPT and partly replaced implantologically. Tooth 25 showed a persistent residual pocket depth of 9 mm distally. This site was regularly instrumented during the UPT. In the case of

periodontally inconspicuous findings on the adjacent mesial tooth 26, surgical intervention was not performed.

Fig. 1 shows the initial findings, characterized by a deep pocket distal to tooth 25 with a probing depth of 8mm and positive bleeding index (BoP+). The radiographic findings show the significant bone defect (Fig. 2).

Our subgingival instrumentation protocol includes thorough scaling/root planing (SRP) using hand instruments with multiple applications of the cleansing gel (PERISOLV®) to aid in biofilm removal (Fig. 5). After mixing the 2 components (Fig. 3-4), the gel is introduced deep into the pocket with the cannula. After a reaction time of 30 sec, mechanical scaling can be continued. Local anaesthesia with Oraquix gel (Sanofi, D) applied directly into the residual pocket may help to make the instrumentation thorough enough.

After completion of the non-surgical debridement, hyaDENT BG is applied into the pocket to promote the healing process (Fig. 6-7). The application of hyaDENT BG is much simplified compared to classical biologics such as enamel matrix proteins, as the wound site does not need to be dry/bloodless and no conditioning of the root surface is required.

Within 7 days, HA (hyaDENT BG) is applied again to compensate for the effect of rapid rinsing.

5 months after treatment (Fig. 8-9), there is a clear improvement in the clinical picture in terms of a significant reduction of the pocket to 4-5mm probing and a stable inflammation-free tissue situation (BOP-). The X-ray findings (Fig. 10) indicate an incipient bony filling of the pocket.

Case presentation 2

Patient, born 1971, non-smoker, generally healthy, has been undergoing UPT in the Department of Periodontology at the UW/H since 2006. Tooth 26 has had furcation involvement for over 10 years, grade 3 furcation involvement from mesial to distal has been documented since 2014. Surgical treatment has not taken place and is not desired by the patient. Despite regular instrumentation of the residual pocket on this molar, an acute inflammatory situation developed on 26 with the consequence of increasing tooth loosening, proliferation of granulation tissue into the interradicular space of the furcation involvement, which further reduced the cleanability of this area, as well as leading to occlusal complaints (Fig. 11).

The closed instrumentation of the pockets, including the furcation, supported by the application of Perisolv and Hyadent BG, analogous to the protocol described above, resulted in the abatement of acute conditions and healing of the residual pockets. Figs. 12-13 show the inflammation-free situation on tooth 26 with a significant reduction of the special depths in the mesial and distal aspects. The radiological control 6 months after treatment is convincing with a clear improvement of the periodontal tissue level (Fig. 14).

Conclusion

The adjunctive use of a hypochlorite gel in closed subgingival instrumentation offers a simple and effective option for biofilm removal. Subsequent sealing of the wound space with cross-linked hyaluronic acid improves wound space stabilization, accelerates wound healing and supports

regenerative processes for periodontal tissue regeneration. Thus, several relevant pre-criteria for success are fulfilled for a predictable regenerative treatment success in complex defects.

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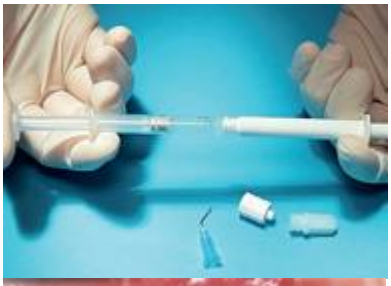
Figures 1 and 2:

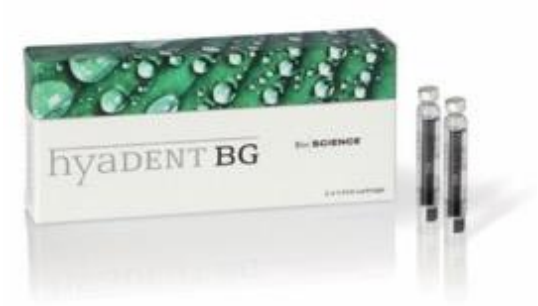
Deep pocket distal to tooth 25 with a probing depth of 8mm and positive bleeding index (BoP+).

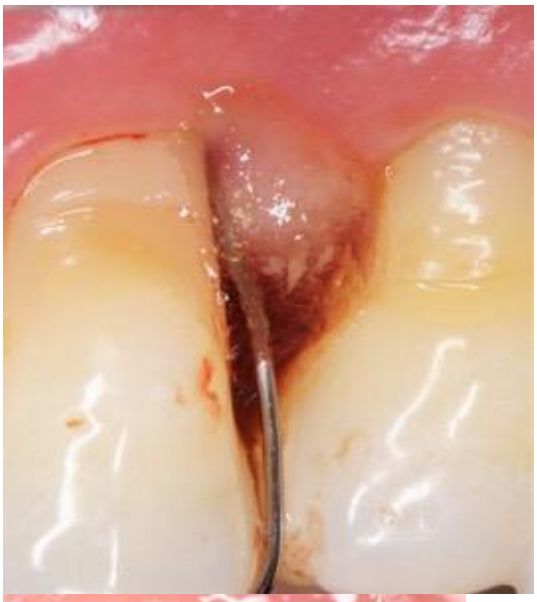
Figure 2:
The X-ray findings show the significant bone defect.



Figures 3-4:
Prepare the cleansing gel (PERISOLV) by mixing the two components.

Figure 5:
Application of the cleansing gel.





Figures 6-7:
Defect sealing: Application of cross-linked hyaluronic acid (hyaDENT BG).

Figures 8-9:
Significant reduction of the pocket to 4-5mm probing, stable inflammation-free tissue situation (BOP-).

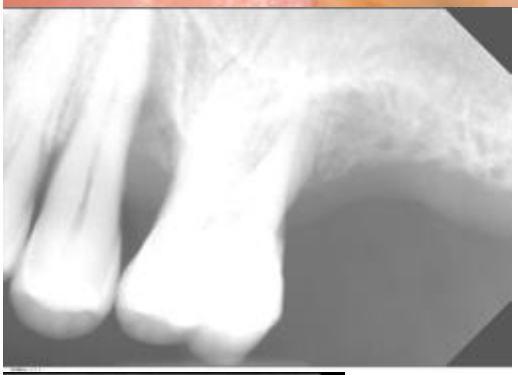


Fig. 10:
The x-ray findings show an incipient bony filling of the pocket.

Fig. 11:
X-ray findings show the extent of periodontal tissue loss on tooth 26.

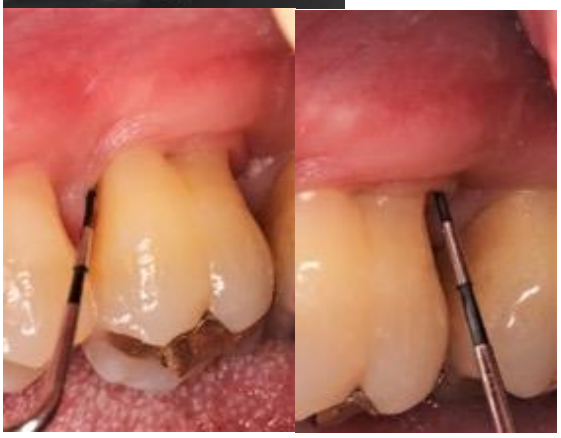


Figure 12-13:
Clinical picture after 6 months with an inflammation-free situation on tooth 26 and a significant reduction in the depths of the abnormalities.

Fig. 14:
Significant hard tissue gain around tooth 26.

LITTERATURE

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