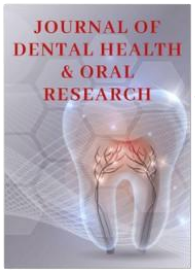

e-ISSN 3050-9432

Journal of Dental Health and Oral Research

ATHENAEUM SCIENTIFIC PUBLISHERS

Case Report

Check for updates

Reconsidering Surgical Indications in Periodontitis: Insights from Patient-Level Analysis and Clinical Case Reports

Siegfried Mixner[1*]

[1]Medical Periodontal and Peri-Implant Treatment Concepts, Dr. Maria Fischer, St. Johann in der Haide, Austria

***Correspondence author:** Siegfried Mixner, Medical Periodontal and Peri-Implant Treatment Concepts, Dr. Maria Fischer, St. Johann in der Haide, Austria; E-mail: siegfried.mixner@regedent.com

Citation: Mixner S. Reconsidering Surgical Indications in Periodontitis: Insights from Patient-Level Analysis and Clinical Case Reports. J Dental Health Oral Res. 2026;7(2):1-10.

https://doi.org/10.46889/JDHOR.2026.7224

Received Date: 04-06-2026

Accepted Date: 29-06-2026

Published Date: 06-07-2026

Abstract

A reanalysis of the dataset of a randomized prospective study evaluating the impact of adjuvant hypochlorite gel and crosslinked hyaluronic acid to standard subgingival instrumentation on patient-level, combined with a clinical cases from a general dental practice in Austria, raises important questions regarding the contemporary role of periodontal surgery in treatment planning.

Keywords: Periodontitis; Austria; Periodontal Surgery; Hyaluronic Acid

Introduction

The Conventional Treatment Paradigm in Periodontitis

The treatment of periodontitis has traditionally followed a structured and sequential model which was recently summarized by the European Federation of Periodontology [1]. Following diagnosis, defined oral hygiene instructions and supragingival biofilm removal (phase 1), patients undergo active non-surgical periodontal therapy in terms of subgingival biofilm removal by Scaling and Root Planing (SRP - phase 2). The objective of this initial phase is to reduce microbial burden, resolve inflammation and decrease probing pocket depths.

After a healing period of at least 3 months, patients are re-evaluated. Sites exhibiting persistent probing pocket depths, particularly those ≥5-6 mm accompanied by bleeding on probing, are commonly regarded as residual periodontal lesions associated with an increased risk of disease progression. According to current treatment concepts, such sites represent indications for further intervention, usually either subgingival re-instrumentation or surgical periodontal therapy (phase 3).

Following completion of active periodontal therapy (phase 3), patients enter supportive periodontal therapy (SPT - phase 4), which focuses on the long-term maintenance of periodontal health and treatment outcomes. This phase involves regular periodontal monitoring, reinforcement of patient-performed oral hygiene measures and professional supra- and subgingival biofilm removal at individualized recall intervals. This stepwise approach has become deeply embedded in periodontal treatment planning and has formed the basis of clinical decision-making for decades. Surgical therapy is therefore frequently regarded not as a treatment failure but rather as a routine continuation of care when non-surgical measures alone are most likely unable to achieve complete disease resolution.

The Clinical Challenge of Residual Periodontal Pockets

Although conventional non-surgical periodontal therapy is highly effective in reducing inflammation and improving clinical parameters, complete pocket closure remains difficult to achieve, particularly in patients presenting with advanced disease [2].

One of the central limitations of the conventional model is that treatment success is basically evaluated by general improvement of clinically relevant parameters like Probing Pocket Depth (PPD) or the incidence of Bleeding on Probing (BoP).

Improvements in probing pocket depth and reductions in bleeding scores may appear highly favourable when assessed as average value. However, patients rarely present with a single isolated periodontal lesion. Instead, advanced periodontitis is typically characterized by multiple deep pockets distributed throughout the dentition.

As a consequence, even when a substantial proportion of sites respond successfully to treatment, a patient may still retain one or more residual active lesions. From a clinical perspective, the persistence of only a few untreated pockets may be sufficient to prevent direct transfer into Supportive Periodontal Therapy (SPT) and necessitate additional treatment.

Therefore further parameter with a higher practical relevance of determining therapy success are measured in recent studies. One of them is the "pocket closure rate" providing the percentage of formerly periodontally active pockets which are closed after therapy.

The most important parameter for treatment success is represented by the "patient resolution". This is the percentage of patients without any remaining active periodontal pocket after treatment. This means that the active phase of periodontal treatment was accomplished and the patients can be transferred in phase 4 (SPT) directly.

Evidence from Everyday Clinical Practice

The limitations of conventional therapy become particularly apparent when treatment outcomes are evaluated under patient-relevant outcome criteria (Fig. 1).

In a multicentre field study involving 615 patients treated in 59 dental practices, Tomasi, et al., reported six-month pocket-closure rates of only approximately 30-33% for periodontal pockets initially measuring ≥7 mm. These findings reflect the reality encountered in routine clinical practice, where deep periodontal lesions frequently remain partially unresolved despite appropriate treatment.

Even by re-instrumentation of the remaining active sites in phase 3 of the periodontal treatment about 50% of deep pocket remain [2,3].

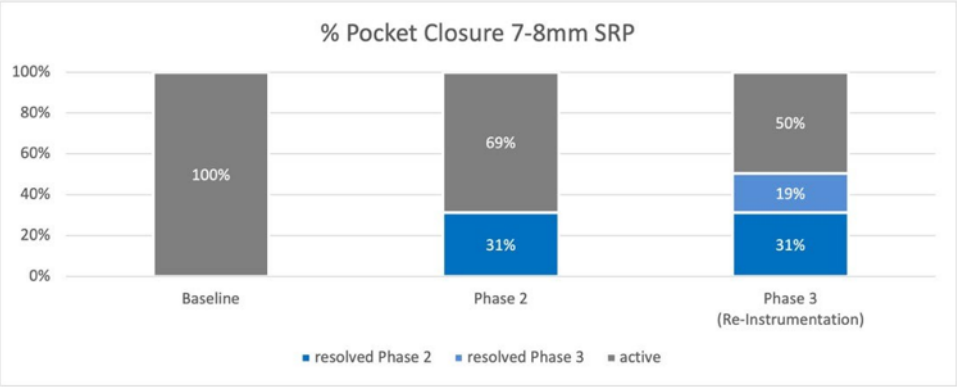

Figure 1: Pocket closure rate of deep periodontal pockets in phase 2 and 3 after non-surgical treatment approach.

When translated to the patient level, the implications become clear. A patient presenting with numerous deep periodontal pockets may experience significant clinical improvement while still retaining residual lesions that require further intervention. Surgical periodontal therapy is known to result in higher pocket closure rates even for deep pockets [4]. Consequently, many patients continue along the traditional treatment pathway toward surgical therapy despite successful completion of non-surgical treatment (Fig. 2).

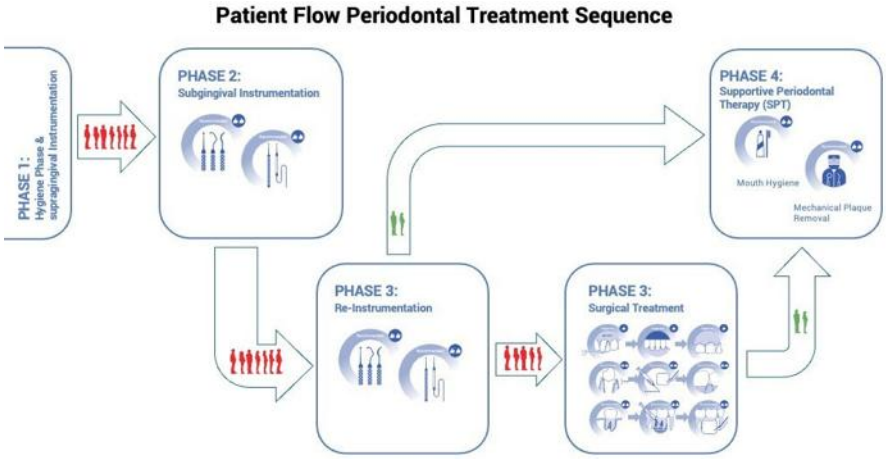

Figure 2: Most likely patient flow in the conventional periodontal treatment protocol.

These observations raise an important question, is the high frequency of periodontal surgery an unavoidable consequence of disease severity or does it reflect the biological limitations of current non-surgical treatment approaches?

The Biological Rationale for Improving Non-Surgical Therapy

To understand how non-surgical outcomes might be improved, it is necessary to consider the biological limitations of conventional instrumentation. Mechanical debridement remains the cornerstone of periodontal treatment. However, successful instrumentation is challenged by complex root anatomy, deep periodontal defects, furcation, root concavities and limitations in access. Complete removal of biofilm, calculus and diseased tissue can therefore be difficult to achieve [5].

Furthermore, successful treatment depends not only on decontamination but also on the quality of healing that follows instrumentation. Even after effective biofilm disruption, the wound environment remains vulnerable during the early phases of healing. Blood clot stability, cellular migration, angiogenesis and connective tissue repair all influence the final clinical outcome. These considerations have led to increasing interest in treatment approaches that combine enhanced decontamination with biological support of wound healing.

The Clean and Seal Concept

The Clean and Seal Concept combines improved periodontal pocket decontamination and wound stabilization in a single treatment session.

Clean: A sodium hypochlorite-amino acid gel (Perisolv, Regedent GmbH) is applied into the periodontal pocket before instrumentation. The gel disrupts biofilm, softens calculus deposits and facilitates the removal of inflamed and necrotic tissue. [6]. Mechanical debridement with hand and ultrasonic instruments is then performed and is supposed to be repeated 2-3 times to achieve thorough decontamination.

Seal: Following debridement, a combination of non-cross-linked and cross-linked hyaluronic acid (xHyA, hyaDENT BG, Regedent GmbH) is administered into the defect. The non-cross-linked fraction supports hydration and wound healing, while the cross-linked fraction forms a temporary matrix that stabilizes the blood clot and protects the healing site [7,8].

The concept is based on the synergy between cleaning the periodontal pocket and sealing the wound environment, creating optimal conditions for periodontal healing and tissue regeneration.

Moving Beyond Site-Level Outcomes

The impact of this improved protocol for non-surgical instrumentation in phase 2 of the periodontal therapy was investigated by Ramanauskaite, et al., in a prospective comparative trial [9]. The adjunctive use of hypochlorite gel and xHyA resulted in a significant improvement of all clinically relevant parameters like PPD, BoP and clinical attachment. The importance of the promising results on site- and patient-level were highlighted by additional data evaluation of the study [10].

While the control group demonstrated reduced pocket-closure rates especially for deep pockets (approx. 50%), the test group with additional application of the C and S protocol resulted in consistently higher pocket closure rates, particularly pronounced in deep pockets (Fig. 3).

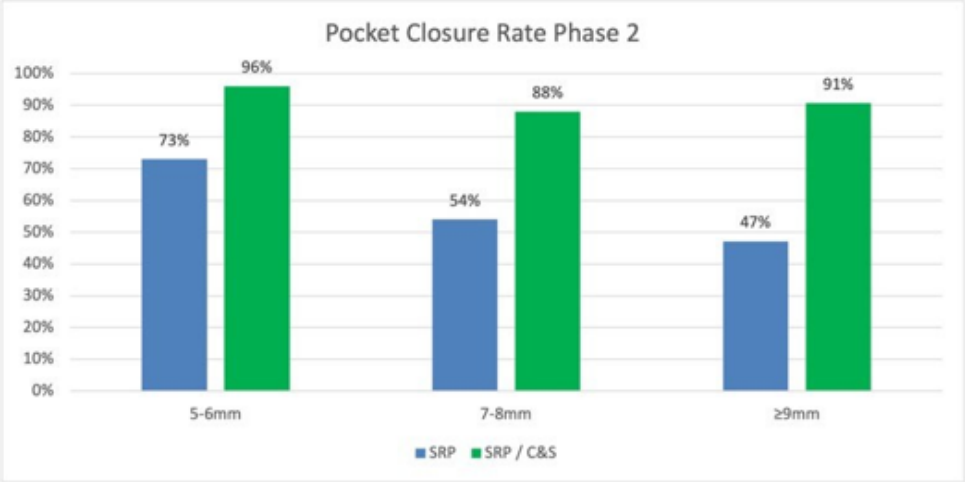

Figure 3: Effect of the Clean and Seal protocol on pocket closure rate.

As site-level outcomes alone do not necessarily reflect the clinical reality experienced by patients, furthermore a patient-level reanalysis of the original dataset was performed by the study's principal investigator. The results revealed a striking difference between treatment groups.

Among patients treated with conventional scaling and root planing alone, none achieved complete clinical resolution sufficient for direct transfer into supportive periodontal therapy. In contrast, 10 of 24 patients treated with the enhanced protocol achieved complete pocket closure and entered supportive care without requiring any additional treatment. This corresponded to 42% of the study population (Fig. 4).

These findings suggest that the true clinical significance of improved pocket closure may not lie solely in the reduction of individual probing depths but rather in its impact on the overall treatment journey of the patient.

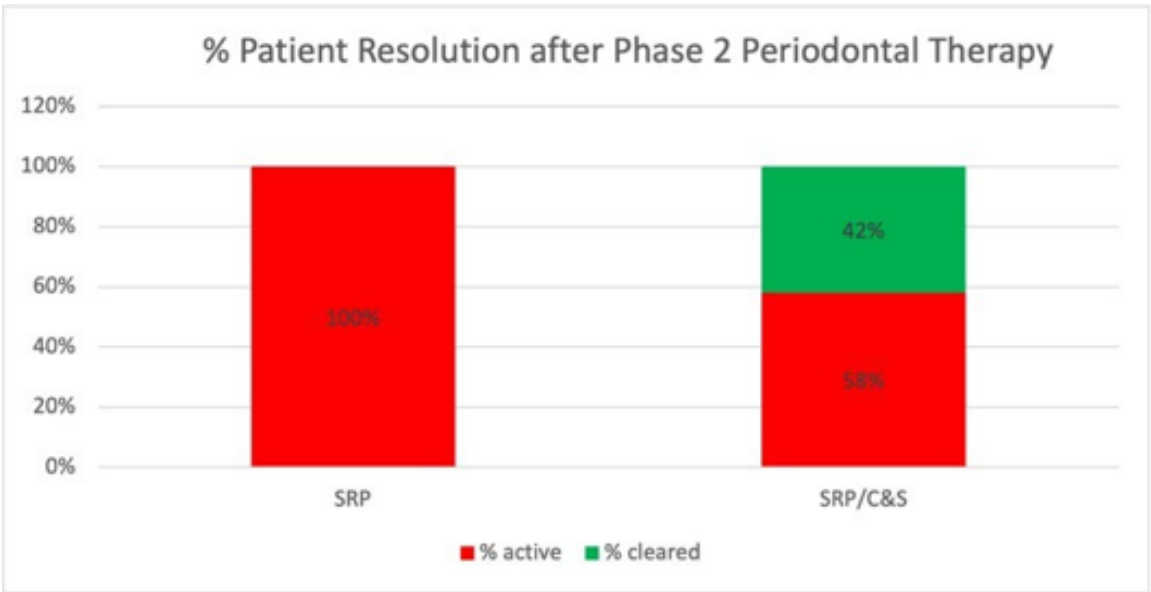

Figure 4: Patient-level outcomes following completion of phase 2 non-surgical periodontal therapy. In the control group (SRP alone), no patient achieved complete pocket closure and direct transition into Supportive Periodontal Therapy (SPT). In the test group (SRP plus Clean and Seal), 10 of 24 patients (42%) achieved complete pocket closure.

From Disease Control to Disease Resolution

This distinction is clinically relevant. Disease control implies that additional interventions remain necessary. Disease resolution, in contrast, permits direct entry into supportive periodontal therapy and significantly reduces the burden of treatment for both patients and clinicians.

Traditionally, non-surgical periodontal therapy has been viewed primarily as a method of disease control. The objective was to reduce inflammation, improve clinical parameters and prepare the patient for either maintenance therapy or surgical intervention [1].

The patient-level findings reported by Ramanauskaite suggest a different perspective. If a substantial proportion of patients can achieve complete disease resolution following non-surgical treatment alone, then the role of active instrumentation therapy may extend beyond disease control toward actual completion of treatment.

This hypothesis is backed up by histological and histomorphometrically data provided by Shirakata, et al. [11]. In an animal model chronic periodontal defects were treated either with subgingival instrumentation alone or with the adjunctive application of the C and S protocol. After a healing time of 6 weeks besides clinical parameter a histological analysis of the former periodontal defect was performed.

Whereas conventional treatment resulted in partial pocket closure by long junction epithelium, the additional application of the C and S protocol lead to significant reformation of dentin, periodontal ligament and periodontal bone, all of them signs of true periodontal regeneration which usually can only be achieved by surgical interventions.

Can the Need for Periodontal Surgery Be Reduced?

The question arising from these observations is not whether periodontal surgery remains valuable. Surgical therapy continues to play an essential role in the management of advanced defects, furcation involvements, regenerative procedures and residual lesions that do not respond adequately to any non-surgical treatment.

The more relevant question is whether the number of patients and remaining sites requiring surgery can be reduced by improving the effectiveness of the non-surgical phase.

Evidence supporting this opportunity emerged when the patient-level findings of Ramanauskaite, et al., are considered together with randomized controlled trials in phase 3 of the treatment sequence conducted by other groups [12,13]. Both studies result in comparable results regarding the superiority of the C and S-enhanced SRP protocol beyond conventional instrumentation, especially when analysed in terms of pocket closure rates.

Therefore, these data suggest a substantial shift in patient flow following treatment. Under conventional therapy, in the test group of the study no patients could directly enter supportive care phase 4 immediately after completion of the first active instrumentation therapy (phase 2). Even after re-instrumentation in phase 3, a considerable proportion ultimately remained with the need for surgical intervention. In contrast, enhanced non-surgical treatment resulted in a markedly larger proportion of patients achieving periodontal stability without surgery, even immediately after phase 2 of the periodontal treatment sequence. Although larger prospective studies are required to confirm these findings, they challenge the traditional assumption that surgery is an inevitable next step for many patients with advanced periodontitis.

Purpose of the Presented Case Report

The following clinical case report was performed in a general dental practice in Austria. It illustrates the clinical application of the Clean and Seal concept in patients with advanced periodontal disease in phase 2 of the treatment sequence and demonstrates treatment outcome achieved through an enhanced non-surgical approach.

The case is not intended to replace evidence derived from controlled clinical trials. Rather, it provides a practical clinical perspective on how contemporary non-surgical treatment concepts may contribute to periodontal stabilization and potentially reduce the need for surgical intervention in selected patients.

Case Report: Complete Pocket Closure Following a Single Clean-and-Seal Intervention

Patient Background

A 56-year-old female patient presented seeking periodontal treatment. The patient was systemically healthy (ASA I), reported no relevant medical conditions and was not taking any medication known to affect periodontal status or wound healing. She was a lifelong non-smoker and had no history of previous periodontal therapy. Regular dental attendance and satisfactory oral hygiene were reported, although the patient had recently noticed occasional gingival bleeding in the mandibular anterior region.

The absence of systemic risk factors, combined with the patient's good compliance and generally favourable oral health status, provided a suitable biological environment for non-surgical periodontal treatment.

Initial Examination

Comprehensive periodontal examination revealed localized periodontitis affecting the mandibular anterior teeth (Fig. 5,6). The most pronounced lesion was detected at tooth 32, where a probing pocket depth of 8 mm was recorded (Fig. 5). Adjacent tooth 31 also demonstrated slightly increased probing depths and signs of active periodontal inflammation.

Bleeding on probing was present at all affected sites, indicating ongoing inflammatory activity within the periodontal tissues.

Despite the localized nature of the disease, the depth of the lesion suggested a substantial bacterial burden and a heightened risk of further attachment loss if left untreated. According to contemporary periodontal treatment concepts, the patient clearly fulfilled the criteria for active periodontal therapy by means of non-surgical subgingival instrumentation.

Active Periodontal Therapy

After phase 1 the active treatment was performed as a single-session subgingival instrumentation in combination with the Clean&Seal protocol. Thorough decontamination and biofilm disruption was performed by installing the amino acid-buffered hypochlorite gel (Perisolv) into the deep pockets around teeth 32 and 31. After an exposure time of at least 60 seconds thorough instrumentation was performed with ultrasonic instruments. The sequence of gel application, exposure time of 60 seconds and subgingival instrumentation was repeated 3 times. After the last sequence the pocket was rinsed carefully with saline solution and crosslinked hyaluronic acid (hyaDENT BG) was installed into the pocket according the “seal” protocol.

The patient was instructed not to eat or drink for 2 hours and not to start brushing teeth until the evening of the treatment day. In addition, rinsing with CHX-containing products was not allowed for 24 hours.

During the subsequent healing phase, neither re-instrumentation nor surgical intervention was performed and no adjunctive systemic medication was prescribed.

Re-evaluation Findings

The patient returned for clinical re-evaluation three months after treatment. Examination revealed a remarkable improvement in periodontal status throughout the treated region. Probing pocket depths had decreased substantially at all previously diseased sites, with the deepest baseline pocket of 8 mm at tooth 32 reducing to 2 mm. Similar improvements were observed at the adjacent teeth, resulting in probing depths of 2 mm or less throughout the treated area (Fig. 7). The most striking clinical observation at re-evaluation was the complete absence of bleeding on probing. Whereas all affected sites exhibited bleeding at baseline, no bleeding was recorded three months after treatment. From a clinical perspective, these findings indicated complete pocket closure and successful resolution of the previously diseased periodontal sites (Fig. 8). No residual pockets requiring additional active therapy were detected. The combination of pocket reduction and complete resolution of bleeding on probing indicates that the treated sites had transitioned from active disease to a state compatible with periodontal health.

Post-Treatment Assessment

The clinical outcome observed in this patient can be considered highly favorable. Deep periodontal pockets are generally regarded as difficult to resolve completely through non-surgical therapy alone, particularly when initial probing depths approach or exceed 8 mm.

Nevertheless, complete pocket closure was achieved within three months following a single treatment session. Importantly, the observed improvement was not limited to a reduction in probing depths. The simultaneous elimination of bleeding on probing and absence of residual disease suggest genuine clinical stabilization rather than merely partial improvement. At the time of reevaluation, no signs indicated the need for further active periodontal treatment.

Clinical Implications

The present case illustrates that complete pocket closure can be achieved following a single session of non-surgical periodontal therapy, even in sites presenting with advanced probing depths. While individual outcomes inevitably vary and not all patients can be expected to achieve comparable results, the case demonstrates the biological potential of optimized anti-infective treatment strategies under favourable conditions.

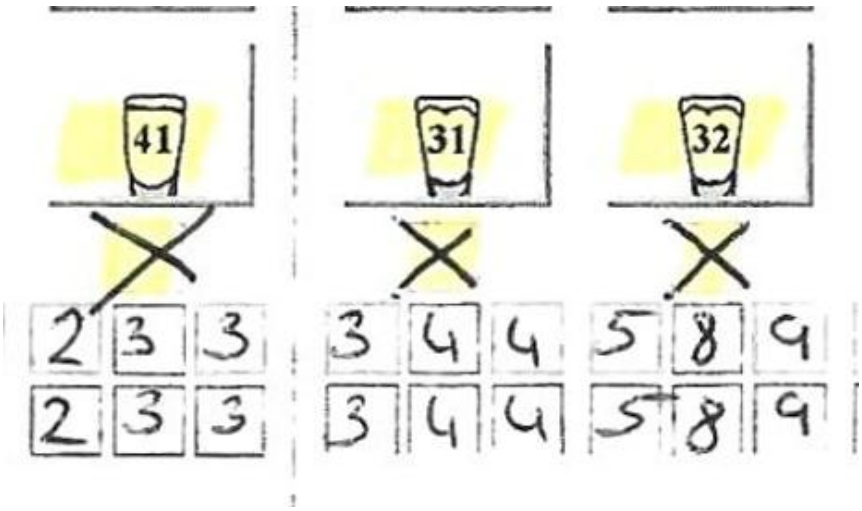

Figure 5: Baseline periodontal chart of the mandibular anterior region (teeth 31, 32 and 41) before Active Instrumentation Therapy (AIT) using the Clean-and-Seal protocol. Localized periodontal destruction was present, with probing pocket depths of up to 8 mm and bleeding on probing at all affected sites.

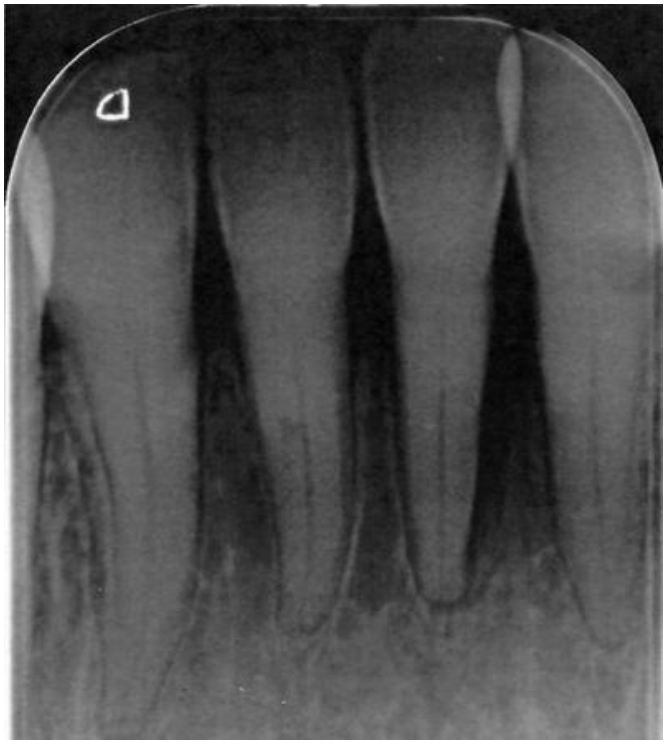

Figure 6: Baseline radiograph of 32-42 showing pocket depths of 8 mm and above at tooth 32 with bleeding on probing.

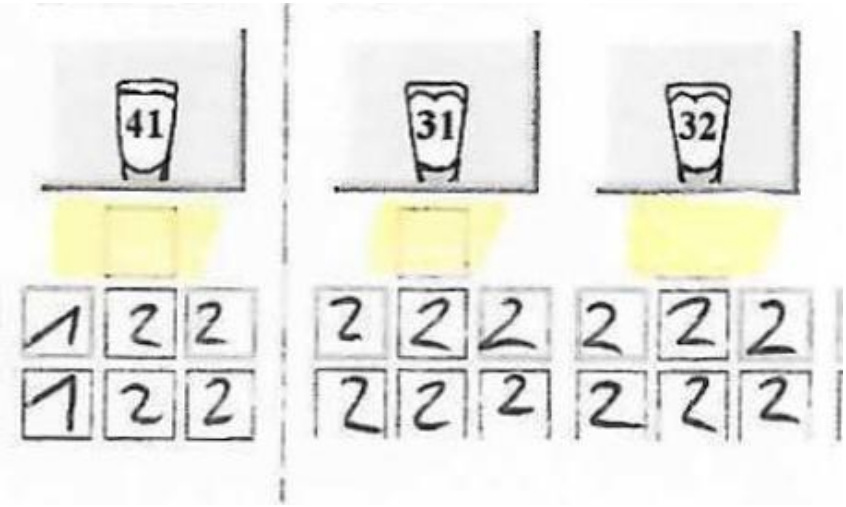

Figure 7: Periodontal chart of the mandibular anterior region three months after a single session of subgingival instrumentation therapy in phase 2 using the Clean and Seal protocol. Complete pocket closure was achieved at all previously diseased sites, with probing pocket depths reduced to ≤ 2 mm and complete elimination of bleeding on probing.

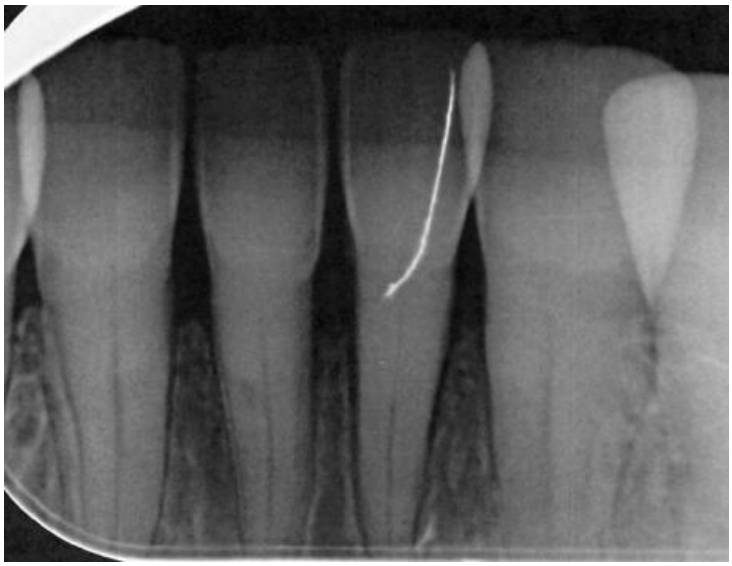

Figure 8: Radiograph showing the regression of the disease three months after using Clean and Seal protocol was implemented.

Limitation: Our Honest Point of View

Several limitations should be acknowledged and discussed transparently.

First, the pocket closure rate as well as the patient-level reanalysis reporting the figures of 0% and 42% was done after having published the "conventional" clinical parameter. The corresponding manuscript is currently in preparation and has not yet undergone peer review. Consequently, these patient-level findings are not part of the published 2023 paper but represent an extended analysis of the original raw data. This distinction should be clearly recognized when interpreting the results.

Second, the patient population included in the Ramanauskaite study consisted primarily of non-smoking Stage II-III periodontitis patients treated in a single university centre in Kaunas, Lithuania. Similarly, the two single center studies investigating the effect in phase 3 of the periodontal treatment comprised 52 resp. 70 patients treated in a private specialist practices [12,13]. Therefore, these findings cannot automatically be extrapolated to patients with Stage IV disease, Grade C progression, smoking habits or significant systemic comorbidities.

Third, the clinical case presented in this article represents a retrospective observation from a single general dental practice in Austria, performed by one clinician and evaluated over a follow-up period of three months. It does not constitute a clinical trial

and cannot be interpreted as proof of efficacy. Nevertheless, it illustrates that treatment outcomes of a magnitude like those described in the patient-level analyses may also be observed under routine practice conditions.

When Surgery Remains the Standard of Care

The purpose of this discussion is not to abandon periodontal surgery, but to reconsider the level at which surgery becomes necessary.

Periodontal surgery remains an essential component of contemporary periodontal therapy in a variety of clinical situations. Regenerative treatment of intrabony defects, particularly when combined with membranes, enamel matrix derivatives and increasingly hyaluronic acid-based adjuncts, continues to represent a well-established indication [14]. Likewise, mucogingival procedures, including root coverage and augmentation of keratinized tissue, remain fundamentally surgical interventions [15]. Complex furcation involvements, treatment-resistant lesions and sites that fail to respond adequately to well-performed non-surgical therapy might also require surgical access to achieve long-term stability [14]. In such situations, surgery remains the most predictable treatment option.

However, the data discussed in this article suggest that the number of periodontally active sites as well as the population of patients ultimately requiring surgical intervention may be smaller than traditionally assumed. If a substantial proportion of patients can achieve clinical resolution through optimized non-surgical therapy alone, the role of surgery may increasingly shift from a routine next step to a more selective and biologically driven intervention. The central question is therefore not whether periodontal surgery remains necessary-it clearly does. Rather, the question is how often patients should undergo surgery after this modern non-surgical treatment has been fully utilized.

Conclusion

The findings presented in this article do not argue against periodontal surgery. Instead, they shall invite clinicians to reconsider how success is defined after non-surgical treatment. For decades, residual pockets have frequently been regarded as an almost inevitable consequence of non-surgical periodontal therapy and, consequently, as an indication for surgical intervention. Emerging patient-level data, supported by the clinical case presented here, suggest that this paradigm may deserve re-evaluation. If larger prospective studies confirm that a substantial proportion of patients can achieve complete clinical resolution without repeated instrumentation or surgery, future treatment algorithms may place greater emphasis on maximizing the potential of non-surgical therapy before progressing to surgical treatment. In this context, the most relevant clinical question may no longer be how early surgery should be performed, but rather how often surgery can be avoided while still achieving long-term periodontal stability. It is inevitable to pronounce that, from a practical perspective, successful resolution of deep periodontal lesions without re-instrumentation or surgery offers important benefits for both clinicians and patients, including reduced treatment burden, lower morbidity and improved acceptance of periodontal therapy.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

Acknowledgement

The authors have no acknowledgments to declare.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement

The project did not meet the definition of human subject research under the preview of the IRB according to federal regulations and therefore was exempt.

Informed Consent Statement

Informed consent was obtained from all participants included in the study.

Authors' Contributions

All authors contributed equally to this paper.

References

1. Sanz M, Herrera D, Kebschull M, Chapple I, Jepsen S, Berglundh T, et al. Treatment of stage I-III periodontitis-The EFP S3 level clinical practice guideline. J Clin Periodontol. 2020.
2. Tomasi C, Liss A, Welander M, Alian AY, Abrahamsson KH, Wennström JL. A randomized multi-centre study on the effectiveness of non-surgical periodontal therapy in general practice. J Clin Periodontol. 2022;49(11):1092-105.
3. Liss A, Wennström JL, Welander M, Tomasi C, Petzold M, Abrahamsson KH. Patient-reported experiences and outcomes following two different approaches for non-surgical periodontal treatment: A randomized field study. BMC Oral Health. 2021;21(1):1-13.
4. Simonelli A, Farina R, Minenna L, Scapoli C, Trombelli L. Factors influencing pocket closure in surgically-treated intraosseous defects: A retrospective analysis. Clin Oral Investig. 2025;29(6):316.
5. Anderson W, Pye A. Management of intrabony defects in periodontal disease. Dent Update. 2019;46(3):257-65.
6. Radulescu V, Boariu MI, Rusu D, Roman A, Surlin P, Voicu A, et al. Clinical and microbiological effects of a single application of sodium hypochlorite gel during subgingival reinstrumentation: A triple-blind randomized placebo-controlled clinical trial. Clin Oral Investig. 2022;26(11):6639-52.
7. Eliezer M, Imber JC, Sculean A, Pandis N, Teich S. Hyaluronic acid as adjunctive to non-surgical and surgical periodontal therapy: A systematic review and meta-analysis. Clin Oral Investig. 2019;23(9):3423-35.
8. Iorio-Siciliano V, Blasi A, Mauriello L, Salvi GE, Ramaglia L, Sculean A. Non-surgical treatment of moderate periodontal intrabony defects with adjunctive cross-linked hyaluronic acid: A single-blinded randomized controlled clinical trial. J Clin Periodontol. 2025;52(2):310-22.
9. Ramanauskaite E, Machiulskiene V, Sakalauskaite U, Eliezer M, Sculean A. Clinical evaluation of a novel combination of sodium hypochlorite/amino acid and cross-linked hyaluronic acid adjunctive to non-surgical periodontal treatment: A case series. Oral Health Prev Dent. 2023;21:279-84.
10. Ramanauskaite E. Additional data evaluation: RCT, 48 patients, 6 months. Site-level closure: 88.7% (test) vs 53% (control). Patient-level re-analysis: 42% vs 0% achieved UPT² status immediately after Phase 2. 2023.
11. Shirakata Y, Nakamura T, Setoguchi F, Imafuji T, Shinohara Y, Matsumura S, et al. Histological evaluation of nonsurgical periodontal treatment with and without the use of sodium hypochlorite/amino acids and cross-linked hyaluronic acid gels in dogs. Clin Oral Investig. 2024;28(5):281.
12. Bényei. Pilot RCT, 52 patients, 9 months, residual pocket setting (Stage 3). For deep pockets ≥8 mm: 94% closure (test) vs 42% (control). An additional patient-level healing rate of 31% was observed in the CCS group following Phase 3. 2024.
13. Jungbauer G, Stalder F, Müller S, Sculean A, Eick S, Jentsch H. Effect of sodium hypochlorite and hyaluronic acid in subgingival re-instrumentation: A randomized clinical trial. BMC Oral Health. 2026;26(1):1022.
14. Pihlstrom BL. Surgical versus non-surgical treatment of periodontitis: The past, the present, the future. J Periodontal Res. 2025;60(6):519-23.
15. Pilloni A, Schmidlin PR, Sahrmann P, Sculean A, Rojas MA. Effectiveness of adjunctive hyaluronic acid application in coronally advanced flap in Miller class I single gingival recession sites: A randomized controlled clinical trial. Clin Oral Investig. 2018.