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BEYOND ROUTINE SUBGINGIVAL INSTRUMENTATION: AN EVIDENCE-BASED FRAMEWORK FOR INDIVIDUALIZED SUPPORTIVE PERIODONTAL THERAPY IN PERIODONTITIS PATIENTS

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ABSTRACT

Background: Supportive periodontal therapy (SPT) is essential for maintaining periodontal stability after active treatment of periodontitis. Although subgingival instrumentation is a well-established component of active periodontal therapy, its routine repetition during maintenance visits remains clinically debated. Evidence supporting instrumentation during disease resolution cannot be directly extrapolated to all patients receiving long-term supportive care.

Aim: This narrative review critically evaluates current evidence regarding routine versus selective subgingival instrumentation during SPT and proposes an evidence-based framework for individualized periodontal maintenance.

Methods: A targeted narrative synthesis of randomized and prospective clinical studies, systematic reviews, consensus reports, and evidence-based periodontal guidelines was undertaken. Particular attention was given to probing pocket depth, clinical attachment level, bleeding on probing, residual pockets, microbiological outcomes, risk factors, and patient adherence.

Evidence synthesis: Available comparative evidence does not demonstrate a consistent additional benefit of routine subgingival instrumentation for every periodontally stable patient. A two-year randomized trial (Angst et al., 2019) found comparable overall maintenance with or without routine subgingival instrumentation, whereas a more recent randomized trial (Isola et al., 2026) reported additional improvements in bleeding-related and residual-pocket outcomes when subgingival instrumentation was included. These apparently divergent findings support context-dependent rather than universal treatment decisions.

Conclusions: SPT should move from automatic procedure-based protocols toward individualized, risk-based care. Subgingival instrumentation remains an important therapeutic tool, but its use during maintenance should be guided by current disease activity, residual pocket characteristics, patient-level risk factors, and longitudinal stability.

KEYWORDS

Periodontitis, Supportive Periodontal Therapy, Periodontal Maintenance, Subgingival Instrumentation, Periodontal Risk Assessment, Personalized Periodontal Care

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1. Introduction

Periodontitis is a chronic, multifactorial inflammatory disease associated with dysbiotic dental biofilms and progressive destruction of the tooth-supporting apparatus. Its clinical manifestations include attachment loss, periodontal pocket formation, gingival inflammation, and alveolar bone loss. Contemporary classification frameworks emphasize not only the severity and complexity of established disease but also the expected rate of progression and the contribution of modifying factors, reinforcing the concept that patients with apparently similar periodontal destruction may have substantially different future risks (Tonetti et al., 2018). Periodontal treatment can arrest disease activity and substantially improve clinical parameters, but it does not convert a previously susceptible patient into an individual who no longer requires surveillance. Long-term management is therefore an integral component of periodontal therapy rather than an optional phase that begins only when treatment has “finished.”

Supportive periodontal therapy (SPT), also termed supportive periodontal care or periodontal maintenance, is the structured phase of care following active periodontal treatment. It typically combines reassessment of periodontal status, reinforcement of self-performed oral hygiene, professional mechanical plaque removal, monitoring of local and systemic risk factors, and site-specific retreatment when indicated. Current European Federation of Periodontology guidance explicitly incorporates supportive care into the stepwise management of periodontitis and frames treatment decisions within disease stage, complexity, risk, and the need to preserve a functional dentition over time (Sanz et al., 2020). This long-term perspective is

clinically important because the effectiveness of active therapy can be compromised if recurrent inflammation, poor plaque control, smoking, metabolic risk, or non-adherence is not addressed during maintenance.

Evidence supporting the broad value of maintenance is substantial, although the exact contribution of individual procedures within maintenance is less certain. Long-term observational work has consistently shown that structured professional plaque-control programs are associated with favorable tooth-retention and periodontal outcomes. In the classic 30-year maintenance cohort described by Axelsson et al. (2004), sustained preventive care was associated with very low tooth mortality and long-term maintenance of periodontal health. A systematic review by Trombelli et al. (2015) similarly found generally low rates of tooth loss and limited attachment deterioration among periodontitis patients participating in long-term programs that included professional mechanical plaque removal, while also emphasizing limitations in the available comparative evidence. Thus, the clinical value of SPT as a whole should be distinguished from the question of whether every component of SPT must be delivered routinely to every patient at every visit.

One of the most important unresolved questions concerns routine subgingival instrumentation. During active non-surgical periodontal treatment, subgingival instrumentation is an evidence-based intervention that disrupts subgingival biofilm, removes calculus and other deposits, reduces inflammation, and improves probing outcomes. A systematic review commissioned for the EFP guideline confirmed the effectiveness of subgingival instrumentation in active periodontitis treatment (Suvan et al., 2020). The clinical objective during active therapy, however, is resolution or substantial control of established disease. The objective during maintenance is different: preservation of stability, early detection of recurrence, and targeted management of sites or patients that show renewed disease activity. A procedure that is indispensable during active disease control is not automatically required with the same intensity after stability has been achieved.

This distinction is more than semantic. Historically, maintenance protocols often included repeated root debridement or subgingival instrumentation at fixed intervals, partly based on the assumption that recolonization of subgingival sites would otherwise lead predictably to recurrent disease. Yet modern concepts of periodontal pathogenesis do not support a simple one-directional model in which the detection or re-establishment of periodontitis-associated microorganisms is equivalent to active tissue destruction. Periodontal breakdown emerges from interactions between dysbiotic microbial communities and a susceptible host in a specific ecological and behavioral context. Smoking, glycemic control, plaque accumulation, residual pocket anatomy, adherence, and prior disease experience may modify the probability that a given site will deteriorate. Consequently, routine instrumentation may offer different marginal benefits in a stable low-risk patient than in a smoker with persistent bleeding and multiple residual pockets.

The clinical literature illustrates this uncertainty. Jenkins et al. (2000) compared repeated subgingival scaling during supportive therapy with a more selective approach in patients who retained periodontal pockets after conventional treatment. Repeated instrumentation at three-month intervals did not produce significant advantages in probing depth, relative attachment level, or bleeding outcomes. Nearly two decades later, Angst et al. (2019) randomized 62 treated patients with moderate-to-severe periodontitis to oral prophylaxis and oral hygiene instruction alone or the same protocol supplemented by subgingival instrumentation every three months. Both strategies maintained the previously achieved periodontal condition to a comparable overall extent during two years of follow-up. A later microbiological report from the same cohort similarly found no meaningful between-group advantage in the subgingival bacterial outcomes examined (Angst et al., 2024).

The evidence is not uniformly negative, however. A randomized controlled trial by Isola et al. (2026) compared supportive care based on oral hygiene instruction, supragingival instrumentation, and polishing with a protocol that additionally included subgingival instrumentation. At 24 months, both groups improved, but the intervention including subgingival instrumentation showed greater reductions in bleeding on probing, gingival bleeding, and several residual-pocket categories. Smoking and deeper pocket profiles negatively influenced bleeding outcomes. These findings are highly relevant because they argue against replacing routine instrumentation with a universal “supragingival-only” strategy. Instead, the contrast between trials suggests that the effect of additional instrumentation is likely to depend on the population treated, the baseline burden of residual disease, the maintenance protocol, and the outcomes selected.

The resulting clinical question should therefore be reframed. It is not whether subgingival instrumentation is useful in periodontology; that point is well established. It is whether routine repetition of subgingival instrumentation provides sufficient additional benefit in every patient receiving supportive care to justify universal application. A more clinically meaningful formulation is: which patients and which sites are most likely to benefit from additional subgingival intervention, at what point during maintenance, and according to which indicators of disease activity and risk?

This narrative review critically evaluates the biological rationale and clinical evidence relevant to that question. It distinguishes active periodontal treatment from maintenance, examines comparative evidence on routine versus selective subgingival instrumentation, discusses residual pockets, bleeding on probing, smoking, systemic risk, and adherence, and proposes a practical framework for individualized SPT. The objective is not to advocate less treatment, but to support more proportionate treatment: sufficient intervention where the expected benefit is meaningful, and avoidance of automatic procedures when current evidence does not demonstrate a clear incremental advantage.

2. Methodology

This article was developed as a targeted narrative review rather than a systematic review or meta-analysis. The purpose was to critically synthesize clinically relevant evidence concerning the role of subgingival instrumentation during SPT and to integrate that evidence with established concepts of periodontal risk assessment and long-term maintenance. Because the review was designed to address a focused clinical decision problem rather than estimate a pooled treatment effect, no formal PRISMA workflow, duplicate screening process, or quantitative meta-analysis was undertaken.

The evidence base considered for this review comprised randomized and prospective clinical studies directly comparing supportive-care protocols with and without routine subgingival instrumentation, systematic reviews evaluating professional mechanical plaque removal or subgingival instrumentation, consensus reports and clinical practice guidelines, and longitudinal studies relevant to periodontal recurrence and risk. A targeted search of PubMed/MEDLINE (conducted in September 2026) used combinations of the terms “supportive periodontal therapy”, “periodontal maintenance”, “subgingival instrumentation”, “professional mechanical plaque removal”, and “recall interval”, and was supplemented by examination of the reference lists of key reviews and guidelines. Priority was given to studies with direct relevance to treated periodontitis patients in maintenance, to contemporary evidence-based guidance, and to studies that clarified risk modifiers or long-term outcomes.

Clinical outcomes of interest included probing pocket depth (PPD), clinical attachment level (CAL), bleeding on probing (BOP), gingival bleeding, residual-pocket burden, tooth loss, and evidence of periodontal progression. Microbiological findings were considered when they helped clarify whether additional subgingival instrumentation produced an effect beyond clinical plaque control and monitoring. Patient-level factors included smoking, diabetes and glycemic control, adherence to maintenance, baseline disease severity, and residual disease after active therapy.

The evidence was interpreted with attention to study design, unit of analysis, sample size, duration of follow-up, comparability of the maintenance protocols, baseline periodontal condition, and the distinction between statistical and clinical significance. Particular caution was applied when interpreting site-level outcomes, because periodontal data are inherently clustered within patients and because patient-level treatment allocation does not make individual sites statistically independent. Where different reports originated from the same trial cohort, they were treated as complementary reports rather than independent studies; this is especially relevant to the clinical and microbiological reports from the Angst et al. randomized trial.

This methodological approach has limitations. A narrative review cannot claim comprehensive capture of every eligible study, nor can it provide a formal certainty-of-evidence rating comparable with a systematic review using GRADE. The value of the present approach lies instead in critical clinical interpretation: distinguishing direct evidence on supportive care from evidence on active treatment, identifying plausible sources of heterogeneity, and translating the available literature into a practical decision framework without overstating the strength of inference.

3. Evidence synthesis and critical appraisal of current literature

The evidence relevant to subgingival instrumentation during supportive care is best understood by separating three levels of reasoning: biological plausibility, direct comparative clinical evidence, and risk-based interpretation. Biological plausibility explains why subgingival intervention can be useful; comparative trials indicate whether its routine repetition produces measurable incremental benefit; and risk-based interpretation determines whether those average trial effects can be applied to a specific patient or site. Conflating these levels can lead either to overtreatment, by assuming that a biologically plausible intervention must be routinely repeated, or to undertreatment, by misreading a neutral average trial result as evidence that the intervention is unnecessary in active sites.

3.1 Biological rationale for subgingival biofilm control

Periodontitis develops through a reciprocal relationship between dysbiotic microbial communities and a susceptible host inflammatory response. Subgingival biofilms provide persistent antigenic and inflammatory stimulation, but tissue destruction is not a deterministic consequence of detecting a specific organism. The same broad microbial taxa may be present at different abundance and activity levels in health, stability, and disease, and the clinical outcome depends on ecological conditions and host response. This concept is consistent with modern classifications of periodontal health and disease, which recognize stable periodontal health on a reduced periodontium after successful treatment (Chapple et al., 2018).

During active periodontal therapy, the rationale for subgingival instrumentation is strong. Mechanical disruption of the subgingival biofilm and removal of calculus reduce the microbial challenge and create conditions that favor resolution of inflammation. The systematic review by Suvan et al. (2020) supports subgingival instrumentation as a fundamental component of non-surgical treatment. Importantly, that evidence addresses active periodontitis. It should not be interpreted as direct proof that the same procedure must be repeated in the same way at every subsequent maintenance appointment.

After treatment, recolonization of periodontal sites occurs. Historically, this observation encouraged repeated instrumentation on the assumption that the microbial community should be mechanically reset before it could become pathogenic. Yet the clinical objective of maintenance is not sterilization of the periodontal pocket. Such an objective is biologically unrealistic and clinically unnecessary. The practical objective is sustained control of inflammation and prevention of progressive attachment and tooth loss. If a treated patient demonstrates low bleeding, stable probing measurements, good plaque control, and no evidence of progression, the presence of subgingival microorganisms alone does not establish an indication for repeated mechanical intervention.

This is also relevant to treatment burden. Repeated instrumentation is generally safe when properly performed, but it is not completely biologically neutral. Instrumentation may be associated with transient discomfort, root sensitivity, gingival recession, and cumulative removal of root-surface material. These considerations were central to the trial by Jenkins et al. (2000), which tested whether repeated subgingival debridement during supportive therapy produces a benefit proportional to its burden. The practical issue is therefore marginal benefit: whether the incremental improvement attributable to routine subgingival instrumentation is large enough to justify its repeated use in a patient who is already clinically stable.

The biological argument for selective instrumentation is stronger in residual or inflamed sites. Deep pockets create a more anaerobic environment, complicate self-performed plaque control, and may retain calculus or biofilm inaccessible to routine supragingival measures. Persistent BOP can signal sustained inflammatory activity. Long-term observational evidence shows that residual pocket depth is not merely an anatomic finding: Matuliene et al. (2008) found that residual PPD of 5 mm or greater, especially deeper sites, was associated with increased risk of disease progression and tooth loss during maintenance. Thus, the rationale for instrumentation is not abolished during SPT; it becomes more conditional and more dependent on site-level findings.

A clinically coherent maintenance model therefore requires a distinction between subgingival instrumentation as a therapeutic tool and routine subgingival instrumentation as a default schedule. The former remains central to periodontal care. The latter should be justified by evidence of incremental benefit and by the patient's risk profile.

3.2 Direct clinical evidence: early controlled data

Jenkins et al. (2000) provided one of the earliest direct tests of routine repeated subgingival scaling during supportive therapy. The prospective study recruited 39 maintenance patients who retained at least four periodontal pockets of at least 4 mm after conventional treatment. Participants were assigned to a coronal-scaling strategy or to regular subgingival scaling. At each visit, both groups received coronal scaling and oral-hygiene measures, whereas the subgingival-scaling group received thorough subgingival debridement. In the coronal-scaling group, subgingival intervention was reserved for sites that demonstrated clinically relevant attachment deterioration.

Thirty-one patients completed the study. The investigators evaluated PPD, BOP, and relative attachment level over 12 months. The number of “loser” sites was similar between groups, and there were no significant between-group differences in the principal clinical parameters. The authors concluded that the findings called into question the value of repeated subgingival scaling at three-month intervals in this specific population.

The study is clinically provocative but should not be overinterpreted. It was small, attrition reduced the analyzable sample further, and periodontal practice and risk stratification have evolved considerably since 2000. The study population also consisted of patients with persistent disease after conventional therapy rather than a uniformly stable maintenance cohort. In addition, site-level data were aggregated within relatively small patient groups, which may obscure heterogeneity in localized disease behavior. Nevertheless, the study remains directly relevant because it tested the added value of a scheduled procedure rather than the effectiveness of periodontal instrumentation in active treatment.

The main lesson from Jenkins et al. is therefore not that subgingival debridement is ineffective. Rather, it demonstrates that routine repetition may fail to produce a detectable incremental advantage when compared with careful monitoring and selective retreatment. That distinction foreshadows the contemporary concept of risk-based maintenance.

3.3 Contemporary randomized evidence: Angst et al.

The most directly applicable modern randomized evidence was provided by Angst et al. (2019). The study enrolled 62 patients who had completed non-surgical treatment for moderate-to-severe periodontitis. Participants were randomized to two supportive-care protocols delivered every three months for two years. The test group received full-mouth oral prophylaxis and individualized oral-hygiene instruction without routine subgingival instrumentation. The control group received the same care plus full-mouth subgingival instrumentation intended to remove or disrupt subgingival biofilm. The investigators used full-mouth periodontal measurements and generalized estimating equations, an important methodological strength given the clustered and longitudinal nature of periodontal data.

At baseline, the groups were broadly comparable, although mean PPD was slightly greater in the group without routine instrumentation (2.32 mm vs. 2.17 mm, $p = .03$). Over time, both groups showed changes in PPD, BOP, and CAL, but the overall clinical outcomes after two years were comparable. The distribution of sites with clinically relevant attachment gain or loss was also similar. The investigators concluded that oral prophylaxis and oral-hygiene instruction alone or combined with subgingival instrumentation maintained the previously achieved periodontal condition to a comparable extent during two years of SPT.

This finding is central to the present review because the trial evaluates exactly the additional value of routine instrumentation during maintenance rather than the effectiveness of active periodontal treatment. It provides randomized evidence against assuming that universal full-mouth subgingival instrumentation is necessary at every maintenance visit in all treated patients.

Several nuances are important. First, the trial should not be interpreted as proof of equivalence in every clinically relevant subgroup. Its sample size was modest (62 patients) and was not necessarily sufficient to detect small effects within specific risk strata. Second, the population had already received intensive non-surgical therapy before entering maintenance. The marginal value of repeated subgingival instrumentation is likely to be lower in such a carefully treated population than in patients who enter maintenance with residual calculus, unstable inflammation, or incomplete therapy. Third, a limited number of deeper residual sites remained, and site-specific responses can differ from patient-level average outcomes.

The trial also produced a finding that cautions against simplistic interpretation of deep sites: PPD reduction at sites of at least 5 mm was greater in the group without routine subgingival instrumentation. This does not prove that avoiding instrumentation improves deep pockets; it illustrates how local regression to the mean, baseline imbalances, site selection, and complex healing trajectories can produce results that should not

be converted into rigid procedural rules. The defensible conclusion is narrower: routine full-mouth instrumentation did not provide a consistent overall additional benefit in this treated cohort.

From a clinical-significance perspective, the absence of a meaningful overall difference matters even if small numerical differences occur. Maintenance procedures are repeated over years or decades. A statistically detectable but clinically trivial incremental difference would need to be weighed against procedure time, patient discomfort, resource use, and the possibility that selective intervention could achieve the same long-term stability. Angst et al. therefore shift the decision problem from “should instrumentation be part of SPT?” to “under which circumstances does additional instrumentation materially improve outcomes?”

3.4 Microbiological evidence from the same randomized cohort

The microbiological analysis published by Angst et al. (2024) provides an important complementary perspective. The study used the same randomized cohort and compared subgingival microbial outcomes during supportive care with and without routine subgingival instrumentation. Because it derives from the same participants as the 2019 clinical report, it should not be counted as an independent trial; rather, it offers mechanistic information about the clinical comparison.

Subgingival biofilm samples were evaluated for total bacterial load and selected periodontal pathogens, including *Porphyromonas gingivalis*, *Tannerella forsythia*, and *Treponema denticola*. After two years, bacterial levels and periodontal parameters at sampled sites did not differ significantly between groups. The result challenges a straightforward mechanistic assumption that routine mechanical disruption must necessarily produce a sustained microbiological advantage during maintenance.

The interpretation should remain cautious. Quantification of selected species cannot capture the full functional behavior of a complex microbial community, and absence of a difference in measured taxa does not prove that the microbiomes were biologically identical. Moreover, microbiological endpoints are surrogate outcomes; long-term tooth retention and prevention of progressive attachment loss are ultimately more clinically important. Even so, the findings support a central principle: microbiological presence alone is not an adequate trigger for intervention in a clinically stable patient.

The result also illustrates why periodontal maintenance should not be designed around the unattainable goal of eliminating all periodontitis-associated organisms. A stable host-microbial relationship may be maintained through excellent supragingival plaque control, regular reassessment, risk-factor modification, and selective local therapy. Routine subgingival instrumentation may still be useful in an inflamed residual pocket, but the rationale is the clinical risk represented by that site, not the abstract objective of repeatedly suppressing the entire subgingival microbiota.

3.5 Newer randomized evidence: Isola et al. and the importance of context

The randomized controlled trial by Isola et al. (2026) is especially important because its findings differ from those of Angst et al. (2019). Fifty-six patients with periodontitis underwent active periodontal treatment and were then randomized to two supportive-care protocols. The control strategy included oral-hygiene instruction, supragingival instrumentation, and polishing. The test strategy added subgingival instrumentation. Both groups improved during 24 months, but the group receiving subgingival instrumentation demonstrated greater reductions in median BOP, gingival bleeding, and several residual-pocket outcomes. Notably, the arm labels differ between the two trials: in the trial by Angst et al. (2019), the group labeled “test” received care without routine subgingival instrumentation, whereas in the Isola trial, the “test” group received the protocol that included subgingival instrumentation.

This trial prevents an overly strong conclusion that routine subgingival instrumentation never provides incremental benefit. Instead, it strengthens the argument for clinical heterogeneity. Differences between the Angst and Isola trials may reflect differences in baseline residual disease, treatment delivery, operator technique, population characteristics, smoking distribution, outcome definitions, or the exact intensity of maintenance. Isola et al. also found that smoking and deeper pocket profiles negatively influenced BOP reduction, directly linking patient and site characteristics with treatment response.

The primary outcome in the Isola trial was BOP. BOP is clinically relevant, but it is not equivalent to attachment loss or tooth retention. A greater reduction in bleeding may represent improved inflammatory control without necessarily translating into a proportionate long-term difference in tooth survival. Nevertheless, because persistent inflammation is undesirable and because bleeding patterns form part of periodontal risk

assessment, the result is clinically meaningful and should not be dismissed simply because another trial found no overall difference in PPD or CAL.

The two trials can be reconciled without false equivalence. Angst et al. provides evidence that routine full-mouth subgingival instrumentation may be unnecessary for maintaining overall stability in a well-treated cohort. Isola et al. provides evidence that adding subgingival instrumentation can improve selected inflammatory and pocket outcomes in another treated cohort. Together they argue against universal prescriptions in either direction. The most plausible interpretation is effect modification: the incremental value of instrumentation depends on who is treated, which sites remain at risk, and what outcome the clinician seeks to improve.

3.6 Professional mechanical plaque removal and recall intervals

The broader evidence on professional mechanical plaque removal supports regular supportive care but does not establish a single universally optimal maintenance schedule. Trombelli et al. (2015) reviewed prospective studies in which professional mechanical plaque removal formed part of long-term secondary prevention. They found low rates of tooth loss and limited attachment deterioration in many cohorts, but the absence of randomized comparisons against no maintenance prevented a precise estimate of the causal contribution of PMPR itself. A companion consensus report emphasized the clinical importance of supportive care while acknowledging the limitations of the evidence base (Sanz et al., 2015).

Farooqi et al. (2015) specifically examined recall intervals. The systematic review found no randomized trials establishing an ideal universal interval and concluded that evidence supporting one fixed schedule for all patients was weak. This result parallels the instrumentation debate. Both recall frequency and procedural intensity have historically been standardized for convenience, yet both may be better determined by individual risk.

The clinical implication is not that three- or four-month recalls are inappropriate. Short intervals are entirely justified in high-risk patients and in the early maintenance period after active therapy. Rather, the evidence argues against converting a common interval into a biological law. Recall frequency should be aligned with disease history, residual pocket burden, inflammation, adherence, smoking, systemic risk, and observed stability over time.

The available randomized evidence (summarized in Table 1) should be interpreted with consideration of study limitations. Jenkins et al. (2000) was limited by small sample size and an older treatment protocol. Angst et al. (2019) provides strong direct evidence against universal routine full-mouth instrumentation in a well-treated maintenance cohort, but was not powered for detailed subgroup effects. Angst et al. (2024) provides complementary microbiological data from the same cohort rather than an independent trial. Isola et al. (2026) provides evidence that additional instrumentation may improve selected inflammatory outcomes, although long-term tooth-retention endpoints remain unavailable.

Table 1. Key evidence relevant to routine versus selective subgingival instrumentation during supportive periodontal therapy

Study	Design / sample	Maintenance comparison	Follow-up	Key outcomes	Interpretation
Jenkins et al., 2000	Prospective controlled study; 39 recruited, 31 completers	Coronal scaling with selective rescue debridement vs repeated subgingival scaling	12 months	PPD, RAL, BOP; no significant between-group advantage	Questions fixed-interval repeated instrumentation; small study and older protocol
Angst et al., 2019	Randomized clinical trial; 62 treated periodontitis patients	Oral prophylaxis + OHI vs same care + routine subgingival instrumentation every 3 months	24 months	Overall PPD, BOP and CAL outcomes comparable	Strong direct evidence that routine full-mouth instrumentation may add little in a well-treated maintenance cohort

Study	Design / sample	Maintenance comparison	Follow-up	Key outcomes	Interpretation
Angst et al., 2024	Microbiological analysis of the same randomized cohort	SPT with vs without routine subgingival instrumentation	24 months	No significant between-group advantage in measured bacterial counts or sampled-site periodontal parameters	Supports clinical rather than microbiological triggers for intervention; not an independent trial
Isola et al., 2026	Randomized controlled trial; 56 treated periodontitis patients	Supragingival SPC vs supragingival + subgingival instrumentation	24 months	Greater reduction in BOP, gingival bleeding and several residual-pocket categories with subgingival instrumentation	Important counterpoint: incremental benefit may be population-, site- and outcome-dependent
Trombelli et al., 2015	Systematic review; 19 prospective studies of long-term PMPR/SPT	Long-term professional mechanical plaque removal as part of SPT	≥3 years in included studies	Generally low tooth loss and limited attachment deterioration	Supports SPT as a system; does not prove every procedure is required routinely
Farooqi et al., 2015	Systematic review; 8 cohort studies	Different periodontal maintenance recall patterns	Variable	No RCT evidence for one universal recall interval	Supports risk-based rather than fixed scheduling

Note. SPT = supportive periodontal therapy; SPC = supportive periodontal care; OHI = oral hygiene instruction; PPD = probing pocket depth; CAL = clinical attachment level; BOP = bleeding on probing; RAL = relative attachment level; RCT = randomized controlled trial.

4. Discussion: From procedure-based maintenance toward individualized periodontal care

The central finding of this narrative synthesis is that evidence does not support a simple binary rule for subgingival instrumentation during SPT. The procedure remains indispensable when clinically indicated, but its routine full-mouth repetition in every treated patient is not consistently associated with additional benefit. Conversely, newer randomized evidence demonstrates that additional subgingival instrumentation can improve selected outcomes in some maintenance populations. These findings are best interpreted through individualized risk rather than through a universal “instrument” or “do not instrument” protocol.

This interpretation aligns with the broader evolution of periodontology. Staging and grading explicitly incorporate complexity and expected progression into diagnosis (Tonetti et al., 2018), while SPT risk models incorporate current inflammation, residual pockets, tooth loss, bone loss relative to age, smoking, and systemic factors (Lang & Tonetti, 2003). In other words, modern periodontal care already accepts that identical diagnoses can require different management intensity. Extending the same principle to supportive instrumentation is conceptually coherent.

The distinction between patient-level and site-level decisions is particularly important. A patient can be stable overall and still have one molar with a bleeding 6-mm pocket. Treating the entire dentition as if every site had the same risk may lead to unnecessary instrumentation; treating the patient as completely stable because average full-mouth values are favorable may miss a high-risk site. Precision in maintenance therefore requires movement between levels of analysis: the clinician assesses the patient's overall susceptibility and then identifies individual sites that justify local intervention.

The unit-of-analysis issue is also methodologically relevant when interpreting periodontal trials. Multiple sites within one patient are correlated because they share host characteristics, behaviors, systemic exposures, and treatment allocation. Studies that treat each site as an independent observation risk

pseudoreplication and overly narrow confidence intervals. The use of generalized estimating equations in the Angst trial is therefore a strength. Future trials should continue to model clustering explicitly and should predefine whether primary inference is intended at the patient, tooth, or site level.

Another important point is the difference between statistical significance and clinical significance. Maintenance decisions are repeated frequently and accumulate over a lifetime. A statistically significant small difference in BOP or PPD may be valuable if it predicts a meaningful reduction in future disease or treatment need, but it may be less compelling if it does not influence attachment, tooth retention, symptoms, or patient burden. Conversely, a non-significant trial result may still be compatible with meaningful benefit in a high-risk subgroup if the study is underpowered for interaction effects. This is why average trial effects should guide but not replace individualized clinical judgment.

A risk-based framework also reduces the temptation to equate treatment intensity with quality. More instrumentation is not automatically better care; less instrumentation is not automatically minimally invasive excellence. High-quality maintenance is proportionate care: enough intervention to control disease in the person and site at risk, while avoiding repetitive procedures that add burden without demonstrable benefit.

This framework is consistent with the findings of long-term maintenance research. Trombelli et al. (2015) and Axelsson et al. (2004) demonstrate the value of sustained preventive systems, while Farooqi et al. (2015) show that even a basic component such as recall interval lacks a universally validated fixed schedule. Echeverría et al. (2019) further emphasize that adherence is essential: a technically sophisticated maintenance protocol cannot succeed if patients do not return or if self-performed plaque control remains inadequate.

Therefore, the practical task for the periodontist is not simply to decide whether subgingival instrumentation belongs on the maintenance checklist. The task is to identify the clinical conditions under which its incremental benefit is likely to be meaningful.

4.1 Residual pockets and bleeding on probing

Residual periodontal pockets are among the most important findings that can modify maintenance intensity. Matuliene et al. (2008) followed 172 patients during long-term SPT and found a strong association between residual pocket depth and subsequent progression or tooth loss. Pockets of 5 mm already carried increased risk compared with shallow sites, and the risk increased markedly with greater probing depth. At the patient level, residual pockets of at least 6 mm and high BOP burden were associated with adverse outcomes.

These findings support further therapy for clinically significant residual pockets, but they do not imply that every 5-mm site requires immediate repeated root instrumentation. Pocket depth must be interpreted together with inflammation, anatomy, trend over time, and patient susceptibility. A stable non-bleeding 5-mm site in an adherent non-smoker may not have the same prognosis as a repeatedly bleeding 5-mm site in a smoker with poor plaque control.

BOP provides complementary information. Lang et al. (1986) studied its prognostic role during maintenance and helped establish the concept that repeated inflammatory findings are more informative than isolated bleeding. BOP has high clinical sensitivity for inflammation but limited specificity for future breakdown when considered alone. Accordingly, its greatest value is in longitudinal patterns and in combination with pocket depth, attachment changes, and risk factors.

This combined interpretation helps explain the Isola trial, in which additional subgingival instrumentation improved BOP and residual-pocket outcomes, without invalidating the Angst trial's overall finding of comparable maintenance. If a study population contains more sites in which inflammation and pocket anatomy create a reasonable indication for retreatment, the average benefit of additional instrumentation should be larger. Patient and site selection are therefore potential effect modifiers rather than mere nuisance variables.

4.2 Smoking, diabetes, and other patient-level modifiers

Smoking is one of the most consistently demonstrated modifiable predictors of adverse periodontal outcomes. Heitz-Mayfield (2005) identified smoking as a strong predictor of progressive periodontitis, and Heasman et al. (2006) reviewed evidence showing poorer periodontal treatment responses among smokers. Smoking can also suppress overt gingival bleeding while increasing destructive risk, complicating reliance on BOP as a single monitoring parameter. The Isola trial further showed a negative association between smoking exposure and BOP improvement during supportive care.

For smokers, individualized maintenance may therefore require shorter review intervals, more attention to residual pockets, reinforcement of cessation support, and a lower threshold for local retreatment when disease activity is suspected. This does not mean that every smoker should automatically receive full-mouth subgingival instrumentation at every visit. It means that the expected benefit of intervention must be evaluated in the context of elevated susceptibility and potentially muted inflammatory signs.

Diabetes represents another important modifier. The joint EFP/International Diabetes Federation consensus summarized bidirectional links between diabetes and periodontal disease and emphasized the importance of glycemic control in periodontal management (Sanz et al., 2018). Poor glycemic control can increase inflammatory burden and impair healing, so metabolic status should inform maintenance planning. A patient with well-controlled diabetes and stable periodontal findings may not require the same intensity as a patient with uncontrolled hyperglycemia, persistent pockets, and repeated bleeding.

Age, previous severity, tooth anatomy, furcation involvement, and tooth type also influence risk. Molars are disproportionately represented among teeth lost during long-term periodontal maintenance because of complex root anatomy, furcations, and restorative challenges (Wood et al., 1989). These factors reinforce the need for tooth- and site-specific assessment rather than reliance on full-mouth averages alone.

4.3 Adherence and self-performed plaque control

No professional maintenance procedure can compensate indefinitely for poor daily plaque control and irregular attendance. Echeverría et al. (2019) emphasize adherence as a central determinant of long-term periodontal maintenance. Patients who repeatedly miss supportive visits are deprived not only of professional plaque removal but also of reassessment, reinforcement of behavior, and early retreatment of unstable sites.

This point is important when interpreting the relative value of subgingival instrumentation. If a maintenance program provides high-quality oral-hygiene instruction, close monitoring, and strong patient adherence, the incremental effect of routine instrumentation may be small because the baseline level of preventive care is already effective. In poorly adherent patients, however, the issue is not simply whether more instrumentation should be delivered when they attend; the maintenance system must address barriers to attendance, plaque control, smoking, and other behavioral determinants.

The distinction also has implications for resource allocation. Routine instrumentation takes clinical time that could otherwise be directed toward risk counseling, self-care coaching, detailed reassessment, or targeted treatment of high-risk sites. A risk-based protocol is not necessarily shorter or cheaper in every visit; rather, it directs professional effort toward the components most likely to improve outcomes for the individual patient.

4.4 Balancing overtreatment and undertreatment

An individualized approach seeks to avoid two symmetrical errors. Overtreatment occurs when stable sites undergo repeated intervention despite little evidence that the additional procedure changes meaningful outcomes. Undertreatment occurs when residual inflammation or deep pockets are normalized as an acceptable consequence of previous disease and are not adequately managed.

The risk of overtreatment should not be exaggerated. Properly performed subgingival instrumentation is a standard periodontal procedure and adverse effects are generally manageable. Nevertheless, repeated procedures can contribute to transient sensitivity, gingival recession, treatment fatigue, and cumulative burden. Over many years of maintenance, even modest procedural burden matters, particularly if the incremental clinical effect is negligible.

Undertreatment may have more serious consequences. Persistent deep pockets and inflammation can be associated with progressive attachment loss and tooth loss, especially in susceptible patients. Matuliene et al. (2008) strongly support the prognostic importance of residual pockets. Thus, a minimalist approach that systematically avoids subgingival intervention would be inconsistent with the evidence.

The appropriate balance is dynamic. A stable patient may initially receive conservative maintenance, then require targeted subgingival instrumentation if a site begins to bleed repeatedly, deepens, accumulates calculus, or shows attachment change. Conversely, a patient who initially required intensive retreatment may later move to a less intervention-heavy protocol after sustained stability. Maintenance intensity should therefore be periodically reassessed rather than permanently assigned.

5. Practical framework for individualized supportive periodontal therapy

A practical framework can be built around three sequential questions: Is the patient stable? Are there specific unstable sites? Are there patient-level factors that increase the probability that apparently minor findings will progress?

First, patient-level stability should be assessed using full-mouth plaque and bleeding patterns, the distribution of residual pockets, evidence of new attachment loss or radiographic progression, smoking status, systemic risk, and adherence. The Periodontal Risk Assessment framework developed by Lang and Tonetti (2003) remains conceptually useful because it combines rather than isolates risk domains. Modern staging and grading provide additional context concerning historical severity and expected progression (Tonetti et al., 2018).

Second, site-level evaluation should identify residual pockets with repeated BOP, suppuration, calculus, progressive PPD, new attachment loss, or anatomically complex features. These findings represent stronger indications for subgingival instrumentation than a history of periodontitis alone. The clinician should also consider whether non-surgical retreatment is likely to be sufficient or whether surgical access, regenerative therapy, or another intervention is required.

Third, maintenance intensity should be matched to the combined risk profile. A low-risk patient with stable measurements, low bleeding, good plaque control, and reliable attendance may be managed primarily with reassessment, supragingival professional plaque removal as needed, and reinforcement of self-care. Routine full-mouth subgingival instrumentation at every visit is unlikely to be justified solely by past diagnosis.

A moderate-risk patient may have localized residual pockets, intermittent BOP, imperfect plaque control, or one or more modifying factors. These patients are well suited to selective instrumentation: treatment is directed to sites with evidence of activity while stable areas are monitored. Recall intervals can be adjusted according to the frequency and severity of unstable findings.

A high-risk patient may have multiple deep residual pockets, persistent BOP or suppuration, smoking, poorly controlled diabetes, a history of rapid progression, poor adherence, or complex posterior anatomy. Such patients may require shorter intervals, repeated subgingival instrumentation where clinically indicated, more intensive behavioral intervention, and early escalation when non-surgical retreatment fails. In this context, repeated subgingival intervention is not “routine” in the sense of being automatic; it is repeatedly indicated because risk and disease activity remain high.

This framework also accommodates the conflicting randomized evidence. The Angst trial is most applicable to well-treated patients in a structured maintenance program where routine full-mouth instrumentation added little overall benefit. The Isola trial reminds clinicians that additional instrumentation may improve inflammatory and residual-pocket outcomes in another population. Rather than choosing one trial as “correct,” individualized care asks which trial most closely resembles the patient in front of the clinician and which outcomes are clinically relevant for that patient.

Finally, treatment decisions should be documented longitudinally. A maintenance record should allow the clinician to explain why a site was instrumented, why another was observed, and whether the strategy produced the expected response. Such documentation transforms maintenance from a repeated procedure into a monitored therapeutic process.

6. Patient-centered and service-level considerations

Periodontal maintenance is a lifelong intervention, and patient-centered outcomes therefore deserve greater attention than they typically receive in procedure-focused trials. Comfort, dentin hypersensitivity, appointment duration, treatment fatigue, perceived value, and willingness to continue long-term maintenance may influence adherence. A technically effective protocol that patients find excessively burdensome can become clinically ineffective if attendance deteriorates.

Shared decision-making is particularly appropriate when the expected incremental benefit of a procedure is uncertain. For a stable patient with low risk, the clinician can explain that current evidence does not demonstrate a consistent advantage from routine full-mouth subgingival instrumentation and that the maintenance plan will emphasize monitoring and targeted retreatment. For a patient with persistent bleeding, deep pockets, and smoking exposure, the clinician can explain why additional subgingival intervention is more strongly justified and how modification of risk factors may reduce future treatment need.

Service design also matters. A risk-based maintenance model requires adequate time for periodontal reassessment and clinical reasoning. If reimbursement systems reward procedures more than surveillance and prevention, clinicians may be incentivized toward routine instrumentation even when a selective strategy is reasonable. Conversely, overly restrictive systems may discourage necessary retreatment. Future health-services research should therefore evaluate not only periodontal outcomes but also treatment time, cost, adherence, and patient-reported experience.

Importantly, a personalized approach should not be used to justify reduced access to supportive care. Patients with periodontitis require continuing professional follow-up. Individualization concerns the content and intensity of maintenance, not whether maintenance is provided at all.

7. Future directions

Future research should move beyond repeating average comparisons of “instrumentation versus no instrumentation” and instead investigate effect modifiers that can support clinical personalization. The most useful trials would stratify or prespecify analyses by residual pocket burden, BOP profile, smoking, diabetes, baseline plaque control, disease grade, and adherence. Interaction analyses should be powered appropriately; otherwise, subgroup conclusions will remain exploratory.

Longer follow-up is essential. Two-year trials are valuable for inflammatory and probing outcomes, but periodontal maintenance extends over decades. Clinically important endpoints include progressive CAL, tooth loss due to periodontitis, need for periodontal surgery, patient-reported burden, and maintenance costs. Studies should also distinguish site-level improvement from patient-level benefit and account statistically for clustering of sites and teeth within patients.

Biomarkers may eventually improve identification of unstable disease, but they are not yet a substitute for clinical assessment. Salivary or crevicular inflammatory markers, microbial profiles, and host-response signatures may add predictive information, but their incremental value over careful periodontal examination and established risk factors requires validation.

Digital technologies may facilitate longitudinal monitoring. Structured periodontal charting, automated visualization of pocket trajectories, and decision-support systems could help identify subtle patterns that are difficult to detect from isolated visits.

A particularly promising research direction is adaptive maintenance: protocols in which recall intervals and procedure intensity change in response to observed stability. Such designs more closely resemble real clinical practice than fixed regimens and could identify when patients can safely transition to less intensive maintenance or when escalating intervention improves outcomes.

Future evidence should also address patient priorities. If two maintenance strategies produce similar attachment and tooth-retention outcomes, but one reduces discomfort, appointment time, or sensitivity, that difference is clinically important. Conversely, if additional instrumentation substantially reduces bleeding or future surgery in a high-risk subgroup, the added burden may be justified. Personalized maintenance therefore requires integration of biological risk, treatment effect, and patient preference.

8. Limitations of the current evidence and of this review

Several limitations constrain the conclusions that can be drawn from the available literature. First, the number of randomized trials directly comparing supportive protocols with and without routine subgingival instrumentation is small. This limits precision and makes it difficult to determine whether treatment effects differ across clinically important subgroups.

Second, maintenance protocols are heterogeneous. Studies differ in active treatment before randomization, operator technique, the definition of supragingival prophylaxis, whether subgingival instrumentation is full-mouth or site-specific, recall frequency, thresholds for rescue treatment, and outcome definitions. These differences reduce direct comparability and are plausible explanations for divergent findings.

Third, periodontal outcomes are multilevel and correlated. Site-level PPD or BOP values are nested within teeth and patients. Analyses that fail to account for clustering can overstate precision. Trial design and statistical analysis should therefore be examined carefully before converting site-level findings into patient-level recommendations.

Fourth, many endpoints are surrogate or intermediate measures. PPD, CAL, and BOP are clinically meaningful, but long-term tooth retention and avoidance of progressive periodontal destruction are more

consequential. A maintenance strategy that improves BOP by a small amount may or may not produce meaningful long-term benefit. Conversely, a small average PPD difference may still matter if concentrated in high-risk residual pockets.

Fifth, smoking, diabetes, adherence, and other modifiers can confound observational evidence and modify treatment response in trials. Even randomization does not guarantee adequate power to detect interaction effects in small samples. The absence of a statistically significant subgroup difference should therefore not be interpreted as proof that the subgroup behaves identically.

This review also has methodological limitations. It is a targeted narrative review, not a systematic review. The literature search was designed to identify the most clinically relevant comparative studies, systematic reviews, risk evidence, and guidelines, but comprehensive retrieval and duplicate screening were not performed. No formal risk-of-bias tool or GRADE certainty assessment was applied. Consequently, the review should be interpreted as a critical clinical synthesis rather than a definitive quantitative estimate of treatment effect.

Despite these limitations, the convergence of direct randomized evidence, long-term risk studies, and contemporary guidelines supports a clinically coherent conclusion: routine subgingival instrumentation should not be treated as an automatic requirement for every maintenance patient, but subgingival intervention remains important when current findings indicate disease activity or elevated risk.

9. Conclusions

Supportive periodontal therapy is an indispensable component of long-term periodontitis management. The key issue is not whether subgingival instrumentation is effective; it is a well-established intervention during active treatment and remains essential when residual or recurrent disease requires therapy. The more specific question is whether it should be repeated routinely at every maintenance visit in all patients who have already achieved periodontal stability.

Current evidence does not support a universal answer. The prospective study by Jenkins et al. (2000) and the randomized trial by Angst et al. (2019) indicate that structured supportive care without routine full-mouth subgingival instrumentation can maintain favorable periodontal conditions in selected treated patients. The microbiological follow-up of the Angst cohort also failed to show a sustained microbial advantage from routine instrumentation. In contrast, the randomized trial by Isola et al. demonstrated additional improvements in bleeding and residual-pocket outcomes when subgingival instrumentation was included, particularly in a context where smoking and deeper pockets influenced response.

These findings are best understood as evidence for heterogeneity rather than contradiction. The incremental value of subgingival instrumentation during maintenance is likely to depend on residual disease burden, inflammatory activity, patient susceptibility, adherence, and the outcome of interest. Persistent deep pockets, repeated BOP, calculus, progressive attachment change, smoking, poor glycemic control, and other high-risk features strengthen the indication for targeted or repeated subgingival treatment. Stable periodontal conditions, low inflammatory burden, good plaque control, and reliable adherence reduce the rationale for automatic full-mouth instrumentation.

The preferred model is therefore individualized, risk-based SPT. Maintenance should combine patient-level risk assessment with site-level clinical evaluation and should allow treatment intensity to change over time. This approach avoids the false choice between routine instrumentation for everyone and avoidance of instrumentation altogether. It aims instead to deliver the right intervention to the right patient and site at the time when the expected clinical benefit is greatest.

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