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Original Article

Retaining a Periodontally Compromised Tooth or Replacing It with an Implant: A Normative Decision Framework Incorporating Prognostic Uncertainty, Treatment Burden, and Future Retreatability

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ABSTRACT

Decisions to retain or extract a periodontally compromised tooth are often framed primarily through prognosis, yet prognosis alone cannot determine whether an irreversible intervention is justified. This normative decision analysis examines how prognostic uncertainty, cumulative treatment burden, patient preferences, reversibility, and future retreatability should interact when both tooth preservation and replacement remain clinically feasible. Evidence from contemporary periodontal prognostic systems, long-term supportive care, regenerative treatment, prosthetic and orthodontic rehabilitation, implant therapy, and peri-implant disease management is used to establish the empirical boundaries within which normative reasoning can operate. The analysis distinguishes disease severity from treatment necessity and argues that predicted tooth loss should be treated as one decision input rather than as an automatic extraction threshold. Preservation can retain future therapeutic options, including later extraction and replacement, but may also expose patients to recurrent inflammation, repeated intervention, maintenance demands, and prolonged uncertainty. Extraction removes the natural tooth irreversibly and initiates a different sequence of site management, prosthetic or implant rehabilitation, and future maintenance obligations. A defensible decision therefore requires proportionality between expected benefit and cumulative burden, meaningful incorporation of patient goals, explicit recognition of predictive uncertainty, and attention to which therapeutic options remain available after each action. This approach does not privilege retention or replacement categorically; it instead raises the evidentiary and justificatory standard for irreversible treatment when reasonable alternatives remain.

Keywords: Periodontal prognosis, Tooth retention, Dental implants, Shared decision-making, Retreatability, Treatment burden

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Introduction

Choosing whether to retain a periodontally compromised tooth or replace it with an implant is a preference-sensitive clinical decision in which the relevant question is not merely whether a tooth can survive, but which available pathway can be justified for a particular patient. Shared decision-making requires that clinicians clarify options, communicate uncertainty, and incorporate patient priorities rather than converting professional risk assessment directly into a treatment instruction [1]. Contemporary periodontal classification similarly resists reduction of disease to a single prognostic descriptor: staging integrates severity and treatment complexity [2], whereas the current case definition and grading system explicitly situate progression risk within a multidimensional clinical assessment [3]. For patients with Stage IV periodontitis, this complexity extends beyond infection control to functional rehabilitation,

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tooth position, occlusal demands, prosthetic requirements, and interdisciplinary care [4]. A decision to extract therefore follows from a wider clinical judgment than the classification of disease itself.

The distinction matters because prognostic systems are probabilistic instruments rather than deterministic descriptions of an individual tooth's future. Prognostic models can estimate survival using combinations of tooth-level and patient-level characteristics, but their performance is necessarily bounded by the populations, treatment environments, follow-up periods, and predictor definitions from which they were derived [5]. Comparative evaluation of several periodontal prognostic systems has shown that adverse prognostic classifications may identify increased risk while still having relatively low sensitivity or positive predictive value for subsequent tooth loss [6]. More recent external validation comparing a traditional clinical prognostic system with machine-learning approaches demonstrates the same underlying problem from another direction: increasing sensitivity may require sacrificing specificity, whereas very high specificity may coexist with failure to identify many teeth eventually lost [7]. These trade-offs are clinically useful information, but none converts prediction into a mandate for extraction.

Long-horizon evidence further complicates any rule in which a poor prognosis is treated as equivalent to futility. In patients receiving structured periodontal treatment and maintenance, many compromised teeth remain functional for prolonged periods, and tooth loss is often concentrated in a minority of individuals rather than distributed uniformly across the treated population [8]. Systematic review evidence likewise indicates that average tooth loss during long-term periodontal maintenance is generally modest, although risk estimates and predictor effects vary considerably across studies [9]. Thirty-year observational evidence confirms that substantial tooth retention is compatible with a history of periodontitis, even while advanced disease continues to increase the likelihood of loss [10]. Prospective evaluation of supportive periodontal care has also reinforced an important asymmetry in prognosis: negative predictions can be reassuring, whereas positive predictions may identify more teeth as vulnerable than will actually be lost [11]. Measures of periodontal stability and disease control are consequently relevant but imperfect guides to future loss rather than categorical thresholds for irreversible treatment [12].

This creates a normative problem that cannot be solved by improving prediction alone. A clinician may believe, with reasonable evidentiary support, that one tooth has a greater probability of future failure than another, yet the ethical significance of that probability depends on what follows from acting on it. Extracting a tooth transforms an uncertain future risk into a certain present loss of the natural tooth. Retaining it preserves the possibility of continued function and later reassessment, but also preserves exposure to recurrent disease, retreatment, repeated monitoring, and potentially greater cumulative burden. Replacement may provide excellent long-term function but introduces its own biological and maintenance requirements. The central question is therefore not whether prognosis should influence extraction decisions; it plainly should. The question is whether prognosis is sufficient, by itself, to justify closing a therapeutic option that cannot subsequently be restored.

The analysis developed here treats that problem as one of proportionality, autonomy, and reversibility. These concepts are not substitutes for periodontal diagnosis or technical judgment. They operate only after clinically feasible alternatives have been identified. Their purpose is to clarify what kind of reasons are required before an uncertain forecast is converted into an irreversible intervention and how the burdens of retention and replacement should be compared across different time horizons.

Normative foundations of tooth retention and replacement

Proportionality requires the expected clinical benefit of an intervention to be considered together with the biological, procedural, financial, temporal, and experiential burdens needed to obtain that benefit. In periodontal decision-making, this prevents survival probability from becoming the sole unit of value. A severely compromised tooth may still provide useful function if inflammation can be controlled, the tooth can be maintained, and the anticipated burden of continued care remains acceptable. Conversely, a tooth that is technically retainable may impose repeated treatment, functional limitation, or maintenance demands that make preservation disproportionate for a particular patient.

The importance of this distinction is supported by the limited direct comparative evidence available for extremely compromised teeth. In a randomized clinical trial involving teeth with severe attachment loss, periodontal regeneration produced long-term tooth retention in many treated sites and remained a viable alternative to extraction followed by prosthetic or implant replacement over ten years [13]. The study does not establish a universal preference for

preservation. Its participants were highly selected, treatment was delivered in an expert setting, and both pathways achieved substantial survival. Its normative relevance is narrower but important: the presence of severe periodontal destruction does not necessarily eliminate preservation as a legitimate therapeutic option. If preservation remains clinically feasible, the decision must compare the burdens and consequences of both paths rather than treating extraction as the logical continuation of a prognostic label.

Those burdens unfold over time. Long-term periodontal care may include recurrent instrumentation, surgery, restorative intervention, additional maintenance, and repeated treatment of sites that become unstable. Retrospective evidence indicates that retreatment remains common during extended supportive care and varies according to disease stage and grade [14]. A retention strategy should therefore not be described as merely "conservative" if it commits the patient to years of intensive surveillance and repeated intervention. Yet the corresponding replacement pathway also contains staged procedures, biological complications, professional maintenance, and possible later retreatment. Proportionality requires comparison of cumulative pathways rather than comparison of a current tooth with an idealized implant.

Autonomy introduces a second requirement: patients must be given information that makes the alternatives meaningfully comparable. A choice between retention and replacement cannot be considered well informed if one option is described through its complications and uncertainties while the other is presented primarily through expected survival. Patient-reported outcomes after implant rehabilitation illustrate why this matters. High levels of satisfaction can coexist with substantial reports of complications and with differences in how adequately patients felt informed before treatment [15]. Survival and satisfaction are therefore related but non-identical outcomes. Patients may place different weights on preserving a natural tooth, avoiding repeated periodontal procedures, shortening treatment time, minimizing future surgery, maintaining fixed function, avoiding removable prostheses, or reducing uncertainty.

Autonomy does not mean that every patient preference must be implemented regardless of clinical feasibility. A request to preserve a tooth that cannot be maintained without uncontrolled infection or unacceptable harm remains constrained by professional obligations. Likewise, a request for implant replacement may be limited by anatomical, systemic, behavioral, or maintenance-related factors. The normative requirement is instead that, when more than one clinically defensible option exists, the patient's values should influence how comparable risks and burdens are interpreted.

Reversibility provides a third and more distinctive dimension. Retaining a tooth for a period of observation or treatment generally preserves the possibility of later extraction if the biological or functional situation deteriorates. Extraction does not preserve the inverse possibility: once the natural tooth is removed, the option to continue treating that tooth is eliminated. This asymmetry does not prove that retention is preferable. Delay may permit additional bone loss, recurrent infection, restorative deterioration, or changes that complicate subsequent rehabilitation. Nevertheless, when prognosis is uncertain and the current burden of preservation remains proportionate, preserving an option that can still be relinquished later has normative relevance.

The practical importance of proportionality, autonomy, and reversibility is that they force the decision to be framed around consequences rather than labels. The relevant comparison is not "questionable tooth versus implant." It is between two or more longitudinal treatment pathways, each of which has its own entry conditions, maintenance commitments, potential failure states, and future choices. **Table 1** organizes these distinctions without assigning numerical weights or implying that one pathway is intrinsically superior.

Table 1. Decision dimensions that change the justification for retaining a compromised tooth or proceeding to extraction and replacement

Decision dimension	Retaining the natural tooth commits the patient to	Extraction and replacement changes or closes	Circumstances that strengthen the case for retention	Circumstances that strengthen the case for extraction or replacement	Required interpretive caution
Current biological controllability	Continued periodontal treatment, surveillance, and maintenance	Eliminates the diseased tooth but not necessarily the patient's susceptibility to inflammatory disease	Inflammation can be controlled and the tooth remains maintainable	Persistent instability despite appropriate therapy or an anatomy that prevents predictable maintenance	Disease severity alone does not establish therapeutic futility

Prognostic uncertainty	Living with a non-zero probability of later deterioration or loss	Converts uncertain future loss into certain immediate tooth loss	Forecast is materially uncertain and false-positive prediction would lead to premature irreversible intervention	Multiple independent clinical findings indicate a very low probability of useful maintenance	Prognostic category should not be interpreted as certain outcome
Cumulative treatment burden	Possible retreatment, supportive care, restorative procedures, and repeated reassessment	Introduces extraction-related treatment and subsequent rehabilitation burden	Maintenance burden is acceptable to the patient and clinically sustainable	Recurrent intervention is becoming excessive relative to expected benefit	"Conservative" treatment may still be burdensome
Natural-tooth option value	Preserves present function and the possibility of later extraction if needed	Permanently removes the option of treating or monitoring that tooth	Continued function has plausible value and delayed extraction does not create disproportionate risk	Delay is likely to compromise future rehabilitation or expose the patient to unacceptable harm	Option preservation is not equivalent to unlimited postponement
Rehabilitation pathway	May permit later tooth-supported, orthodontic, regenerative, or mixed rehabilitation	May shift care toward socket management, prosthetic reconstruction, or implant therapy	Retention supports a feasible functional plan	Tooth position, restorability, mobility, structural damage, or functional requirements make the tooth incompatible with rehabilitation	Technical feasibility must be established before normative comparison
Patient-valued outcome	Preserves a natural tooth but may prolong uncertainty and maintenance	May provide a different functional experience but requires acceptance of irreversible loss and subsequent treatment	Patient strongly values tooth preservation and understands the associated burden	Patient gives greater weight to replacement, treatment predictability, or avoidance of repeated periodontal intervention	Preference must be informed by balanced presentation of both pathways
Future retreatability	Allows reassessment and escalation if conditions change	Creates a new treatment state whose complications require prosthetic or implant-oriented management	Monitoring can occur without unacceptable biological cost	Waiting substantially worsens later options or imposes disproportionate risk	Reversibility is qualitative and context dependent, not a numerical score

Prognostic uncertainty and competing treatment burdens

The normative significance of prognosis becomes clearer when the burden of retention is separated from the burden of replacement. Continuing to retain a tooth can expose the patient to repeated periodontal maintenance, restorative repair, prosthetic modification, mobility management, and eventual loss. Removable prosthetic rehabilitation in patients with periodontitis may remain clinically serviceable, but systematic review evidence is limited and heterogeneous, preventing simple claims about comparative superiority or harm [16]. Tooth-supported prostheses can also function successfully in appropriately treated patients with Stage IV periodontitis, although available evidence is dominated by observational series and technical complications remain relevant [17]. These findings make an important point: retaining teeth does not mean avoiding rehabilitation. In some patients, preservation becomes part of a technically demanding prosthetic pathway whose burden must be considered explicitly.

The same scrutiny must be applied to replacement. A history of periodontitis does not cease to matter when a tooth is extracted. Meta-analytic evidence indicates that patients with previous periodontitis can experience less favorable implant-related outcomes and greater risk of peri-implant disease than patients without that history [18]. This does not justify a general argument against implants; high implant survival is common

even among previously treated periodontal patients. It does show that extraction should not be represented as a transition from a biologically uncertain tooth to a biologically risk-free replacement.

Direct comparisons between tooth-supported and implant-supported rehabilitation remain particularly important because they reveal the limitations of the evidence base. In patients with terminal dentitions, systematic review evidence for direct comparison between tooth-supported and implant-supported removable rehabilitation is weak, with substantial heterogeneity and critically limited head-to-head evidence [19]. Similarly, evidence concerning full-arch fixed rehabilitation in Stage IV periodontitis does not provide a robust basis for declaring either tooth-supported or implant-supported reconstruction categorically superior [20]. In a normative decision analysis, this absence of reliable superiority evidence is not an empty finding. It constrains what clinicians may legitimately tell patients. A recommendation may still be justified, but it must be based on the patient's clinical configuration and priorities rather than on an unsupported assertion that one support modality is generally better.

Retention may also preserve interdisciplinary options that disappear once the tooth is extracted. Orthodontic therapy performed after periodontal stabilization can be feasible in appropriately selected patients, although systematic review evidence remains limited by heterogeneity and risk of bias [21]. In severe periodontitis accompanied by pathological migration, flaring, or elongation, combined periodontal-orthodontic treatment has been associated with clinically meaningful correction in selected cases [22]. These findings are not reasons to preserve every compromised tooth for possible future orthodontics. They instead demonstrate that the value of a tooth can extend beyond its immediate survival probability when it participates in a broader rehabilitation strategy.

At the same time, anatomical risk cannot be minimized merely because long-term retention is possible. Furcation involvement illustrates this tension. Large registry evidence shows that advanced furcation involvement increases the risk of molar loss, while also showing that a substantial proportion of affected molars remain present over years of follow-up [23]. Such anatomy therefore alters the burden and probability structure of preservation without automatically settling the decision. The clinician must still ask whether the tooth's expected function, maintainability, role in rehabilitation, and future retreatability justify continued treatment in that individual case.

These competing considerations make pathway comparison more useful than a binary “save or extract” framing. The clinically relevant alternatives can include supportive retention, regenerative treatment, tooth-supported rehabilitation, periodontal-orthodontic rehabilitation, extraction with later prosthetic treatment, or extraction followed by implant-supported reconstruction. Each pathway preserves some options, closes others, and carries different kinds of uncertainty. **Table 2** distinguishes those consequences without using survival rates from dissimilar studies as though they constituted a direct comparative trial.

Table 2. Consequences and retreatability of clinically plausible pathways after a tooth is judged periodontally compromised

Treatment pathway	Initial biological or therapeutic commitment	Options retained after entering the pathway	Principal later retreatment possibilities	Dominant burden that must be disclosed	Major uncertainty influencing choice	Boundary on interpretation
Supportive retention without immediate major reconstruction	Continued periodontal control and monitoring of the natural tooth	Continued function, later periodontal intervention, later extraction, later prosthetic or implant rehabilitation	Repeat nonsurgical or surgical periodontal therapy, restorative treatment, extraction if deterioration occurs	Long-term maintenance, uncertainty, possible recurrence, repeated clinical review	Whether apparent stability will persist sufficiently to justify continued retention	Appropriate only while the tooth remains maintainable and continued observation does not impose disproportionate risk

Periodontal regenerative treatment	Surgical attempt to improve periodontal support in a selected defect	Natural-tooth function, later reassessment, later extraction if regeneration is insufficient or deteriorates	Additional periodontal treatment, supportive care, eventual extraction and replacement	Surgical treatment, healing period, maintenance, possibility of incomplete or non-durable response	Extent to which a highly selected regenerative indication applies to the individual tooth	Successful results in selected defects cannot be generalized to every severely compromised tooth
Tooth-supported prosthetic rehabilitation	Continued dependence on retained teeth as part of the reconstruction	Natural abutments, future repair or modification, possible later transition to another prosthetic design	Technical repair, periodontal retreatment, abutment management, redesign after tooth loss	Combined periodontal and prosthetic maintenance	Longevity of compromised abutments and technical components	Observational survival does not establish equivalence or superiority over implant support
Periodontal-orthodontic rehabilitation	Disease control followed by controlled movement of retained teeth	Correction of pathological migration, repositioning for later restorative planning, continued natural-tooth function	Periodontal retreatment, orthodontic adjustment, restorative modification, extraction if the tooth later fails	Extended treatment time, interdisciplinary coordination, maintenance demands	Suitability of the periodontium for movement and durability of the achieved condition	Feasibility in selected stabilized patients should not be interpreted as universal safety
Extraction followed by staged site management	Irreversible removal of the natural tooth and initiation of socket-healing decisions	Choice among prosthetic replacement, delayed implant treatment, or in selected cases no replacement	Ridge management, additional augmentation, prosthetic revision, later implant treatment	Surgery, healing intervals, anatomical site changes, additional procedures	Future ridge condition and rehabilitation requirements	Extraction does not itself determine the final replacement modality
Extraction and implant-supported rehabilitation	Irreversible tooth removal followed by establishment of an implant-supported state	Implant maintenance, prosthetic modification, treatment of future peri-implant disease, possible implant removal/replacement	Professional maintenance, prosthetic repair, peri-implant treatment, reconstructive intervention if complications occur	Surgical and prosthetic treatment, long-term maintenance, biological and technical complications	Long-horizon interaction among periodontal history, hygiene, adherence, anatomy, and implant condition	High implant survival does not mean absence of complications, and periodontal susceptibility is not necessarily eliminated by extraction

The comparisons in **Table 2** reinforce why treatment burden must be interpreted longitudinally. Retention exposes the patient to the possibility that a compromised tooth will require further intervention, but it can preserve an existing biological structure and defer irreversible treatment. Replacement can remove a problematic tooth and may provide durable function, yet it initiates a different maintenance system and closes the possibility of future treatment of that natural tooth. Neither pathway should therefore be presented as the inherently conservative or inherently definitive option. Their defensibility depends on what happens next, which therapeutic possibilities remain available,

and whether the patient considers the resulting pattern of burden acceptable.

Retreatability and consequences of irreversible intervention

Retention is retreatable in an important but qualified sense. Continued periodontal treatment preserves the natural tooth while allowing the clinician to reassess the decision if inflammation, attachment loss, structural deterioration, or patient burden later changes. This does not make retention consequence-free. Long-term evidence shows that recurrence or progression may occur despite treatment and supportive care, and some patients eventually experience additional attachment loss or tooth loss [24]. A preserve-and-reassess strategy is therefore defensible only while the biological cost of continued observation remains acceptable. Reversibility should not become an argument for indefinite postponement when deterioration is sufficiently probable or already occurring.

Extraction has a different temporal structure because removal of the natural tooth cannot subsequently be reversed. It also does not terminate clinical decision-making. Once extraction occurs, clinicians and patients must determine how the socket will be managed and whether replacement should be immediate, early, delayed, prosthetic, implant-supported, or unnecessary. Consensus evidence on post-extraction management emphasizes that site anatomy, healing, aesthetic demands, infection status, and the intended rehabilitation influence these subsequent choices [25]. Prospective evidence from periodontally compromised molar sockets further demonstrates that ridge preservation and later implant placement can constitute a staged pathway involving healing, reassessment, and additional treatment rather than a single definitive event [26].

Replacement also changes the biological problem rather than abolishing it. Peri-implant mucositis and peri-implantitis are recognized disease entities with diagnostic characteristics distinct from periodontitis [27]. Long-term prospective observation nevertheless shows that implant therapy can achieve high survival over decades, including in patients with a history of periodontal disease, while biological complications and the effects of maintenance adherence remain clinically relevant [28]. Contemporary guideline recommendations consequently treat implant rehabilitation as a pathway requiring continuing prevention, professional surveillance, patient-performed plaque control, and condition-specific intervention when peri-implant disease develops [29].

The asymmetry is therefore not simply that “teeth can fail whereas implants can fail.” Retaining a tooth generally preserves both the current tooth and the possibility of later extraction. Extracting it closes the preservation pathway immediately and substitutes a new set of future choices. That option loss may be ethically relevant when prognosis remains uncertain, but its importance diminishes when continued retention exposes the patient to escalating biological harm, repeated unsuccessful therapy, or disproportionate treatment burden. Retreatability is consequently a reason that modifies the threshold for irreversible intervention, not a categorical instruction to avoid extraction.

This sequential logic is summarized in **Figure 1**.

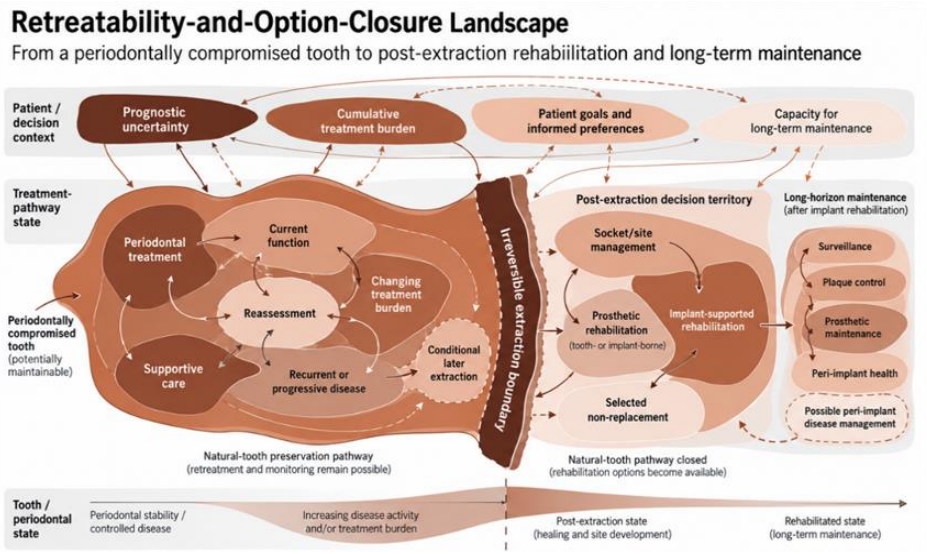

Figure 1. Where therapeutic options remain open and where they close during periodontal preservation and replacement decisions

A normative framework for defensible treatment choice

The evidence assembled here supports a restrained conclusion: prognosis should influence treatment, but a prognostic category should not function as an automatic extraction rule. Prognostic models can stratify risk while retaining clinically important false-positive and false-negative uncertainty [6, 7]. This uncertainty becomes normatively important when the proposed response is irreversible. The relevant clinical question is therefore not whether the tooth has risk, but whether the combination of biological feasibility, predicted risk, expected burden, patient priorities, and future option loss provides sufficient reason to intervene now.

Four actions can be distinguished without converting the framework into a scoring system. Preserve is justified when disease can be controlled, useful function is plausible, maintenance burden is proportionate, and continued retention does not materially compromise later treatment. Reassess is appropriate when prognosis remains uncertain and additional time, treatment response, or monitoring can provide clinically relevant information without exposing the patient to disproportionate harm. Extract becomes defensible when continued retention is biologically untenable, repeatedly unsuccessful, incompatible with rehabilitation, or excessively burdensome relative to expected benefit. Replace is a subsequent decision requiring independent justification because extraction does not itself establish that an implant—or any particular prosthetic option—is the preferred next treatment.

These actions should not be ordered as a hierarchy. The regenerative trial evidence shows that selected severely compromised teeth can remain viable after preservation [13], whereas long-term retreatment evidence confirms that retention can carry substantial continuing burden [14]. Patient-reported implant outcomes demonstrate that replacement can produce high satisfaction while still involving complications and informational needs [15]. Likewise, systematic review evidence does not establish categorical tooth-supported or implant-supported superiority in several Stage IV rehabilitation settings [18-20]. The defensible choice therefore emerges from the fit between a treatment pathway and the patient rather than from a universal ranking of modalities.

The framework's distinctive role is to make explicit the evidentiary burden created by irreversible action. When uncertainty is high and preservation remains proportionate, a clinician requires stronger justification for closing an option that can still be maintained and reassessed. When biological deterioration, repeated unsuccessful retreatment, or unacceptable patient burden becomes dominant, the option value of retention weakens. This is a qualitative judgment requiring reason-giving, not an equation or numerical threshold.

Clinical applications and ethical limitations

The framework is most useful when at least two clinically credible pathways remain. Stage IV periodontal guidance already assumes that advanced disease may require individualized combinations of periodontal, restorative, orthodontic, and prosthetic care [4]. In this setting, the framework can structure discussion by separating three questions that are often collapsed: whether the tooth is maintainable, whether continued retention is proportionate, and whether extraction followed by a particular replacement strategy is independently justified.

Patient context can alter the answer even when anatomy appears similar. Long-term maintenance capacity, tolerance for repeated treatment, anticipated adherence, access to specialist care, financial burden, and personal valuation of natural-tooth preservation may change which pathway is proportionate. These factors should not be disguised as biological facts. A tooth is not biologically hopeless merely because a patient cannot access an intensive maintenance pathway; equally, a theoretically maintainable tooth does not have to be preserved when the associated burden conflicts with an informed patient's priorities.

Important limitations remain. Much of the retention evidence comes from maintained cohorts and specialist settings, whereas several rehabilitation comparisons depend on heterogeneous observational evidence [12, 20]. Implant outcomes are influenced by periodontal history and maintenance but remain favorable for many appropriately treated patients [18, 28]. Recurrence during periodontal care and peri-implant disease after replacement therefore represent risks requiring management rather than deterministic outcomes [24, 29]. The framework must consequently remain transparent about where evidence is direct, where comparison is indirect, and where the article is making an original normative inference.

Most importantly, the framework itself has not been prospectively validated as a clinical decision instrument. It should not be assigned sensitivity, specificity, predictive accuracy, weights, or decision thresholds. Future research could test whether explicit discussion of prognosis, cumulative burden, reversibility, and patient goals improves decisional quality, concordance, regret, or long-term patient-reported outcomes. Until such evidence exists, its

legitimate function is to improve the quality and transparency of clinical reasoning rather than to automate treatment choice.

Conclusion

A periodontally compromised tooth should not be extracted solely because a prognostic system assigns it a high risk of future loss. Prognosis is essential information, but irreversible treatment requires a broader justification. When preservation remains biologically feasible, clinicians should also consider uncertainty, cumulative treatment burden, patient priorities, the consequences of delaying intervention, and which future options each choice preserves or closes.

Retention is not inherently superior to replacement. It may require prolonged maintenance, retreatment, and acceptance of continuing uncertainty. Extraction may be entirely proportionate when disease cannot be controlled or preservation no longer offers sufficient benefit. Yet extraction permanently eliminates the natural-tooth pathway and begins another sequence of biological, prosthetic, or implant-related decisions. A defensible choice therefore depends on transparent comparison of complete treatment pathways rather than on prognosis alone. The proposed framework treats preservation, reassessment, extraction, and replacement as context-dependent actions whose justification changes with clinical feasibility, patient values, treatment burden, and future retreatability.

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References

1. Elwyn G, Durand MA, Song J, Aarts J, Barr PJ, Berger Z, et al. A three-talk model for shared decision making: Multistage consultation process. BMJ. 2017;359. doi:10.1136/bmj.j4891
2. Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. J Clin Periodontol. 2018;45(Suppl 20). doi:10.1111/jcpe.12945
3. Papapanou PN, Sanz M, Buduneli N, Dietrich T, Feres M, Fine DH, et al. Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Clin Periodontol. 2018;45(Suppl 20). doi:10.1111/jcpe.12946
4. Herrera D, Sanz M, Kebschull M, Jepsen S, Sculean A, Berglundh T, et al. Treatment of stage IV periodontitis: The EFP S3 level clinical practice guideline. J Clin Periodontol. 2022;49(Suppl 24):4-71. doi:10.1111/jcpe.13639
5. Martinez-Canut P, Alcaraz J, Alcaraz J Jr, Alvarez-Novoa P, Alvarez-Novoa C, Marcos A, et al. Introduction of a prediction model to assigning periodontal prognosis based on survival time. J Clin Periodontol. 2018;45(1):46-55. doi:10.1111/jcpe.12810
6. Saydzai S, Buontempo Z, Patel P, Hasan F, Sun C, Akcalı A, et al. Comparison of the efficacy of periodontal prognostic systems in predicting tooth loss. J Clin Periodontol. 2022;49(8):740-8. doi:10.1111/jcpe.13672
7. Santamaria P, Troiano G, Serroni M, Araùjo TG, Ravidà A, Nibali L. Exploring the accuracy of tooth loss prediction between a clinical periodontal prognostic system and a machine learning prognostic model. J Clin Periodontol. 2024;51(10):1333-41. doi:10.1111/jcpe.14023
8. Graetz C, Plaumann A, Schlattmann P, Kahl M, Springer C, Sälzer S, et al. Long-term tooth retention in chronic periodontitis—results after 18 years of a conservative periodontal treatment regimen in a university setting. J Clin Periodontol. 2017;44(2):169-77. doi:10.1111/jcpe.12680
9. Carvalho R, Botelho J, Machado V, Mascarenhas P, Alcoforado G, Mendes JJ, et al. Predictors of tooth loss during long-term periodontal maintenance: An updated systematic review. J Clin Periodontol. 2021;48(8):1019-36. doi:10.1111/jcpe.13488
10. Agudio G, Buti J, Bonaccini D, Pini Prato G, Cortellini P. Longevity of teeth in patients susceptible to periodontitis: Clinical outcomes and risk factors associated with tooth loss after active therapy and 30 years of supportive periodontal care. J Clin Periodontol. 2023;50(4):520-32. doi:10.1111/jcpe.13770
11. Hasan F, Magan-Fernandez A, Akcalı A, Sun C, Donos N, Nibali L. Tooth loss during supportive periodontal care: A prospective study. J Clin Periodontol. 2024;51(5):583-95. doi:10.1111/jcpe.13943
12. Rattu V, Raindi D, Antonoglou GN, Nibali L. Prevalence of stable and successfully treated periodontitis subjects and incidence of subsequent

tooth loss within supportive periodontal care: A systematic review with meta-analyses. J Clin Periodontol. 2023;50(10):1371-89. doi:10.1111/jcpe.13835

13. Cortellini P, Stalpers G, Mollo A, Tonetti MS. Periodontal regeneration versus extraction and dental implant or prosthetic replacement of teeth severely compromised by attachment loss to the apex: A randomized controlled clinical trial reporting 10-year outcomes, survival analysis and mean cumulative cost of recurrence. J Clin Periodontol. 2020;47(6):768-76. doi:10.1111/jcpe.13289
14. Saleh MHA, Decker A, Ravidà A, Wang HL, Tonetti MS. Periodontitis stage and grade modifies the benefit of regular supportive periodontal care in terms of need for retreatment and mean cumulative cost. J Clin Periodontol. 2024;51(2):167-76. doi:10.1111/jcpe.13909
15. Mauland EK, Bull VH, Melbye EL, Verket A. Patient-reported outcomes following dental implant rehabilitation according to reason for missing teeth: A survey from a Norwegian population 8 years following treatment. J Clin Periodontol. 2024;51(2):135-44. doi:10.1111/jcpe.13895
16. Gotfredsen K, Rimborg S, Stavropoulos A. Efficacy and risks of removable partial prosthesis in periodontitis patients: A systematic review. J Clin Periodontol. 2022;49(Suppl 24):167-81. doi:10.1111/jcpe.13519
17. Montero E, Molina A, Palombo D, Morón B, Pradíes G, Sanz-Sánchez I. Efficacy and risks of tooth-supported prostheses in the treatment of partially edentulous patients with stage IV periodontitis. A systematic review and meta-analysis. J Clin Periodontol. 2022;49(Suppl 24):182-207. doi:10.1111/jcpe.13482
18. Carra MC, Rangé H, Swerts PJ, Tuand K, Vandamme K, Bouchard P. Effectiveness of implant-supported fixed partial denture in patients with history of periodontitis: A systematic review and meta-analysis. J Clin Periodontol. 2022;49(Suppl 24):208-23. doi:10.1111/jcpe.13481
19. Donos N, Mezzomo LA, Mardas N, Goldoni M, Calciolari E. Efficacy of tooth-supported compared to implant-supported full-arch removable prostheses in patients with terminal dentition. A systematic review. J Clin Periodontol. 2022;49(Suppl 24):224-47. doi:10.1111/jcpe.13477
20. Tomasi C, Albouy JP, Schaller D, Camino Navarro R, Derks J. Efficacy of rehabilitation of stage IV periodontitis patients with full-arch fixed prostheses: Tooth-supported versus implant-supported—A systematic review. J Clin Periodontol. 2022;49(Suppl 24):248-71. doi:10.1111/jcpe.13511
21. Martin C, Celis B, Ambrosio N, Bollain J, Antonoglou GN, Figuero E. Effect of orthodontic therapy in periodontitis and non-periodontitis patients: A systematic review with meta-analysis. J Clin Periodontol. 2022;49(Suppl 24):72-101. doi:10.1111/jcpe.13487
22. Papageorgiou SN, Antonoglou GN, Michelogiannakis D, Kakali L, Eliades T, Madianos P. Effect of periodontal-orthodontic treatment of teeth with pathological tooth flaring, drifting, and elongation in patients with severe periodontitis: A systematic review with meta-analysis. J Clin Periodontol. 2022;49(Suppl 24):102-20. doi:10.1111/jcpe.13529
23. Trullenque-Eriksson A, Tomasi C, Petzold M, Berglundh T, Derks J. Furcation involvement and tooth loss: A registry-based retrospective cohort study. J Clin Periodontol. 2023;50(3):339-47. doi:10.1111/jcpe.13754
24. Leow NM, Moreno F, Marletta D, Hussain SB, Buti J, Almond N, et al. Recurrence and progression of periodontitis and methods of management in long-term care: A systematic review and meta-analysis. J Clin Periodontol. 2022;49(Suppl 24):291-313. doi:10.1111/jcpe.13553
25. Tonetti MS, Jung RE, Avila-Ortiz G, Blanco J, Cosyn J, Fickl S, et al. Management of the extraction socket and timing of implant placement: Consensus report and clinical recommendations of group 3 of the XV European Workshop in Periodontology. J Clin Periodontol. 2019;46(Suppl 21):183-94. doi:10.1111/jcpe.13131
26. Zhao L, Hu W, Liu Y, Chung KH. Evaluation of implant placement following ridge preservation in periodontally compromised molar extraction sockets: Three-year results of a prospective cohort study. Clin Oral Implants Res. 2022;33(7):735-44. doi:10.1111/clr.13949
27. Berglundh T, Armitage G, Araujo MG, Avila-Ortiz G, Blanco J, Camargo PM, et al. Peri-implant diseases and conditions: Consensus report of workgroup 4 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant

Diseases and Conditions. J Clin Periodontol. 2018;45(Suppl 20). doi:10.1111/jcpe.12957

28. Roccuzzo A, Imber JC, Marruganti C, Salvi GE, Ramieri G, Roccuzzo M. Clinical outcomes of dental implants in patients with and without history of periodontitis: A 20-year prospective study. J Clin Periodontol. 2022;49(12):1346-56. doi:10.1111/jcpe.13716
29. Herrera D, Berglundh T, Schwarz F, Chapple I, Jepsen S, Sculean A, et al. Prevention and treatment of peri-implant diseases—The EFP S3 level clinical practice guideline. J Clin Periodontol. 2023;50(Suppl 26):4-76. doi:10.1111/jcpe.13823