

Review Article

Ethical Boundaries of Orthodontic Treatment in Severe Periodontal Disease

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ABSTRACT

Severe periodontal disease presents unique challenges for orthodontic treatment, prompting critical ethical considerations regarding the balance between potential benefits and risks of harm. This narrative review synthesizes peer-reviewed literature to explore the ethical boundaries of initiating or continuing orthodontic therapy in patients with advanced periodontal involvement. Key themes include the pathophysiological interplay between orthodontic forces and compromised periodontal tissues, the risks of exacerbated bone loss and tooth mobility, the benefits of improved esthetics and function, and the application of ethical principles such as beneficence, non-maleficence, autonomy, and justice. Emphasis is placed on the pivotal role of informed consent, multidisciplinary collaboration, and patient-centered decision-making to ensure treatment aligns with ethical standards. The review concludes that orthodontic treatment can be ethically justified in select cases with stabilized periodontal conditions, rigorous maintenance, and clear communication of uncertainties, but must be avoided when risks predominate, to uphold the do-no-harm imperative.

Keywords: Orthodontics, Severe periodontal disease, Ethical boundaries, Informed consent, Multidisciplinary approach, Patient autonomy

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Introduction

Periodontal disease is one of the most common chronic inflammatory conditions affecting the oral cavity and remains a major cause of tooth loss in adults worldwide. It involves the progressive destruction of the tooth-supporting structures, including the gingiva, periodontal ligament, cementum, and alveolar bone, primarily driven by a dysregulated host immune response to microbial biofilms [1]. When the disease progresses to a severe stage, it is marked by extensive clinical attachment loss, increased probing depths, gingival recession, and significant alveolar bone resorption. These pathological changes compromise

tooth stability and function, often resulting in tooth mobility, pathological migration, spacing, occlusal discrepancies, and ultimately tooth loss if left untreated [2, 3]. Beyond its local effects, severe periodontal disease has been associated with systemic conditions such as cardiovascular disease and diabetes, further emphasizing the need for careful clinical management. Orthodontic treatment aims to correct malocclusion, improve masticatory efficiency, enhance facial esthetics, and contribute to long-term oral health. This is achieved through the controlled application of mechanical forces to induce tooth movement within the alveolar bone. Traditionally, however, the presence of severe periodontal disease has been considered a

relative or absolute contraindication to orthodontic therapy. The concern stems from the reduced periodontal support and altered biomechanical environment, which may increase the risk of further attachment loss, root resorption, and accelerated bone destruction when orthodontic forces are applied [4, 5]. As a result, clinicians have historically adopted a conservative approach, often excluding patients with advanced periodontal breakdown from orthodontic care.

In recent years, significant advances in periodontal therapy, including improved non-surgical and surgical techniques, regenerative procedures, and maintenance protocols, have altered this traditional viewpoint. In parallel, orthodontic biomechanics have evolved, with lighter forces, improved appliance design, and better anchorage control now available. These developments have enabled more predictable tooth movement even in periodontally compromised dentitions, provided that inflammation is well controlled and patients adhere to strict supportive periodontal care [6, 7]. Consequently, orthodontic treatment is increasingly being considered as part of a comprehensive rehabilitation plan for selected patients with severe periodontal disease, particularly to correct pathological tooth migration and improve function and hygiene access.

This expanding therapeutic possibility, however, raises important ethical questions. The ethical boundaries of orthodontic treatment in patients with severe periodontal disease refer to the point at which intervention may conflict with fundamental principles of medical ethics, such as non-maleficence, beneficence, autonomy, and justice [8, 9]. Clinicians must carefully weigh the potential benefits of orthodontic intervention against the risk of irreversible harm, including further periodontal breakdown or tooth loss. These boundaries are not fixed and are influenced by multiple factors, including the severity and stability of periodontal destruction, the patient's oral hygiene and compliance with maintenance therapy, systemic health status, psychosocial expectations, and the availability of alternative restorative or prosthetic options [10, 11].

From a historical perspective, ethical decision-making in this context favored avoidance of orthodontic treatment to prevent harm. However, contemporary literature published reflects a gradual shift toward individualized, evidence-based decision-making. Recent systematic reviews, clinical trials, and interdisciplinary case series suggest that, under carefully controlled conditions, orthodontic treatment can be performed safely and may even contribute to improved periodontal outcomes in selected cases [12, 13]. This shift underscores the importance of

reassessing ethical limits in light of emerging scientific evidence, while remaining vigilant about patient safety and informed choice.

The purpose of this narrative review is to provide a comprehensive overview of the ethical considerations surrounding orthodontic treatment in patients with severe periodontal disease. Specifically, this review aims to: (1) explain the pathophysiological mechanisms governing the interaction between orthodontic forces and compromised periodontal tissues; (2) critically evaluate the potential risks and benefits associated with such treatment; (3) analyze treatment decisions through the lens of established ethical principles; (4) emphasize the central role of informed consent and shared decision-making; and (5) explore the importance of multidisciplinary collaboration and alternative treatment strategies. By synthesizing evidence from peer-reviewed journal articles published recently, this review seeks to support clinicians in making ethically sound, patient-centered decisions that prioritize long-term oral health, functional outcomes, and respect for patient autonomy.

Pathophysiology of severe periodontal disease and its interaction with orthodontic forces

Severe periodontal disease, often classified as stage IV periodontitis, represents the most advanced form of the condition and is characterized by extensive destruction of the supporting structures of the teeth. Clinically, it manifests with probing depths exceeding 6 mm, significant horizontal and vertical alveolar bone defects, gingival recession, and involvement of multiple teeth, frequently leading to mobility, pathologic migration, and compromised function [2, 14]. The underlying pathogenesis is driven primarily by microbial dysbiosis within the subgingival biofilm, which triggers an exaggerated host immune-inflammatory response. This response releases a cascade of pro-inflammatory cytokines and matrix metalloproteinases, resulting in progressive degradation of the periodontal ligament, alveolar bone, and connective tissue attachment [15]. In this context, the structural integrity of the alveolar bone and periodontal ligament is severely compromised, reducing the periodontium's capacity to withstand additional mechanical stresses [16, 17].

Orthodontic tooth movement relies on the principle of bone remodeling, as described by the pressure-tension theory. When a force is applied to a tooth, compression of the periodontal ligament on one side stimulates osteoclast activation and localized bone resorption, whereas tension on the opposite side promotes osteoblast-mediated bone formation [18, 19]. In healthy periodontal tissues, this remodeling is carefully

balanced, allowing controlled tooth movement without permanent damage. However, in severe periodontal disease, the inflamed and structurally weakened environment disrupts this balance. Increased osteoclastic activity and diminished regenerative capacity can accelerate alveolar bone loss, root exposure, and attachment destruction if forces are not carefully managed [20, 21].

Evidence supports the critical role of force magnitude and inflammation control in determining outcomes. A 2022 systematic review reported that orthodontic tooth movement in periodontally compromised patients may exacerbate attachment loss, particularly when forces exceed 50 g or inflammation remains uncontrolled [22, 23]. Conversely, applying controlled, lighter forces ranging from 20 to 50 g in stabilized cases has been

shown to facilitate favorable bone remodeling, with some studies demonstrating increased bone density in intruded teeth and improved periodontal architecture [24, 25].

Biomechanical considerations further complicate the interaction between orthodontics and severe periodontitis. Reduced alveolar bone support alters the distribution of orthodontic forces, making teeth more susceptible to tipping, extrusion, and progression of furcation defects [26, 27]. Emerging research from 2021 highlights the role of periodontal ligament stem cells in tissue regeneration; in inflamed periodontal environments, orthodontic forces may impair the regenerative potential of these cells, resulting in delayed healing and compromised long-term outcomes [28, 29].

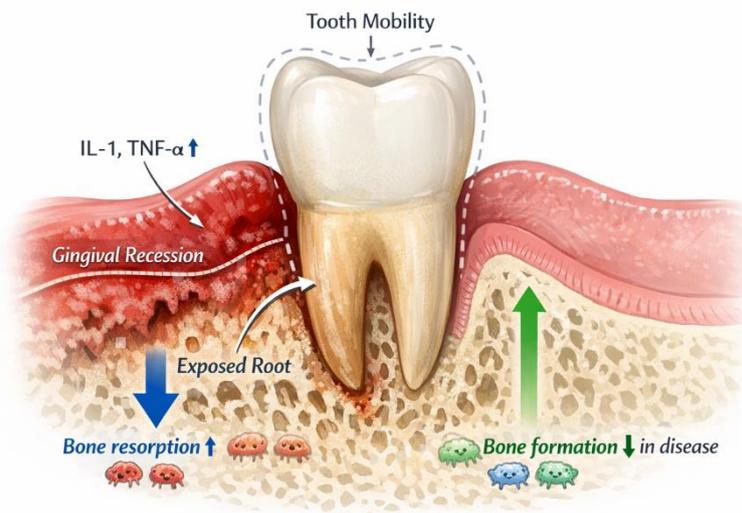


Figure 1. Interaction between Orthodontic Forces and Severe Periodontal Disease

Understanding these pathophysiological mechanisms is crucial for defining the ethical boundaries of orthodontic intervention in patients with severe periodontal disease. Neglecting the vulnerabilities of compromised tissues or applying indiscriminate forces can constitute clinical negligence, violating the principle of non-maleficence and potentially leading to irreversible harm [30, 31]. Therefore, careful assessment, inflammation control, appropriate force selection, and continuous monitoring are essential to ethically integrate orthodontic treatment into the management of advanced periodontitis.

Risks associated with orthodontic treatment in severe periodontal disease

The risks associated with orthodontic treatment in patients with severe periodontal disease are substantial and form a central aspect of ethical consideration. The primary concerns include accelerated alveolar bone loss, increased tooth mobility, and heightened susceptibility to root resorption, all of which can compromise long-term tooth survival [32, 33]. Evidence from a 2022 meta-analysis of randomized controlled trials indicated that periodontally compromised patients undergoing orthodontic therapy experienced an average additional clinical attachment loss of 0.5–1 mm compared to non-orthodontically treated controls, particularly when active inflammation was present [22, 34].

These risks are further amplified by challenges in maintaining oral hygiene. Fixed orthodontic appliances

can obstruct effective plaque removal, leading to gingival inflammation, deepening periodontal pockets, and exacerbating tissue breakdown [35, 36]. Gingival recession is another common complication, which can expose root surfaces, increase sensitivity, and result in esthetic concerns. A 2023 cohort study reported that mandibular incisors in patients with severe periodontitis experienced up to 2 mm of recession during orthodontic proclination. This was linked to a thin gingival biotype and insufficient keratinized tissue, highlighting the role of individual anatomical factors in risk stratification [37, 38].

Beyond local periodontal effects, systemic risks must also be considered. Orthodontic interventions in the context of uncontrolled periodontal infection can lead to transient bacteremia, which poses potential health threats, particularly for immunocompromised patients or those with systemic conditions such as cardiovascular disease [39, 40].

From an ethical perspective, these risks invoke the principle of non-maleficence, which obligates clinicians to avoid causing harm. When orthodontic treatment is performed in cases of extensive periodontal destruction, particularly when bone loss exceeds 50%, the likelihood of irreversible damage—including tooth loss—is significant, raising serious ethical and legal considerations [41, 42]. To mitigate these risks, clinicians are encouraged to employ structured risk assessment tools, such as periodontal risk profiles, which help define the thresholds at which orthodontic intervention is contraindicated and guide decision-making to safeguard patient well-being [43]. This careful balance between potential benefit and harm underscores the ethical imperative to evaluate each patient individually, ensuring that treatment planning respects both clinical limitations and patient safety.

Benefits and potential positive outcomes of orthodontic treatment

Despite the inherent risks, orthodontic treatment can provide meaningful benefits for carefully selected patients with severe periodontal disease, supporting its ethical justification when applied under controlled conditions [5]. Clinically, these benefits include improved esthetics through proper tooth alignment, enhanced occlusal function, and facilitation of prosthetic rehabilitation, such as closing edentulous spaces or extruding teeth to enable optimal crown placement [44]. Evidence from a 2019 review demonstrated that orthodontic intrusion of periodontally compromised teeth can decrease pocket depths by 1–2 mm, promoting reattachment of

periodontal tissues and stimulating alveolar bone regeneration [45].

Orthodontic intervention also contributes to improved oral hygiene. By correcting pathological tooth migration and creating aligned dentition, it facilitates more effective plaque removal and reduces sites prone to food impaction, thereby supporting long-term periodontal stability [46, 47]. Recent studies from 2021 highlight the advantages of multidisciplinary approaches, combining periodontal regenerative procedures with orthodontic treatment. Such integrated strategies have demonstrated positive outcomes, including bone fill in vertical defects, stabilization of tooth positions, and preservation of periodontal attachment [28, 48].

Patient-centered outcomes further reinforce the value of orthodontic care in this context. Reports indicate enhanced quality of life and increased self-confidence due to improved smile aesthetics, reflecting the psychosocial impact of functional and esthetic rehabilitation [49].

From an ethical standpoint, these benefits reflect the principle of beneficence, which obliges clinicians to act in the patient's best interest and promote well-being [8, 50]. However, literature consistently emphasizes that such benefits are contingent upon prior stabilization of periodontal disease and adherence to strict maintenance protocols [51]. In scenarios where the potential gains are marginal or uncertain, ethical considerations favor a conservative approach, prioritizing periodontal stability and the prevention of harm over elective esthetic or functional enhancements [30, 52].

This balance highlights the necessity of individualized treatment planning, where the anticipated benefits justify the intervention only when rigorous control of the disease and patient compliance can be ensured.

Ethical principles guiding treatment decisions in orthodontic care

Ethical principles serve as a critical framework for establishing boundaries in orthodontic treatment for patients with severe periodontal disease. The principle of beneficence obligates clinicians to maximize patient well-being, including restoring function, improving esthetics, and supporting long-term oral health. Conversely, non-maleficence prohibits actions that may cause harm, such as initiating orthodontic treatment in the presence of active or uncontrolled periodontal disease [8]. Supporting this, a 2020 evidence-based review on ethical concerns in orthodontics emphasized that proceeding with treatment without sufficient periodontal control

constitutes a violation of non-maleficence and exposes patients to preventable risks [53]. Autonomy is another central principle, requiring that patients' preferences and values be respected, provided they have the capacity to make informed decisions [54]. This necessitates comprehensive disclosure of potential risks, benefits, and alternative treatment options, ensuring that consent is truly informed. Justice, meanwhile, demands equitable access to care, preventing discrimination based on the severity of periodontal disease or other clinical factors [55].

In clinical practice, these principles often intersect and must be balanced carefully. For instance, a patient's strong desire for orthodontic correction must be weighed against the risk of irreversible periodontal damage [41]. Recent literature from 2023 highlights the importance of structured ethical decision-making models, which integrate individualized risk-benefit analyses, patient preferences, and clinical evidence to guide treatment planning [56].

Table 1. Summary of Ethical Considerations, Risks, and Benefits of Orthodontic Treatment in Severe Periodontal Disease

Aspect	Key Points	Ethical Principle	Evidence / Reference
Risks	Accelerated alveolar bone loss, increased tooth mobility, root resorption, gingival recession, plaque accumulation, systemic bacteremia	Non-maleficence	[22, 32, 35, 37, 39, 41, 43]
Benefits	Improved esthetics, occlusal function, facilitation of prosthetic rehabilitation, enhanced oral hygiene, psychosocial well-being	Beneficence	[5, 28, 44-46, 49, 51]
Patient Autonomy	Informed consent, understanding risks, benefits, alternatives, and option of no treatment	Autonomy	[6, 44, 46, 54-56]
Justice	Equitable access to care, resource allocation, avoiding discrimination	Justice	[41, 43]
Decision-making	Multidisciplinary collaboration, risk-benefit assessment, disease stabilization	Beneficence & Non-maleficence	[8, 10, 12, 15, 16, 18, 22]

Clinicians must also recognize situations in which ethical boundaries are crossed. For example, proceeding with orthodontic intervention in non-compliant patients, or those unable to maintain strict oral hygiene, may be considered unethical, as it risks causing harm contrary to both non-maleficence and beneficence [39]. This framework underscores the necessity of continuous ethical vigilance, ensuring that patient care aligns with professional standards while respecting individual rights and clinical realities.

The role of informed consent in upholding patient autonomy

Informed consent is a fundamental pillar of ethical orthodontic practice, particularly in cases of severe periodontal disease where treatment outcomes carry significant uncertainties [54]. It requires comprehensive disclosure of all relevant information, including potential risks such as further alveolar bone loss, tooth mobility, or root resorption; anticipated benefits like improved esthetics and occlusal function; available alternatives, including prosthetic rehabilitation or conservative management; and the option of no treatment [44]. By providing this information, clinicians empower patients to make autonomous, well-informed decisions about their care.

Evidence supports the use of enhanced communication strategies to improve patient understanding. For example, a 2022 randomized trial demonstrated that multimedia aids, such as instructional videos, significantly improved long-term recall of consent information among orthodontic patients, thereby strengthening patient autonomy and engagement in decision-making [46].

In the context of periodontal compromise, informed consent must address disease-specific considerations, including the necessity for lifelong periodontal maintenance, the potential for treatment failure, and the risk of irreversible damage if disease control is inadequate [6]. Failure to obtain valid, comprehensible consent not only constitutes an ethical breach but may also expose clinicians to legal liability [41, 57].

Current literature emphasizes that consent should be individualized and adapted to each patient's literacy and comprehension level, ensuring that complex clinical information is understood. This patient-centered approach respects autonomy while fostering trust, facilitating shared decision-making, and supporting ethically sound treatment planning in the management of severe periodontal disease [55].

Results and Discussion

The integration of orthodontic treatment in patients with severe periodontal disease represents a complex and debated area of clinical practice, requiring careful balancing of potential therapeutic benefits against significant risks of further periodontal deterioration [1, 2]. Pathophysiological insights underscore the delicate equilibrium needed when applying orthodontic forces to compromised periodontal tissues. In severe periodontitis, the persistent inflammatory environment disrupts normal bone remodeling, increasing the risk of excessive resorption rather than adaptive formation [5, 6]. This highlights the ethical imperative of ensuring disease stabilization before initiating orthodontic therapy, as uncontrolled inflammation can exacerbate attachment loss, directly invoking the principle of non-maleficence [8, 10]. Recent systematic reviews suggest that while low-magnitude orthodontic forces may promote favorable outcomes in stabilized cases, higher forces carry a substantial risk of accelerating tissue pathology, emphasizing the need for individualized force calibration [12, 15].

The ethical evaluation of orthodontic intervention involves a nuanced assessment of risks and benefits. Documented risks include increased alveolar bone loss, gingival recession, and tooth mobility, with meta-analyses showing modest yet significant deterioration in periodontal parameters during treatment [2, 16]. These potential harms are particularly salient in elective cases, raising questions about whether the principle of beneficence is truly upheld [18, 20]. Conversely, benefits such as improved occlusion, enhanced esthetics, and better access for oral hygiene can significantly improve patient quality of life, particularly when orthodontics is integrated into a multidisciplinary care plan alongside periodontal therapy [22, 24]. Ethical boundaries are therefore defined by case-specific risk-benefit assessments: treatment may be ethically justified in patients with controlled disease and high compliance, but contraindicated in active or advanced cases where anticipated harm outweighs potential gain [26, 28].

Applying core ethical principles—beneficence, non-maleficence, autonomy, and justice—provides a structured framework for decision-making in this context [30, 32]. Beneficence and non-maleficence necessitate comprehensive pre-treatment evaluation, including detailed periodontal charting and risk profiling, to avoid iatrogenic damage [35, 58]. Autonomy is safeguarded through informed consent, though challenges persist in ensuring patients fully understand complex risks and treatment implications, as demonstrated in studies assessing readability and recall of consent information [37, 39]. Justice requires

equitable access to care, ensuring that patients with severe disease are not discriminated against, while also considering resource allocation in multidisciplinary settings [41, 43]. Ethical dilemmas often arise when patient preferences conflict with clinical judgment—for example, when patients request orthodontic treatment despite high risk—necessitating shared decision-making models to mediate these conflicts [44, 45].

Informed consent emerges as a pivotal mechanism for upholding ethical practice. It bridges patient autonomy with clinical responsibility, ensuring patients are fully aware of potential outcomes, including the possibility of tooth loss or treatment failure [46, 49]. Recent studies advocate for enhanced consent processes, such as multimedia presentations or rehearsal techniques, which improve long-term retention and comprehension of complex information, particularly in the periodontal-orthodontic context [51, 53]. Failure to obtain valid, comprehensive consent not only breaches autonomy but also exposes clinicians to legal and ethical scrutiny [54, 55]. Tailoring consent to patient literacy, cultural background, and cognitive capacity further strengthens ethical practice, ensuring decisions are genuinely informed [56].

Effective management of orthodontic treatment in severe periodontal disease often requires a multidisciplinary approach. Collaboration among periodontists, orthodontists, and prosthodontists facilitates comprehensive treatment planning and implementation, as evidenced by case reports showing stable outcomes with combined interventions [8, 10]. Nevertheless, barriers such as communication gaps or differing clinical perspectives can compromise care, highlighting the need for standardized protocols and interprofessional coordination [15, 16]. Future research should focus on developing evidence-based guidelines for interdisciplinary management, incorporating ethical training to proactively address dilemmas and optimize patient-centered outcomes [18, 22].

Limitations in the existing literature include a predominance of case reports and small cohort studies, with few high-quality randomized trials, largely due to ethical constraints against withholding treatment in compromised patients [2, 6]. Variability in disease staging and treatment modalities further complicates meta-analytic synthesis, potentially over- or underestimating outcomes [12, 45]. Additionally, explicit ethical analysis is often lacking, with moral reasoning implied rather than systematically explored [30, 32]. Prospective studies with long-term follow-up are needed to delineate safe thresholds for orthodontic intervention in periodontally compromised patients,

while investigating innovations such as clear aligners, which may reduce periodontal stress and enhance treatment safety [12, 56].

This body of evidence highlights that ethical orthodontic management in severe periodontal disease requires individualized assessment, rigorous disease control, informed patient engagement, and close interdisciplinary collaboration to optimize outcomes while minimizing harm.

Conclusion

In conclusion, orthodontic treatment in severe periodontal disease is ethically bounded by the need to prioritize patient safety and autonomy while maximizing benefits through evidence-informed practices. Treatment is justifiable in stabilized cases with multidisciplinary support and robust informed consent but must be eschewed when risks of harm outweigh gains, upholding non-maleficence as paramount.

Future directions include conducting larger, ethically feasible prospective studies to refine risk stratification tools and treatment protocols. Integrating advanced imaging and biomarkers could enhance pre-treatment assessments, while educational initiatives should emphasize ethical training for clinicians. Additionally, exploring patient perspectives through qualitative research will better align care with autonomy and justice, ultimately advancing ethical standards in periodontal-orthodontic integration.

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