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THE INFLUENCE OF ORTHODONTIC THERAPY ON PERIODONTAL HEALTH: A CONTEMPORARY LITERATURE REVIEW

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Abstract

Background: Orthodontic treatment is an interdisciplinary dental procedure that, besides offering functional and aesthetic benefits, can also influence periodontal health. The biomechanical forces applied during tooth movement trigger complex biological responses within the periodontal tissues. While these reactions are physiologically reversible when plaque control is adequate, accumulation of biofilm and inflammation may lead to unwanted periodontal changes.
Objective: To present a contemporary literature review focusing on the effects of orthodontic therapy on periodontal health, emphasizing biological mechanisms, risk factors, and preventive strategies.
Materials and Methods: A literature search covering the period 2010–2025 was conducted. The findings show that orthodontic forces, when applied appropriately and accompanied by good oral hygiene, do not cause irreversible periodontal damage. However, inadequate plaque control, improper biomechanics, or pre-existing periodontal disease may result in attachment loss, gingival recession, and inflammatory complications.
Conclusion: Periodontal health during orthodontic treatment depends on tissue tolerance, oral hygiene habits, and continuous professional monitoring.
Keywords: orthodontic therapy, periodontal health, biomechanics, inflammation, plaque, prevention

Introduction

Orthodontic treatment is an integral component of modern dental practice aimed at correcting tooth malposition and jaw discrepancies. Properly executed orthodontic therapy improves function, aesthetics, and psychosocial well-being. However, it does not occur independently of the biological context of the oral environment. Forces applied to teeth initiate cellular responses in the periodontal ligament, bone, cementum and gingiva.

Every tooth movement results in alveolar bone remodeling and connective tissue adaptation. Under healthy conditions, this biological response is reversible and essential for successful orthodontic treatment. In the presence of inflammation, plaque accumulation, or reduced periodontal support, these reactions may progress into pathological alterations including gingivitis, gingival recession, and attachment loss. Understanding the interaction between orthodontic forces and periodontal tissues is crucial for safe and predictable outcomes.

Literature Review

Biological basis of orthodontic forces and periodontal response

Orthodontic tooth movement is driven by alveolar bone remodeling and periodontal ligament adaptation. Controlled forces cause compression on one side of the root and tension on the other, activating osteoblasts and osteoclasts. According to Krishnan & Davidovitch[1], moderate inflammation is a normal physiological response in this process. Excessive forces may lead to hyalinization, root resorption, and ischemic necrosis.

Influence of orthodontic appliances on plaque accumulation

Fixed appliances provide retentive surfaces for plaque deposition and changes in microbiota. Kim et al.[2] confirmed a significant increase in *Streptococcus mutans* and *Lactobacillus spp.* six weeks after treatment initiation. Mobile appliances allow easier cleaning and present lower risk of plaque retention.

Inflammatory changes in the gingiva

Clinical studies report that mild gingivitis occurs in 60–80% of patients within the first three months of treatment, particularly around brackets and ligatures[3]. This response is generally reversible but may progress to periodontitis if oral hygiene is inadequate.

Changes in alveolar bone

Pellegrini[4] and Ristic[5] documented physiological bone height reduction up to 0.2 mm during treatment. However, excessive force (>200 g) or inflammation can induce alveolar resorption and support loss.

Table. Classification of periodontal changes during orthodontic therapy

Type of change	Primary cause	Clinical signs	Reversibility
Gingivitis	Plaque accumulation	Redness, bleeding on brushing	Yes
Periodontitis	Chronic inflammation	Pockets, tooth mobility	Partial
Gingival recession	Thin biotype, mechanical stress	Root exposure, sensitivity	No
Root resorption	Excessive orthodontic forces	Radiographic finding	Partial
Alveolar bone loss	Inflammation + uncontrolled force	Reduced bone height	Partial

Scheme 1. Interaction between orthodontic forces and periodontal reactions

Orthodontic forces → Periodontal ligament → Cellular response → Bone remodeling
↓
If plaque present → Inflammation → Gingivitis / recession / resorption risk

Contemporary Evidence Summary

Most studies agree that orthodontic therapy is not contraindicated in patients with stable periodontal status, but requires proper evaluation and collaboration with a periodontist.
• Krishnan & Davidovitch (2021) described cellular responses driving tissue remodeling.
• Bollen (2019) showed that fixed appliances increase plaque and alter microbiota.
• Ren & Maltha (2020) proved physiological forces produce controlled remodeling.
• Kloukos (2025) meta-analysis links orthodontics with recession in thin biotype.
• Sambale (2024) confirmed prolonged heavy force increases root resorption risk.
• Levin (2012) and Feng (2025) recommend biomarker-based monitoring.

Aim of the Study

To present an updated literature-based overview of the influence of orthodontic therapy on periodontal health, focusing on:
• biological mechanisms,
• risk factors for complications,
• comparison of fixed vs. removable appliances,
• preventive strategies and clinical recommendations.

Materials and Methods

A systematic review of publications (2010–2025) from PubMed, Scopus, Web of Science and Google Scholar was conducted using keywords: *orthodontic treatment, periodontal health, gingival recession, inflammation, fixed appliances, plaque control*. Inclusion criteria: clinical studies, systematic reviews, meta-analyses on patients with orthodontic appliances, reporting periodontal outcomes.
Exclusion: animal studies, non-peer reviewed papers, incomplete data, non-English articles.
From 186 identified papers, 20 matched the criteria and were categorized by topic: biological response, microbiological changes, inflammation, clinical outcomes.

Discussion

Most studies show that periodontal changes during orthodontic therapy are controlled and reversible when forces are biologically acceptable and hygiene is adequate[6,7]. Excessive force or plaque-induced inflammation can result in recession, root resorption or bone loss.

Clinical Cases

Case 1: Early gingival inflammation during fixed therapy – reversible after scaling and hygiene reinforcement.
Case 2: Gingival recession in thin biotype – required soft tissue grafting and force modification.
Case 3: Apical root resorption from heavy force – stabilized after reducing force levels.

Clinical Case 1 – Early Gingival Inflammation During Orthodontic Treatment

A 16-year-old female patient, systemically healthy, was in the second phase of orthodontic treatment with a fixed appliance (0.018 slot, Roth technique). Six weeks after the initiation of active treatment, the patient reported sensitivity and bleeding during brushing in the region of the upper lateral incisors and canines. Clinical examination revealed erythema, edema, and bleeding on probing, with no periodontal pockets present. After professional dental cleaning and reinforcement of oral hygiene instruction, symptoms gradually reduced. The inflammatory changes completely resolved within two weeks.
This case demonstrates that in the early stages of orthodontic therapy, gingivitis caused by plaque accumulation is the most frequent complication and is reversible with proper oral hygiene.

Case 1: Early gingival inflammation during fixed therapy – reversible after scaling and hygiene reinforcement.

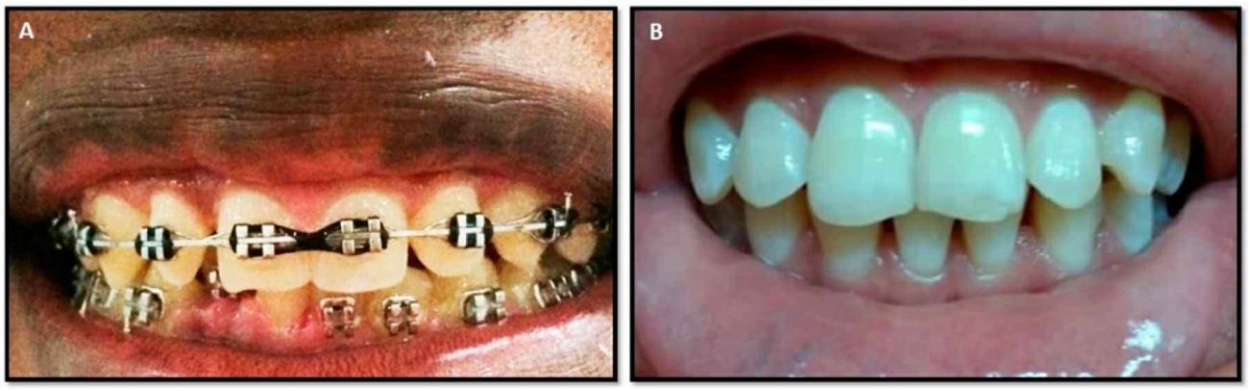
Clinical Case 2 – Gingival Recession in a Thin Gingival Biotype

A 28-year-old male patient, with no history of periodontal therapy, began orthodontic treatment due to mild lower anterior crowding and a narrow symphysis. At the third follow-up appointment (six months after the start of active therapy), a localized gingival recession of tooth 31 was observed, with cervical root exposure of approximately 1.5 mm. The patient exhibited a clinically thin gingival biotype with a high mucogingival junction. After consultation with a periodontist, the force level was reduced and active movement in the lower anterior region was paused for three months. Once tissue stability was achieved, a soft tissue graft procedure was performed to cover the recession. The outcome was stable with satisfactory esthetics and no further progression.

Case 2: Gingival recession in thin biotype – required soft tissue grafting and force modification.

Clinical Case 3 – Apical Root Resorption Due to Excessive Orthodontic Force

A 19-year-old female patient, treated for Class II subdivision 1 malocclusion, was using intermaxillary elastics applying approximately 200 g of force. After eight months of active therapy, radiographic examination showed shortening of the apical third of the roots of teeth 11 and 21 by approximately 1.5–2 mm. The patient reported no pain and maintained healthy periodontal tissues, but orthodontically induced inflammatory root resorption was suspected. Elastic use was discontinued and orthodontic force levels were reduced. At a six-month follow-up, no further resorption progression was detected. This case highlights the importance of careful biomechanical control and continuous monitoring during orthodontic treatment to prevent root damage.



Case 3: Apical root resorption from heavy force – stabilized after reducing force level

Clinical Recommendations

• Pre-treatment periodontal evaluation is mandatory.
• Use low-intensity forces (<150 g) to reduce compression-induced damage.
• Professional oral hygiene every 4–6 weeks.
• Close cooperation between orthodontist and periodontist.
• Strong patient motivation and hygiene education.

Conclusion

Orthodontic therapy, when properly planned and monitored, does not pose a threat to periodontal health. Correction of malocclusion may enhance hygiene and long-term periodontal stability. Complications mainly arise from poor hygiene, excessive mechanical force and neglect of biological limits. Modern biomechanics, regular follow-ups and interdisciplinary collaboration minimize risks. Periodontal integrity must remain a priority at every treatment stage.

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