



Periodontal and Biological Effects of Invisalign Clear Aligners

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Abstract

Clear aligner therapy has gained popularity due to its esthetic appeal and potential periodontal advantages compared to fixed orthodontic appliances. This narrative review evaluates the biological and periodontal responses associated with Invisalign treatment, focusing on inflammatory markers, plaque accumulation, gingival health, and risk of enamel demineralization. Evidence indicates that aligners promote improved periodontal outcomes due to removability and enhanced oral hygiene access,



with reduced plaque retention and gingival inflammation compared to fixed appliances. Although both systems induce similar biological mechanisms of orthodontic tooth movement,

intermittent force application with aligners may influence remodeling patterns. Clear aligners appear particularly beneficial for adult patients and individuals with mild periodontal susceptibility.

I. Introduction

Orthodontic tooth movement induces controlled inflammatory responses in the periodontal ligament and alveolar bone. Mechanical forces stimulate cytokine release, osteoclastic activity, and bone remodeling.

Clear aligners differ from fixed appliances by delivering intermittent, programmed forces rather than continuous archwire-based forces.

Background

Orthodontic appliances may influence periodontal health through:

- Plaque retention
- Gingival inflammation
- Enamel demineralization
- Changes in microbiota



Fixed appliances create retentive areas around brackets, increasing risk of biofilm accumulation. Aligners, being removable, allow improved brushing and flossing.

Materials and Methods

A narrative review was conducted including clinical studies published between 2008 and 2025 evaluating periodontal parameters during aligner therapy.

Search keywords:

- “Invisalign periodontal health”
- “clear aligners gingival index”
- “white spot lesions orthodontics”
- “inflammatory markers orthodontics”

Inclusion criteria:



- Clinical trials
- Prospective cohort studies
- Comparative periodontal studies

Approximately 25 studies were evaluated.

II. Discussion

Periodontal Indices

Clinical studies demonstrate:

- Lower plaque index scores
- Reduced gingival index values
- Decreased bleeding on probing



when compared with fixed appliances.

Inflammatory Response

Cytokines such as IL-1 β and TNF- α increase during orthodontic tooth movement in both systems. However, intermittent force delivery with aligners may reduce prolonged inflammatory stimulation.

White Spot Lesions

Fixed appliances are associated with significantly higher rates of enamel decalcification. Clear aligners demonstrate reduced incidence due to absence of bracket-related plaque traps.

Adult Patient Benefits

Aligners are particularly suitable for adults concerned with periodontal health and esthetics.



III. Conclusion

Invisalign clear aligners provide favorable periodontal outcomes compared with fixed orthodontic appliances. While both systems activate similar biological pathways for tooth movement, aligners offer advantages in plaque control and gingival health, making them an attractive option for adult orthodontic patients.

References

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