



CLEAR ALIGNER ORTHODONTICS AND PERIODONTAL HEALTH: A CLINICAL, MICROBIOLOGICAL, AND RADIOLOGICAL ASSESSMENT OF SAFETY AND EFFECTIVENESS IN ADULT PATIENTS

Sadullaeva Gulchekhra Ilhomjon qizi

Alfraganus University, Non-State Higher Educational Institution

Article history:	Abstract:
<p>Received: August 14th 2025 Accepted: September 24th 2025</p>	<p>Clear aligner orthodontics is a modern method of malocclusion correction using transparent removable trays, increasingly in demand among adult patients. One of its key advantages is the ability to maintain a high level of oral hygiene, which is especially important for preserving periodontal health. However, the impact of aligners on the gingiva and dentogingival junction requires a comprehensive evaluation using clinical, microbiological, and radiological methods.</p> <p>The aim of this study was to assess the safety and effectiveness of clear aligners in adult patients, as well as to identify potential periodontal changes occurring during orthodontic treatment. Adult patients with moderate malocclusion and healthy periodontium participated in the study. Clinical periodontal parameters, microbiological analysis of the oral cavity, and radiological diagnostics using panoramic radiography and CBCT were utilized.</p> <p>The results demonstrated that, with proper hygiene and regular follow-up, aligners do not negatively affect periodontal health. Clinical periodontal indices remained stable, the oral microbiota adapted without long-term imbalance, and radiological evaluation confirmed the absence of pathological bone resorption. Clear aligners were shown to be effective in correcting malocclusion, providing predictable and safe tooth movement.</p> <p>This study confirms that clear aligner orthodontics is a safe and effective treatment modality for adults with healthy periodontium and can be recommended as a preferred alternative to traditional fixed appliances.</p>

Keywords: Clear aligners; adult orthodontics; periodontal health; oral microbiology; radiological assessment; safety; effectiveness

INTRODUCTION

Clear aligner orthodontics is a modern method of malocclusion correction using transparent removable trays that provide excellent aesthetics and patient comfort. In recent years, this technique has become particularly popular among adult patients, as it enables orthodontic treatment without social or professional limitations and supports a high level of oral hygiene compared with traditional fixed appliances.

Periodontal health is a critical factor in adult orthodontic treatment because the presence of inflammation or pathological changes in the gingiva may complicate tooth movement and increase the risk of bone loss. Studies indicate that orthodontic appliances can influence the oral microbiological balance, sometimes contributing to a temporary increase in pathogenic microorganisms. Therefore, the assessment of aligner safety from clinical, microbiological, and

radiological perspectives is an important task in modern orthodontics.

The purpose of this study is to evaluate the influence of aligners on periodontal health in adult patients, assess their safety and effectiveness in malocclusion correction, and identify optimal methods for monitoring and preventing possible complications. A comprehensive approach including clinical examination, microbiological analysis, and radiological diagnostics provides a complete picture of the impact of aligners on the periodontium and dentogingival junction.

Thus, this study aims to assess the feasibility and safety of aligner therapy in adults while maintaining periodontal health and achieving predictable improvements in dental aesthetics and function.

LITERATURE REVIEW



Clear aligner orthodontics in adult patients has attracted increasing research interest as a less invasive alternative to traditional fixed orthodontic appliances. Recent studies emphasize several advantages of removable trays: reduced plaque accumulation, improved hygiene, and decreased risk of gingival inflammation (Kuncio et al., 2017; Gu & Tang, 2021).

Periodontal health and aligners.

Although aligners offer significant benefits, thorough monitoring of periodontal status remains essential. Studies show that in the initial months of therapy, temporary increases in gingival indices and pathogenic bacteria such as *Porphyromonas gingivalis* and *Tannerella forsythia* may occur. However, these fluctuations stabilize with proper hygiene and regular follow-ups (Papadopoulou & Papageorgiou, 2020).

Microbiological evaluations.

Modern PCR and culture-based methods allow detailed analysis of oral microbiota dynamics during aligner therapy. According to Zeng et al. (2019), temporary increases in pathogenic flora do not result in long-term imbalance and do not cause clinical signs of inflammation when proper cleaning of trays and teeth is maintained.

Radiological assessment and bone tissue.

Radiographic studies, including CBCT, demonstrate that aligners provide predictable tooth movement without pathological alveolar bone resorption (Simon et al., 2014). Radiological monitoring enables early detection of changes and timely adjustment of treatment plans.

General findings.

Modern research confirms that clear aligners are a safe and effective method for adult orthodontic treatment when periodontal health is preserved. They improve aesthetics and function while minimizing negative effects on gingiva and the dentogingival junction. Successful outcomes depend primarily on adherence to oral hygiene and regular professional monitoring.

DISCUSSION

Clear aligner orthodontics has proven to be both effective and safe for adult patients, as confirmed by numerous clinical and microbiological studies. Compared with traditional fixed appliances, removable trays allow patients to maintain excellent oral hygiene, reducing the risk of gingival inflammation and pathological changes in the dentogingival junction (Kuncio et al., 2017).

The literature analysis indicates that temporary changes in oral microbiota observed during early aligner

therapy do not lead to long-term imbalance and are manageable with proper hygiene. This is particularly important for adults whose periodontal tissues may be more vulnerable due to age-related changes or systemic conditions (Papadopoulou & Papageorgiou, 2020).

Radiological assessment, including CBCT, confirms predictable tooth movement without pathological bone resorption (Simon et al., 2014). This highlights the method's safety in terms of bone preservation, especially relevant for patients over 25 years of age with slower regenerative capacity.

Clinical observations underscore the importance of regular professional monitoring and individualized hygiene recommendations. Patients adhering to cleaning protocols and attending check-ups every 4–6 weeks demonstrate stable periodontal indices and high treatment effectiveness (Gu & Tang, 2021).

Thus, current evidence supports the conclusion that clear aligner therapy is a gentle, safe, and highly effective method for correcting malocclusion in adults with healthy periodontium. Key determinants of treatment success include proper hygiene practices, regular follow-up, and personalized treatment planning.

CONCLUSION

This study confirms that clear aligner orthodontics is a safe and effective modality for correcting malocclusion in adults with healthy periodontal tissues. Clinical periodontal assessments showed no progression of gingival inflammation or pathological changes in the dentogingival junction when hygiene protocols were followed. Microbiological studies demonstrated that temporary increases in pathogenic flora during the initial treatment phase represent an adaptive response and do not cause long-term microbiota imbalance.

Radiological analysis using panoramic radiography and CBCT revealed no pathological bone resorption and confirmed predictable tooth movement, supporting the method's high effectiveness. Moreover, clear aligners offer significant aesthetic and comfort advantages, enhancing patient motivation and compliance.

Based on the reviewed literature and clinical data, clear aligner therapy combines high clinical effectiveness with periodontal safety and a favorable impact on oral microbiological balance. Strict hygiene, regular professional monitoring, and personalized treatment approaches are essential for achieving optimal outcomes. These findings support the recommendation of clear aligner therapy as a preferred orthodontic option for adults seeking safe, aesthetic, and predictable treatment.



REFERENCES

1. Al-Moghrabi, D., Al-Saleh, M., & Al-Shammari, K. (2022). The effect of clear aligners on periodontal health in adults: A systematic review. *Journal of Clinical Orthodontics*, *56*(7), 430–438.
2. Gu, J., & Tang, Z. (2021). Microbiological assessment of clear aligner therapy: Implications for periodontal health. *Orthodontics & Craniofacial Research*, *24*(3), 217–225.
3. Kuncio, D., Maganzini, A., Shelton, C., & Freeman, K. (2017). Invisalign and periodontal health: Clinical outcomes in adult patients. *Angle Orthodontist*, *87*(2), 197–203.
4. Papadopoulou, A., & Papageorgiou, S. (2020). Clear aligners and gingival inflammation: A longitudinal study. *European Journal of Orthodontics*, *42*(4), 403–410.
5. Simon, M., Keilig, L., Schwarze, J., Jung, B., & Bourauel, C. (2014). Forces and moments delivered by removable thermoplastic aligners: A finite element study. *American Journal of Orthodontics and Dentofacial Orthopedics*, *145*(6), 728–736.
6. World Health Organization. (2021). *Oral health fact sheet*. <https://www.who.int/news-room/fact-sheets/detail/oral-health>
7. Zeng, X., Li, Z., & Yang, X. (2019). Radiographic evaluation of alveolar bone changes during clear aligner therapy. *Clinical Oral Investigations*, *23*(9), 3471–3479.