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

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**Abstract**
Clear aligner orthodontics has become increasingly popular among adult patients due to its aesthetic advantages, removability, and improved oral hygiene maintenance compared with fixed appliances. However, the impact of aligners on periodontal tissues, oral microbiota, and alveolar bone requires comprehensive evaluation.
The aim of this study was to assess the safety and effectiveness of clear aligner therapy in adult patients using clinical, microbiological, and radiological parameters.
Adult patients with moderate malocclusions and healthy periodontal conditions were examined. The assessment included clinical periodontal indices, PCR-based analysis of periodontal pathogens, and radiological evaluation using panoramic radiography and cone-beam computed tomography (CBCT).
The results demonstrated that clear aligner therapy does not negatively affect periodontal health when adequate oral hygiene is maintained. Microbiological changes observed during the initial stages of treatment were transient and not associated with clinical inflammation. Radiological findings confirmed the absence of pathological alveolar bone resorption and the predictability of orthodontic tooth movement.
Clear aligner therapy can be considered a safe and effective orthodontic treatment option for adults with preserved periodontal health.

**Keywords**
clear aligner orthodontics; periodontal health; adult patients; oral microbiota; PCR diagnostics; CBCT; orthodontic safety.

## Relevance

Clear aligner therapy has gained significant popularity among adult patients due to its aesthetic advantages, removability, and improved hygiene maintenance compared with fixed orthodontic appliances. Despite these benefits, the potential effects of aligners on periodontal tissues, oral microbiota, and alveolar bone integrity remain insufficiently explored. Considering that adults are more susceptible to periodontal changes, evaluating the safety of clear aligners is a relevant task for contemporary orthodontics.

**Aim of the Study**

To assess the safety and effectiveness of clear aligner therapy in adult patients using clinical, microbiological, and radiological evaluation methods.

**Objectives**

1. To analyze changes in clinical periodontal indicators during aligner therapy.
2. To investigate modifications in oral microbiota using PCR analysis.
3. To evaluate alveolar bone status through panoramic radiography and CBCT.
4. To determine the predictability and clinical efficiency of tooth movement using clear aligners.

**Materials and Methods**

The study involved adult patients with moderate malocclusions and preserved periodontal health. The diagnostic protocol included:

– Clinical periodontal examination (GI, PMA, probing depth).

– PCR-based microbial analysis of key periodontal pathogens (*P. gingivalis*, *T. forsythia*, etc.).

– Radiological imaging (panoramic radiography and CBCT) to assess alveolar bone integrity and tooth movement.

– Digital orthodontic planning and evaluation of treatment efficiency.

**Results**

Clinical findings demonstrated that clear aligners do not adversely affect periodontal health when adequate hygiene is maintained. Periodontal indices remained stable throughout treatment.

Microbiological testing revealed a temporary increase in pathogenic microorganisms during the initial phases of aligner use, followed by restoration of microbial balance without clinical inflammation.

Radiological evaluation confirmed the absence of pathological bone resorption and verified the predictability of planned tooth movement.

Overall, patients reported high comfort and satisfaction levels, contributing to strong treatment compliance.

**Conclusions**

Clear aligner therapy is a safe and effective orthodontic treatment modality for adults with healthy periodontal conditions. It does not induce inflammatory progression, does not cause long-term microbial imbalance, and does not lead to alveolar bone loss. Successful outcomes depend on strict oral hygiene, scheduled follow-up visits, and individualized treatment planning. Aligners may be recommended as a preferred

method for adults seeking an aesthetic, minimally invasive, and biologically safe orthodontic correction.

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