



Gingival Health Evaluation in Patients Undergoing Fixed Orthodontic Therapy

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ABSTRACT:

Aim- The aim of the study is to evaluate the relationship between orthodontic treatment and gingival health.

Materials and methods- This study aimed to evaluate the impact of fixed orthodontic treatment on gingival health in a cohort of 50 patients preparing for orthodontic intervention. Detailed data collection included intraoral and extra-oral radiographs, along with photographic documentation, all recorded on separate forms. A thorough intraoral examination assessed visible plaque, clinically evident inflammation, and instances of gingival recession, classified according to Miller's criteria. Gingival biotype was analyzed by examining gingival texture and capillary transparency. Follow-up records were also reviewed. Patient demographics, including age and gender, were documented to assess potential correlations. Data analysis was performed using SPSS software to identify significant trends and outcomes.

Results- 50 patients undergoing fixed orthodontic treatment were divided into two groups: those with dental extractions (30 patients) and those without (20 patients). The mean age of the extraction group was 17.8 years, and the non-extraction group had a mean age of 16.4 years. Gender distribution was equal in the extraction group, while the non-extraction group had more females. The treatment duration was slightly longer in the non-extraction group. Significant increases in oral health parameters were observed post-treatment, including visible plaque, which rose from 2.5 to 5.8, visible inflammation, which increased from 3.24 to 10.72, and gingival recession, which increased from 0.10 to 0.82. Additionally, the gingival biotype analysis showed an increase in both thin and thick biotypes in both the maxilla and mandible after treatment.

Conclusion- Orthodontic treatment involving fixed appliances is linked to a rise in plaque buildup, inflammation, gingival recession, and alterations in gingival biotype.



Introduction

orthodontic treatment, driven by a growing societal focus on aesthetics and health consciousness. However, managing orthodontic issues in adult patients often involves addressing underlying periodontal problems, which tend to increase with age. Many adult orthodontic patients suffer from reduced periodontal support, leading to pathological migration, proclination of maxillary anterior teeth, interdental spacing, rotation, and overeruption, ultimately compromising both function and aesthetics.^{1,2,3}

The relationship between orthodontics and periodontics is complex and remains a topic of debate. Malocclusion can negatively impact periodontal health, and one of the primary objectives of orthodontic treatment is to improve oral health and prolong the life of the dentition.⁴ By correcting dental irregularities, orthodontic treatment enhances oral hygiene, reduces occlusal trauma, and promotes a healthier periodontium. Properly aligned teeth are generally easier to clean, reducing plaque accumulation and the risk of periodontal issues.⁵

Despite the benefits, orthodontic treatment can also pose challenges to periodontal health. The placement of orthodontic appliances often leads to changes in oral hygiene habits and can provoke local soft tissue responses in the gingiva.⁶ These appliances, due to their proximity to the gingival sulcus, can contribute to plaque accumulation and complicate oral hygiene maintenance. Additionally, factors such as thin gingival biotype, visible plaque, and inflammation are recognized as predictors of gingival recession, which may be exacerbated by orthodontic tooth movement, especially when it extends beyond the labial or lingual alveolar plate, potentially leading to dehiscence formation and further periodontal complications.^{7,8}

Hence, the aim of this study was to evaluate the impact of fixed orthodontic therapy on various parameters of gingival health in patients undergoing orthodontic treatment. This evaluation encompassed the examination of visible plaque buildup, clinically observable inflammation, gingival recession, and gingival biotype, with the intention of gaining a deeper insight into the effects of orthodontic devices on oral health.

An increasing number of adults are now seeking

Materials and methods

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Oral examination assessed visible plaque, clinically evident inflammation, and instances of gingival recession, classified according to Miller's criteria. Gingival biotype was analyzed by examining gingival texture and capillary transparency. Follow-up records were also reviewed. Patient demographics, including age and gender, were documented to assess potential correlations.

The study aimed to provide a comprehensive understanding of how orthodontic appliances affect gingival health over time. Data analysis was performed using SPSS software to identify significant trends and outcomes.

Results

Table 1: Demographic data

Parameter	Fixed Orthodontic Treatment (n = 50)	
	With Dental Extraction (n = 30)	Without Dental Extraction (n = 20)
Mean age (years)	17.8	16.4
Gender		
Male	15	6
Female	15	14
Mean treatment time(months)	28.5	30.1

Table 1 presents the demographic data for patients undergoing fixed orthodontic treatment, categorized into two groups: those with dental extractions (n = 30) and those without dental extractions (n = 20). The mean age for the extraction group was 17.8 years, while the non-extraction group had a mean age of 16.4 years. Gender distribution in the extraction group was equal, with 15



males and 15 females, whereas the non-extraction group consisted of 6 males and 14 females. The mean treatment duration was slightly longer in the non-extraction group, averaging 30.1 months, compared to 28.5 months in the extraction group.

Table 2: Comparison of Oral Health Parameters

Variable	Fixed Orthodontic Treatment	P value
Visible Plaque Value		
Before Treatment	2.5	0.002*
After Treatment	5.8	
Visible Inflammation Value		
Before Treatment	3.24	0.015*
After Treatment	10.72	
Gingival Recession Score		
Before Treatment	0.10	0.002*
After Treatment	0.82	

Table 2 compares oral health parameters before and after fixed orthodontic treatment, highlighting significant changes. The visible plaque value increased from 2.5 before treatment to 5.8 after treatment, with a statistically significant P value of 0.002. Visible inflammation also showed a marked rise, from 3.24 before treatment to 10.72 after treatment, with a P value of 0.015. Additionally, the gingival recession score increased from 0.10 before treatment to 0.82 post-treatment, indicating a significant change with a P value of 0.002. These findings suggest that fixed orthodontic treatment is associated with notable increases in visible plaque, inflammation, and gingival recession.

Table 3-Comparison of gingival biotype

Gingival Biotype Score	Percentage of affected patients Before treatment	Percentage of affected patients After treatment
Maxilla		

Thin	40%	55%
Thick	60%	68%
Mandible		
Thin	29%	33%
Thick	35%	39%

The gingival biotype scores for patients before and after treatment are presented as percentages of affected patients. In the maxilla, 40% of patients had a thin biotype before treatment, which increased to 55% after treatment. For the thick biotype in the maxilla, 60% were affected before treatment, and this figure rose to 68% after treatment. In the mandible, 29% of patients had a thin biotype before treatment, with a slight increase to 33% after treatment. For the thick biotype in the mandible, the percentage of affected patients was 35% before treatment and increased to 39% after treatment.

Discussion

Gingival health plays a crucial role in overall oral well-being, and its evaluation becomes particularly important in patients undergoing fixed orthodontic therapy. Orthodontic treatment, while beneficial for correcting dental malocclusions and improving esthetics, can also have significant effects on the gingiva.⁸ The presence of orthodontic appliances can complicate oral hygiene maintenance, leading to plaque accumulation, increased inflammation, and a higher risk of gingival recession. Furthermore, the mechanical forces applied during tooth movement can influence the gingival biotype and its response to orthodontic treatment.^{9,10} Understanding how fixed orthodontic therapy impacts gingival health is essential for optimizing patient care, minimizing potential adverse effects, and ensuring long-term periodontal stability. This evaluation typically involves assessing visible plaque, gingival inflammation, recession, and the gingival biotype before, during, and after treatment to gauge the influence of orthodontic interventions on the periodontium.

In our study, 50 patients undergoing fixed orthodontic treatment were divided into two groups: those with dental extractions (30 patients) and those without (20 patients). The mean age of the extraction group was 17.8 years, and the non-extraction group had a mean age of 16.4 years. Gender distribution was equal in the extraction group, while the non-extraction group had more females. The



treatment duration was slightly longer in the non-extraction group. Significant increases in oral health parameters were observed post-treatment, including visible plaque, which rose from 2.5 to 5.8, visible inflammation, which increased from 3.24 to 10.72, and gingival recession, which increased from 0.10 to 0.82. Additionally, the gingival biotype analysis showed an increase in both thin and thick biotypes in both the maxilla and mandible after treatment.

In the study conducted by Kumar V et al.,¹² the effect of fixed orthodontic treatment on gingival health was assessed in 120 patients scheduled for orthodontic therapy. Comprehensive data collection included intra- and extraoral radiographs, photographic documentation, and a complete intraoral examination to record visible plaque, clinical inflammation, and gingival recession. Gingival biotype was analyzed based on gingival texture and capillary transparency, and follow-up records were also reviewed. The results showed a significant increase in visible plaque (from 3.11 to 5.81), visible inflammation (from 2.89 to 15.43), and gingival recession (from 0.19 to 0.383) after treatment. Additionally, the study found an increase in the thick gingival biotype in both the maxillary and mandibular arches, while the thin maxillary biotype decreased. The findings emphasized the importance of regular oral prophylaxis during orthodontic treatment to manage the increased plaque accumulation, inflammation, and gingival recession.

In the study by Akkaya M. et al.,¹³ the relationship between fixed orthodontic treatment and gingival health was compared between adolescents and young adults. The results indicated a statistically significant increase in visible inflammation and gingival recession in the young adult group, while the visible plaque and inflammation values increased in the adolescent group after treatment. However, changes in gingival biotype were not statistically significant in either group. The study concluded that periodontal tissue responses to orthodontic treatment were more favorable in adolescents than in young adults. This highlights the importance of considering age-related differences when evaluating the impact of orthodontic treatment on gingival health.

Boke F et al.¹⁴ aimed to evaluate the relationship between orthodontic treatment and gingival health in 251 patients

(177 girls and 74 boys) treated at the Department of Orthodontics, Faculty of Dentistry, University of Gazi. The study analyzed patient records from 2006 to 2012, considering factors such as age, treatment time, and type of orthodontic treatment. Intra-oral photographs assessed visible plaque, inflammation, and gingival recession, while lateral cephalometric films analyzed incisor inclinations before and after treatment. The results showed that patients treated with functional appliances had no significant changes in gingival health, whereas those treated with fixed appliances experienced significant increases in visible plaque, inflammation, and gingival recession, with no change in gingival biotype. A positive correlation was found between lower incisor position and gingival recession, particularly in patients treated with fixed appliances and extractions, with cuspids showing the highest prevalence of gingival recession. The study concluded that effective cooperation among patients, orthodontists, and periodontists is essential for managing gingival health during orthodontic treatment.

In comparison to the studies by Kumar V et al., Akkaya M. et al., and Boke F et al., our study shares similarities in assessing the impact of fixed orthodontic treatment on gingival health but also presents some distinct differences. Like the other studies, we observed significant increases in visible plaque, inflammation, and gingival recession following orthodontic treatment. Kumar V et al. found similar increases in these parameters, reinforcing the notion that orthodontic treatment contributes to worsening gingival health. Akkaya M. et al.'s study, however, emphasized age-related differences, showing more favorable periodontal responses in adolescents compared to young adults, a distinction not specifically highlighted in our research. Additionally, while our study and Boke F et al.'s study both assessed gingival biotype changes, the latter study focused on the relationship between lower incisor position and gingival recession, particularly in patients treated with extractions, which we did not explore in our research. Despite these differences, all studies underline the importance of managing oral hygiene and collaboration between orthodontists and periodontists to mitigate the negative effects on gingival health during orthodontic treatment.

However the less sample size in our research limits the applicability of these findings. To gain a comprehensive



understanding of the long-term effects of orthodontic treatment on periodontal health and to enhance best practices for reducing negative outcomes, future studies should involve larger and more diverse populations.

Conclusion

Orthodontic treatment involving fixed appliances is linked to a rise in plaque buildup, inflammation, gingival recession, and alterations in gingival biotype.

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