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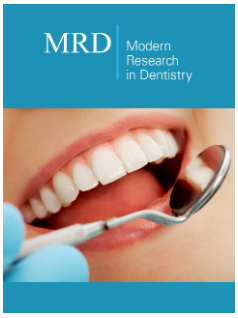
Mini Review

Relationship Between Orthodontic Treatment and Gingival Recession: A Mini-Review

Dai Tsuchida* and Masahiro Iijima

Department of Oral Growth and Development, Japan

ISSN: 2637-7764



***Corresponding author:** Dai Tsuchida, Division of Orthodontics and Dentofacial Orthopedics, Department of Oral Growth and Development, School of Dentistry, Health Sciences University of Hokkaido, Japan

Submission: April 13, 2023

Published: April 25, 2023

Volume 7 - Issue 5

How to cite this article: Dai Tsuchida* and Masahiro Iijima. Relationship Between Orthodontic Treatment and Gingival Recession: A Mini-Review. Mod Res Dent. 7(5). MRD. 000671. 2023. DOI: 10.31031/MRD.2023.07.000671

Abstract

Gingival recession is a common phenomenon classified as a manifestation of periodontal disease, and its prevalence increases with age. While improper brushing pressure and bruxism are among the multifactorial causes of gingival recession, there is ongoing debate regarding its relationship with orthodontic treatment. This mini review aims to examine the relationship between orthodontic treatments and gingival recession, as well as preventive and treatment methods for gingival recession.

Keywords: Orthodontic treatment; Gingival recession; Tooth movement; Risk factors; Prevention

Introduction

Gingival recession is a common problem that can cause root caries, tooth sensitivity, and aesthetic concerns. It is defined as the displacement of the marginal gingiva from the Cemento-Enamel Junction (CEJ), and its pathogenesis can be attributed to direct causes and predisposing factors [1]. Direct causes include inappropriate tooth brushing, chronic trauma from occlusion or bruxism, poor oral hygiene, inflammation of periodontal tissues due to systemic conditions or smoking, aging, genetic factors, and race. Predisposing factors include ectopic eruption or morphological problems of teeth, skeletal patterns, gingival biotype, and bone loss, or the presence of fenestrations in the alveolar bone [2]. A large epidemiological study conducted in 2018 reported a prevalence of gingival recession of 91.6%, with 70.7% occurring in esthetic areas such as the anterior teeth [3]. Despite its prevalence and clinical significance, the etiology and pathogenesis of gingival recession remain poorly understood.

An Orthodontic treatment is essential for resolving malocclusion and improving oral hygiene by removing plaque, improving occlusal stability, and harmonizing with perioral muscles to eliminate dysfunction [4,5]. Moreover, it has been reported that the elimination of malocclusion increases self-esteem and social acceptance, which has a significant impact on the quality of life [6]. However, orthodontic treatment has been reported as a risk factor for gingival recession [7]. A study involving 302 patients treated with fixed orthodontic appliances found that gingival recession occurred more frequently in maxillary canines, first premolars, first molars, mandibular incisors, and mandibular first premolars, with an incidence of 20-30% 2 to 5 years after orthodontic treatments [8]. The incidence of gingival recession at 2 to 5 years after orthodontic treatments was higher than the incidence in the general population, although another report found no correlation between orthodontic treatments and the frequency of gingival recession [9]. The relationship between orthodontic treatment and gingival recession remains controversial.

This mini-review aims to discuss the risk factors for gingival recession in orthodontic treatment and its prevention and treatment based on the literature reported to date.

Discussion

Orthodontic treatment and periodontal health

An Orthodontic treatment using fixed appliances is a prolonged process that can potentially modify the oral microflora, resulting in a bacterial composition similar to that found in periodontally affected areas [10]. However, a 2008 meta-analysis reported that the impact on periodontal tissues is minor when the treatment is administered with appropriate orthodontic force [11]. Nevertheless, patients with a prior history of periodontitis should undergo treatment for the disease before initiating orthodontic tooth movement [10]. It is therefore recommended to conduct a thorough periodontal examination before and during orthodontic treatment to monitor the condition of periodontal tissues [5,12].

Amelioration of gingival recession with orthodontic treatment

Several case reports suggest that proper torque control on mandibular anterior teeth and positioning of tooth roots within the alveolar bone through orthodontic treatment can improve gingival recession [13,14]. However, it is unclear whether this can be considered a histologic cure. Although an orthodontic treatment may ameliorate gingival recession, it does not address the underlying problem. Exposed root surfaces lack periodontal ligament, are contaminated by bacterial lipopolysaccharide (LPS), and do not recover alveolar bone levels even after being moved lingually by orthodontic treatments. While the acquisition of long epithelial attachments may improve gingival recession in some cases, potential risks may remain unresolved [2]. Therefore, although some clinical cases may pass without problems, it is important to consider the potential risks associated with an orthodontic treatment for gingival recession.

Importance of identifying periodontal biotype in orthodontic treatment planning

It is highly recommended to identify the periodontal biotype before initiating orthodontic treatments [15,16]. The periodontal biotype, also known as phenotype, comprises the thickness of gingival tissues, bone morphology type, and others [17]. Thin periodontal phenotypes are also characterized by thin alveolar bone and are more susceptible to fenestration and dehiscence [18], which can predispose to gingival recession. Tooth movement in areas with thin bone can cause root deviation from the alveolar bone, which further increases the likelihood of fenestration and dehiscence, and subsequent gingival recession [2,19].

Orthodontists must pay special attention to patients with skeletal Class III pattern, as they tend to have thinner alveolar bone around the mandibular incisors, which puts them at an increased risk for gingival recession, especially when labial movement of the anterior mandibular teeth is required during surgical orthodontic treatments [20,21]. Although there is no consensus on the most reliable method to determine periodontal biotype, the simplest approach involves using a periodontal pocket probe to measure gingival thickness. If the probe transmits light easily, the gingival thickness is considered thin, while if it transmits light poorly, the gingival thickness is thick [18]. This method may not always accurately determine gingival biotype due to variations in the dental unit, light source, and the operator, but it serves as a useful screening method.

Cone-Beam Computerized Tomography (CBCT) is indispensable in assessing bone limits when planning orthodontic treatment for patients with thin gingiva. Ideally, all teeth should be moved within the alveolar bone to prevent gingival recession [2,22]. Ongoing monitoring using CBCT is necessary to ensure tooth movement remains within the alveolar bone [23,24]. However, diagnosing using CBCT can be challenging because the limits of alveolar bone are not static, even in adults. In the past, it was believed that teeth could not move beyond the alveolar crest [25,26]. However, recent studies reported that the alveolar bone moves anteriorly with labial movement of anterior teeth and posteriorly with retraction of teeth, suggesting that the boundary of an orthodontic treatment is dynamic [27,28]. Nevertheless, caution must be exercised in making a diagnosis by CBCT, as when the bone plate is thin and delicate, fenestration and dehiscence may often be false positives due to the low resolution of CBCT. Additionally, the risk of unnecessary radiation exposure to dental patients should be carefully weighed before using CBCT for all patients [29].

Current evidence on orthodontic treatment for thin gingival biotype patients

In 2020, the American Academy of Periodontology conducted a best evidence review on orthodontic treatments for patients with thin gingival biotypes. The consensus is that Corticotomy-Assisted Orthodontic Therapy (CAOT) with hard tissue augmentation via particulate bone grafting can modify the periodontal phenotype, promote tooth movement, increase the range of incisor movement, and provide clinical benefit for patients with mandibular issues. However, the benefits of orthodontic treatments with soft tissue augmentation alone have yet to be determined [30].

The Accelerated Osteogenic Orthodontic (AOO) and periodontal AOO methods are novel techniques that combine selective alveolar decortication, osteotomies, and bone thinning with no osseous mobilization and particulate bone grafting material to activate bone and augment alveolar bone. An Orthodontic treatment can be included in this process [31,32]. Recently, Optimized Periodontal Regeneration for Orthodontic Movement (O-PRO) has been applied to ensure that bone density does not interfere with tooth movement and is optimized for orthodontic tooth movement [33].

In summary, there are several promising techniques for orthodontic treatments for patients with thin gingival biotypes, including CAOT with hard tissue augmentation, AOO and periodontal AOO methods, and O-PRO. However, more detailed studies are necessary to fully evaluate the benefits and limitations of these techniques and to determine whether tooth movement beyond the “wall of orthodontic treatment” is possible [30].

Conclusion

Gingival recession is a complex condition with multiple causative factors. Although the relationship between orthodontic treatments and gingival recession is still a subject of debate, it is crucial for orthodontic clinicians to consider gingival biotypes and the potential risks of gingival recession during treatment planning in order to avoid its occurrence. In some cases, surgical hard tissue augmentation before commencing orthodontic treatments may be necessary; however, the effectiveness of the methods discussed in this study needs further investigation.

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