

The Potential Relationship Between Gingival Recession And Bone Thickness In The Context Of Orthodontic Treatment

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ABSTRACT

Background : The term gingival recession describes the downward movement of the gum border in relation to the cemento-enamel junction (CEJ), which is the point where the crown and root of a tooth meet. There are several different factors that might contribute to gingival recession, including as mechanical trauma, orthodontic treatment, or plaque-induced inflammation. Not only do patients receive orthodontic treatment, but also practising dentists do so because they see orthodontic therapy as a crucial part of multidisciplinary dental care.

Method : To discuss the potential relationship between gingival recession and bone thickness in the context of orthodontic treatment.

Discussion: Bone thickness is impacted by orthodontic treatment however bone density is not linked to a higher incidence of gingival recession. The patient's periodontal phenotype, which is determined by genetics, environment, and the way they wash their teeth, is connected to increased gingival recession during orthodontic therapy.

Conclusion : There is no potential relationship between gingival recession and bone thickness in the context of orthodontic treatment.

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INTRODUCTION

The term "gingival recession" describes the downward movement of the junction to the gingival edge between the tooth's crown and root, known as the cemento-enamel junction (CEJ). It often requires treatment to address aesthetic concerns, dentin hypersensitivity, or cervical lesions, both carious and non-carious. The causes of gingival recession are varied and may include inflammation caused by plaque, mechanical trauma, or orthodontic therapy(1). Recession is correlated with the form of the gingival tissue, also known as gingival biotype and the success of surgical procedures to cover the recessed areas(2). The gingival biotype, which is genetically determined, is defined by the thickness of the gingiva (GT), its specific morphology, and the underlying alveolar bone(3). The clinical appearance of normal gingival tissue reflects the underlying anatomy of the epithelium and lamina propria in part. Gingival thickness was highly influenced by periodontal probing depth, gingiva width, and tooth type(4). There are three types of gingival tissue: thick, average, and thin. In contrast to thin gingival tissue, which is fragile and has less keratinization than thick gingival tissue, densely fibrous thick gingival tissue and heavily keratinized. It is thought that thick gingiva prevents gingival recession while weak tissue is more vulnerable to it(2).

Orthodontic interventions aim to achieve a stable, healthy, functional, and aesthetically pleasing occlusion that

integrates with the overall facial appearance. While orthodontic treatment offers numerous benefits, it also carries some risks, including potential effects on periodontal tissue health(5). Although the benefits of treatment are numerous, it might involve some risks including also periodontal tissue health(6). Nevertheless, a study conducted by Kalina et al. revealed that among patients undergoing orthodontic treatment, there is a higher incidence of gingival recessions and bone dehiscences compared to the general population. The occurrence of gingival recessions was observed to be 5.8-11.5% more frequent in the orthodontically treated group, with a particular propensity for the anterior mandibular teeth to develop gingival recession dehiscences and fenestrations(5).

Renkema et al. (7) compared young adults who had undergone orthodontic treatment with untreated controls and found that in comparison to those who had not received orthodontic treatment, those had recession sites were 4.5 times more likely to have a history of therapy. Uncertainty surrounds the precise method by which orthodontic treatment may influence the onset of gingival recession. However, mandibular incisor proclination (forward inclination) in a small alveolar process might result in alveolar bone dehiscences, which can cause gingival recession. Gingival recession has been linked to the amount of alveolar bone, with thicker buccal alveolar bone demonstrating less vertical resorption of the alveolus.(2)

The precise mechanisms that lead to gingival recession during orthodontic treatment are not fully comprehended. However, numerous studies have indicated that orthodontic treatment can bring about changes in the periodontal tissues, including modifications in the alveolar bone and root structure. Moreover, when orthodontic forces are applied to teeth with occlusal dysfunction, pathological mechanisms of gingival recession can be triggered, particularly when the gingiva is in an unhealthy condition. This may elucidate why gingival recession can manifest in cases of infraversion or open bite resulting from orthodontic treatment. Additionally, other factors such as having thin gingival tissue and undergoing tooth extractions can also influence the occurrence of gingival recession subsequent to orthodontic treatment(8).

The purpose of this literature review is to talk about the potential relationship between gingival recession and bone thickness in the context of orthodontic treatment.

Gingival Recession

The shifting of a tooth's cemento-enamel junction's (CEJ) apical gingival border is referred to as gingival recession, also known as soft tissue recession. The periodontal tissues, such as the gingiva, root, periodontal ligament, cementum, and alveolar bone. When referring to this condition at teeth, according to scholars, the phrase "periodontal recession" is preferable than "gingival recession." (9).

Four groups were established by Miller in 1985, organizing the gingiva based on their placement compared to the mucogingival junction (MGJ). These groups help determine if there are any recessions in the gingiva. There is absence of gingival recession or any deterioration of bone or soft tissue between the teeth in Grade 1 as per the MGJ. In easier terms, Class II involves a minimal recession, possibly exceeding the MGJ, without any loss of bone or gingival. When the gingival detaches from the tooth, it extends past the area where the tooth and gingival unite in Class III, but it does not reach the root. In Class IV conditions, there is gingival recession towards the area where the teeth and gingival meet, and bone loss between the teeth that is lower than the level of the gingival recession(10).

It is possible to divide the gingiva into various phenotypes or biotypes. Three main groups are typically acknowledged. The interproximal contacts near to the incisal edge, the limited zone of keratinized tissue (KT), the delicate and thin gingiva, and the relatively thin alveolar bone are all characteristics of thin scalloped phenotypes. Square-shaped tooth crowns, prominent cervical convexity, more apical interproximal contact sites, a broad zone of KT, thick and fibrotic gingiva, and relatively thick alveolar bone are all characteristics of thick flat phenotypes. Thick scalloped phenotypes are characterised by thick and fibrotic gingiva, narrow teeth, a small zone of KT, and a prominent gingival scallop.. The definitions, however, may vary and

overlap, and the gingival phenotype may differ both within and between individuals(9).

Orthodontic Treatment

Through tooth movement, orthodontic treatment seeks to realign teeth and reestablish a healthy occlusal connection. Scholars have different perspectives on how orthodontic treatment affects gingival recession. Some claim that receiving the proper orthodontic care can reduce gingival recession, while others assert that orthodontic care either causes or exacerbates gingival recession(8).

According to conventional orthodontic biology, alveolar bone undergoes absorption and apposition on the pressure and tension sides when teeth are shifted in the direction of the lips and tongue. In order to keep the thickness of the corresponding alveolar bone constant, compensatory apposition and absorption also occur on its surface. Cone-beam computed tomography (CBCT) studies have revealed, however, that after the evacuation of first premolars and retraction of anterior teeth, the alveolar bone does not migrate proportionately with the teeth. The labial alveolar bone's thickness typically doesn't change or only exhibits mild apposition, whereas the palatal alveolar bone's thickness typically declines. Most of the time, apposition is minimal and alveolar bone absorption is prominent(11).

Bone Thickness

Clinicians must have a thorough understanding of alveolar ridge morphology and bone density in order to predict how much bone will be lost during tooth extraction. It is well known that the buccal side of the mouth has more bone loss than the lingual or palatal side, and that nearby healthy teeth contribute to the maintenance of bone density in close proximity. The morphological alterations that take place after tooth extraction are significantly influenced by the thickness of the alveolar bone. According to studies, there is an average height loss of 7.5 mm in the post-extraction alveolus when the bone thickness is less than 1 mm, compared to 1.1 mm in cases when the thickness is greater than 1 mm. Some writers even use bone thickness to predict when to insert implants following tooth extraction. On the other hand, there is not yet agreement on the bare minimum bone thickness needed to avoid ridge resorption(12).

Numerous variables have been examined for their effects on bone thickness, including systemic illnesses, occlusal connections, and smoking behaviors, but none of them have had a discernible impact on bone structure. It has been found that a patient's hormonal status, particularly in those who are 50 years or older, might affect the thickness of the facial bones. Patient age is another element that affects bone thickness(12).

The thickness of the buccal plate has been identified as a risk factor for marginal soft tissue recession following implant installation and as a contributing factor to dimensional changes in the alveolus after tooth extraction. According to certain study, gingival recession and buccal bone dehiscences may be linked. Three-dimensional imaging methods have consistently revealed that the buccal bone that surrounds the maxillary front teeth is frequently scant or nonexistent. However, attempts to correlate radiographic buccal bone values with clinical assessments of gingival thickness have had inconsistent results(13).

DISCUSSION

Periodontal ligaments in the pressure area and the tension zone elongate and relax as a result of the application of orthodontic pressures. The remodeling of the alveolar socket is caused by a series of biological processes that are sparked by a mechanical stimulus. According to the theory, bone apposition takes place on the opposite side from when aseptic necrosis develops in the region of compression. In this situation, the incisors' proclination would be the cause of bone dehiscences, whilst the front teeth's retroclination or retraction would lead to decrease in bone height on the palate or lingual side and apposition of the buccal bone. In actuality, the type of bone reaction is determined by the nonlinear nature of periodontal fibers, variations the direction and strength of orthodontic force, as well as changes in bone density and metabolic rate

(5). There are a number of potential ways that orthodontic treatment may affect how gingival recessions develop. The alveolar plate may thin or even develop a dehiscence as a result of tooth movement, particularly tooth movement to positions outside the labial or lingual alveolar plate(7).

The dimensions of the buccal bone reduced during the healing process, according to a thorough research that the thickness of the buccal bone before and after immediate implant implantation was investigated.. Surprisingly, prior to implant placement, a thick buccal plate (more than 1 mm) was associated with a lesser reduction in height after implant insertion and subsequent healing, according to the study's findings(13).

In order to establish appropriate medical intervention, it is crucial to analyze and compare the association between gingival recession and the state of the outer bone adjacent to the central part of the tooth root. The tissue connection, outer layer of the gingiva, and depth of the gingiva pocket may all be less than 3 mm on a tooth with a 1 mm receding gingiva line. A tooth with 1 mm gum recession is expected to have less bone on the outer side at 4 mm below the gum line, no matter if the person has thick or thin gums. The width of the soft tissue above the gums is different for each tooth and person.(13)

According to D' Silva et al. there is a correlation between the thickness of buccal bone in the anterior maxilla and

gingival recession. They took two measurements, M1 and M2, with M2 being taken at a point half of the root length and M1 being taken 4 mm away from the horizontal reference line. They found that females tend to have a decrease in buccal bone thickness at M1, while older patients had an increase in buccal bone width at M1 and M2. Gingival recession was also associated with a decrease in buccal bone width at both M1 and M2. The periodontal biotype with a thick gingiva was found to have a wider ring of keratinised tissue, which supports the theory that there is a connection between the buccal bone beneath the gums and the periodontal soft tissue biotype(13).

According to Ji et al., people who have inadequate occlusal function, such as open bites and infraversion, are more likely to have gingival recession after receiving orthodontic treatment. In individuals with infraversion and an open bite, gingival recession was observed to be more common after orthodontic treatment than it was before. Additionally, patients who lose teeth during orthodontic treatment as well as those who have thin gingival tissue and a high gingival index prior to treatment are more likely to experience gingival recession. This study raises the possibility that more investigation is required to create preventative strategies for patients with inadequate occlusal function who are receiving orthodontic treatment(8)

The results of a study conducted by Vlachodimou et al.(3) showed that the periodontal phenotype is related to the

breadth of keratinized gingiva. The term "periodontal phenotype" describes the phenotypic traits of the bone and the gingival phenotype (GP), which includes keratinized tissue (KT) and gingival thickness (GT), that lies on top of the bone. A thin gingival plane (GP) has been linked to a higher incidence of gingival recessions (GRs), both over the course of a patient's lifetime and as a result of particular dental therapies like orthodontics. (14). A more pronounced width of keratinized gingiva is a characteristic of periodontal tissues with a thick biotype. When designing successful periodontal, prosthetic, and orthodontic treatments, consideration must be given to the thickness and contour of the gingiva.

The periodontal phenotype was categorized into three groups by Vlachodimou et al.(3): thin scalloped, thick and flat, and thick scalloped. Planning orthodontic treatment and ensuring periodontal health depend on determining the gingival phenotype. Two crucial factors that can affect the results of dental therapy are the width of keratinized gingiva (WKG) and the periodontal phenotype. In both periodontal and orthodontic therapies, thin periodontal phenotypes increase the likelihood of gingival recession.

The following factors are linked to gingival margin: 1) patient-related factors (such as age and sex); 2) tooth-related factors (such as jaw and position); 3) periodontal factors (such as Gingival Thickness and Bone Thickness); and 4) orthodontic factors (such as history of

orthognathic surgery, tooth inclination, and tooth rotation).(15).

CONCLUSION

Orthodontic treatment affects bone thickness, but bone thickness is not associated with an increased prevalence of gingival recession. Increased gingival recession during orthodontic treatment is related to the patient's periodontal phenotype, and this condition is also influenced by genetic, environment, and the patient's tooth brushing technique.

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CONFLICT OF INTEREST

No conflict of interest

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