



The Effects of Orthodontic Movement on a Subepithelial Connective Tissue Graft in the Treatment of Gingival Recession

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Abstract

Aim: The purpose of this article is to report on the five-year follow-up of a case involving treatment of gingival recession with a subepithelial connective tissue graft prior to orthodontic tooth movement.

Background: Gingival recession has a global prevalence that varies from 3 to 100 percent depending on the population studied and the method of analysis. In addition, the frequency of recession seems to be positively correlated with age. Planned orthodontic tooth movement is not necessarily an etiological factor for gingival recession, so long as it does not move the tooth out of its alveolar process. When the tooth is shifted without adequate biomechanical control, bone dehiscence can develop, and the recession can occur as a consequence of the orthodontic treatment.

Case Description: A 19.6-year-old female patient was referred for orthodontic treatment due to severe anterior-inferior dental crowding and a mandibular right lateral incisor in linguoversion and 4.0 mm of gingival recession on the labial surface. Normal gingival architecture was restored with a subepithelial connective tissue graft used to cover the 4.0 mm defect, after which orthodontic treatment repositioned the malposed incisor into its correct occlusal alignment. Individualized torque was applied to the mandibular right central incisor during the orthodontic treatment. The

patient was reevaluated five years after completion of the orthodontic treatment.

Results: At the five-year recall appointment, the patient exhibited normal tooth alignment and generalized normal gingival architecture; however, 2 mm of gingival recession was noted on the graft site.

Summary: This case demonstrated that periodontal surgical correction of facial gingival recession with a subepithelial graft may be performed prior to initiating orthodontic treatment.

Clinical Significance: The interdisciplinary association between orthodontics and periodontics contributes to good prognosis and acquisition or maintenance of the periodontal tissue health, masticatory function, esthetics, and patient satisfaction. The subepithelial connective tissue graft placed prior to the orthodontic movement showed satisfactory results five years after completion of the orthodontic treatment.

Keywords: Connective tissue, graft, gingival recession, orthodontics, periodontics, subepithelial graft

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Introduction

In the adult patient, esthetic procedures, correction of the occlusion, and the treatment of bone defects have limitations, such as the development of significant gingival recession and certain periodontal conditions.¹ Therefore, it is important to define and discuss the advantages and disadvantages of different treatment options with a patient. Unfortunately, there is only a limited amount of information available on the long-term results of periodontal root coverage procedures.² Therefore, an essential step in the treatment planning process is transmitting the appropriate information to the patient about the etiology, complexity, treatment procedures, and prognosis for his or her clinical case.³

True gingival recession is a static condition in which the marginal gingiva is positioned apically relative to the cemento-enamel junction. Recession can be localized to a single tooth or more broadly involve multiple-tooth segments or the dental arches.⁴ Its etiology is multifactorial and can arise due to a response to bacterial plaque, the position of the teeth in the arch, toothbrushing trauma, traumatic occlusion, high insertion of oral frenula, narrow gingival areas, and anatomic defects, such as dehiscences and fenestrations.⁵ Age and smoking habits are secondary factors related to gingival recession.⁶ While these different factors can have a significant influence individually, they also can act in association.

Gingival recession has a global prevalence that varies from 3 to 100 percent depending on the population studied and the method of analysis. In addition, the frequency of recession seems to be positively correlated with age.^{7,8}

Planned dental movement is not necessarily an etiological factor, if it does not dislocate a tooth out of its alveolar process limit. However, if a tooth is shifted without adequate biomechanical control, a bone dehiscence can develop, and gingival recession becomes a consequence of the movement.⁹ Buccal-lingual dental shifting may lead to bone dehiscence and subsequent gingival recession.¹⁰ However, tooth movement also may induce bone apposition in the labial surface of the alveolar process and can actually help to correct certain mucogingival problems.^{11,12}

A higher frequency of gingival recession during orthodontic treatment has been noted for the mandibular central incisors due to the fact that the labial bone covering the roots of these teeth is thinner.¹³ This observation contradicts Allais and Melsen,¹⁴ who contend that recession involving the mandibular incisors does not increase during orthodontic treatment (labial movement).

There exist a variety of periodontal surgical techniques to correct gingival recession and achieve root coverage.^{15,16} The best technique to use should be determined based on the indications of each clinical case.^{15,16} The actual choice of a particular technique also depends on the receptor and donor areas, the amount of keratinized gingiva, and the extent (depth and width) of the gingival recession defect.¹⁵ One study concluded that a subepithelial graft held up better over time than the use of an acellular dermal matrix (ADM). However, the results were not universal, and in only 32 percent of the cases treated with an acellular dermal matrix did the conditions either improve or remain stable with time.¹⁶

The literature lacks illustrative post-treatment and post-grafting reports. Therefore, this report describes a case in which the influence of the planned orthodontic movement of teeth, including one tooth previously treated with a labial subepithelial graft, was evaluated clinically five years after the conclusion of that orthodontic treatment. Hopefully, the outcomes of this case can aid in the general understanding of similar clinical situations.

Case Report

Diagnosis

A 19.6-year-old female patient with Angle Class I malocclusion was referred to the Graduate Dentistry Program of Orthodontics. Upon evaluation it was determined that she had all her permanent teeth present, severe anterior-inferior dental crowding, the mandibular right central incisor in linguoversion, and 4 mm of gingival recession on the labial surface (Figure 1).

Treatment

Using the palate as the donor site, a subepithelial graft was used to correct the soft tissue defect on

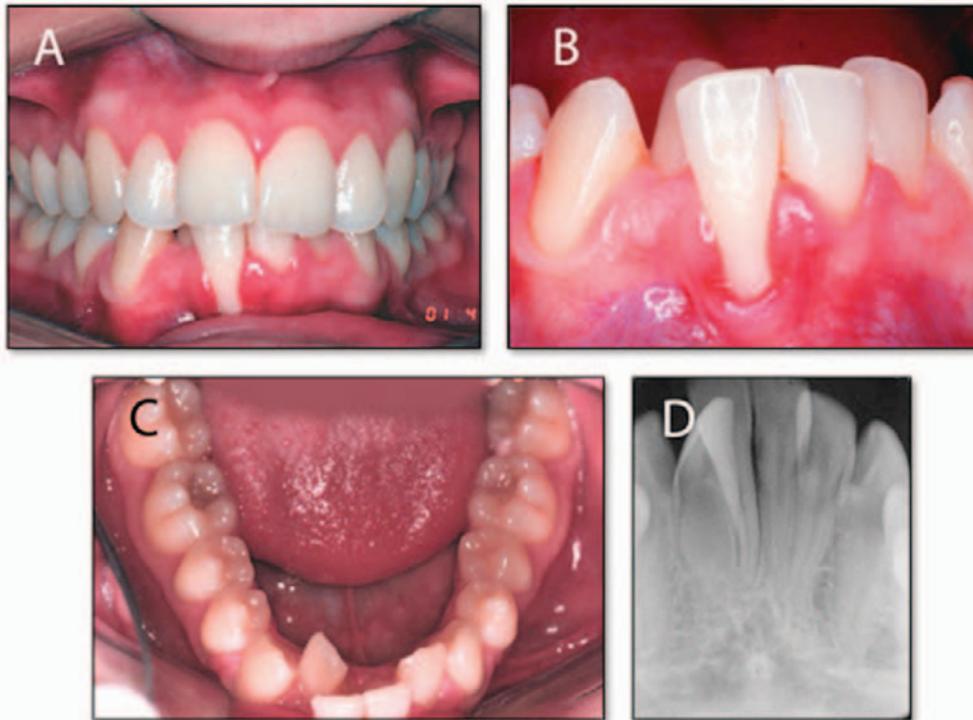


Figure 1. Initial intraoral photos and radiographs: **A.** Preoperative frontal view. **B.** Close-up of mandibular right central incisor showing 4.0 mm of facial recession. **C.** Occlusal view of mandibular arch showing extent of linguoversion of the mandibular right lateral incisor. **D.** Periapical radiograph of the mandibular right central and lateral incisors.



Figure 2. **A.** View of affected area after grafting and before orthodontic movement was initiated. **B.** Appearance after the fixed inferior orthodontic appliance was placed and orthodontic movement was completed. **C.** Palatal donor site.

the facial aspect of the mandibular right central incisor. This surgical treatment was selected because it typically offers greater predictability for successful radicular coverage (Figure 2).¹⁶

Treatment began with a mechanical debridement (root scaling and polishing) and a chemical preparation (24 percent EDTA for one minute) to affect a Miller Class II recession¹⁷ with 4 mm of gingival loss. Next, the surgical area was washed liberally with water. After this, the following surgical steps were taken: intra-crevicular incisions were made following the margin of recession; two horizontal incisions were made at the cement-enamel junction area; and two vertical release incisions were made with a split surgical flap. Sixty days were allowed to elapse before the

orthodontic movement was actually started.

In order to achieve the intended esthetic goals, masticatory function, and maintenance of facial harmony, the following additional treatments were performed: reestablishment of gingival and periodontal health on the labial surface of the maxillary second premolar; elimination of maxillary and mandibular tooth crowding; and creation of an adequate overbite. At the same time, the functional and esthetic objectives for this case were met with the aid of edgewise .022 × .028 in. orthodontic braces in conjunction with extractions of the four first premolars (Figure 3).

Five years after the periodontal and orthodontic treatments, the patient showed occlusal and

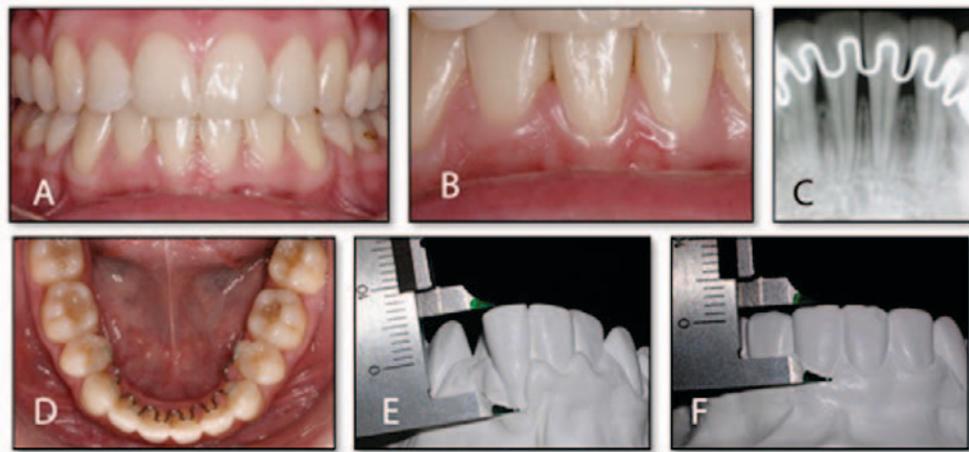


Figure 3. **A.** Final intraoral photograph (frontal view). **B.** Close-up of treatment area. **C.** Periapical radiograph with lingual retainers in place. **D.** Occlusal view with lingual retention. **E.** Measurement of gingival defect on diagnostic cast before surgery and orthodontic treatment showing 9.0 mm total length. **F.** Measure of clinical crown showing 5.0 mm distance with confirmation of 4 mm of gingival coverage of root recession.

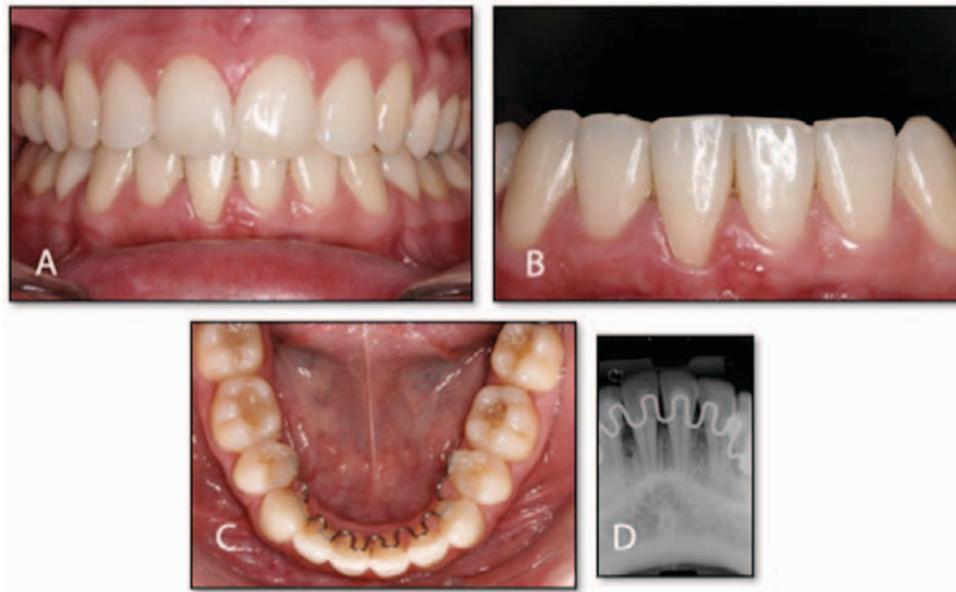


Figure 4. **A.** Front view five years after orthodontic treatment. **B.** At the five-year recall 2.0 mm of recession recurred. **C.** Occlusal view showing correct alignment of the mandibular right lateral incisor and correction of the linguoversion. **D.** Postoperative periapical radiographic of treated teeth.

esthetic harmony stability; however, 2.0 mm of gingival recession occurred on the facial surface of the mandibular right central incisor since the original surgery (Figure 4).

Discussion

Orthodontic treatment and tooth movement through the alveolar bone does cause alveolar bone remodeling and concomitantly engages a

variety of cells and tissue reactions within a set of periodontal fibers.¹⁸ Factors such as inadequate arch length with crowded and crooked teeth, excessive labial inclination, fenestration, and coronally positioned frenula can predispose the mandibular incisors to mucogingival problems. However, the most significant acquired risk factors for such mucogingival conditions are dental plaque accumulation, gingival inflammation, the magnitude and the direction of orthodontic forces, and functional malocclusion.¹⁹

The anatomic defect factor is critically important and must be considered as a risk factor for gingival recession. The most frequent conditions seen are a tooth in labial position or a tooth with a thin periodontium, in which excessive tooth brushing or inflammation from a bacterial infection originated recession. A healthy periodontium may present with thin facial gingiva and narrow cortical bone (or even a dehiscence). It is this particular morphology of the periodontium that is a risk factor for gingival recession.⁹

The effects of orthodontic proclination of the mandibular incisors on the periodontium are controversial. A higher incidence of gingival recession during orthodontic treatment is observed in the mandibular central incisors because the labial bone covering the roots of these teeth is thinner.¹³ Outward dental movement from the alveolar bone due to excessive inclination of the incisors predisposes teeth to the loss of the labial gingival insertion, which can then lead to gingival recession.²⁰⁻²³ It should be noted that some authors claim that there is no evidence to support this association between orthodontic treatment (movement) and gingival recession,^{13,14,24,25} Dorfman²⁶ reported that among 1162 cases with complete orthodontic treatment, 2 percent had insufficient amounts of keratinized gingiva in the mandibular central incisors.

Moreover, in some instances orthodontic treatment actually can help to correct certain mucogingival problems.^{11,12}

The presence of alveolar bone dehiscence predisposes the affected teeth to the loss of gingival tissue.⁵ The labial projection of teeth through the cortical plate also tends to favor the development of gingival recession,⁵ although according to Allais and Melson¹⁴ only 15 percent of the mandibular incisors develop or experience a worsening in existing gingival recession during orthodontic treatment.

In cases of gingival recession, gingival grafts are frequently used as a reparative and preventative therapy to treat mucogingival problems.¹⁹ There exist a variety of surgical techniques designed to correct gingival recession and the best technique is chosen based on the particular indications of each case. The free gingival graft was the method of choice for radicular coverage when there was not sufficient donor tissue in the area adjacent to

the gingival recession. Typically, a graft would be placed using epithelial or subepithelial connective tissue taken from the palatal masticatory mucosa.

Dorfman²⁷ compared the results of gingival grafts with conventional periodontal therapy in patients whose amounts of attached gingiva were insufficient to maintain proper gingival health. After three years, it was observed that periodontal health can be maintained solely with conservative treatment. In fact, there were no apparent differences between the two groups (conservative treatment vs. grafting) at the level of the attached gingiva, although it is known that loss to follow-up for long-term periodontal treatment can happen.²⁸ In fact, Kakudate et al.²⁸ found that assessment of oral health care-specific self-efficacy may be useful in predicting loss to follow-up in long-term periodontal treatment.

Using gingival grafts as preventive measures in patients undergoing orthodontic treatment, who also are at risk to develop gingival recession, is not without controversy.²⁹ Studies have addressed this issue but noted significant differences in methodology such as heterogeneity in subject age groups, as in one study that reported that younger patients tend to be lost more frequently to follow-up than older patients.²⁸ Other factors include variations in the amount of movement obtained and the orthodontic treatments performed, absence of a reference point in the determination of final inferior incisor inclination, differences in the orthodontic post-treatment evaluation period, and differences in the methods employed to analyze the periodontal variables.^{22,23}

As a result, some clinicians prefer to take a “wait and see” approach before selecting the most appropriate root coverage surgical technique for the repair of gingival recession, one reason being that the orthodontic movements that reposition a tooth lingually and back into its alveolus either do not alter or can actually increase the amount of gingiva in some cases.^{4,30,31}

There are situations in which it is necessary to perform orthodontic treatment prior to mucogingival treatment, such as when the recession area is in conjunction with shearing movements; when the gingival recession is located next to one of the mandibular incisors and the orthodontic treatment plan affects a mandibular incisor extraction due to the Bolton discrepancy (in this case, it is preferable to opt for extraction of the affected tooth), and

in cases of teeth in labioversion with gingival recession where the teeth must be moved lingually prior to evaluating the need for mucogingival correction.³²

Radicular coverage procedures are variable and the level of success may differ among practitioners, regardless of the methods employed. Moreover, aspects such as biological factors, recession dimensions, and lack of a biofilm control due to deficient oral hygiene must be considered. In this case report, the patient treated demonstrated a moderate level of oral hygiene maintenance but inadequate control of bacterial plaque.

The treatment approach in the present case included a subepithelial connective tissue graft prior to orthodontic movement to cover the 4 mm recession defect on the mandibular right central incisor. The periodontal surgery was intended to provide a thicker marginal gingiva that would be less susceptible to tooth brushing trauma and, subsequently, less susceptible to development of biofilm that induces gingival inflammation and subsequent labial recession. It has been reported that with this type of graft the mean recession level changes less than can actually be detected, indicating clinical success and a more predictable and stable long-term, root coverage outcome.²

Summary

Gingival recession can be treated successfully with a subepithelial connective tissue graft prior to orthodontic movement of the involved tooth. In this particular case, five years after the orthodontic treatment ceased, the subepithelial graft was still intact but 2 mm of recession from the original post-surgery level was noted. Such a recurrence of recession is more likely to take place if the patient does not maintain adequate oral hygiene and dental plaque removal, as seen with this patient.

Patients who experience gingival recession during orthodontic treatment also are susceptible to develop recession in other teeth after that orthodontic treatment.²⁴ Therefore, the orthodontic and periodontal diagnoses, in particular, must be considered jointly and explained to the patient.

Clinical Significance

The interdisciplinary association between orthodontics and periodontics contributes to good prognosis and acquisition or maintenance of the periodontal tissue health, masticatory function, esthetics, and patient satisfaction. The subepithelial connective tissue graft placed prior to the orthodontic movement showed satisfactory results five years after completion of the orthodontic treatment.

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