



## **Management of Gingival Recession During Orthodontic Treatment - A Review**

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### **ABSTRACT**

Gingival recession (GR) is a prevalent condition affecting periodontal health and aesthetics, characterised by the apical displacement of the gingival margin and root exposure. Its multifactorial aetiology includes local factors such as trauma, plaque accumulation, and occlusal forces, alongside systemic influences like hormonal changes and genetic predisposition. Orthodontic treatment plays a critical role in the management of GR, as applied forces can exacerbate or alleviate the condition. This article reviews current strategies for managing gingival recession during orthodontic therapy, emphasising the importance of interdisciplinary collaboration between orthodontists and periodontists. Various treatment options, including surgical interventions like grafts and nonsurgical approaches, are explored, highlighting their effectiveness in enhancing periodontal health and achieving aesthetic outcomes. This comprehensive overview aims to inform dental professionals about best practices in addressing gingival recession within the orthodontic context, ultimately contributing to improved patient care and satisfaction.

**KEYWORDS:** Gingival Recession, Orthodontics, Periodontal Health, Interdisciplinary Treatment, Surgical Interventions, Root Coverage

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### **INTRODUCTION**

Gingival recession (GR) is a prevalent periodontal condition that affects a significant portion of both the young and adult population, impacting not only the health of the periodontal tissues but also the aesthetic appearance of the smile. Characterised by the apical displacement of the gingival margin, GR can lead to the exposure of the root surfaces of teeth, resulting in heightened sensitivity, increased risk of caries, and a compromised aesthetic appearance. Its multifactorial aetiology includes local factors such as plaque accumulation, tooth position, and trauma, as well as systemic influences like hormonal changes and genetic predisposition. The subjective outcomes of GR can vary greatly among individuals, making it a complex condition for dental professionals to address. In orthodontics, the role of orthodontic treatment in the exacerbation or mitigation of gingival recession is pivotal.<sup>1</sup> Orthodontic forces applied during treatment can influence the position and alignment of teeth, potentially leading to further recession in predisposed individuals. Conversely, proper orthodontic treatment can also improve the alignment of teeth, leading to better oral hygiene and a reduction in the risk of GR.<sup>2</sup> As cosmetic expectations have evolved, orthodontists are increasingly challenged to consider both functional and aesthetic outcomes when planning treatment for patients. This necessitates a comprehensive understanding of periodontal health, as the interplay between orthodontics and periodontology is crucial in addressing GR effectively.<sup>3</sup> The management of gingival recession during orthodontic treatment is therefore essential for maintaining not only periodontal health but also the overall aesthetics of the patient's smile. A variety of treatment options, ranging from nonsurgical approaches to surgical interventions, are available to address GR. These strategies must be tailored to the individual needs of each patient, considering factors such as the severity of recession, the presence of periodontal disease, and the patient's cosmetic expectations. Furthermore, orthodontists must recognise the high association of gingival recession with periodontal disease progression, emphasising the importance of a thorough understanding of periodontal health in diagnosing and managing this condition effectively.<sup>4</sup> This article provides an overview of the strategies for managing gingival recession during orthodontic treatment.

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### **Causes Of Gingival Recession**

Gingival recession (GR) can result from several factors, each contributing to the condition through distinct mechanisms. One primary cause is low-level, chronic trauma, often from inappropriate daily brushing techniques that physically damage gingival tissues over time, typically presenting with associated cervical wear from similar abrasive agents. Chronic inflammatory periodontal disease also plays a significant role, as tissue destruction from such diseases leads to bone loss, apical migration of the gingival margin, and root exposure due to the loss of gingival tissue support. Following periodontal treatment, initial tissue loss may be compensated by gingival swelling, but as the inflammation subsides, root exposure becomes apparent, which may concern patients despite the health of the periodontal tissues. Furthermore, periodontal treatments can lead to considerable tissue loss, with surgical interventions causing temporary inflammation that, when resolved, can result in reduced gingival volume and further root exposure. Early removal of periodontal

disease agents can help minimise gingival enlargement before surgical interventions, allowing for more favourable surgical outcomes.<sup>5</sup> Occlusal trauma is another factor that can induce GR, characterised by diffuse pain and increased tooth mobility, leading to radiographically noticeable changes in the periodontal space and supporting structures. Excessive occlusal forces can stress periodontal fibres, potentially causing bone loss without the presence of dental plaque, identified as "primary occlusal trauma." Clinically, this may present as V-shaped gingival recession, occlusal wear, or abfraction, with the potential for increased sensitivity. It's crucial for professionals to accurately diagnose these conditions, as correcting occlusal issues can lead to spontaneous recovery of gingival recession in some cases. Additionally, several predisposing factors contribute to GR, including reduced alveolar bone crest thickness, which is often seen in specific teeth like maxillary canines and mandibular incisors, as well as dehiscence and fenestration, which increase the likelihood of recession. Finally, frenulum insertion near the gingival margin can exacerbate gingival retraction, particularly when compounded by chronic periodontal disease and poor oral hygiene practices.<sup>6</sup>

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## Review of literature

[1.] A 24-year-old female patient undergoing orthodontic therapy presented with Miller's Class II gingival recession of 7 mm associated with her mandibular right central incisor, which was sensitive to brushing. Treatment involved a free gingival graft, with careful preparation of both recipient and donor sites, including root planing and graft harvesting from the palate. Follow-up after 10 days indicated successful graft acceptance, and by three weeks, complete coverage of the recession was achieved. The procedure aimed to restore the aesthetics of the gingiva and increase the zone of attached gingiva.<sup>7</sup>

[2.] A 24-year-old female patient with Miller's Class II gingival recession associated with her mandibular left central incisor underwent treatment with a sub-epithelial connective tissue graft after one year of orthodontic therapy. The surgical procedure involved careful preparation of the recipient site, graft harvesting from the palatal vault, and stabilisation of the graft with sutures. Follow-up evaluations at 10 days and two months post-surgery showed successful graft acceptance and significant coverage of the recession, with complete healing at the donor site. After 12 months, further recession coverage was observed, attributed to the process of creeping attachment.<sup>8</sup>

[3.] In a study involving twelve adult patients with buccal or lingual gingival recession of mandibular incisors, a goal-oriented segmented appliance was used to reposition the roots toward the centre of the alveolar process. Measurements of recession depth, width, and area, along with pocket probing depth and keratinised tissue height, were taken before and after orthodontic treatment. Results showed a significant reduction in recession depth (23%), width (38%), and area (63%), with all patients improving in Miller's classification from Class III and IV to Class I or II. The findings suggest that orthodontic correction can effectively reduce gingival recessions and improve the prognosis for full root coverage through mucogingival surgery.<sup>9</sup>

[4.] A 30-year-old woman with malpositioned mandibular incisors and severe localised gingival recession sought treatment after undergoing previous orthodontic therapy and two gingival grafts. The current approach involved repositioning the roots within the alveolar bone and referring her to a periodontist for a gingival graft. The report discusses the potential for spontaneous improvement in gingival recession, referencing the "creeping attachment" phenomenon. While the literature presents conflicting views on the relationship between orthodontics and gingival recession, this case illustrates that correcting tooth positioning can lead to spontaneous improvement, thereby increasing the likelihood of successful outcomes when subsequently performing a gingival graft.<sup>10</sup>

[5.] 24-year-old woman who experienced gingival recession following orthodontic treatment and was successfully treated with a free gingival graft (FGG) to enhance keratinised tissue and cover the exposed root. The surgery yielded significant aesthetic improvement and increased attached gingiva, with complete tissue healing observed over 12 months. This highlights the efficacy of FGGs in managing gingival recession, emphasising the importance of surgical technique for optimal outcomes.<sup>11</sup>

[6.] 44-year-old patient with mandibular anterior crowding and localised gingival recession, characterised by thin keratinised gingiva and narrow alveolar bone. To mitigate recession risks during orthodontic therapy, a soft tissue phenotype modification was performed using the vestibular incision subperiosteal tunnel access (VISTA) technique and acellular dermal matrix infused with recombinant human platelet-derived growth factor. Post-operative healing was favourable, enabling subsequent clear aligner orthodontic treatment, which successfully corrected crowding and improved periodontal phenotype without clinical recession. This approach highlights the importance of managing periodontal health in conjunction with orthodontic procedures.<sup>12</sup>

[7.] 59-year-old patient with deep bite, supra-eruption of mandibular anterior teeth, and constricted arches, along with Cairo class RT1 gingival recession and a thin gingival phenotype. An initial phase of clear aligner therapy was employed to reposition the roots within the alveolar bone before performing soft tissue phenotype modification using the VISTA technique and a collagen matrix infused with platelet-rich fibrin. Successful root coverage and increased gingival thickness were achieved within four months, followed by further clear aligner therapy to address orthodontic objectives. Two years post-treatment, soft tissue stability was maintained, demonstrating the effectiveness of this sequential approach.<sup>13</sup>

[8.] 66-year-old female with Cairo RT2 (Miller Class III) gingival recession defects and inter-proximal tissue loss, known as black triangles. Due to the patient's specific conditions, periodontal plastic surgery was deemed unreliable, prompting the decision to proceed with clear aligner orthodontic therapy aimed at optimising root positions. The orthodontic plan involved three phases with interproximal reduction totaling 1.4 mm between the maxillary central incisors. Advanced planning software allowed for the integration of intraoral scans and CBCT 3D imaging, providing visualization of root positions through the alveolar bone, although bone changes were not simulated.<sup>14</sup>

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## Orthodontic planning and recession

Orthodontic treatment can lead to significant aesthetic improvements, particularly for individuals with prominent malocclusions, which can enhance social and psychological well-being. However, this treatment is not without risks, including root resorption, demineralisation, and periodontal complications. Gingival recession often arises from inadequate periodontal support, which may be exacerbated by substantial centio-alveolar changes during orthodontic therapy. Notably, significant arch lengthening can result in resorption of cortical plates, leading to fenestration and dehiscence. Research shows that untreated patients exhibit a high prevalence of labial fenestration (36%) and dehiscence (20%). Safe orthodontic movements are constrained by alveolar housing and soft tissue considerations, and maintaining a minimum of 1 mm of keratinised attached gingiva can help mitigate these risks.<sup>15,16</sup>

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## Gingival Recession Development and Treatment Progression in Orthodontic Patients

Gingival recession defects (GRD) in orthodontic patients are influenced by a combination of local periodontal anatomy and the characteristics of buccal tooth movement during orthodontic treatment. Studies indicate that individuals who experience single GRD during treatment are at a higher risk of developing multiple recessions afterward. Understanding the periodontal anatomy and the behaviour of sites treated with surgical tooth repositioning methods (STPM) is crucial for assessing the need for treating mucogingival deficiencies, such as GRD and inadequate keratinised tissue. Patients with a thin periodontal phenotype, characterised by thin gingiva and alveolar bone, are more susceptible to orthodontic-related GRD. The buccal bone often exhibits unfavourable anatomical features, such as reduced thickness and the presence of fenestrations and dehiscence, which can lead to GRD. Recent systematic reviews suggest that three-dimensional imaging, like Cone Beam Computed Tomography (CBCT), can help assess risk factors and guide treatment planning to prevent GRD, especially in patients with a thin periodontal phenotype. To effectively manage GRD, orthodontic treatment planning should consider six critical factors: interdisciplinary evaluation by periodontists and orthodontists, ensuring periodontal health before treatment, understanding healing outcomes of soft tissue augmentation procedures, assessing the impact of buccal tooth movement, maintaining regular periodontal care during treatment, and jointly evaluating treatment outcomes.<sup>17</sup> Evidence suggests that buccally positioned teeth with mucogingival deformities should undergo orthodontic movement to reposition them within the bone housing before any soft tissue augmentation procedures. Conversely, STPM before orthodontic treatment may reduce the risk of additional attachment loss and is especially crucial in cases where the buccal-lingual width of the bone is larger than the tooth dimension. Histological data supports the use of STPM, as it can prevent GRD development and buccal soft tissue thinning. Clinical trials have shown that combining root coverage procedures with orthodontic treatment can lead to stable root coverage outcomes and improved keratinised tissue width, thereby reducing cervical hypersensitivity.<sup>18</sup>

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## Combined Orthodontic-Periodontal Planning: A Comprehensive Approach

*Effective orthodontic treatment requires careful consideration* of periodontal health, especially in patients with a susceptible phenotype. Risks associated with arch lengthening, such as proclination or expansion, necessitate a tooth-specific assessment, taking into account malocclusion features, patient concerns, individual susceptibilities, and local anatomical factors. For patients with mucogingival deformities, interdisciplinary evaluation is crucial, ensuring periodontal health prior to treatment. Healing times post-gingival augmentation are important; at least six weeks post-procedure is recommended before initiating orthodontic movements.<sup>19</sup> Aligning and properly torquing teeth with labial positioning before augmentation can improve stability and keratinised tissue width, particularly in cases of minimal attached gingiva. The timing and method of space creation must be precisely managed, as uncontrolled arch lengthening can lead to further displacement of roots and compromise aesthetics and health. Local torque delivery is vital for repositioning roots, using appropriate bracket adjustments and auxiliaries to counteract issues caused by thin periodontal phenotypes. Gradual orthodontic movements can enhance gingival aesthetics by harmonising gingival levels, although the degree of tissue movement may vary. In cases of old extraction sites or thin alveolar bone, careful planning is necessary to avoid complications, with realistic expectations set for tooth movement and potential adjunctive treatments such as bone grafting to facilitate space closure.<sup>20</sup>

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## The Role of Orthodontic Movement in Preventing and Addressing Gingival Recession

Orthodontic movement plays a critical role in preventing gingival recession by facilitating the proper positioning of tooth roots within the alveolar bone, thereby enhancing the thickness of the buccal bone plate, which can be confirmed through imaging techniques like CT scans. This preventive approach can bolster the periodontal tissue's resistance to mechanical stresses such as inadequate oral hygiene and occlusal interferences. However, once gingival recession occurs, it presents challenges; exposure of the root surface to the oral environment allows for contamination by bacterial lipopolysaccharides (LPS), preventing natural recolonisation by cementoblasts and restoration of periodontal fibres. Even with orthodontic repositioning of the tooth, the gingival and periosteal levels cannot be naturally restored, necessitating surgical intervention from a periodontist to promote gingival tissue repositioning. This process results in the formation of a long junctional epithelium that restores clinical function but does not regenerate the periodontal ligament or outer bone plate at the exposed site. To effectively prevent gingival recession, early orthodontic intervention is essential to avoid microbial contamination. Adequate orthodontic planning, especially in regions with thin buccal bone plates, can mitigate the risk of recession. While orthodontic treatment is rarely a direct cause of gingival recession, it can exacerbate pre-existing vulnerabilities. Ultimately, orthodontic movement alone may not fully resolve established gingival recession, which often requires a combination of orthodontic and periodontal approaches, particularly in cases linked to occlusal trauma, where correcting the underlying interference can facilitate recovery without the need for surgical intervention.<sup>21,22</sup>

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## Surgical Techniques for Treating Gingival Recession

Several surgical techniques have been developed to effectively treat gingival recession and associated issues such as dentin hypersensitivity. One prominent method is the Modified Coronally Advanced Tunnel Technique, which has proven successful in addressing gingival recession by promoting the regeneration of healthy keratinised tissue while simultaneously providing root coverage. This technique involves creating a tunnel-like flap to cover the exposed root surface, allowing for the repositioning of the gingival tissue without the need for vertical incisions, thereby minimising trauma to the surrounding tissues and enhancing healing. Studies have highlighted the efficacy of this technique in restoring gingival health and sensitivity reduction. Another widely utilised method is the Free Gingival Autograft, which entails harvesting grafts from the palate to augment keratinised gingiva in areas affected by recession. This technique is particularly beneficial in improving the width of attached gingiva, thus enhancing periodontal stability and aesthetics. Research has reported satisfactory outcomes with this approach, noting significant improvements in clinical parameters just one month post-surgery. Both techniques underscore the importance of surgical intervention in managing gingival recession, contributing to better patient outcomes by restoring functional and aesthetic aspects of the gingival architecture.<sup>23,24</sup>

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## Orthodontic methods to manage gingival recession

Orthodontic methods, particularly intrusion, have gained attention for their potential in managing gingival recession and improving periodontal health. Research suggests that orthodontic intrusion can reduce periodontal pocket depth and increase clinical attachment, particularly in patients with reduced periodontium. When combined with periodontal treatments, this approach can enhance outcomes, promote tissue regeneration, and aid in improved papillary regeneration while reducing gingival recession. Surgical techniques, such as the modified multiple papilla full flap combined with tunnelling and de-epithelialized grafts, have proven effective in managing severe gingival recession following orthodontic treatment. Integrating these surgical methods with orthodontic intrusion can optimise recovery and aesthetic results. Additionally, collaboration between orthodontists and periodontists is essential, particularly in cases of malaligned teeth, and preemptive soft tissue augmentation may be needed for patients with thin gingival phenotypes to prevent recession during treatment. While orthodontic intrusion shows promise in addressing gingival recession, patient-specific factors and the potential need for surgical interventions must be carefully considered. A balanced approach between orthodontic and periodontal treatments, with close monitoring, can lead to the best outcomes while mitigating risks.<sup>25</sup>

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## Conclusion

Orthodontic appliances have been shown to contribute to the exacerbation of gingival recession, primarily due to plaque accumulation around the devices and mechanical trauma inflicted on the gingival tissues during treatment. This presents a significant concern for orthodontists and dental practitioners, as maintaining periodontal health is crucial for successful orthodontic outcomes. The relationship between bone thickness and the risk of gingival recession remains a topic of ongoing research, with current findings indicating that patient-specific factors—such as anatomical variations, oral hygiene practices, and individual responses to orthodontic forces—play a critical role in determining the extent of recession. Thus, it is essential for clinicians to adopt a proactive approach when planning orthodontic treatments. This includes conducting thorough assessments of the patient's periodontal status, employing strategies to minimise plaque accumulation, and providing education on proper oral hygiene techniques. Moreover, implementing regular monitoring during treatment can help identify early signs of recession, allowing for timely intervention. While surgical interventions can effectively address existing gingival recession, the potential for recession during orthodontic treatment underscores the importance of careful planning and patient management. By focusing on these aspects, dental professionals can mitigate risks and enhance treatment outcomes, ensuring that patients achieve both aesthetic and functional results without compromising their periodontal health.

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