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Clear aligners for patients with severe gingival recession: A case report

Abstract: Fixed appliances are an excellent treatment approach for mild to severe malocclusions. Increasingly, aligner-based treatments are being provided as a treatment option. The latter may be preferable to fixed appliances in selected cases. A young adult with severe gingival recession is presented who was treated successfully with aligner-based treatment with minimal deterioration of the gingival tissue levels. However, limits should be applied to the buccal and labial movement of teeth to reduce the risk of worsening of the gingival recession.

CPD/Clinical Relevance: Aligner-based treatment may be preferable for orthodontic patients with severe gingival recession.

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Gingival recession occurs when the keratinized gingiva is displaced apically, exposing the root surfaces.¹ The aetiology of gingival recession can be a result of mechanical and physical factors or inflammatory processes.² Mechanical and physical causes include vigorous tooth brushing, traumatic occlusion, trauma from foreign bodies, teeth displaced out of the line of the arch and aberrant frenal attachments. Inflammatory processes causing gingival recession can be seen with thin gingival biotype, periodontal disease and orthodontic tooth movement.

Orthodontic tooth movement *per se* does not cause recession. However, if teeth are moved labially outside the envelope

of the alveolar bone, this will result in loss of buccal bone and a decrease in gingival tissue thickness because of the stretching of the gingivae.³

Orthodontic treatment aims to align teeth and correct malocclusions, improving facial aesthetics and overall oral health. Two different types of orthodontic appliances are commonly used to achieve these goals: traditional fixed appliances using the pre-adjusted edgewise system,⁴ and clear aligners, which are now provided as a treatment option by most orthodontists in the UK and Republic of Ireland.⁵

With fixed appliances, using orthodontic brackets, tubes, and

bands leads to an increase in plaque accumulation, calculus and food deposits. These can be difficult to remove and can cause stimulation of subgingival plaque growth, leading to adverse effects on the periodontal tissues.⁶

Clear aligners have the advantage that they can be removed for oral hygiene practices with no obstruction from orthodontic attachments and wires, and this may decrease the chances of an aligner patient developing periodontal issues.⁷

A systematic review found periodontal indices more favourable in patients treated with clear aligners than fixed appliances.⁷ Similar findings have been reported from meta-analyses.^{8,9} A further systematic review found no adverse periodontal effects to be observed in clear aligner patients.¹⁰ However, further high-quality research is proposed by all reviews to conclusively determine whether aligner-based treatment is associated with better gingival health.

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Figure 2. Pre-treatment panoramic radiograph.

Figure 1. (a–i) Pre-treatment extra- and intra-oral photographs.

The authors present a case of a young adult with severe gingival recession who would be at high risk of significant further gingival recession were orthodontic treatment to be provided. The case was treated with an aligner system (Invisalign, Align Technology, San Jose, California) that demonstrates, with careful digital planning, further gingival recession can be minimized.

Case report

A healthy 29-year-old presented for a second opinion and was seeking to have her teeth aligned (Figure 1). She reported having had four premolar teeth removed as a teenager. Then, she had full fixed appliances followed by a lower canine-to-canine lingual bonded retainer and upper and lower vacuum-

formed retainers. The lingual bonded retainer had been sectioned over the last decade because it had debonded from the canines, and a four-unit retainer was seen on presentation. The vacuum-formed retainers were worn for many months at night time, and then discarded. The patient reported her case was complicated by severe gingival recession, and had previous

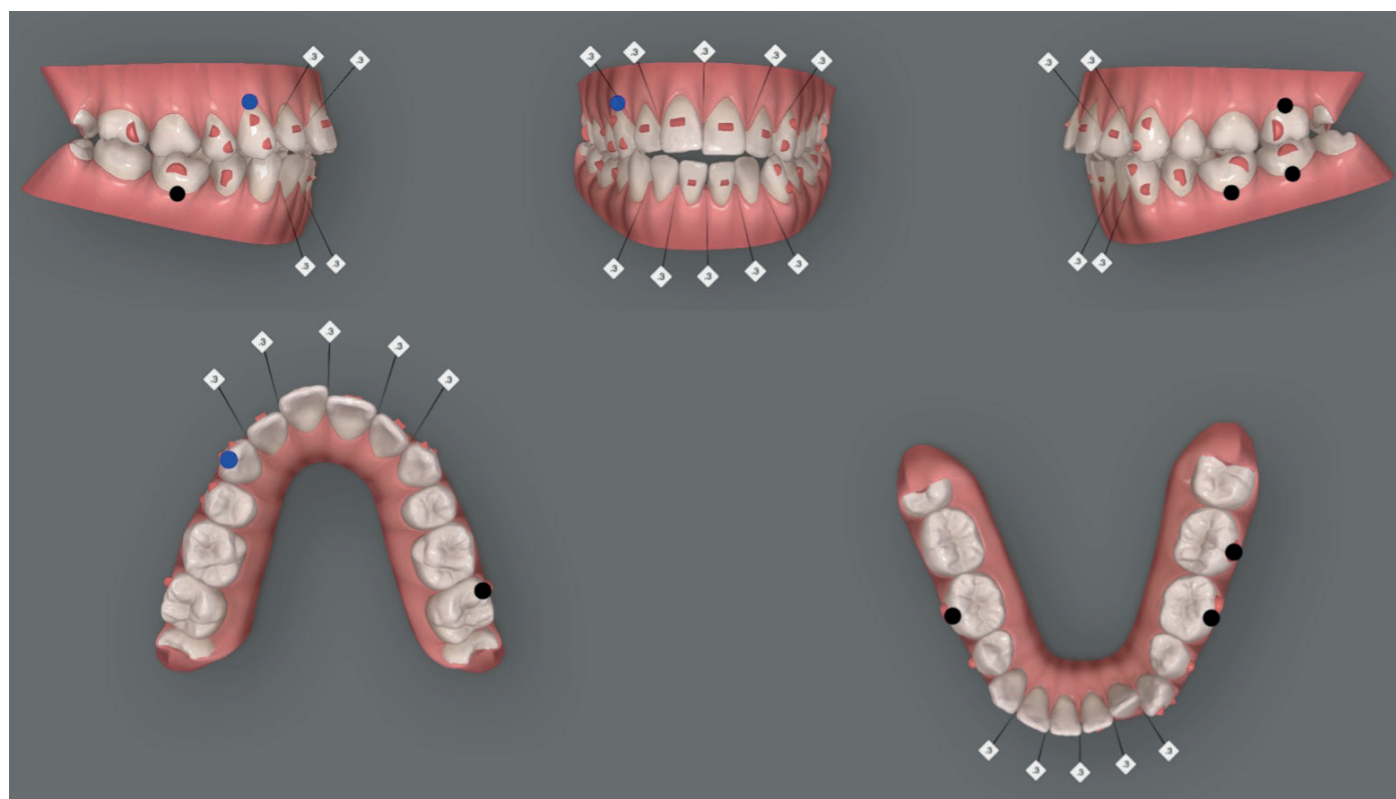


Figure 3. Digital planning.

consultations that had cautioned her about having further orthodontic treatment because it could significantly worsen the gingival recession.

Her family history revealed that her mother had also suffered from significant gingival recession at a young age. The patient recalled that her bite at the front had been improved because of orthodontic treatment, but not fully corrected.

The patient presented with a Class II division I incisor relationship on a skeletal I base with a normal lower anterior face height. There was mild crowding in both arches, a quarter unit Class III molars bilaterally with a quarter Class II canines bilaterally, the overjet was 5 mm, the lower midline was 2 mm to the left relative to the upper midline, and an open bite from canine-to-canine measuring 2 mm at maximum. The case was complicated by severe generalized recession of up to 4 mm and basic periodontal examination scores of 323/323. There was also a possible tongue thrust.

Before confirming any orthodontic intervention, a panoramic radiograph was taken (Figure 2). This revealed a reasonable crown:root ratio, and the presence of all third molars was noted, along with the absence of four premolars, and the lower

lingual bonded retainer across the four incisors. There was minimal generalized alveolar bone loss.

Given the presence of bone loss and significant recession, a periodontal assessment was undertaken, and treatment was provided to stabilize the periodontal condition. Regular visits with the hygienist for professional cleaning punctuated with regular visits to the general dental practitioner were incorporated into the treatment plan. An absence of bleeding on probing and periodontal pockets less than 3 mm was considered the threshold for providing orthodontic treatment. On achieving this, three options were considered:

- Accepting the malocclusion with the removal of the lower lingual bonded retainer;
- Aligning the teeth with interproximal enamel reduction with minimal improvement to the open bite;
- Aligning the teeth with upper and lower distalization, and fully correcting the open bite.

Given that the open bite had not been fully corrected, and there was the possibility of a tongue thrust, alignment with interproximal enamel reduction was selected. The occlusion would be

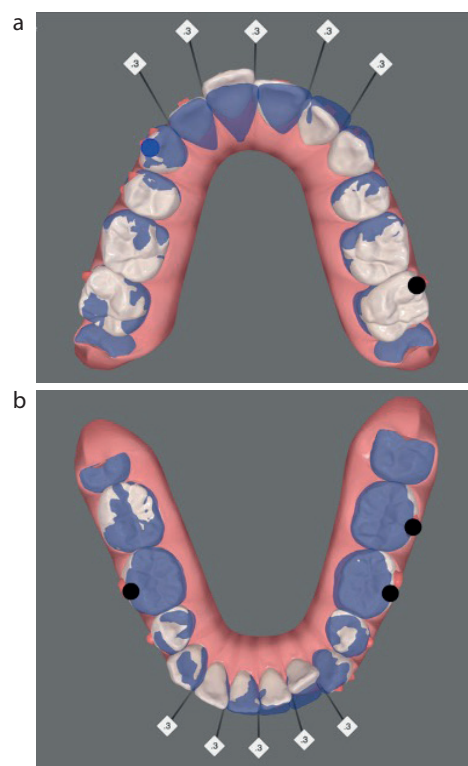


Figure 4. (a,b) Pre- and post-treatment superimposition (post-treatment in blue).

partially improved by accepting the molar and canine relationships and improving the overjet and dental centrelines. The

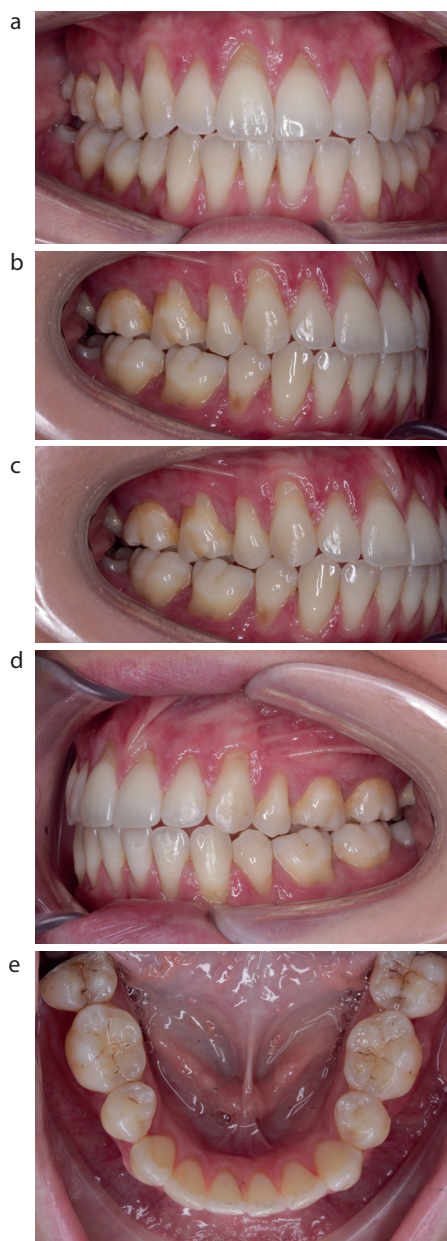


Figure 5. (a–e) Treatment result before refinement.

distalization option was discarded because treatment would require the loss of the third molars and result in prolonged treatment. Aligner-based treatment was selected over fixed appliances, in the hope that worsening of gingival recession would be minimal.

The patient was cautioned that any orthodontic intervention could rapidly worsen the gingival recession, and that care would need to be taken not to move the teeth buccally or labially. The treating clinician was aware that this could occur, so great care would need to be taken in staging tooth movements. It was felt this was more possible with an aligner-based system.



Figure 6. (a–i) Post-treatment extra- and intra-oral photographs at debond.

Digital planning was undertaken to complete alignment with 30 aligners and interproximal enamel reduction across the upper and lower anterior five contact points (Figure 3). Instructions to the technician included prioritizing interproximal enamel reduction for space gain over expansion and proclination. This would also avoid round-tripping. Proclination of the upper incisors was reduced with some retraction of the upper central incisor teeth planned (Figure 4a). In the lower arch, only the lower left central

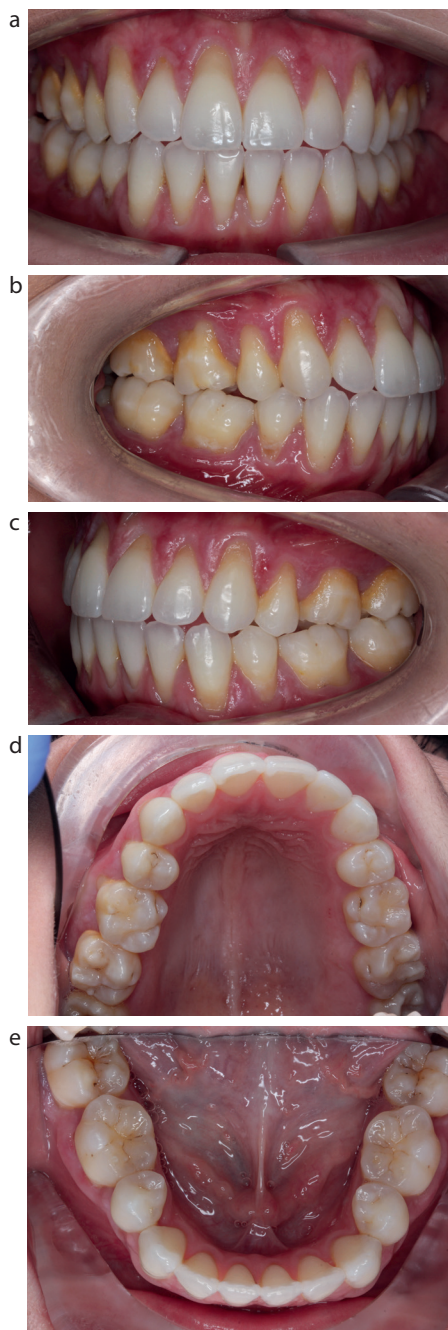


Figure 7. (a–e) Post-treatment extra- and intra-oral photographs at 1-year follow-up.

and lateral incisor teeth were moved labially (Figure 4b).

The patient was provided with a 1-week aligner change schedule, and after 7 months, alignment was almost complete, with some improvement to the open bite. Some tongue training exercises were provided during active treatment. Refinement aligners were ordered with the replacement of all attachments. This stage focused on the incisor positions, and after seven further aligners, the patient was satisfied with the result (Figure 5). Treatment was completed

in 10 months, with minimal deterioration in the degree of gingival recession. The patient selected Vivera retainers (Invisalign, Align Technology), and fixed lingual bonded retainers were declined owing to previous experiences with debonded fixed retainers (Figure 6). The patient was instructed to wear the retainers during sleeping hours. At the 1-year follow-up, the alignment was stable, although a slight reduction in overbite from the time of debond was noted, along with minor gingival recession on the UR1 and LL1 (Figure 7).

Discussion

In the context of an orthodontic assessment, evaluating a patient's periodontal status is crucial as it can have implications for their orthodontic treatment.¹¹ Therefore, the patient had a full periodontal examination undertaken prior to starting orthodontic treatment in line with current recommendations.¹²

Indices, such as plaque index, probing depth, sulcus bleeding index, and gingival index, are crucial for monitoring the impact of orthodontic treatment of periodontal tissues. Regular assessment using these indices has been known to help in the early detection and management of periodontal issues, ensuring better overall outcomes for orthodontic patients.⁸ Incorporation of regular hygiene visits and follow-ups with the dentist/periodontist in the treatment plan ensured satisfactory outcomes for the patient.

It has been argued that if a patient has very good oral hygiene and has regular appointments with their hygienist to ensure reinforcement of adequate control of dental biofilm, then good periodontal health should be maintained regardless of whether treatment is provided with fixed appliances or clear aligners.¹³ However, other literature consistently indicates an increase in plaque accumulation and gingival inflammation associated with fixed appliance treatment as a result of the difficulty in cleaning around brackets, bands and wires.^{7,14}

Clear aligners, such as Invisalign, have been proposed as a more periodontal-friendly alternative, with their primary advantage being removability to maintain better oral hygiene.⁷ Research by Rouzi *et al*¹⁵ and Han¹⁶ support the notion that aligner-based treatment facilitates plaque control and reduces the likelihood of deterioration of the periodontal status, particularly in patients with pre-existing conditions. This was one of the main drivers for aligner-based treatment being preferred in this patient.

Other benefits of an aligner-based treatment plan include the application of regulated intermittent forces during treatment, allowing specific intervals for periodontal membrane rebuilding.¹⁵ Additionally, clear aligners have been shown to provide more even stress distribution. Using 3D finite element analysis, researchers found that strains on the teeth and alveolar bone were more evenly distributed with aligners, resulting in fewer stress concentration areas.¹⁷ A less-often reported lifestyle change with aligner-based treatment is a reduced frequency of snacking. This could contribute to reducing the accumulation of bacterial load in the oral cavity.

Literature has shown various degrees of predictability for aligner-based tooth movements, with root movement particularly challenging.^{18,19} Given that some movements may not be accomplished with aligner-based treatment, this may have contributed to less root movement in this patient. This may have resulted in less detrimental effects on the periodontal tissues.

Cone beam computed tomography (CBCT) has been described as an accurate tool for measuring periodontal defects.²⁰ In the orthodontic setting, CBCT has been used to assess bone parameters, but it has been recommended that it be further investigated for dental applications.²¹ For this reason, CBCT imaging was not employed for this patient to assess the periodontal condition prior to orthodontic treatment. This would be in line with current recommendations.^{22,23}

The changes to the gingival recession were based on visual appearance alone, and this has limitations. No three-dimensional assessment using superimposed gingival tissues of study casts was undertaken, which would enable more accurate quantification of the changes in gingival attachment level pre- and post-orthodontic treatment.

Conclusion

Fixed appliances remain an important tool in the orthodontic practitioner's armamentarium, although treatment with clear aligners may be preferential for selected cases. A young adult with severe gingival recession was treated successfully with aligner-based treatment with minimal deterioration of the gingival tissue levels. Limits should be applied to the buccal and labial movement of teeth to reduce the risk of worsening the gingival recession.

Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

Informed Consent: Informed consent was obtained from the participant included in the article.

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