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Clear Aligner Treatment of Excessive Gingival Display in an Adult Without Skeletal Anchorage: A Case Report

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Abstract

Excessive gingival display (EGD) is a multifactorial aesthetic concern commonly managed through etiology-based treatment planning, with skeletal anchorage frequently employed to achieve predictable vertical control. However, the use of temporary anchorage devices increases treatment complexity, cost, and patient discomfort. With growing demand for minimally invasive and aesthetic-focused orthodontic care, conservative alternatives merit consideration., fatigue, and tactile feedback. Deposit removal was assessed with ImageJ software. This case report describes the treatment of a 38-year-old female presenting with anterior crowding and excessive gingival display who specifically requested clear aligner therapy. Clinical evaluation indicated a predominantly dental etiology for the gummy smile. Treatment was performed using Angel Aligner Pro without skeletal anchorage, utilizing controlled intrusion mechanics and anterior alignment. Significant reduction in gingival display and improvement in smile aesthetics was achieved within five months, followed by refinement. This case demonstrates that contemporary clear aligner systems may offer an effective conservative option for managing selected cases of excessive gingival display in adult patients.

Keywords

Excessive gingival display; Clear aligners; Adult orthodontics; Vertical control; Skeletal anchorage alternatives.

Introduction

Excessive gingival display (EGD), commonly referred to as a gummy smile, is a frequent aesthetic concern influencing facial attractiveness and psychosocial well-being. Smile aesthetics depend on the harmonious relationship between teeth, gingiva, lips, and facial structures [1-2]. Even minor discrepancies may result in disproportionate visual impact. Contemporary orthodontics increasingly emphasizes soft tissue aesthetics alongside functional occlusion, particularly in adult patients who often seek treatment primarily for cosmetic improvement [3].

Current evidence indicates that optimal smile aesthetics in females are associated with approximately 3 mm of gingival exposure during spontaneous smiling, whereas in males, an aesthetically acceptable smile typically involves exposure limited to the anterior dentition without a continuous gingival margin. Numerous studies have demonstrated a higher prevalence and degree of gingival display in females compared with males. Furthermore, the incidence of excessive gingival display decreases with advancing age, primarily due to age-related reductions in perioral muscle tonicity, resulting in diminished maxillary tooth display and increased mandibular tooth visibility [4-7]. Normal gingival exposure has been reported to range between 1 and 4 mm; nevertheless, excessive gingival display is widely recognized as a significant aesthetic discrepancy with potential negative effects on facial attractiveness [6,8,9].

Excessive gingival display may be classified according to severity as mild (2–4 mm), moderate (4–8 mm), or severe (>8 mm). In approximately 88% of cases, gingival exposure presents as a continuous anteroposterior band; however, localized anterior or posterior patterns have also been reported.^{1,10} Once an abnormal smile line is identified, comprehensive evaluation is required to determine the underlying etiology.

EGD presents a multifactorial etiology involving skeletal, dental, and soft tissue components. Skeletal factors typically include vertical maxillary excess characterized by excessive downward growth of the maxilla, often accompanied by increased lower facial height and lip incompetence [1,11,12,13]. Dental contributors include anterior dentoalveolar extrusion, incisor proclination, and occlusal plane discrepancies, frequently observed in adult patients without marked skeletal abnormalities [14-18]. Soft tissue factors such as hypermobile or short upper lips and altered passive eruption may further exacerbate gingival exposure [18-20].

Management strategies for EGD vary according to etiology and include periodontal crown lengthening, minimally invasive soft tissue approaches such as botulinum toxin injections, orthodontic intrusion, and orthognathic surgery. Orthognathic surgery remains the gold standard for severe skeletal discrepancies but carries significant risks and morbidity. Orthodontic intrusion of the anterior dentition has been widely utilized for dental etiologies, traditionally relying on extraoral appliances or, more recently, skeletal anchorage systems [21].

Temporary anchorage devices (TADs) have improved predictability of vertical control by providing absolute anchorage for intrusion mechanics [22]. However, their use is associated with increased

complexity, patient discomfort, and financial cost. With rising demand for minimally invasive aesthetic orthodontic care, interest has grown in conservative aligner-based approaches [23,24].

Clear aligner therapy (CAT) has undergone substantial evolution over the past two decades, progressing from a primarily aesthetic option for minor malocclusions to a widely adopted modality capable of managing increasingly complex orthodontic cases. This advancement has been driven by developments in digital treatment planning and CAD/CAM manufacturing [25-28]. The popularity of aligners is attributed to advantages including improved aesthetics and comfort, reduced pain, minimal impact on speech, and enhanced oral hygiene maintenance, alongside clinical benefits such as reduced chair time and fewer emergencies [29-35].

Clear aligners generate tooth movement through elastic deformation, exerting controlled push forces as they adapt to discrepancies between the programmed and intraoral tooth positions. Effective force transmission depends on aligner engagement, which is influenced by tooth surface area and crown morphology. Teeth with larger clinical crowns demonstrate improved movement expression, whereas reduced morphology may limit engagement. The use of attachments increases surface area and enhances biomechanical control. Anchorage in clear aligner therapy is digitally staged, allowing selective immobilization of specific tooth segments throughout treatment. This enables controlled sequential movements, such as distalization, in which designated anchorage units provide resistance while targeted teeth are repositioned [35-36].

While aligners have demonstrated success in sagittal movements and alignment, predictable vertical control remains challenging and most often needs to rely on TADs.²² Nevertheless, in selected cases with predominantly dental etiologies aligner-only intrusion protocols may offer a viable conservative alternative [26,37].

The present case report describes successful reduction of excessive gingival display in an adult patient using clear aligner therapy without skeletal anchorage, highlighting the importance of etiology-driven treatment planning.

Case Report

Patient history and chief complaint

A 38-year-old female presented seeking improvement in anterior tooth alignment and specifically requested clear aligner therapy. A previous orthodontic consultation had deemed her case unsuitable for Invisalign treatment. She had fair oral hygiene with marginal gingivitis and no history of trauma, parafunctional habits, or prior orthodontic care. Medical history was unremarkable.

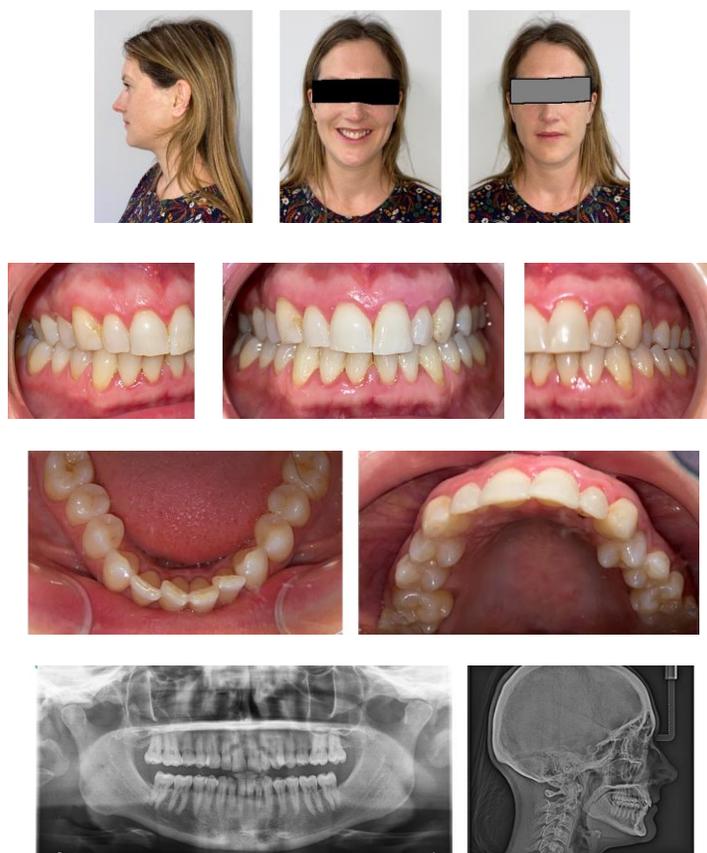
Clinical examination

Extra-oral examination revealed a dolichofacial pattern with a straight profile and increased mandibular plane angle. The lips were competent at rest. Smile analysis demonstrated full maxillary incisal display with approximately 4 mm of gingival exposure during smiling. Dental midlines were coincident with the facial midline, and no occlusal cant was present. Intra-orally, mild anterior crowding was present (1mm maxillary, 3 mm mandibular). Bilateral posterior crossbite involved teeth 16, 24, and 26. Overjet was

within normal limits, and overbite measured approximately 2 mm. Periodontal tissues were generally healthy with mild chronic gingivitis.

Functional examination showed normal mandibular movements without temporomandibular joint symptoms.

Radiographic and digital records



Diagnosis and Treatment Objectives

Cephalometric analysis revealed a Class III skeletal base with a hyperdivergent pattern and retrusive incisors. The diagnosis included Angle's Class III malocclusion, mild anterior crowding, bilateral posterior crossbite, and excessive gingival display.

Clinical and cephalometric findings indicated a predominantly dental etiology for the gummy smile, attributed to anterior dentoalveolar extrusion rather than skeletal or soft tissue abnormalities.

Treatment objectives were to:

- Align the anterior teeth
- Reduce gingival display
- Correct the crossbite of tooth 24
- Achieve functional occlusion

- Improve smile aesthetics with shortest treatment time to avoid periodontal complication due to higher risk of periodontal disease.

Treatment progress

Clear aligner therapy using Angel Aligner Pro was initiated with planned attachments.

Prescription:

1. Aim at correcting crowding, reduce gingival display, 24 crossbite, maintain 16 and 26 crossbite,
2. Maintain upper midline and move lower mid line to coincide
 - Reduce upper anterior display in length.
 - Reduce gingival display to 2mm
3. Gain space for alignment with proclination and IPR.
 - Finish with canine Class I OB 1mm and OJ 2mm
4. Attachments:
 - Vertical on canine
 - Horizontal CRT on molars to maximise anchorage
 - Angel Button on palatal of 24 and buccal of 34 to correct cross bite
 - Occlusal attachments on 37 and 47 (in aligners only) to provide space for cross bite correction.
5. Staging:
 1. Create space first then align and correcting cross bite.

Fourteen initial aligners were delivered in March 2024. After approximately five months, anterior alignment was achieved and the crossbite of tooth 24 was corrected.



By August 2024, following approximately five months of treatment, the patient was ready for the first refinement phase. At this stage, the maxillary anterior teeth were well aligned, and the crossbite of tooth 24 had been successfully corrected. The patient reported high satisfaction with the aesthetic improvements achieved to date and did not request any additional changes.

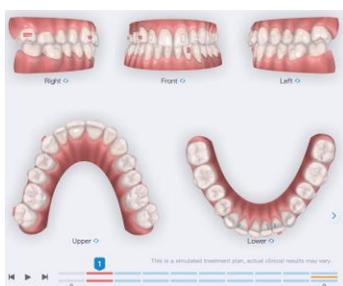
Photos after primary phase





First refinement set up

The aims of the refinement were to intrude and reduce labial excessive gingival display further, continue to align lower anterior teeth.



Treatment Outcome

By October 2024, gingival display had been symmetrically reduced to approximately 1.5 mm, with improved incisal display at rest. The patient expressed satisfaction with the treatment outcome and elected to conclude active therapy. Due to recurrence of marginal gingivitis, active treatment was discontinued at this stage, and the patient continued with passive aligner wear for an additional two months. Attachments were removed in December 2024, followed by delivery of retainers. The total time of treatment is 9 months.



Retention and follow-up

Essix retainers were prescribed for both arches with full-time wear for six months, followed by lifelong night-time wear. Follow-up visits were scheduled at routine six-month dental appointments.

Discussion

Excessive gingival display requires etiology-based diagnosis to guide appropriate treatment selection. Skeletal discrepancies often necessitate surgical correction, while dental etiologies may be managed orthodontically through controlled intrusion. Soft tissue factors may require adjunctive periodontal or minimally invasive procedures.

Advances in clear aligner therapy have expanded its biomechanical capabilities, including vertical tooth movement through optimized attachments and digital staging. Nevertheless, vertical control remains less predictable than sagittal movements.

Temporary anchorage devices have improved predictability of intrusion but introduce greater invasiveness, cost, and patient discomfort. Studies have reported postoperative pain and functional limitations following miniscrew placement, influencing patient acceptance.

For adult patients seeking aesthetic improvement with minimal invasiveness, conservative aligner-only approaches may be appropriate in selected cases. The present case demonstrates successful reduction of gingival display using clear aligners alone in a patient with a predominantly dental etiology. Careful case selection remains essential, as aligner-only protocols may not be suitable for severe skeletal discrepancies.

Conclusion

Excessive gingival display is a multifactorial condition requiring individualized treatment planning. Although skeletal anchorage provides predictable vertical control for complex cases, it increases invasiveness and treatment burden. This case report demonstrates that contemporary clear aligner therapy using Angel Aligner Pro can effectively reduce gingival display in selected adult patients without skeletal anchorage.

Conservative aligner-based treatment may represent a valuable alternative for appropriately diagnosed patients seeking minimally invasive orthodontic care. Further studies are needed to assess long-term stability and predictability.

Ethics approval and consent

This was a retrospective case report.

Conflict of interest

The authors declare no conflict of interest.

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