Case Report

Correction of Anterior Open Bite with Clear Aligner: A Case Report

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Abstract

Background: This case report describes the orthodontic management of a 22-year-old Thai male with anterior open bite and a skeletal Class II hyperdivergent pattern. The patient exhibited a convex profile, increased lower anterior facial height, and severe crowding in the lower arch. Malocclusion presented as a large overjet (6 mm), negative overbite (–3 mm), and Class II canine and Class III molar relationships. A clear aligner system was chosen to address both aesthetic concerns and functional needs. Treatment objectives included correction of anterior open bite, establishment of Class I canine and molar relationships, resolution of crowding, improvement of dental midlines, and enhancement of facial profile. A total of 51 pairs of aligners were used in two sets, with interproximal reduction and expansion employed to create space and correct arch form discrepancies. After 26 months of treatment, normal overjet and overbite were achieved, both arches were well aligned, and a Class I molar and canine relationship was established. The patient's profile improved with a normal smile line and reduced buccal corridor. Posttreatment records confirmed the stability of results with no root resorption or temporomandibular joint symptoms. Cephalometric evaluation showed improved incisor inclinations and a normalized interincisal angle. The patient successfully entered the retention phase with full-time wear of clear retainers. This case highlights the efficacy of clear aligners in treating complex malocclusions that include anterior open bite when case selection, biomechanics, and compliance are carefully managed.

Keywords: Anterior open bite, Clear aligner, Malocclusion, Orthodontic treatment, Skeletal Class II

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Introduction

Anterior open bite is a complex dentofacial anomaly characterized by the absence of vertical overlap between the maxillary and mandibular incisors when the posterior teeth are in full occlusion. This condition can present both functional and esthetic concerns that are often associated with tongue-thrust habits, mouth breathing, and skeletal discrepancies, particularly increased vertical facial dimensions or posterior dentoalveolar extrusion. The etiology of open bite is multifactorial, which involves a combination of genetic, environmental, and functional factors.[1]

Traditionally, the treatment of anterior open bite in adults has posed a significant challenge due to its tendency to relapse and the need to control the vertical dimension. Conventional treatment modalities include fixed appliances with vertical elastics, temporary anchorage devices[2] and orthognathic surgery in severe skeletal cases. However, with the advancement of clear aligner technology, aligner-based treatment has emerged as a viable alternative for selected cases of open bite that offers improved esthetics, comfort, and oral hygiene.

In recent years, clear aligners have become increasingly favored by adult patients due to their superior esthetics, enhanced comfort, ease of maintaining oral hygiene, and reduced chair time compared to conventional fixed appliances.[3] Studies have reported favorable outcomes in tooth movement efficiency, particularly in controlled tipping, intrusion, and space closure, when using aligners. Despite their advantages, clear aligners also have certain limitations, which include reduced efficacy in derotating cylindrical teeth, difficulties in achieving molar uprighting, and decreased aligner retention in teeth with short clinical crowns.[4,5] Such factors must be carefully considered during case selection and treatment planning.

This case report describes the treatment of an anterior open bite using clear aligners, which focused on the biomechanics involved, digital setup considerations, and clinical outcomes. The case highlights the potential of aligner therapy as a viable solution for managing open bite malocclusion in appropriately selected patients.

Case report

A 22-year-old Thai male sought orthodontic treatment at the Orthodontic Clinic of the Dental Hospital, Faculty of Dentistry, Prince of Songkla University, with the chief complaint of anterior open bite. The patient reported no known underlying diseases or allergies and was not taking any medication. The extraoral examination presented normal facial

Figure 1 Pretreatment extraoral examination.

development. The frontal view showed a symmetrical mesofacial type. In the rest position, the patient had competent lips. A low smile line presented while smiling. The patient exhibited a convex facial profile and an obtuse nasolabial angle (Figure 1). Although the patient showed no signs or symptoms of temporomandibular disorders,[6] tongue thrusting was detected during the functional assessment. The patient had with symmetrical arches, with a tapered upper arch and a square lower arch. Bolton's tooth size analysis revealed a discrepancy. The anterior ratio, calculated as (36/45) × 100 = 80.43 %, exceeded the reported mean values of 75.50–77.20–78.90 %,[7] indicating that the lower anterior teeth were 1.20 mm larger than normal, assuming the upper anterior teeth were of standard size. The overall ratio, calculated as (91/98) × 100 = 91.79 %, fell within the reported mean range of 89.40–91.30–93.20 % (Bolton, 1958),[7] suggesting consonance between the upper and lower posterior teeth. suggesting consonance between the upper and lowerposterior teeth (Table).

The intraoral examination found a large overjet (5 mm) and open bite (–3 mm). According to Angle's classification of malocclusion, the molars were Class III relationship (1 mm on the right side and 3 mm on the left side) and the canines were Class II relationship (3 mm on the right side and 2 mm on the left side) (Figures 2 and 3). The upper dental midline coincided

Figure 2 Pretreatment extraoral examination

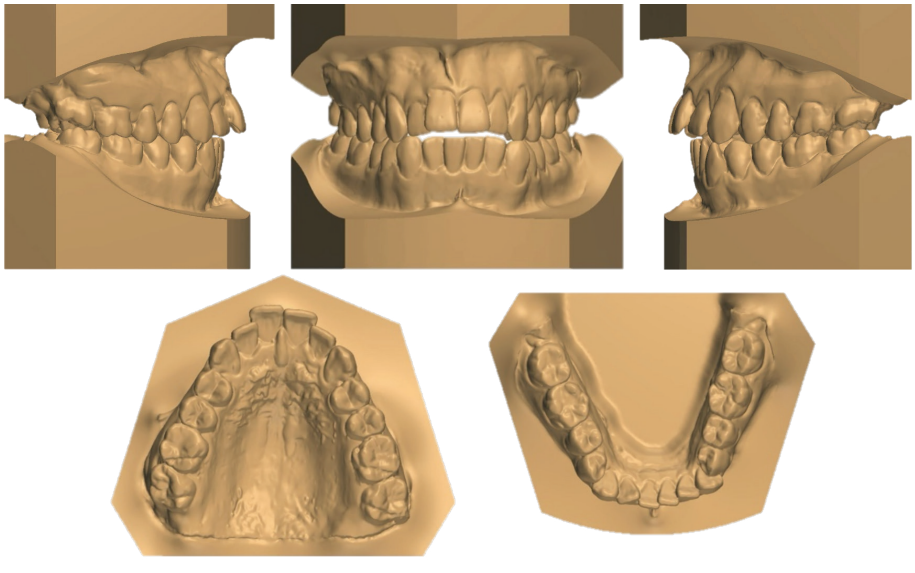

Figure 3 Pretreatment dental casts.

Table 1 Pretreatment tooth size measurements.

Tooth number	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
Size (mm)	-	10	10.5	7.5	8	8	7	8	8	7	8	7.5	7	11	10	-
Size (mm)	-	10	11.5	8	7	7	6	5.5	5.5	6	7	7	7.5	11.5	11	-
Tooth number	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Table 2 Pretreatment Korkhaus's analysis.

	Maxillary arch		Mandibular arch	
Type	Thai norm[8]	Pretreatment	Thai norm[8]	Pretreatment
Arch height (mm)	19.10 ± 2.40	21.00	17.3 ± 2.30	15.00
Anterior arch width (mm)	36.40 ± 1.90	31.00	36.2 ± 2.10	34.00
Posterior arch width (mm)	46.80 ± 2.20	46.50	45.7 ± 2.20	46.50

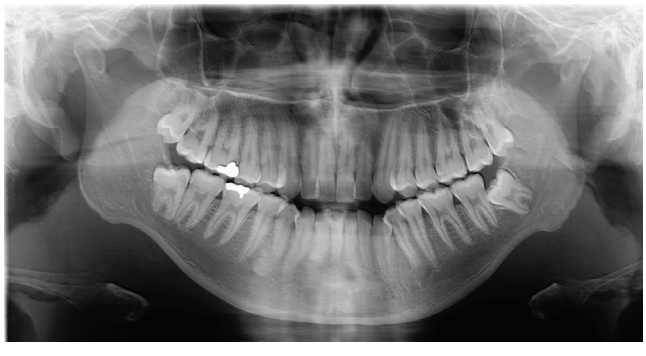

Figure 4 Pretreatment panoramic radiograph.

with the facial midline, and the lower dental midline deviated from the facial midline to the left by 2 mm. Space analysis demonstrated mild crowding of the upper arch and severe crowding on lower arch (Figures 2 and 3). Neither dental interference nor functional shift was detected. The soft tissue presented normal oral soft tissue, mucosa, and adequate attached gingiva. The tongue size and position were normal. The periodontium was diagnosed with gingivitis.

The Korkhaus analysis[8] showed that the upper anterior arch width (AAW) was narrower than the lower AAW, but the upper posterior arch width (PAW) was equal to the lower PAW. Upper and lower AAW were narrower than the standard values, whereas upper and lower PAW were equal to the standard values. The upper arch height (AH) was larger than the lower AH. Upper and lower AH were equal to the standard values (Table 2). Space analysis measurements revealed that the upper arch had a space deficiency of 3 mm and the lower arch had a space deficiency of 7 mm.

A panoramic radiograph showed dental development at the permanent dentition stage. The maxillary nasal septum, bone density, and trabeculation were within normal limits with no other visible pathology. The patient had symmetrical mandibular condyles (Figure 4). A well-defined radiopaque mass was observed at the apex of tooth 44, which was diagnosed as idiopathic osteosclerosis (IO), a benign

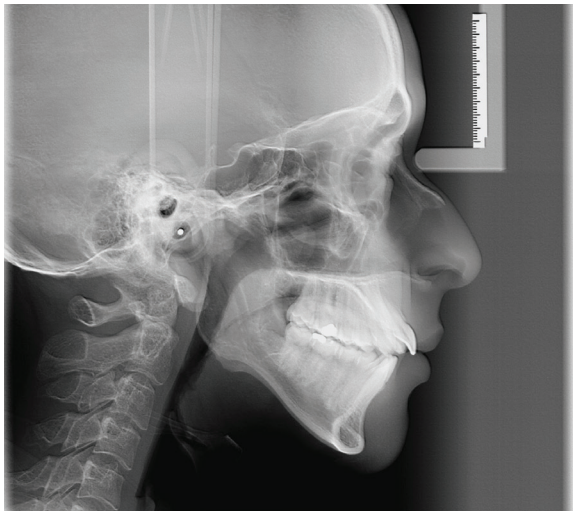

Figure 5 Pretreatment lateral cephalogram.

and asymptomatic bone density variation. Orthodontic treatment in areas affected by IO can be successfully performed without complications.[9]

A lateral cephalometric analysis[10] indicated a skeletal Class II hyperdivergent pattern with an orthognathic maxilla and retrognathic mandible. Also observed were proclined but normally positioned upper incisors, normally inclined and positioned lower incisors, acute interincisal angle, increased posterior dentoalveolar height (PDH), normally positioned upper and lower lips, and an obtuse nasolabial angle (Figure 5 and Table 3).

This patients had skeletal, dental, and soft tissue problems. The skeletal problems included skeletal Class II relationship with retrognathic mandible and hyperdivergent pattern. The dental problems included dental Class I malocclusion with crossbite on 23/33, open bite of the anterior teeth, mild crowding

Table 3 Pretreatment cephalometric analysis.

Area		Measurement	Norm (Mean ± SD)	Pretreatment	Interpretation
Reference line		FH-SN (deg.)[10]	6 ± 3	14	Steep SN plane
Skeletal	Maxilla to cranial base	SNA (degree)[11]	84 + 4	83	Orthognathic maxilla
		A-Nperp (mm)[12]	5 ± 4	6	Orthognathic maxilla
		SN-PP (degree)[12]	9 ± 3	15	Hyperdivergent pattern
	Mandible to cranial base	SNB (degree)[11]	81 ± 4	74	Retrognathic mandible
		Pg-Nperp (mm)[12]	0 ± 6	−3	Orthognathic mandible
		SN-Pg (degree)[11]	82 ± 3	73	Retrognathic mandible
		SN-MP (degree)[11]	29 ± 6	43	Hyperdivergent pattern
		NS-Gn (degree)[11]	68 ± 3	73	Hyperdivergent pattern
	Maxillo-mandibular	ANB (degree)[11]	3 ± 2	9	Skeletal Class II
		Wits (mm)[10]	−3 ± 2	−3	Skeletal Class I
		FMA (degree)[12]	23 ± 5	34	Hyperdivergent pattern
		MP-PP (degree)[11]	21 ± 5	28	Hyperdivergent pattern
Dental	Maxillary dentition	$\underline{1}$ to NA (degree)[11]	22 ± 6	30	Proclined upper incisors
		$\underline{1}$ to NA (mm)[11]	5 ± 2	3	Normally positioned upper incisors
		$\underline{1}$ to SN (degree)[11]	108 ± 6	118	Proclined upper incisors
		ADH (mm)[13]	27.23 ± 2.79	30	Normal ADH
		PDH (mm)[13]	22.24 ± 2.23	26	Increased PDH
	Mandibular dentition	$\overline{1}$ to NB (degree)[11]	30 ± 6	34	Normally inclined lower incisors
		$\overline{1}$ to NB (mm)[11]	7 ± 2	9	Normally positioned lower incisors
		$\overline{1}$ to MP (degree)[10]	99 ± 5	92	Normally inclined lower incisors
	Maxillo-mandibular	$\underline{1}$ to $\overline{1}$ (degree)[11]	125 ± 8	110	Acute interincisal angle
Soft tissue	Soft tissue	E line U. lip (mm)[12]	−1 ± 2	−2	Normally positioned upper lip
		E line L. lip (mm)[12]	2 ± 2	0	Normally positioned lower lip
		NLA (degree)[10]	91 ± 8	108	Obtuse nasolabial angle
		H-angle (degree)[11]	14 ± 4	18	Normally positioned upper lip

of the upper teeth, severe crowding of the lower teeth, proclined upper incisors, acute interincisal angle, increased PDH, negative overbite, large overjet, and lower dental midline shifts to the left side. The soft tissue problems included a convex facial profile and obtuse nasolabial angle. Therefore, the treatment objectives were: 1) to correct anterior open bite by created normal overjet and overbite; 2) to improve the skeletal relationship to obtain normally inclined and positioned upper incisors, 3) to obtain normal alignment and Class I canine and molar relationship, 4) to center the lower dental midline, and 5) to improve the facial profile. The etiology of the malocclusion[14] was due to hereditary factors from the father who also had skeletal Cl II hyperdivergent pattern with anterior open bite and tooth and arch size discrepancies with a tapered upper arch with mild crowding and square lower arch with severe crowding. According to the collected information, the patient was diagnosed as Class II skeletal relationship with orthognathic maxilla with retrognathic mandible and hyperdivergent pattern, dental Class I malocclusion with large overjet and negative overbite, increased PDH, convex facial profile, and obtuse nasolabial angle. We decided to manage this patient using non-extraction clear aligner therapy.

Clear aligners were used to treat the patient as retroclined upper incisors, intruding the upper posterior teeth, solving crowding, shifting the lower dental midline without requiring complex tooth movements while addressing the esthetic concerns of the patient. Space in the upper arch was obtained by expanding and reshaping the arch form with interproximal reduction to adjust the inclination of the upper incisors, intruding the upper posterior teeth, and resolving the crowding. In the lower arch, space was created by proclining the lower incisors and performing interproximal reduction, which addressed the Bolton discrepancy and resolved the issues of crowding and the shifted lower dental midline. The computer-generated virtual setup provided by the aligner company was reviewed, modified, and approved. The treatment was carried out using 29 aligners for both the upper and lower arches in the first set, with interproximal reduction performed at stage 13 for the upper arch and stage 16 for the lower arch. The treatment protocol was implemented with set 2 following the identification of crowding on tooth 33, lower dental midline that shifted to the left, a slight posterior open bite, and a buccal overjet on the right side. The patient was provided with 22 aligners for both the upper and lower arches. The space obtained through the expansion of the lower right jaw was utilized to alleviate the crowding and correct the shifted lower dental midline.

Figure 6 Posttreatment extraoral examination.

After 26 months of treatment, facial evaluation revealed a normal vertical facial proportion and a convex profile. Of particular note, the smile line had improved to a normal smile line. An improvement in the buccal corridor was observed during smiling compared to the pre-treatment condition. The upper dental midline was aligned with the facial midline, whereas the lower dental midline deviated 0.25 mm to the left. The dentition exhibited proper alignment and demonstrated good coordination with both the maxillary and mandibular arch forms. The final occlusion showed a Class I relationship of both canines and molars with normal overjet and overbite (Figures 6, 7, 8, and Table 4).

Figure 7 Posttreatment intraoral examination.

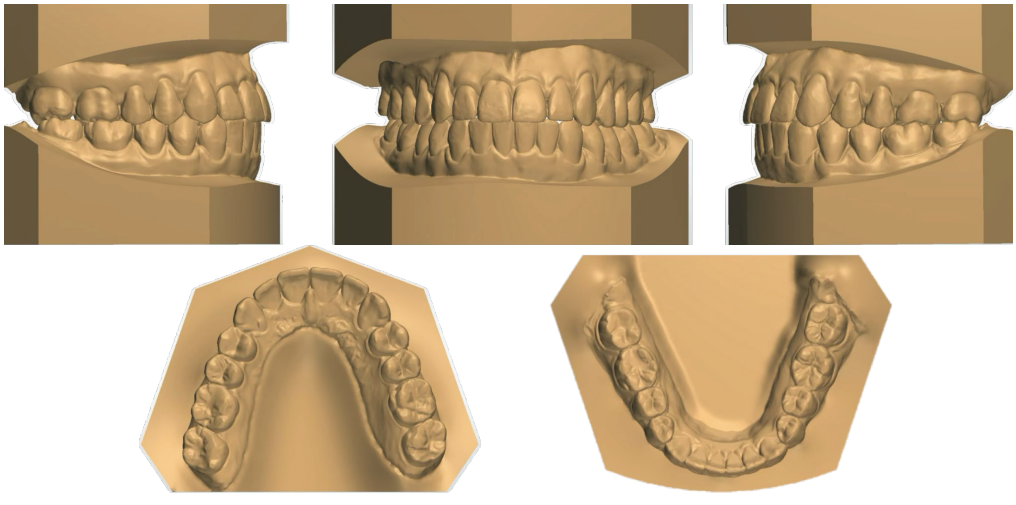

Figure 8 Posttreatment dental casts.

Table 4 Comparison of the pretreatment and posttreatment dental cast analysis.

Parameters		Pretreatment	Posttreatment
Overjet		6 mm	2 mm
Overbite		–3 mm	2 mm
Canine relationships	Right	Cl II 3 mm	Cl I
	Left	Cl II 2 mm	Cl I
Molar relationships	Right	Cl III 1 mm	Cl I
	Left	Cl III 3 mm	Cl I
Upper	Midline	Center	Center
	Arch form	Taper	Paraboloid
	Anterior arch width	31 mm	37 mm
	Posterior arch width	47 mm	50 mm
Lower	Midline	Shift to the left 2 mm	Shift to the left 0.25 mm
	Arch form	Square	Paraboloid
	Anterior arch width	34 mm	36.5 mm
	Posterior arch width	47 mm	49 mm

The post-treatment lateral cephalometric radiograph revealed; 1) skeletal Class II hyperdivergent pattern with orthognathic maxilla and rethognathic mandible, 2) normally inclined and positioned upper and lower incisors, 3) normal interincisal angle, 4) normal PDH, 5) convex soft tissue profile, 6) normally positioned upper and lower lips, and 7) improved obtuse nasolabial angle (Figure 9 and Table 5).

The panoramic radiograph revealed nearly parallel roots and no external root resorption (Figure 10). Additionally, the idiopathic osteosclerosis detected at the initial stage of treatment remained unchanged in both size and location. A cranial base superimposition revealed no growth of either the nasion or basion points, the maxilla, or the mandible. The mandible was found to rotate counterclockwise. The maxillary superimposition represented the upper incisor, which was retroclined and extruded, while the upper molar intruded. Furthermore, an examination of the mandibular superimposition showed that the lower incisor had proclined, while the lower molar was maintained (Figure 11).

Following the removal of all orthodontic appliances, the treatment entered the retention phase. A clear retainer was custom-fitted to maintain the posttreatment dental alignment. The patient was instructed to wear both maxillary and mandibular retainers full-time, removing them only during meals and oral hygiene routines. Follow-up evaluations were scheduled at 1 week, 1 month, and 3 months post-debonding, and subsequently every 6 months, to assess function, esthetics, and stability. At each follow-up, the patient demonstrated a stable occlusion with an acceptable facial profile, proper

Figure 9 Posttreatment lateral cephalogram.

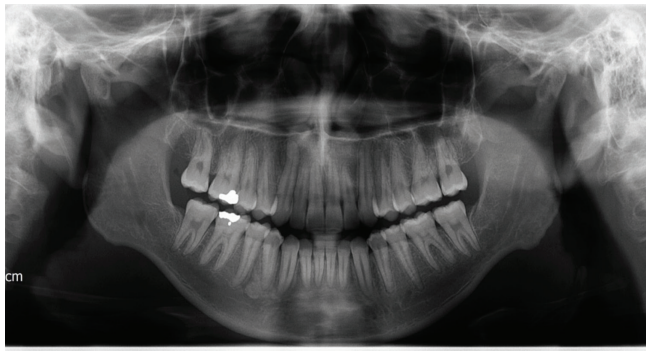

Figure 10 Posttreatment panoramic radiograph.

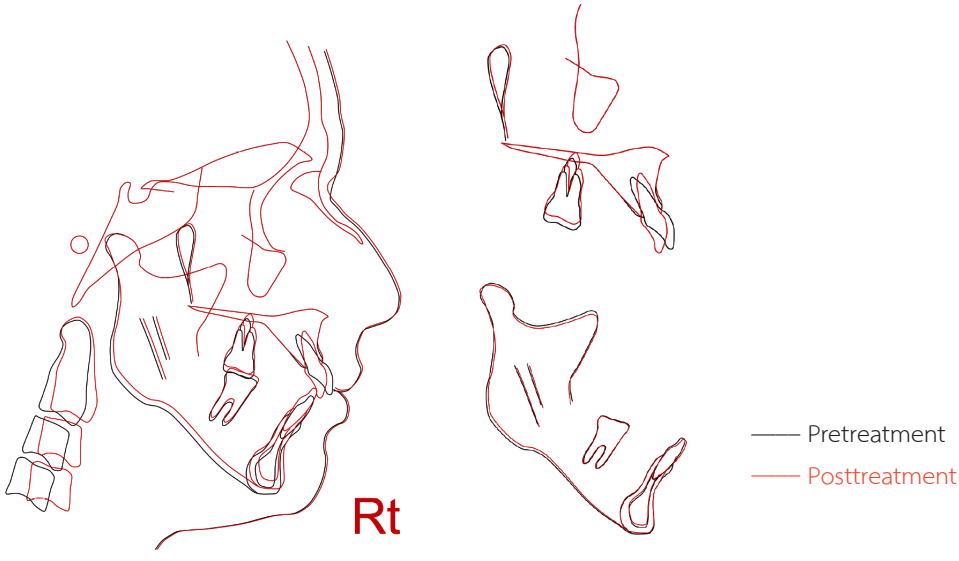

Figure 11 Cephalometric superimposition of pretreatment (black) and posttreatment (red) tracings.

Table 5 Posttreatment cephalometric analysis.

Area		Measurement	Norm (Mean ± SD)	Pretreatment	Posttreatment	Difference
Reference line		FH-SN (deg.)[10]	6 ± 3	14	14	0
Skeletal	Maxilla to cranial base	SNA (degree)[11]	84 + 4	83	83	0
		A-Nperp (mm)[12]	5 ± 4	6	6	0
		SN-PP (degree)[12]	9 ± 3	15	15	0
	Mandible to cranial base	SNB (degree)[11]	81 ± 4	74	75	+1
		Pg-Nperp (mm)[12]	0 ± 6	−3	−2	+1
		SN-Pg (degree)[11]	82 ± 3	73	75	+2
		SN-MP (degree)[11]	29 ± 6	43	41	−2
		NS-Gn (degree)[11]	68 ± 3	73	72	−1
	Maxillo-mandibular	ANB (degree)[11]	3 ± 2	9	8	−1
		Wits (mm)[10]	−3 ± 2	−3	−1	+2
		FMA (degree)[12]	23 ± 5	34	32	−2
		MP-PP (degree)[11]	21 ± 5	28	26	−2
Dental	Maxillary dentition	1 to NA (degree)[11]	22 ± 6	30	16	−14
		1 to NA (mm)[11]	5 ± 2	3	2	−1
		1 to SN (degree)[11]	108 ± 6	118	110	−8
		ADH (mm)[13]	27.23 ± 2.79	30	32	+2
		PDH (mm)[13]	22.24 ± 2.23	26	23	−3
	Mandibular dentition	$\overline{1}$ to NB (degree)[11]	30 ± 6	34	35	+1
		$\overline{1}$ to NB (mm)[11]	7 ± 2	9	9	0
		$\overline{1}$ to MP (degree)[10]	99 ± 5	92	93	0
	Maxillo-mandibular	1 to (degree)[11]	125 ± 8	110	127	+17
Soft tissue	Soft tissue	E line U. lip (mm)[12]	−1 ± 2	−2	−2	0
		E line L. lip (mm)[12]	2 ± 2	0	0	0
		NLA (degree)[10]	91 ± 8	108	105	−3
		H-angle (degree)[11]	14 ± 4	18	18	0

intercuspation, and no interferences during lateral or protrusive mandibular movements. The patient complied well with the full-time wear protocol and showed strong motivation to maintain the alignment that was achieved through orthodontic treatment.

Discussion

This case report presents the successful non-extraction orthodontic management of anterior open bite in an adult patient exhibiting a skeletal Class II hyperdivergent pattern using clear aligner therapy.

The outcome highlights the expanding role of aligners as an effective non-surgical option for selected open bite cases, particularly those with complex vertical and sagittal discrepancies.

Anterior open bite in adults is a multifactorial malocclusion that is often complicated by skeletal growth patterns, soft tissue dysfunctions, and high relapse potential. Conventional treatment modalities typically involve vertical elastics, temporary anchorage devices for molar intrusion, or orthognathic surgery in severe cases.[15] However, recent advances in clear aligner technology have broadened non-invasive treatment possibilities by providing enhanced biomechanical control alongside improved patient comfort and esthetics.

In this patient, factors contributing to the open bite included a hyperdivergent growth pattern, mandibular retrognathia, increased PDH, proclined maxillary incisors, and a familial skeletal pattern. Additionally, significant crowding in the lower arch and an anterior tooth size discrepancy (Bolton's discrepancy) necessitated strategic space management and arch form modification.

Transverse arch expansion was incorporated into the treatment protocol to alleviate the lower arch crowding. Although arch expansion in adults frequently risks exacerbating anterior open bite by causing buccal tipping of posterior teeth and altering occlusal contacts, the use of clear aligners in this case effectively mitigated such side effects. The inherent interocclusal thickness of the aligners provided vertical support that minimized the potential for excessive bite opening during expansion.[16] Furthermore, this thickness generated a favorable intrusive force on the posterior teeth during occlusion, which, while potentially problematic in patients with normal or deep overbite, was advantageous in this anterior open bite case by promoting molar intrusion and facilitating bite closure. Digital treatment planning enabled precise control over incisor inclination, posterior tooth intrusion, and midline correction. The combined use of arch expansion, interproximal reduction, and biomechanical strategies successfully addressed the crowding and Bolton discrepancy while optimizing occlusal relationships and esthetic outcomes.

Posttreatment evaluation confirmed correction of the anterior open bite with normalized overjet and overbite, achievement of Class I molar and canine relationships, and well-aligned dental arches. Cephalometric superimposition demonstrated counterclockwise mandibular rotation, upper incisor retroclination, and upper molar intrusion that contributed to improved vertical dimension control. No signs of root resorption were observed, which underscored the biological safety of aligner therapy over the treatment period. Stability was maintained through clear retainers, with patient compliance and follow-up confirming long-term success.

This case demonstrates the successful management of anterior open bite in a non-growing adult patient using clear aligner therapy. The outcome is consistent with recent evidence supporting the effectiveness of clear aligners in treating open bite malocclusions. In such cases, the bite-plane effect of the aligner's thickness promotes posterior intrusion, which facilitates anterior bite closure and provides a favorable approach for hyperdivergent skeletal patterns.[17,18]

In contrast, managing deep bite with aligner therapy remains challenging. Clinical studies consistently report that posterior extrusion is among the least predictable movements, with only about 30–40 % of the planned extrusion achieved clinically.[19] Moreover, the accuracy of overbite correction after the initial aligner set averages only 33 %.[20] Although some degree of incisor intrusion is achievable, the overall bite reduction is frequently under-expressed compared with the virtual setup, and refinement stages provide limited additional improvement.[20]

Therefore, careful case selection is crucial. Clear aligners are well suited for anterior open bite patients, particularly those with hyperdivergent skeletal patterns,

because of their capacity to induce posterior intrusion. In contrast, patients with deep bite malocclusion may require hybrid protocols or adjunctive mechanics to achieve reliable vertical correction. Recognizing these biomechanical differences allows clinicians to better tailor treatment planning and set realistic expectations for outcomes.[21]

Conclusion

This case illustrates the successful management of anterior open bite in an adult patient through clear aligner therapy. The treatment achieved favorable dental and skeletal outcomes that included normalized overjet and overbite, Class I molar and canine relationships, dental midline correction, and enhanced facial esthetics. Cephalometric superimposition confirmed effective vertical control and stable post-treatment results. Clear aligners may serve as an effective alternative to conventional mechanics in selected adult open bite cases. Nevertheless, the success of such treatment is critically dependent on patient compliance throughout the course of therapy.

Author contributions

PK, NK: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization; BS: Conceptualization, Methodology, Software, Validation, Investigation, Resources, Writing - Review & Editing, Visualization, Supervision, Project administration.

Ethical statement

The patient's consent was obtained before publication.

Disclosure statement

The authors have no conflict of interest.

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