

Open bite case treated with Invisalign

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Abstract

Anterior open bite (AOB) is defined as the lack of incisal contact between anterior teeth in centric relation. Prevalence in the population ranges from 1.5% to 11.6%. The age factor, however, affects prevalence, since sucking habits decrease and oral function matures with age. At six years old 4.2% present with AOB whereas at age 14 the prevalence decreases to 2%. Anterior open bite is considered to be one of the most difficult treatments. Proper diagnosis and treatment planning, successful treatment, and retention have been stressed for the long-term stability of open bite treatment. There are several factors that could be related to the development of open bite. Among these are an unfavorable mandibular growth pattern, heredity, imbalances between jaw postures, digit-sucking habits, nasopharyngeal airway obstruction, tongue posture and activity and head position.

Various treatment modalities have been proposed for the correction of anterior open bites: surgical and nonsurgical. In general, stability is the most important criteria in choosing an acceptable method of treatment for patients with open bite malocclusion. Many previous studies have indicated that if open bite correction is not stable, it is because the tongue continues to be postured anteriorly, which causes the bite to reopen. We will present an adult case treated with Invisalign. The treatment duration was 40 weeks and the anterior open bite was mainly corrected with relative extrusion of the incisors.

The term “open bite” was introduced by Caravelli in 1842 as a distinct classification of malocclusion and can be defined in different manners [1-5]. For semantic reasons, and because it is in agreement with most definitions in the literature, anterior open bite (AOB) is herein defined as the lack of incisal contact between anterior teeth in centric relation. Vertical control during comprehensive orthodontic treatment has been a challenging problem in orthodontics [2, 6]. It is known that fixed appliance therapy tends to extrude teeth and increase the mandibular plane angle during treatment [7, 8].

This phenomenon has more significant adverse effects on nongrowing patients with hyperdivergent facial patterns (high mandibular plane angle) with or without the presence of an open bite, since it can lead to backward rotation of the mandible and reduction in chin projection [7, 8]. Therefore, it is important to control the vertical dimension by preventing extrusion of the posterior teeth when selecting appliances and treatment mechanics in patients with high mandibular plane angles.

Since its introduction by Align Technology in 1999, the clear aligner system has become a popular treatment choice for adult patients. This is largely due to the superior esthetics and comfort that removable clear aligners provide over traditional full bonded fixed appliances [9-11]. Earlier studies showed the significant limitations of Invisalign treatment in treating complex malocclusions. However, with a series of improvements (G series) introduced over the past few years, several clinical case reports using clear aligners have

shown good vertical control. In 2012, Align Technology announced their G4 innovation, which included multi-tooth anterior extrusive attachments for anterior open bite correction. This innovation together with the possibility of intrusive mechanics for posterior molars makes clear aligners a reliable orthodontic appliance for correction of anterior open bite malocclusions.

The biomechanics for anterior openbite correction with clear aligners involve the following:

- Relative extrusion of the incisors when proclined incisors are retroclined during the treatment.
- Pure extrusion of the incisors using multi-tooth optimized extrusive attachments.
- Posterior intrusion of the maxillary and mandibular teeth with concurrent upward and forward mandibular closure (eventually in combination with TADs) [12-14].
- In more severe anterior open bite malocclusions, posterior intrusion may be staged sequentially for a more predictable clinical outcome [13].
- Beyond the range of predictability for aligner movements, it may be necessary to augment the anchorage for posterior intrusion with the use of temporary anchorage devices TADs.

The amount of incisal and gingival display needs to be assessed clinically prior to deciding if pure extrusion is desired from a smile esthetics point of view. When extrusive forces are placed on the anterior part of the aligner for anterior extrusion, the reciprocal force

on the posterior part of the aligner is intrusive [12-14]. Nowadays, the treatment plan for open bite will include not only orthodontic treatment but also the integration of orthodontic treatment and myofunctional therapy, the combination of which will ease and help the treatment outcome to a better stable result [15].

Myofunctional therapy was mentioned by Proffit and Mason. Myofunctional therapy is developed from the idea that teeth are easily displaced by soft tissue pressures, and evolved to specific procedures claimed to correct tongue thrusting to facilitate closure of anterior open bite. The myofunctional therapy survives more than half a decade despite a lack of evidence to support it. Myofunctional therapy is not easy and needs full dedication from the instructor to help and to motivate the patient to exercise every day. It is dependent on the full cooperation from the patient's side. The patient has to continue to exercise until they can do the right swallowing pattern without thinking and have a subconscious awareness [15].

Case presentation

A 34 year old patient presented with chief complaints of crowding in the upper (mainly) and in the lower jaw. The patient was treated orthodontically during adolescence and had a relapse. We had proposed a combined orthodontically surgical treatment but the patient refused. The patient denied the conventional treatment with braces too and as a result the decision was made to treat him with Invisalign.

Clinical extraoral examination showed an increased anterior facial height with an accentuated convex profile. In the anterior view dark corridors were observed associated with inadequate transverse development of the maxillary arch. The smile examination showed an uneven upper incisors gingival margin and protrusion of the upper incisors (Figure 1, Figure 2, Figure 3, Figure 4).



Figure 1



Figure 2

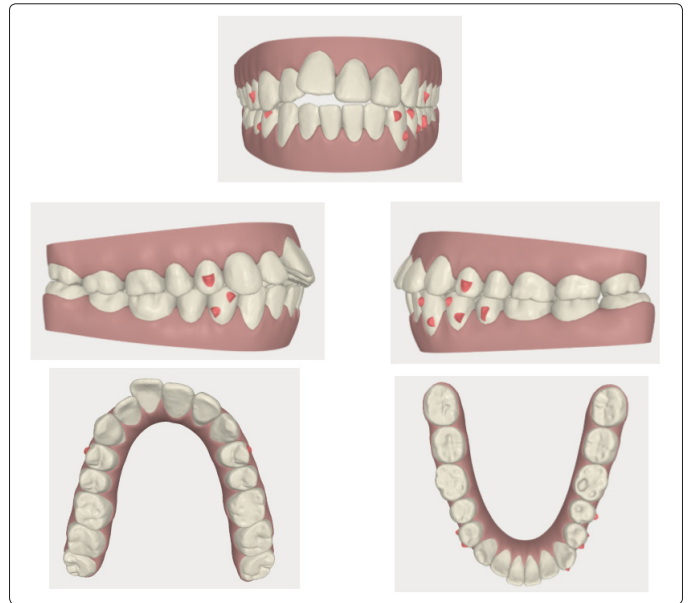


Figure 3

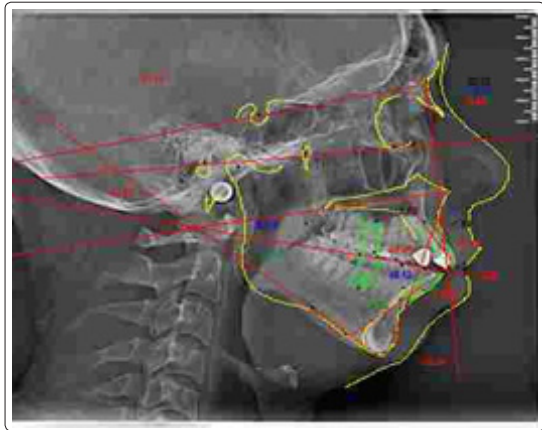
The intraoral examination showed a moderate crowding in the upper front area and a minor crowding in the lower anterior area, Class I molar on the right side, Class II molar on the left side, lower midline deviation to the left, moderate compression of the maxillary arch, minor to moderate generalized recession, tongue interposition in the frontal area, and low tongue posture. A fix lingual retainer was still present in the lower anterior incisors.

The intraoral examination also showed an accentuated abrasion of the occlusal surfaces of the lower molars (mainly on the left side), this was in concordance with the morphology of the left condyle).

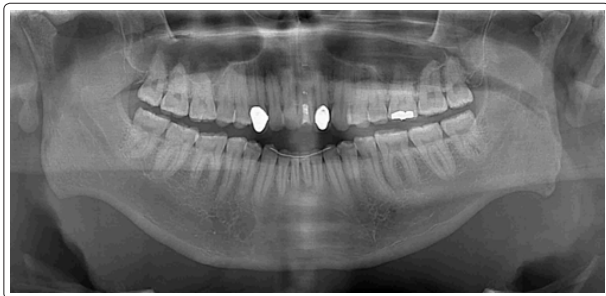


Figure 4

The cephalometric analysis showed: an accentuated convex profile with mandibular retrusion, slight protrusion of the upper incisors, severe protrusion of the lower incisors (Lower 1 to A pogonion = 10,86), vertical pattern (MaxP- mand= 37,80), Class II skeletal pattern, protruded upper and lower lips.



The panoramic radiograph showed all permanent teeth normally erupted, with minimal generalized loss of alveolar bone and a root canal filling on the 21 that had to be revised.



Treatment objectives

1. Level and align the dentition in both arches.
2. Expand both arches to correct tongue posture and retract the upper and lower incisors.
3. Myofunctional therapy.
4. Correction of the axial inclination of the upper incisors.
5. Correction of the axial inclination of the lower incisors.
6. Correction of the open bite with relative extrusion of the upper and lower incisors and intrusion of the molars (more of the lower molars).
7. Interproximal reduction in the upper front to create an extra space for the retrusion of the upper frontals.

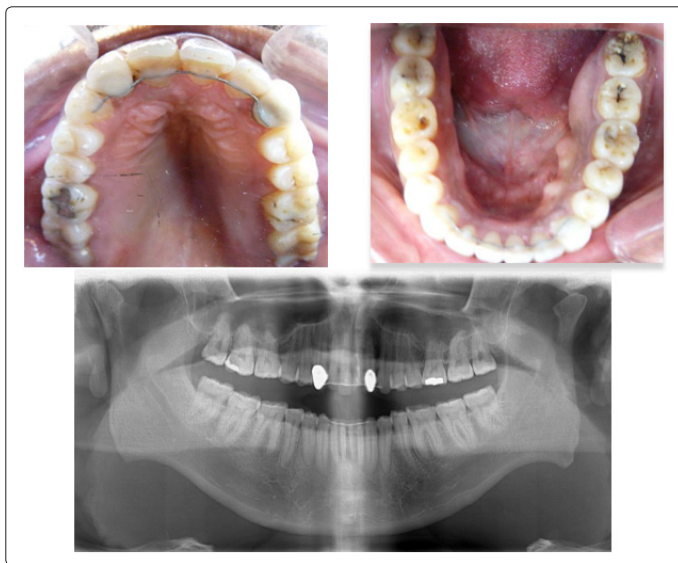


Overall, a total of 20 aligners were specified for the entire treatment. The patient was instructed to consistently wear those 20-22 hours a day, and only remove them for eating and tooth brushing. The aligners were worn 14 days each. The clinical objectives were to correct the crowding and expand the transverse dimension of the dental arches and to retract the incisors. Biomechanics rationale with the clear aligners is to expand each arch to decrease its sagittal length, and the incisors are simultaneously retracted because they have less anchorage value than the posterior segments [14].

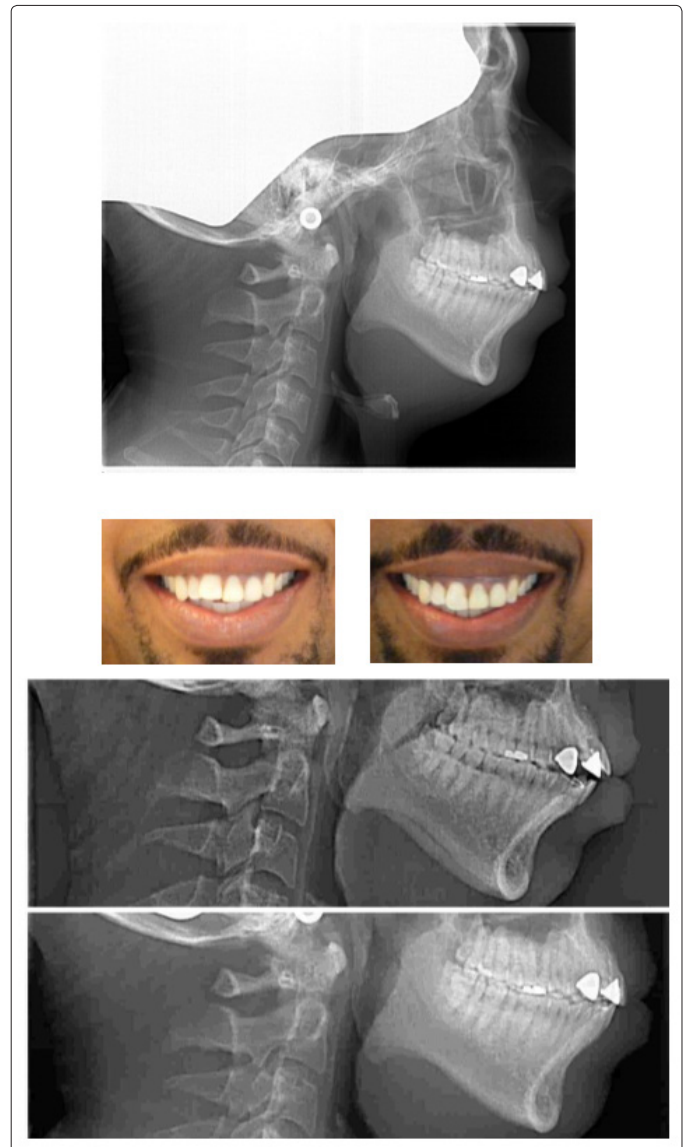
Treatment results (Figure 5) compared to the pre-treatment records, the post-treatment facial photographs and cephalometric documentation show that the crowding was markedly improved with 10 months of clear aligner treatment. Dental alignment is nearly ideal as originally specified by the digital set up. The panoramic radiograph reveals that axial inclinations of the dentition are not ideal but quite acceptable for 10 months of treatment.



Figure 5



U1 Protrusion (U1- APog) 6,00 mm	15,39	13,83
L1 Protrusion (L1- APog) 2,00 mm	10,86	8,69
U1-OccP 57°	46,45°	63,20°
L1-OccP 62°	48,12°	56,26°
Interincisal Angle 133,6°	93,4°	115,7°
SOFT TISSUES	Pre-treatment	Post-treatment
Nasolabial angle 110,3	116,7°	115,6°
LS- SN-Pog° 2,4	25,8	29,3
LI- SN-Pog° 2,2	42	40,4
LI to E-Line -3,4	35,5	34,4



Treatment outcome

- Correction of the crowding and relative extrusion (with consecutive axial correction) of the lower and more of the upper incisors.
- Correction of the open bite with slight intrusion of the molars

HORIZONTAL SKELETAL ANALYSIS	Pre-treatment	Post- treatment
SNA 82°	82,03°	80,99°
SNB 80°	71,16°	70,17°
ANB 2°	9,35°	8,91°
VERTICAL SKELETAL ANALYSIS	Pre-treatment	Post-treatment
SN-MP 32,00°	50,59°	50,09°
FMA 26,00°	44,09°	44,87°
MaxP-Mand angle 28°	37,60°	37,34°
Lower facial height 65,90 mm	75,31	67,05
Facial Axis 90°	76,82°	75,49°
DENTAL-BASAL, DENTAL	Pre-treatment	Post-treatment
U1-Max P 110°	112,88°	94,72°
L1- MP 95,00°	104,04°	94,66°

- and more with the relative extrusion of the incisors.
- The lower facial height was reduced.
- The protrusion of the lower incisors was also reduced.
- From the cephalometric analysis we can conclude that a correction of the open bite was obtained mainly from relative extrusion of the incisors and secondarily from molar intrusion (once the patient denied the use of TADS in order to increase the predictability of molar intrusion).

Retention

In both arches fix retainers were placed and the patient also had to wear an ESSIX® thermoplastic retainer at night (during sleeping hours).

Conclusions

- We can treat dental, dento-alveolar of moderate to mild skeletal anterior open bite with clear aligners.
- Very important is a good planification of the movements in the Clincheck [14-16].
- To increase the predictability of the movements clinically, it might be necessary to use auxiliaries such as elastics or TADs [14, 16].
- Myofunctional therapy can be used in combination with clear aligner treatment.

References

1. Parker JH (1971) The interception of the open bite in the early growth period. *Angle Orthod* 41: 24-44.
2. Subtelny HD, Sakuda M (1964) Open bite: diagnosis and treatment. *Am J Orthod* 50: 337-358.
3. Huang GJ, Justus R, Kennedy DB, Kokich VG (1990) Stability of anterior openbite treated with crib therapy. *Angle Orthod* 10: 17-24.
4. Shapiro PA (2002) Stability of open bite treatment. *Am J Orthod Dentofacial Orthop* 121: 566-568.
5. Cozza P, Mucedero M, Baccetti T, Franchi L (2005) Early orthodontic treatment of skeletal open bite malocclusion: a systematic review. *Angle Orthod* 75: 707-713.
6. Dung DJ, Smith RJ (1998) Cephalometric and clinical diagnoses of openbite tendency. *Am J Orthod* 94: 484-490.
7. Arat M, Iseri H (1992) Orthodontic and orthopaedic approach in the treatment of skeletal open bite. *Eur J Orthod* 14: 207-215.
8. Ryan MJ, Schneider BJ, BeGole EA, Muhl ZF (1998) Opening rotations of the mandible during and after treatment. *Am J Orthod Dentofacial Orthop* 114: 142-149.
9. White DW, Julien KC, Jacob H, Campbell PM, Buschang PM (2017) Discomfort associated with Invisalign and traditional brackets: a randomized, prospective trial. *Angle Orthod* 87: 801-808.
10. Djeu G, Shelton C, Maganzini A (2005) Outcome assessment of Invisalign and traditional orthodontic treatment compared with the American Board of Orthodontics Objective Grading System. *Am J Orthod Dentofacial Orthop* 128: 292-298.
11. Kuncio D, Maganzini A, Shelton C, Freeman K (2007) Invisalign and traditional orthodontic treatment postretention outcomes compared using the American Board of Orthodontics Objective Grading System. *Angle Orthod* 77: 864-869.
12. *The Insider's Guide to Invisalign Treatment* By Barry J (2017) Glasser DMD.
13. *Clear Aligner Technique*, Sandra Tai, BDS,MS, © 2018 Quintessence Publishing Co, Inc

14. *Clear Ortho International Program*, Dr Ivan Malagon, Dr. Diego Peydro, Madrid, 2018
15. Oral presentation, Dr. George Anka, WIOC 2019, Bucharest, Romania
16. *Severe Malocclusion with Openbite, Incompetent Lips and Gummy Smile (DI 29) Treated in 16 Months with Clear Aligners to a Board Quality Result (CRE 18)*, Dr. Diego Peydro Herrero, Dr. Chris Chang, Dr. W. Eugene Roberts, IJOI 48

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