Class II orthodontic treatment of a growing patient using the Invisalign® System with mandibular advancement featuring occlusal blocks.

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Dr. Sluiter graduated from the Faculty of Dentistry at the University of Groningen, Netherlands. He completed his specialized training in orthodontics at the Vrije Universiteit in Amsterdam. While entering private orthodontic practice, Dr. Sluiter worked at Sophia Children's Hospital in Rotterdam, and as a staff member at the Academic Center for Dentistry in Amsterdam. As a long-time committee member of the Dutch Dental Association, he participated in the formulation of the Quality Manual for Dutch Orthodontists. He is currently an international member of the American Association of Orthodontists, and the New Zealand Association of Orthodontists. He manages his private practice in Christchurch, New Zealand. In addition to his work, Dr. Sluiter enjoys spending time with his family and traveling.

Case report

Patient:

Age: 14 years, 8-month old male

Chief concern: Patient complains of protruding teeth.

Diagnosis:

- Class II skeletal patient
- Retrognathic mandible with good projection of pogonion (Convex profile)
- Proclined upper incisors
- Canine and molar relation left side: full Class II
- Canine and molar elation right side: full Class II
- Overbite: 5.5 mm
- Overjet: 8mm
- Both dental arches presented mild crowding
- Coinciding dental midlines

Cephalometric values

Measurement	Value	Norm	St. deviation
SNA	81	82	3
SNB	77	79	3
ANB	4	3	2
U1-SN	117	103	6
L1-MP	100	90	5
Interincisal angle	116	135	11
FH-MP (FMA)	25	24	3

Initial records

Treatment goals:

1. Resolve crowding and expand arches
2. Retract upper incisors and improve increased overjet
3. Correct occlusion to a solid Class I relation
4. Level de curve of Spee
5. Correct deep bite

Treatment options:

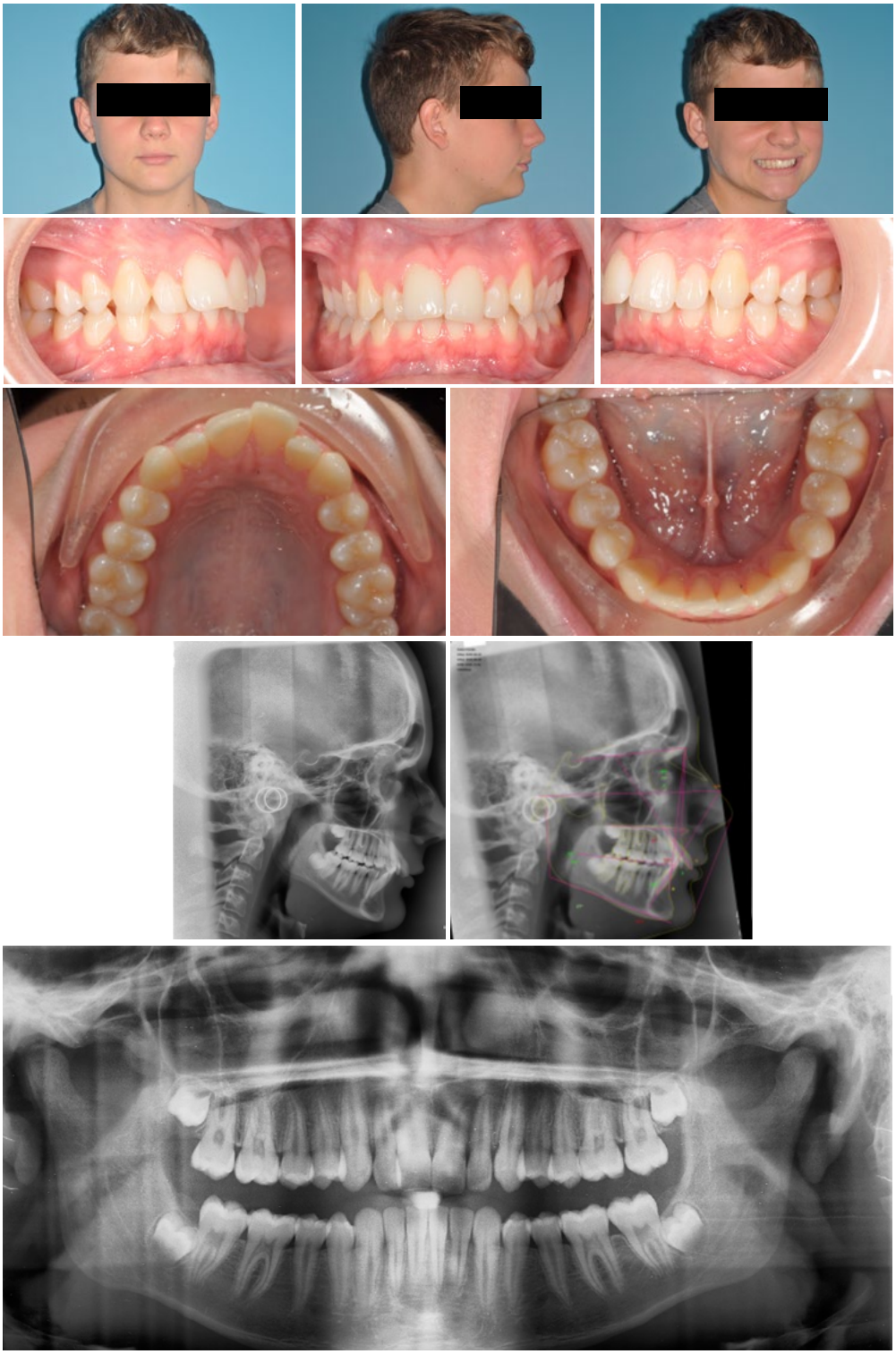
Since the patient is still growing, the treatment plan options include conventional twin blocks or the Invisalign® System with mandibular advancement featuring occlusal blocks. The preferred option was the Invisalign occlusal blocks, as it offers the possibility of correcting the anteroposterior (AP) condition while simultaneously leveling and aligning the rest of the dentition.

Treatment plan:

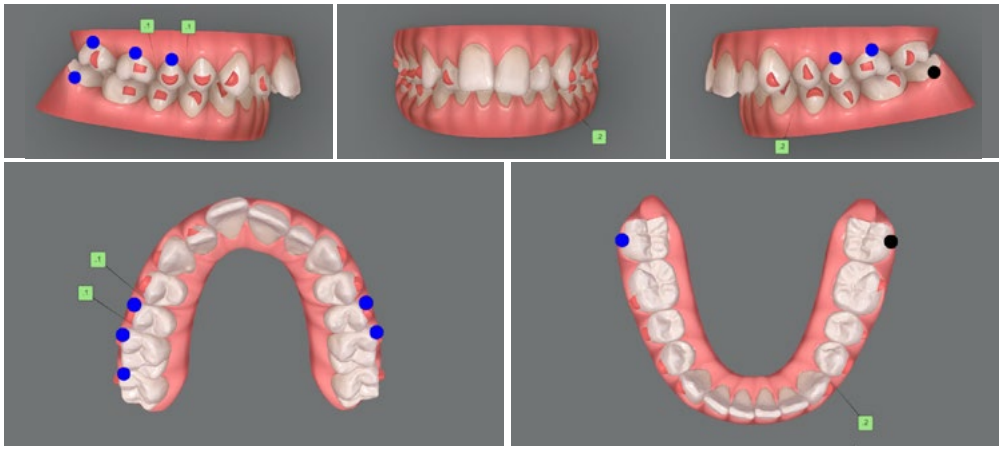
1. Align and level upper and lower teeth.
2. Begin to retract and upright the upper incisors while advancing the mandible using aligners with mandibular advancement occlusal blocks.
3. Detail and finish with additional aligners with CII and vertical elastics to close bite and detailed AP correction.
4. Retain the teeth with printed retainer for the upper arch and lower fixed retainer.

Invisalign aligner features used:

- Mandibular advancement featuring occlusal blocks.
- Optimized and conventional attachments.
- Precision cut-outs (slits) for the upper and lower first molars and for the upper and lower canines (after MA phase only).



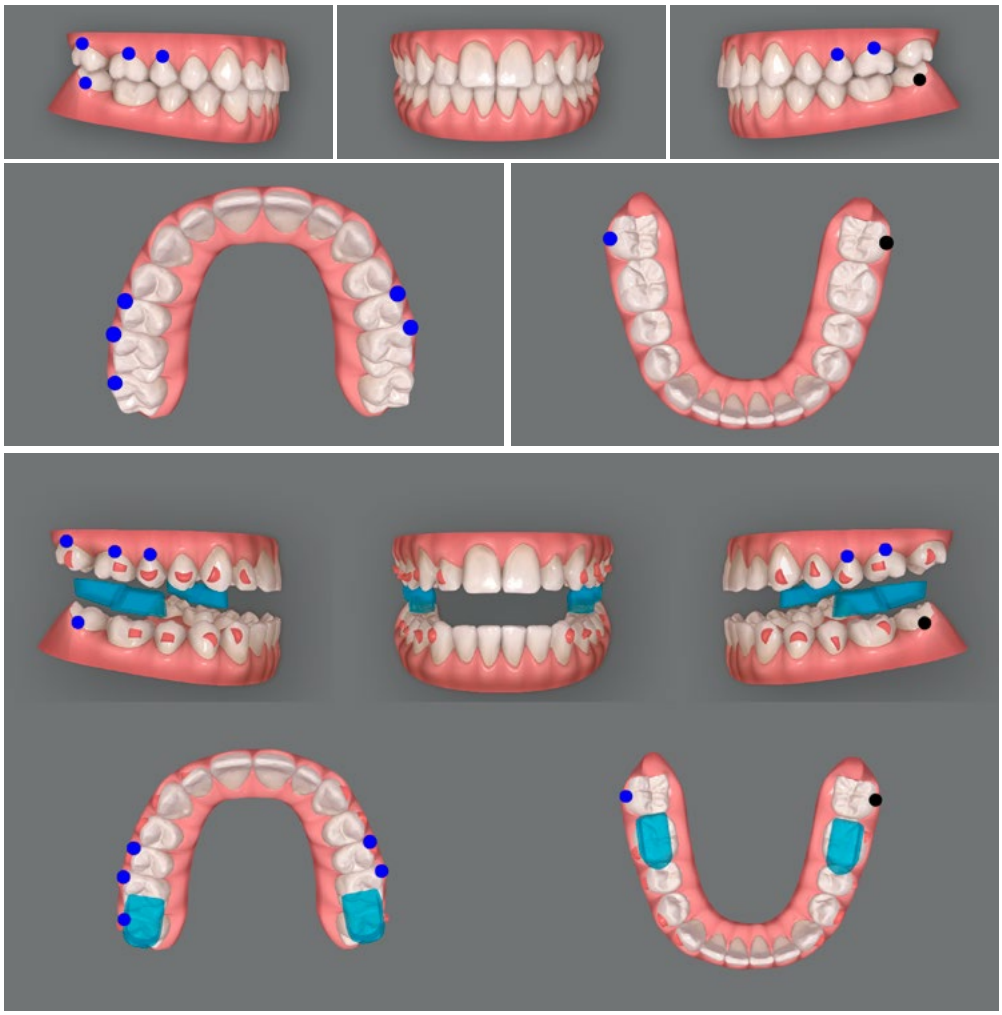
Initial position on initial order:



ClinCheck® software set-up and staging:

1. The initial treatment plan included 40 stages. The mandibular advancement aligner phase begins simultaneously with the general alignment phase.
2. Both upper and lower incisors start their intrusion along with overall arch expansion.
3. During the mandibular advancement phase, upper incisor retraction and arch leveling continue to avoid anterior interferences while correcting the overjet.
4. An additional aligner phase, consisting of 17 stages, includes precision cuts on the upper and lower canines and molars to close the bite.

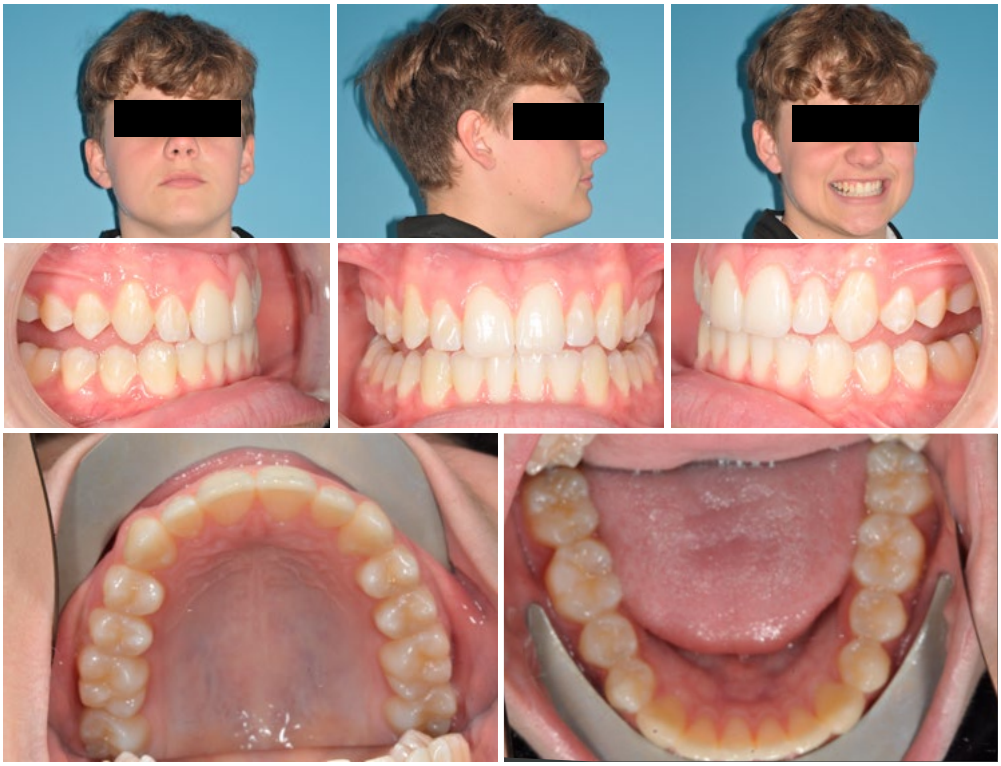
Initial order goal:



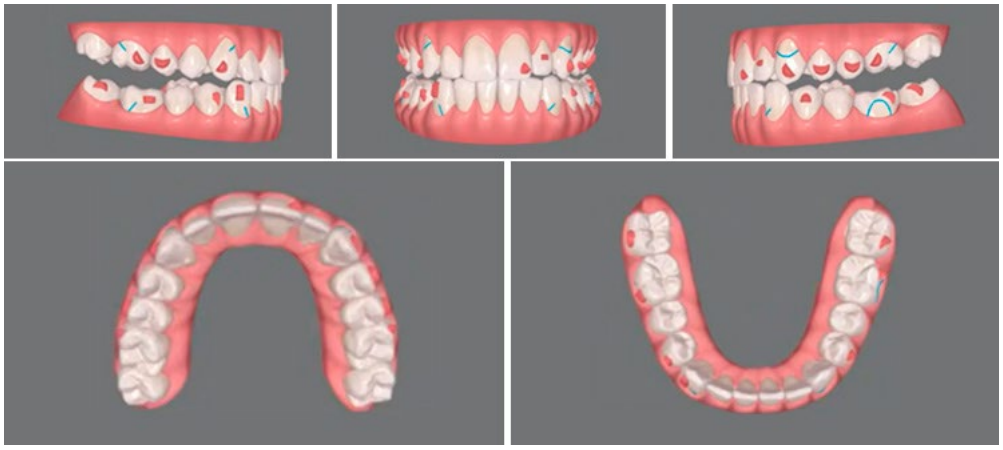
Initial order goal (Stages #1-40). The set-up with the mandibular advancement feature and attachments visible. Mandibular advancement phase begins at stage #2 until the end of the treatment pan. The ability to perform tooth movements, specially uprighting the lower incisors, during the anterior posterior correction is a great differentiator among conventional appliances.

Staging pattern for initial order:

Progress records:



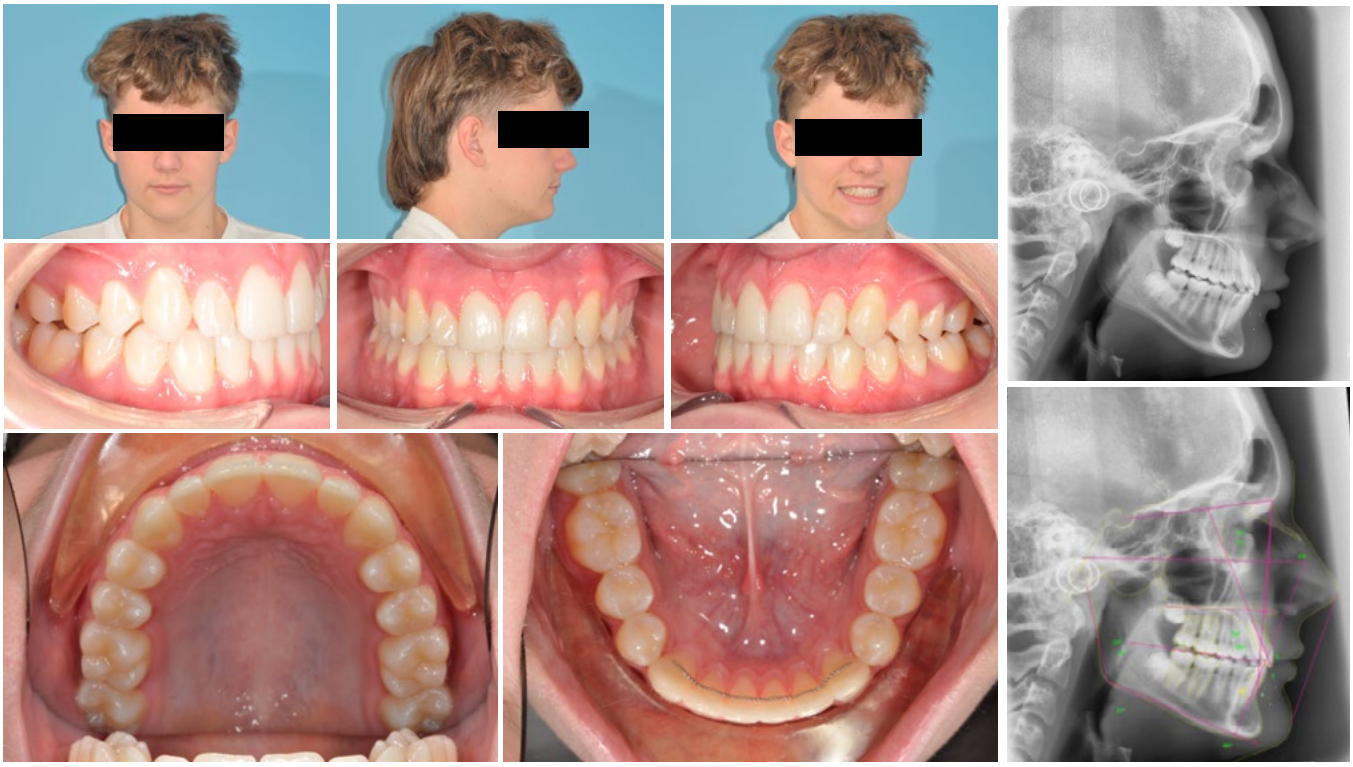
The initial position of the additional aligners, without mandibular occlusal blocks, shows a better projection of the mandible in the extra-oral photos, resulting in a more balanced and straighter profile compared to the convex profile at the beginning of the treatment plan. The intra-oral photos demonstrate good alignment and leveling, along with significant anteroposterior (AP) correction. The presence of a lateral open bite is a good sign that the sagittal correction is happening. This is expected while treating Class II with twin-block appliances as well. This open bite is a side effect of quickly correcting the AP while the curve of Spee was not fully leveled. The main goal for the additional aligner set is to settle the bite.



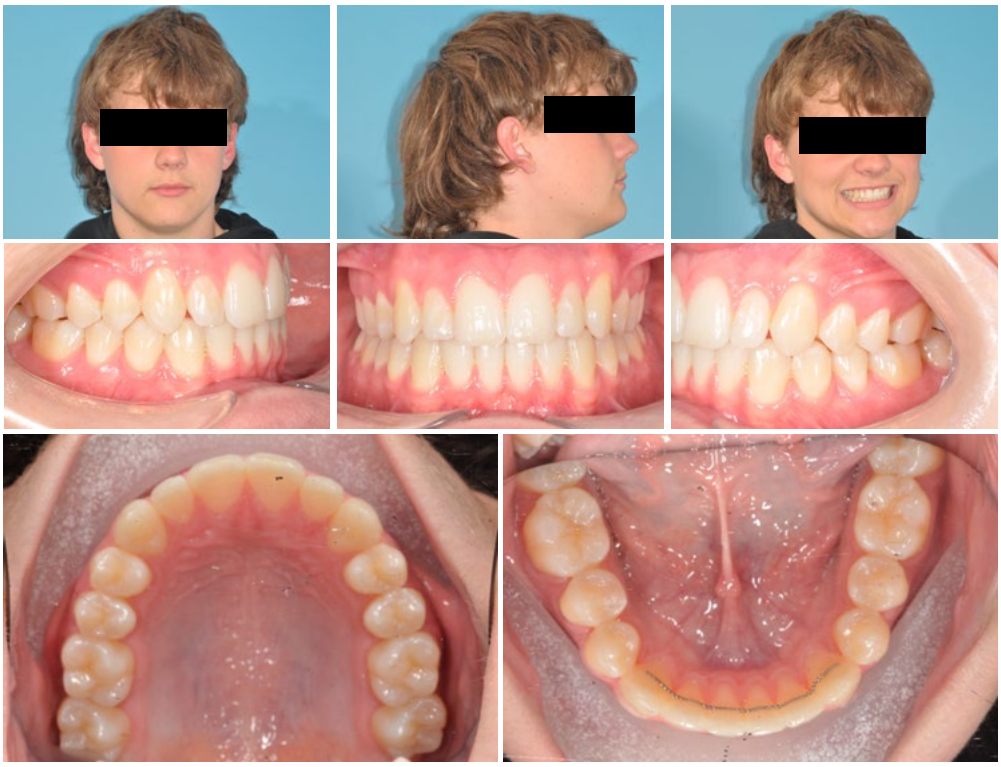
It is common for Dr. Sluiter to request precision cuts on all canines and first molars on the additional aligner orders as he likes the possibility of using AP elastics in all possible orientations. For this case he requested for the upper left canine and lower left lower molar button cut outs and indicate the patient to wear Class II elastics on this side to enhance the anterior posterior correction.

Photos taken when additional aligner treatment was finished:

After the detailing phase with 17 upper and lower additional aligners, the crowding has been resolved, and a solid Class I occlusion has been achieved, along with ideal overbite and overjet. Skeletal anterior posterior changes are confirmed in the cephalometric radiograph and tracings.



Photos 3 months into retention:



Cephalometric values:

Measurement	Value before MAOB	Value after MAOB	Value difference	Norm	St. deviation
SNA	81	81	No value diff.	82	3
SNB	77	80	3	79	3
ANB	4	1	3	3	2
U1-SN	117	106	11	103	6
L1-MP	100	90	10	90	5
Interincisal angle	116	136	20	135	11
FH-MP (FMA)	25	22	3	24	3

Significant anteroposterior changes were achieved following the mandibular advancement treatment. Cephalometric analysis revealed a reduction in the overjet from 8mm to 2mm, indicating improved alignment of the upper and lower incisors. Additionally, the ANB angle decreased from 4° to 1°, reflecting enhanced jaw relationship and overall facial harmony. These changes demonstrate the effectiveness of the treatment in correcting the anteroposterior discrepancy both skeletally and dentally while also contributing to better occlusion and aesthetic outcomes.

Treatment summary:

Number of aligners used:

- **Upper:** 57 aligners. 40 Aligners on the initial order plus 17 aligners from the additional aligners for detailing.
- **Lower:** 57 aligners. 40 Aligners on the initial order plus 17 aligners from the additional aligners for detailing.
- **Aligner change interval:** weekly.
- **Treatment time:** 15 months of active aligner treatment.

Appointment scheduling:

Following the initial delivery of the MAOB aligner, the patient was scheduled for follow-up visits every six weeks. These appointments allowed for tracking the patient's progress, encouraging compliance, identifying potential side effects, and ultimately achieving excellent results without treatment fatigue.

- After the MA-phase was completed, the patient wore additional aligners. These were worn for 6 months for the detailing phase.
  1. 3/16" 4.5 oz. Class II elastics were used full-time during aligners #1-17 of the detailing and finishing phase to help detail and maintain the A-P changes achieved during the mandibular advancement (MA) aligner phase. The patient only used elastics for 4 months.
  2. Total number of visits: 14 from start to finish.

Clinical discussion

The patient's Class II skeletal malocclusion was successfully corrected to Class I using the Invisalign® occlusal blocks. The severe deep bite and excessive overjet were also corrected to an ideal. The patient's cooperation was excellent throughout treatment.

After the MA-phase was completed, a new scan was taken for additional aligners. The remaining open bite from the MA phase was resolved by using vertical and Class II Aligners on an additional aligner set.

Special clinical section:
Managing lateral open bites in growing patients treated with mandibular advancement aligners

When the mandible advances from Class II to Class I, the depth of the curve of Spee can become visibly obvious, particularly if the lower arch is not yet fully leveled. A posterior open bite during mandibular advancement treatment can be a common phenomenon with twin block therapy. The presence of a lateral open bite is an expected result of the anterior-posterior correction and is an indication of the sagittal correction happening. Nevertheless, seeing this happen during treatment may be surprising to those less familiar with mandibular advancement treatment and how best to manage this common side effect.

Leverage the fact that the occlusion of growing patients is quite adaptable at this stage. Most teeth are still capable of erupting at a rapid but physiologically healthy rate.

On the additional aligner phase, you can correct the open bite with vertical elastics and buttons or with sectional fixed appliances.

To address this condition, the curve of Spee was leveled by extruding the upper and lower posterior teeth and intruding the upper and lower incisors. Attachments for deep bite correction were included. Elastics were also used for 4 months.

The intercuspation would set even better after some time as the lower posterior teeth are not hold on retention phase and they still are under the influence of erupting forces. These will allow some minor dental adaption that will further enhance and improve the intercuspation.

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