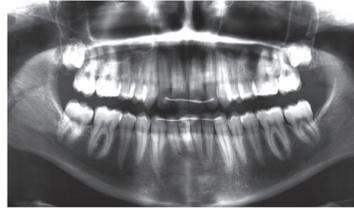


VI. Panoramic radiograph after treatment



VII. Final ClinCheck treatment plan



Considering the mandibular retrusion and straight lip profile of the patient, the non-extraction approach with the Invisalign Full treatment option was preferred. Following treatment, the crowding was relieved, the crossbites corrected and the posterior right occlusion settled. The deep bite was also improved and the alignment almost fully corrected in the lower arch; thus, the patient's treatment goals were achieved with the Invisalign System along with the use of elastics and IPR.

In this case, the top retainer had holes cut in the buccal surface for button placement, but the retainer still covered the occlusal and lingual surfaces to prevent palatal rolling.

- As done for this patient, the lower retainer can be cut short stopping at the right second premolars to allow for the vertical and lingual rolling of the molars. This helps in vertical settling and maintenance of the crossbite correction.
- Patients should be advised to carefully insert and remove aligners made with the SmartTrack material. Patients should be instructed to use Chewies for at least the first few days of each new aligner, but can also be told that they can use them for the entire treatment period.
- Discomfort due to edge rubbing can be easily overcome by smoothing the aligner with a nail file at home or at the clinic.
- Refinement aligners can be over-expanded in the first molar regions to ensure transverse correction, as done for this patient.

Impact on clinical practice

This case demonstrates that the Invisalign System is effective at relieving crowding and correcting crossbites in conjunction with elastics and IPR. Treatment with the Invisalign System

is more convenient in cases such as this where the patient presents with teeth crowding, given the excellent fit the aligners provide, minimising any discomfort. Aligners made from the SmartTrack material are also easy to insert and remove by patients. In this case, no trimming of the aligners was required. Additionally, in my experience, the more the teeth are aligned, the less the aligner wear interval needs to be, which is encouraging to patients.

Conclusion

This case involved significant malalignment that compromised the aesthetics of the patient's smile and therefore his confidence. Considering the mandibular retrusion and straight lip profile of the patient, the non-extraction approach with the Invisalign Full treatment option was preferred. Following treatment, the crowding was relieved, the crossbites corrected and the posterior right occlusion settled. The deep bite was also improved and the alignment almost fully corrected in the lower arch; thus, the patient's treatment goals were achieved with the Invisalign System along with the use of elastics and IPR. The patient was very happy with the treatment outcome.

Author disclosure

Dr Peter Miles was provided an honorarium from Align Technology, Inc., for his contribution towards the creation of this case report.

Dr Peter Miles

Peter Miles received his dental degree with honours from the University of Queensland in Australia and his Masters degree in orthodontics from the University of Pittsburgh in the USA, and he is Australian Orthodontic Board certified. He was a part-time senior lecturer in orthodontics at the University of Queensland for over 10 years and is currently a visiting lecturer at Seton Hill University in the USA. Dr Miles is also a reviewer for several journals, including the *American Journal of Orthodontics* and *Dentofacial Orthopedics* and is on the editorial board of *The Angle Orthodontist*. He has lectured at various national and international meetings, including the American Orthodontic Congress, the British Orthodontic Congress, the World Orthodontic Congress and the Moyers Symposium. Dr Miles has published over 45 articles on clinical topics relating to treatment effectiveness and is one of the editors and authors of the book *Evidence Based Clinical Orthodontics*. He currently runs his own private practice in Caloundra, Queensland. Dr Miles is a Key Opinion Leader with Invisalign Australia.



Treating an Adolescent Patient with Deep Overbite and Crowding with the Invisalign System



Dr Peter Miles
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The patient, a teenage male, was 17 years of age at the time of first presentation. The patient was concerned with the crowding of his teeth and a retained top left deciduous canine which was subsequently extracted. There was significant malalignment, which compromised the patient's smile and his confidence.

I. Intra- and extra-oral images before treatment



Pre-Treatment

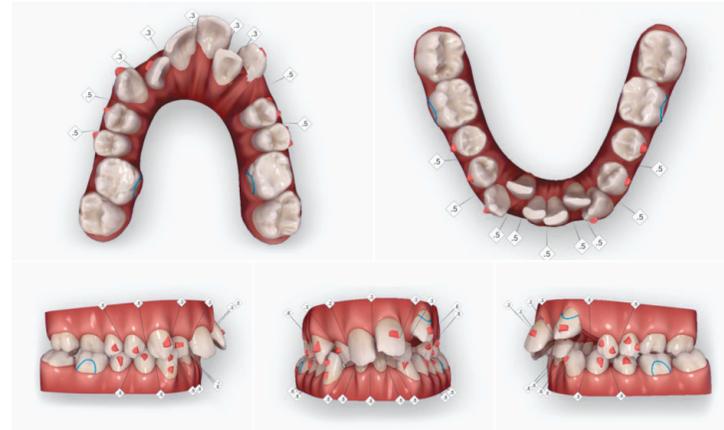
Clinical presentation

The patient presented with a significant overjet, deep overbite as well as severe crowding and crossbites in both arches, resulting in a narrow smile.

II. Panoramic radiograph before treatment



III. Initial ClinCheck treatment plan



Clinical findings

- Mild Class II facial profile with a Class I molar relationship.
- Overjet of 10 mm.
- Deep overbite with the first molars in crossbite.
- Constricted and V-shaped upper and lower arches.
- Both arches presented with 5–6 mm crowding.
- No lower wisdom teeth and deep restorations in his upper first molars (symptomless), as shown in the panoramic radiograph.
- Thick tissue type in the lower anterior region and good oral hygiene, as a result of which the risk of lower incisor gingival recession was considered low.

Treatment goals

- Relieve crowding in both arches.
- Achieve ideal overjet and overbite.
- Correct alignment.
- Crossbite correction.

Treatment approach

Treatment options were discussed with the patient and his parents. One of the options was a non-extraction approach involving transverse and sagittal expansion with the Invisalign Full treatment option. The other option under consideration involved

extraction of all four second premolar teeth. Considering the mandibular retrusion and straight lip profile of the patient, the non-extraction option was chosen, along with upper and lower interproximal reduction (IPR), to relieve the crowding. Commencing treatment with the non-extraction approach allows the conduct of a 'therapeutic diagnosis', whereby the decision to extract can be made, if needed, during the course of the treatment.

Treatment details

Active treatment time

17 months.

Aligners used

Initial treatment phase using 45 sets of aligners.

- Treatment commenced in April 2015, with attachments bonded and the first four aligners issued and worn at 2-week intervals.
- Aligners 5 to 10 were issued and buttons were attached for 1/4" 6 oz cross-elastics. The patient was instructed to wear the cross-elastics for 12 hours at night on the palatal of the upper first molars to the buccal of the lower first molars; the initial IPR was performed.
- Aligners 11 to 17 were issued and further IPR performed. The cross-elastics were continued nightly, while a clear button was bonded to the

buccal of the maxillary left canine for a Class II 5/16" 3.5 oz elastic that was to be worn on the left side during the day.

- Aligners 18 to 32 were issued and the molar cross-elastic stopped on the left side, but continued on the right at night. The final IPR was performed and the Class II elastic wear was continued on the left side during the day. The aligner interval was reduced to 10 days and then 9 days at around aligner 21.
- Aligners 33 to 40 were issued to be worn at 8-day intervals. The molar cross-elastic on the right side was stopped but the Class II elastic wear was continued.
- Aligners 41 to 45 were issued; the patient was instructed to stop at aligner 45 as the last three aligners were virtual c-chain aligners which were not required as the anterior contacts were firm. The aligners were replaced every 7 days.

Refinement phase using 14 aligners.

- All attachments were removed and a scan performed to determine the additional aligners needed to refine the alignment and occlusion.
- In August 2016, the additional aligners were issued. Aligners 1 to 7 were worn at 8-day intervals.
- The patient unfortunately lost aligner 7 and was instructed to stay on aligner 6 until the other aligners were issued.
- The patient was stopped on aligner 14 as the last three were virtual c-chain aligners which were not required.

Attachments

Initial treatment phase

- Optimised Root Control Attachments on teeth 14, 15, 24, 25, 43 and 44.
- Optimised Rotation Attachments on teeth 13, 33, 34 and 45.
- Optimised Deep Bite Attachment on tooth 35.
- Conventional horizontal bevel gingival attachments (3 mm) on teeth 12, 21 and 23.

Refinement phase

- Optimised Root Control Attachments on teeth 11, 12, 13 and 34.

The Invisalign System has the advantage of disoccluding teeth and therefore unlocking the occlusion during crossbite correction. It also splints the teeth together preventing unpredictable teeth movement due to unwanted interferences as the crossbite corrects.

- Optimised Rotation Attachment on tooth 33.
- Optimised Deep Bite Attachments on teeth 35, 44 and 45.
- Optimised Extrusion Attachment on tooth 43.

Retention

During the treatment course, the patient graduated high school and needed to move location to be closer to his chosen university, approximately 90 minutes' drive away. He was informed of a residual lower incisor rotation and that the right side posterior buccal occlusion required settling. He opted to stop aligner treatment and transition to retainers over the Christmas holidays. The use of elastics to settle the occlusion was also discussed with the patient and agreed upon. Attachments were removed and fixed-wire retainers were bonded in both arches (upper 2–2 and lower 3–3). In addition, vacuum-formed retainers were issued to be worn nightly.

In January 2017, the posterior occlusion was again discussed and buttons bonded on the right side for a triangular 1/4" 6 oz elastic that was to be worn for 12 hours every night along with the removable

IV. Triangular 1/4" 6 oz elastic for settling of the posterior occlusion on the right side



retainers. The top retainer had holes cut in the buccal surface, but still covered the occlusal and lingual surfaces to prevent the elastic rolling the upper molars back into crossbite. The lower retainer was cut distal to the right second premolar teeth to allow vertical and lingual movement of the lower molars, which helped both the vertical settling and maintenance of the crossbite correction.

Treatment was completed in March 2017. New impressions were taken for manufacture of vacuum-formed retainers that were to be worn nightly and covering all the posterior teeth.

V. Intra- and extra-oral images after treatment



Post-Treatment

Treatment outcome

The crossbites of the first molars were corrected with the support of elastic wear. The posterior right buccal occlusion was difficult to settle vertically; however, this was eventually achieved over a 2-month period with the support of a triangular elastic worn nightly in conjunction with a removable retainer. The deep bite was improved and the alignment almost fully corrected in the lower arch, however, the patient decided to accept the minor rotation of tooth 41 as he was attending university which, as mentioned previously, was a significant drive away.

Clinical tips

- The Invisalign System has the advantage of disoccluding teeth and therefore unlocking the occlusion during crossbite correction. It also splints the teeth together preventing unpredictable teeth movement due to unwanted interferences as the crossbite corrects.
- Vacuum-formed retainers can be designed to prevent the elastic from rolling the upper molars palatally and potentially re-creating the crossbite.