

Treatment of Class III Malocclusion Requiring Extraction of a Lower Lateral Incisor with the Invisalign System



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The male patient was 26 years of age at the time of first presentation. The patient's main concerns were his "crooked teeth" and anterior crossbite. The Invisalign System was chosen as he was not interested in any treatment that involved conventional braces.

I. Intra- and extra-oral images before treatment



II. Panoramic radiograph before treatment



Clinical presentation

The patient presented with a concave facial profile due to mandibular protrusion, an anterior crossbite as well as crowding, and malaligned teeth in the upper and lower arches.

Clinical findings

- Skeletal Class III malocclusion due to the mandibular protrusion.
- Bilateral Class III dental relationship.
- Reverse overjet of 1 mm.
- Reduced overbite of 0 mm.
- Moderate upper and lower crowding.
- Malaligned teeth in the upper and lower arches.
- Deviation of the lower midline by 1 mm to the left.
- Protrusion of the lower lip.
- Normal tooth and gingival display when smiling.

Treatment goals

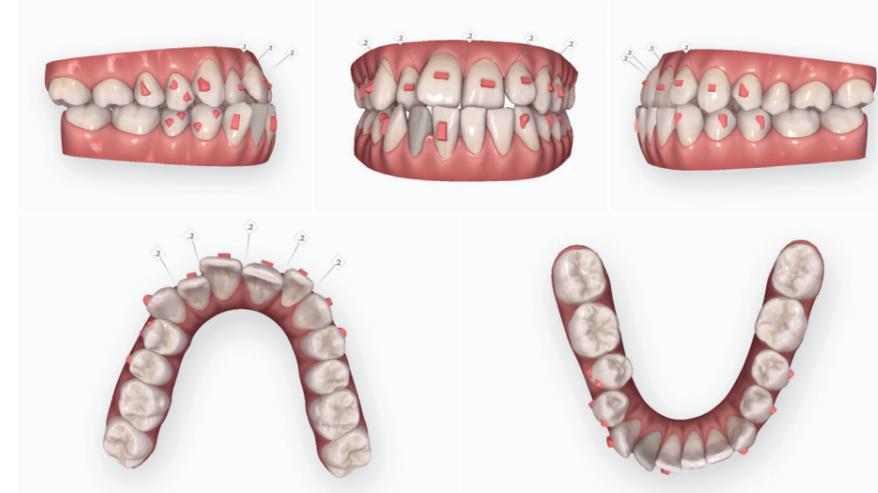
- Achieve bilateral Class I dental relationship.
- Obtain positive overjet and overbite.
- Relieve crowding in both arches.
- Correct malalignment of teeth in the upper and lower arches.
- Coordinate the lower midline with the facial midline.
- Reduce protrusion of the lower lip.

Treatment approach

The patient was originally offered two treatment options. The first option involved surgery combined with orthodontic treatment using a fixed appliance to correct both the skeletal and dental malocclusion. The second option was orthodontic treatment alone with the Invisalign System to correct the dental malocclusion. The patient declined the combined treatment option and opted for the minimally invasive approach with the Invisalign System.

Given that the non-surgical approach was chosen, tooth extraction was deemed necessary to prevent excessive proclination of the upper incisors. Thus, extraction of

III. Initial ClinCheck treatment plan



the lower right lateral incisor (tooth 42) was decided upon; this tooth was selected due to the more severe Class III canine relationship on the right side. Alternative extraction options were also considered, including removal of a lower premolar or all four first premolars. However, extraction of a single lower premolar could have resulted in an unwanted shift of the lower midline, while extracting the four first premolars would have created excessive space.

The Invisalign System was used for alignment of the dentition. Invisalign Optimised Attachments were used to help facilitate various tooth movements for correction of the rotated and malaligned teeth. Interproximal reduction (IPR) was conducted in the upper arch to relieve the crowding and facilitate alignment of the upper anterior teeth. Extraction of tooth 42 aided in the alleviation of crowding, as well as alignment of teeth in the lower arch. Conventional attachments were used on teeth 41 and 43 during the initial treatment phase to preserve their crown and root angulation during closure of the extraction space.

Initial treatment phase

Digital impressions with the iTero scanner were used for development of the ClinCheck treatment plan. Tooth 42 was extracted following patient approval of the ClinCheck treatment plan and several days before the initiation of treatment with the aligners.

A total of 22 upper and 28 lower aligners were prescribed for the initial treatment phase. The patient was instructed to wear the aligners for 22 hours each day and change them every 2 weeks. The patient's progress was reviewed at 8-week intervals. Attachments were bonded with Tetric EvoFlow (Ivoclar Vivadent). IPR of 0.2 mm was conducted on the upper anterior teeth prior to aligner stage 6.

Refinement phase

The goal of refinement was to aid with any tooth movements not achieved during treatment with the initial aligners. The patient underwent refinement with 12 sets of aligners that were changed weekly. Progress was reviewed every 6 to 8 weeks and he was instructed to wear the aligners for 22 hours each day. No attachments were used during the refinement phase.

Treatment details

Active treatment time

- Initial treatment phase: 12 months.
- Refinement phase: 3 months.

Aligners used

- 22 + 12 upper aligners.
- 28 + 12 lower aligners.

Attachments

Initial treatment phase

- Optimised Extrusion Attachments on teeth 11, 12, 21, 22 and 23.
- Optimised Root Control Attachments on teeth 14, 44 and 45.
- Optimised Rotation Attachments on teeth 13, 15, 24, 33, 34 and 35.
- Conventional long vertical attachments on teeth 41 and 43.

Retention

- Upper and lower 3-3 fixed lingual wires were used along with removable nightly upper and lower Essix retainers. Supervised retention was conducted for 2 years; however the patient was recommended to continue with retention in the long term so as to prevent relapse.

Treatment outcome

At the completion of treatment, the dental relationship was corrected to Class I on the left and a Class II canine relationship and Class III tending molar relationship was achieved on the right. An overjet of 1 mm and overbite of 2 mm were also achieved, and crowding and malalignment in the upper and lower arches were corrected. The lower midline was coordinated with the facial midline. There were no undesirable changes in the angulation of the upper and lower incisors, nor any skeletal changes. The protrusion of the patient's lower lip was reduced. The patient was very compliant in his aligner wear and extremely satisfied with the results of his Invisalign treatment and final occlusion.

Clinical tips

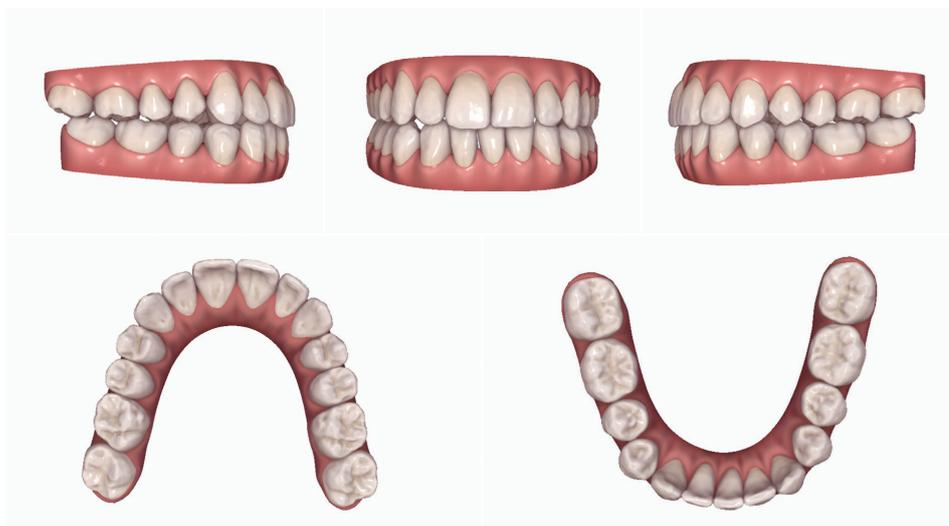
- The appropriateness of non-surgical treatment only for a Class III patient should be carefully evaluated. An advantage of the Invisalign System lies in the diagnostic ability of the ClinCheck software, whereby the results of several treatment plans may be visualised by both the clinician and the patient. In doing so, the key is to recognise malocclusions that are beyond the threshold of non-surgical treatment alone.
- Ideal candidates for non-surgical treatment only include:
 - ▶ patients with mild skeletal Class III malocclusion who decline surgical treatment
 - ▶ patients with retroclined, normally angulated or only slightly proclined upper incisors.
- Surgical treatment or extraction of the upper teeth should be considered for a patient if their upper incisors are already proclined, but further proclination is required to correct the reverse overjet.
- In patients with mild-to-moderate crowding, if the crowding is excessive, particularly in the lower arch, non-surgical treatment with extractions may not be sufficient to relieve the crowding in order to correct the dental relationship.
- Selecting the teeth for extraction should be based on the long-term prognosis of the teeth, the degree of movement required, dental relationship and degree of crowding. The teeth with the worst prognosis should be considered for extraction, as should those requiring complex movements; namely, any severely rotated teeth.
- Anchorage requirements vary according to the severity of the malocclusion. Class III elastics may be used to increase anchorage, although they were not used in this case.

IV. Intra- and extra-oral images after treatment



Post-Treatment

V. Final ClinCheck treatment plan

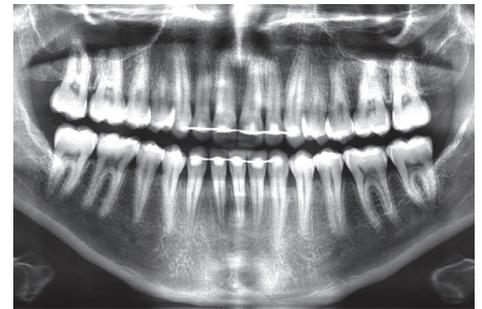


Impact on clinical practice

This case demonstrates that treatment with the Invisalign System is effective in complex Class III cases requiring tooth extraction, while enabling good alignment of the dentition. Fewer and shorter appointments were needed compared to treatment with a fixed appliance, and a number of appointments could be delegated to auxiliary

staff, reducing clinician involvement time. The patient considered treatment with the Invisalign System more acceptable on account of its transparent appearance and its low impact on his lifestyle. From a clinical standpoint, treatment with the Invisalign System allowed for greater control of the tooth movements. In my experience, unlike fixed appliances that tend to procline retroclined lower incisors in Class III patients

VI. Panoramic radiograph after treatment



and worsen their reverse overjet, the Invisalign System moves only selected teeth, which reduces unwanted tooth movements.

Conclusion

The patient presented with mandibular protrusion resulting in skeletal Class III malocclusion. This was accompanied with bilateral dental Class III relationship, reverse overjet and reduced overbite, moderate upper and lower crowding, deviated lower midline, as well as malaligned teeth. Treatment was conducted with the Invisalign System in addition to the extraction of tooth 42. At the completion of treatment, a bilateral Class I dental relationship and an ideal overjet and overbite were achieved along with positive soft tissue changes to the lower lip, ultimately reducing the appearance of the patient's mandibular protrusion. The crowding, malaligned teeth and deviated lower midline were also corrected. The patient was very satisfied with the treatment outcomes. This case demonstrates that treatment with the Invisalign System is effective in complex Class III cases requiring tooth extraction and enables good alignment of the dentition.

Author disclosure

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

Dr David Austin

David Austin obtained a Bachelor of Dental Science (BDS) from the University of Melbourne, Australia. He later undertook specialist training in orthodontics at the University of Hong Kong, completing the 3-year Master of Dental Surgery in Orthodontics and Dentofacial Orthopaedics. Dr Austin holds Membership in Orthodontics from the Royal College of Surgeons of Edinburgh. He is also a member of the World Federation of Orthodontists, the European Orthodontic Society, the Hong Kong Society of Orthodontists and the Australian Dental Association.

Following completion of his primary degree, Dr Austin practised at several private general and specialist orthodontic clinics in Melbourne, as well as working part-time for the Australian Defence Force. After completion of his specialist degree, he joined renowned private practices in Shanghai and Singapore. Dr Austin has published a paper in the leading European orthodontic journal, *Progress Orthodontics*.

Dr Austin has now returned to Melbourne and works at one of the largest Invisalign clinics in Australia. He has treated almost 1,000 patients with the Invisalign System and is an Invisalign Diamond Provider.