



Treating Adult Patients with Bilateral Posterior Crossbite, Vertical Growth Pattern and Class II Division 1 Malocclusion with the Invisalign System



Dr Dan Smethurst

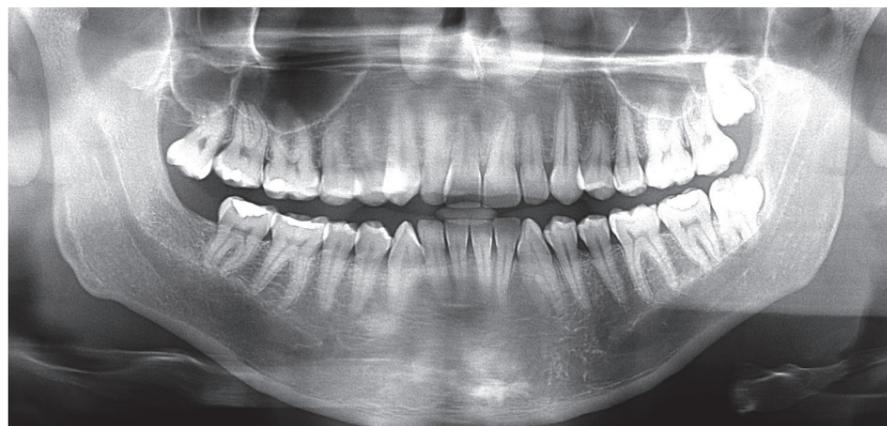
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The patient, KJ, was 30 years of age at the time of first presentation. KJ was concerned with his narrow smile and protrusive teeth. He was not comfortable wearing conventional braces.

I. Intra- and extra-oral images before treatment



II. Panoramic radiograph before treatment



Clinical presentation

KJ presented with Class III skeletal base and Class II division 1 incisor relationship with a 5 mm overjet. He also had bilateral posterior crossbite with palatally inclined upper right molars and a broad lower arch.

III. Cephalometric radiograph before treatment



Clinical findings

- Class II division 1 incisor relationship.
- Class III skeletal base.
- 1/2 unit Class II right buccal segment relationship.
- Class I left buccal segment relationship.
- 5 mm overjet.
- Upper and lower centre lines deviated to the left of facial midline by 2 mm.
- Asymmetric upper arch with mesial movement of right buccal segment.
- Reduced overbite and vertical growth pattern.
- Bilateral posterior crossbite with palatally inclined upper right molars and broad lower arch.
- Bolton's discrepancy with mandibular excess 3-3 of 3.52 mm and 6-6 of 4.02 mm.

Treatment goals

- Align arches.
- Reduce overjet.
- Correct bilateral posterior crossbite.
- Control vertical dimension during upper arch expansion.
- Maintain positive overjet and overbite during correction of underlying skeletal Class III malocclusion.

Treatment approach

Correction of posterior crossbites with upper arch expansion in non-growing individuals can give rise to unwanted gingival recession in patients with a thin gingival biotype. KJ's treatment involved uprighting of the palatally inclined upper right molars; thus, for this reason, significant expansion was deemed possible without the likelihood of gingival recession.

KJ's case involved correction in all three dimensions.

1. Transverse dimension: expansion was supported with cross elastics (Ormco Bears 1/4" 4.5 oz elastics) from the palatal of upper first molars to the buccal of lower first molars.
2. Horizontal dimension: Class III changes occurred during alignment owing to the underlying Class III skeletal pattern, proclination of the crowded lower arch during alignment as well as the underlying Bolton's discrepancy with mandibular excess 6-6 of 4.02 mm. This was controlled by significant interproximal reduction (IPR) of KJ's very broad lower incisor teeth. Opening a small space for possible build-up of

IV. Initial ClinCheck treatment plan



the small upper lateral incisors was also incorporated into the treatment plan.

3. Vertical dimension: an increase in vertical dimension can occur with upper arch expansion due to palatal cusps swing down. This can be more pronounced in non-growing individuals due to lack of ramus growth. Therefore, good torque control of the upper buccal segments was important during posterior crossbite correction. The full occlusal coverage of aligners also provided excellent control of the vertical dimension, due to posterior dental intrusion. It is important to note that while posterior dental intrusion is a benefit in terms of control of the vertical dimension, it has the unwanted effect of Class III changes due to counterclockwise mandibular rotation.

Treatment details

Active treatment time
19 months.

Aligners used

- 21+9 upper aligners.
- 24+9 lower aligners.

Attachments

Initial treatment phase

- Optimised Attachments
 - Optimised Root Control Attachments on teeth 23, 24, 35 and 45.
 - Optimised Rotation Attachments on teeth 13, 15, 34 and 44.

- Conventional vertical rectangular attachments on lower 3-3 and upper 2-2 teeth to assist with root control.
- Button cutouts palatal of upper first molars and buccal of lower first molars for cross elastics.
- IPR of 0.5 mm on 2-2 lower teeth for control of lower incisors during alignment and to maintain a positive overjet, and 0.2 mm IPR on teeth 11 and 21 to reduce black triangle formation.

Refinement phase

- Optimised Attachments
 - Optimised Root Control Attachments on teeth 11 and 13.
 - Optimised Deep Bite Attachments on teeth 35 and 44.
 - Optimised Rotation Attachments on teeth 23, 34 and 43.
 - Optimised Multiplane Attachment on tooth 12.
- Conventional attachments used were rectangular horizontal attachments on teeth 16, 24, 26 and 45 to assist in open bite closure and long vertical attachments on teeth 33 and 42 to control root uprighting.
- Precision Cuts for Class II elastics on the right and Class III on the left to improve the buccal segment relationships.
- IPR of 0.2 mm on the 2-2 lower teeth (not all the 2-2 lower teeth underwent IPR during treatment with the initial aligners).

V. Intra- and extra-oral images after treatment



Treatment outcome

A pleasing aesthetic and functional occlusion was achieved despite us not attempting to fully correct the right buccal segment relationship. The 'end-on-end' right buccal segment relationship was due in part to mesial migration of the upper right buccal segment, an asymmetric upper arch, Bolton's discrepancy with relative mandibular excess, and small teeth 12 and 22.

Further improvements in the right buccal segment could have been made by additional IPR in the lower anterior region so as to allow mesial movement of the lower right quadrant as well as additional space opening of tooth 12 to allow distalisation of the upper right quadrant.

However, the patient wanted to avoid restorative veneer build-ups of teeth 12 and 22. Additionally, distalisation in the upper right quadrant was not advisable due to the underlying Class III skeletal pattern.

This treatment decision to not fully correct the right buccal segment relationship was independent of the Invisalign System.

KJ has been referred for the removal of his unopposed and overerupted tooth 18.

Clinical tips

- Bonded buttons enabled easy placement of cross elastics in this adult patient and did not compromise aligner retention and fit. This was important for the success of this case, as consistent cross elastic wear was imperative throughout treatment to support the planned expansion.
- The use of intermaxillary cross elastics to bonded buttons to assist complicated and unpredictable

teeth movement, such as maxillary expansion, was necessary, especially in this non-growing patient. The use of cross elastics allowed good tracking of the treatment throughout the planned tooth movements.

- Full occlusal coverage of all erupted teeth allowed excellent control of the vertical dimension in this patient with a vertical growth pattern.
- After using Invisalign aligners, the patient found laboratory made vacuum-formed retainers unsatisfactory as he found them of poor quality and fit compared to his aligners. The ability to order Vivera retainers from the last active stage of treatment is a great benefit from a practice management and patient comfort perspective.

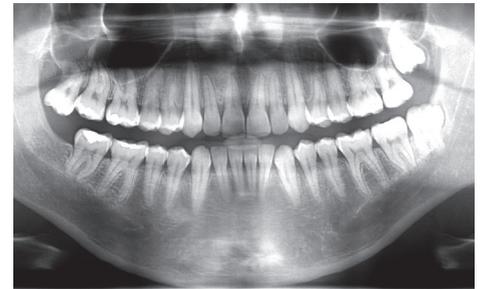
Impact on clinical practice

- The Invisalign System can be viewed as the appliance of choice for the treatment of patients with an increased vertical dimension, especially when correcting posterior crossbites that can also have a bite-opening effect.
- The use of intermaxillary cross elastics can assist complicated and unpredictable tooth movements, such as maxillary expansion.
- The 'bite-plane effect' of clear aligners aids the correction of crossbites.

Conclusion

- This case demonstrates how a complicated case in a non-growing individual involving correction in the transverse, horizontal and vertical dimensions can be achieved with the Invisalign System.

VI. Panoramic radiograph after treatment



VII. Cephalometric radiograph after treatment



- Posterior crossbite correction was achieved whilst maintaining good control of the vertical dimension, even in this non-growing individual.
- The Invisalign System may be viewed as the treatment modality of choice when treating posterior crossbites in patients with a vertical growth pattern.

Author disclosure

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

Dr Dan Smethurst

Dan Smethurst was born in Britain and graduated from the University of Wales, College of Medicine in Cardiff in 1989 with a Bachelor of Dental Surgery. Following graduation, he came to New Zealand to work at the University of Otago Dental School in 1990. Thereafter, Dr Smethurst moved to Auckland to work in private practice.

In 1994 Dr Smethurst returned to the UK to gain Fellowship in Dental Surgery of the Royal College of Surgeons (England), whilst working as a Senior House Officer in oral and maxillofacial surgery. In 1999 he completed his orthodontic specialist training (with distinction) at the University of Wales College of Medicine and gained Membership in Orthodontics at the Royal College of Surgeons (Edinburgh).

He spent the next 5 years working in a specialist orthodontic practice in Cardiff and worked part-time at a nearby hospital treating complex orthodontic cases with specialist dental and surgical colleagues. In 2004 Dr Smethurst returned to New Zealand, where he now works exclusively in private practice in Tauranga. He lectures on the Invisalign System in New Zealand.