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Case Report

Non-extraction Tip-Edge appliance management of a moderate Angle Class II division 1 malocclusion commenced in the late mixed dentition

Russell J. Kift
BDS(Syd), MDS(Syd)
Specialist practice, Orthodontics
Maitland
Australia

This case report was a winner of the Begg Medallion nominated case award for 1999, presented by the Australian Begg Orthodontic Society.

This case presentation concerns the correction of a moderate Angle Class II division 1 malocclusion of a patient whose treatment began during the late mixed dentition. Owing to the need to preserve and improve the existing facial aesthetics, treatment was started with a non-extraction approach and, in order to exploit favourable dentofacial growth changes and to avoid the possibility of extraction of teeth, was timed to coincide with the patient's expected adolescent growth spurt. Fixed appliances only were used. Special consideration had to be made for the patient's fractured upper central incisor teeth. An aesthetically pleasing treatment outcome was achieved within the expected time frame for correction. The case shows the successful combination of typical Begg mechanotherapy used during the early stages of treatment and Tip-Edge rectangular archwire mechanotherapy as used for the later and finishing stages.
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Erratum

Because of a production error in the previous issue of the Journal (Volume 16: 3), Dr Kift's case report, although listed in the contents, was not bound in the issue. It has been reprinted here in its entirety. The Journal staff concerned apologises for this error.

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Introduction

This case is presented showing a non-extraction treatment approach begun in the mixed dentition of an Angle Class II division 1 malocclusion with a deep overbite, large overjet, vertical maxillary excess and anterior spacing. The upper incisors had already suffered fracturing of the incisal edges due to their protrusion and proclination.

Treatment was aimed at co-inciding with the expected dentofacial growth changes, and fixed appliances (Tip-Edge®) alone were used. Typical lightwire Begg mechanotherapy was employed during the early stages of treatment to open the bite, retract the upper anterior teeth, correct the sagittal relationships and to close spaces. During the later and finishing stages of treatment, typical Tip-Edge mechanotherapy was employed, using full-size rectangular archwires and self-limiting uprighting springs to achieve the required tip and torque on individual teeth as required for optimal results. A rewarding outcome was achieved following good patient co-operation and favourable growth during treatment. Judicious aesthetic detailing of the anterior teeth by enameloplasty allowed optimal smile aesthetics also to be achieved.

History

A male patient aged twelve years, six months, presented for treatment of a moderate Class II skeletal tendency in association with proclination and protrusion of the upper anterior teeth. The upper anterior teeth had been traumatised, resulting in fracturing of the incisal edges. His chief complaint was the spacing and protrusion of these teeth.

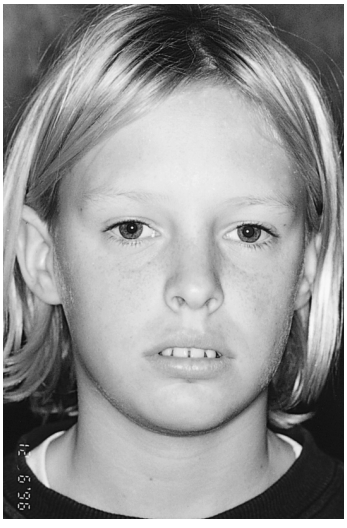


Figure 1a. Pretreatment extra-oral frontal view, at rest.

Figure 1b. Pretreatment frontal view, smiling.

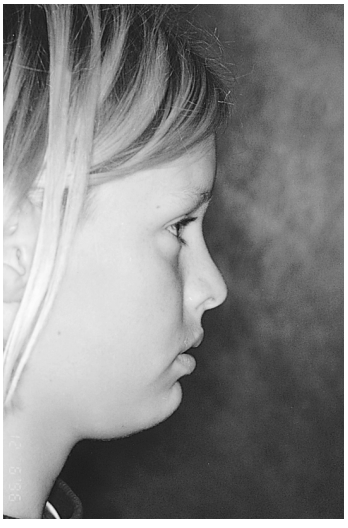


Figure 1c. Pretreatment facial profile.

Figures 2a, b and c. Pretreatment intra-oral views.

Figure 2b.

Diagnosis

The patient presented with reasonably good facial aesthetics. The frontal view (Figures 1a and b) showed a meso/dolichofacial pattern. The lips were apart at rest, showing prominence and spacing of the upper anterior teeth. There was a distinct mental groove below the lower lip and pronounced soft tissue over the chin point. His smile was slightly asymmetric, with exposure of the upper teeth back to the bicuspid regions, the upper anterior teeth were positioned just over the lower lip, and an excessive amount of gingival tissue was displayed. In profile (Figure 1c), his chin was recessive and the nasolabial angle was high.

The soft tissue functional analysis showed high circumoral muscle activity, and intense mentalis muscle activity associated with the relatively short upper lip. There was forward static and dynamic tongue function. Speech was reasonably good, except for an articulation defect with distortion of the /S/ sounds.

Parafunction was present, with nail biting causing mandibular protrusion in order to gain interincisal contact.

Examination of the temporo-mandibular function revealed a click/crack in the left temporo-mandibular joint when the patient moved the mandible laterally. He experienced occasional head and neck aches. The rest of the dental/medical history was unremarkable.

The patient was assessed as mesomorphic, and his growth status was prepubertal.

The patient's social history revealed that he was physically active, participating in sporting pursuits such as soccer, swimming and surfing.

* TP Orthodontics, Inc., LaPorte, Indiana USA

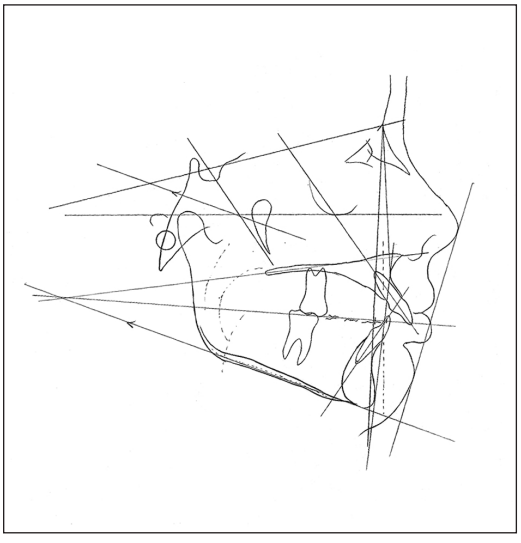


Figure 7. Pretreatment cephalometric tracing.

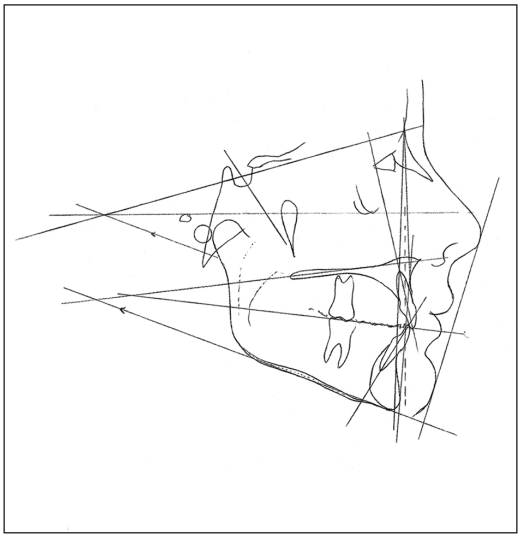


Figure 8. Post-treatment cephalometric tracing.

Figure 2c.

Figures 2d and e. Pretreatment maxillary and mandibular views.

Figure 2e.

Intra-oral examination

Intra-oral examination (Figures 2a, b, c, d and e) showed a moderate Angle Class II division 1 malocclusion. The overjet was 9.0 mm. The overbite was 90 per cent and incomplete due to the forward tongue function. The anterior teeth were protruded and spaced, with proclination of the upper anteriors. The lower midline was deviated slightly to the left side. Tooth 21 showed a significant mesio/incisal crown fracture. Tooth 11 showed a slight incisal crown fracture.

Radiographic examination

Radiographic examination showed three developing third molars (teeth 28, 38 and 48). Primary tooth 75 was still present, several bicuspid teeth were still erupting, three second molars were erupting, and tooth 37 was unerupted.

Cephalometric analysis

The cephalometric analysis showed a skeletal Class II relationship due to a retrognathic mandible. Both upper and lower anterior teeth were proclined, which produced a decreased interincisal angle. Cephalometric measurements of the pre- and post-treatment tracings shown in Figures 7 and 8 are presented in Table I.

Table I. Cephalometric values.

	Norm	Start	Finish
SNA	81/3	79	76.5
SNB	78/3	73	72
ANB	3.7/2.0	6	4.5
Yaxis/SN	67/3	70.5	71.5
MPl/SN	33/5	34	36
MMA	26-28	27	27
A/NaPerp	+1/3	+3	+2
P/NaPerp	-4/3	-3	-2
SN	80/4	75	77
WITS	0/2	5	1.5
⊥AP	7/3	11	3
⊤AP	2/3	1.5	1
⊤MPl	96/7	104	101
⊥ / ⊤	128/11	112	135
⊥ /SN	103/6	111	87
LL/EPl	-3/2	+1.5	-4.5

Figures 3a, b and c. Initial appliances.

Figures 4a, b and c. Rectangular archwires and uprighting springs.

Treatment plan and prognosis

Treatment commenced within two months of examination, while the patient was in the late mixed dentition. The decision to begin at that stage was based on the need to reduce the overjet as early as possible, since the upper anterior teeth were excessively protruded and were "at risk", especially with the patient's active lifestyle. Also, treatment was timed to coincide with the patient's expected growth changes, thereby exploiting any favourable dentofacial growth response during treatment. This was especially critical for a non-extraction outcome, which was assessed as being the best way to approach this case for an optimal facial outcome.

Full upper and lower fixed Tip-Edge appliances were planned, with an expected active treatment time of 18 to 24 months. Retention using upper and lower removable appliances was planned following the removal of the fixed appliances, although consideration would be given to the need to place fixed lingual retainers if deemed necessary. Reassessment of any indication to place fixed retainers would be based on whether or not there was a tendency for the anterior spaces to reopen. Reassessment of the status of the third molars was planned several years into the future, during retention.

Treatment objectives

1. Intrude and retract the upper anterior teeth.
2. Level the lower occlusal plane.
3. Promote forward mandibular growth while holding the maxilla and dentition back.
4. Achieve Class I anterior relationships, including midline correction.
5. Close remaining spaces and correct the posterior relationships.
6. Finishing: tip, torque, and correction of tooth size.
7. Normalise soft tissue function.
8. Adjustment and detailing of incisal edges, especially tooth 21.
9. Stabilisation/retention.

The success of treatment would depend on a favourable biological response of the hard and soft tissues, and excellent patient co-operation.

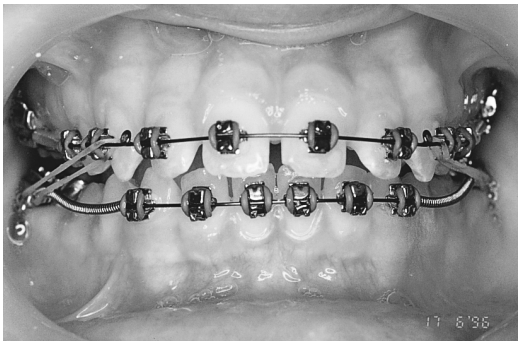


Figure 3b.

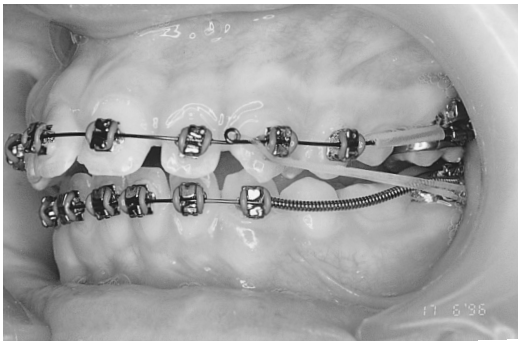


Figure 3c.

Figure 4b.

Figure 4c.

Adequate Class II elastic wear would be critical for upper incisor retraction, holding of the maxillary dentition, promotion of mandibular forward growth, and mesial movement of the lower posterior teeth to correct the buccal relationships. Care would need to be taken with the palatal root torque of the upper incisors that had been traumatised. Avoidance of further proclination of the lower anterior teeth would be necessary, especially when using Class II elastics after the lower spaces had closed. Undesirable rebound opening of the upper spaces would have to be avoided, and managed as necessary. The overall aesthetic result could be hampered by the incisal anatomy of the fractured tooth 21, so planning for its final position and shape would be necessary before placement of the fixed appliances.

Treatment progress

June 1996: Fixed Tip-Edge appliances were placed, bypassing the upper second bicuspids and the lower first and second bicuspids (Figures 3a, b and c). Initial archwires were stainless steel 0.016" Straight Premium Plus†, with reverse curve in the upper arch and moderate anchor bends in the lower arch. Light Class II elastics (3/8" 2 oz) were commenced and changed every three days. Protective sleeving was placed over the upper archwire at the second bicuspid region. Passive stainless steel closed coil springs were placed on the lower archwire between the first molars and canines. This was necessary to keep the distance between the molars and the anterior teeth, to protect the archwire from occlusal trauma and to increase the anchorage capacity of the lower arch for Class II elastic traction while opening the bite.

August 1996 (2 months into treatment): The overjet had been reduced to 5 mm, and bite opening was occurring. Class II elastics were changed to 5/16" 2 oz, to be replaced every two days.

September 1996 (3 months into treatment): The overjet was 1mm, the bite was open, tooth 75 had exfoliated and tooth 35 was erupting.

November 1996 (5 months into treatment): The overjet was 0.5 mm, and elastics were used only as required to avoid the occurrence of a negative overjet.

† A.J. Wilcock, Whittlesea, Vic. Australia

Figures 5a, b and c. Post-treatment intra-oral views.

Figure 5b.

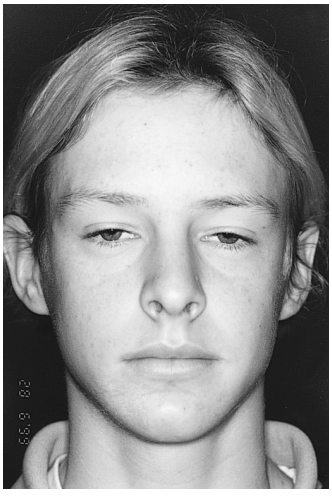


Figure 6a. Post-treatment extra-oral frontal view, at rest.

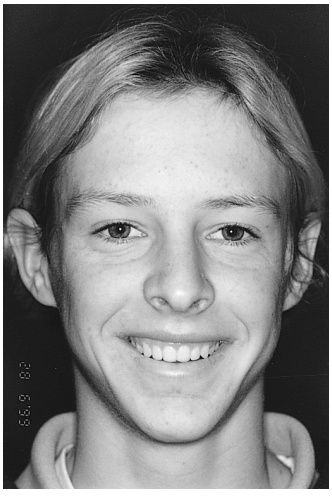


Figure 6b. Post-treatment frontal view, smiling.

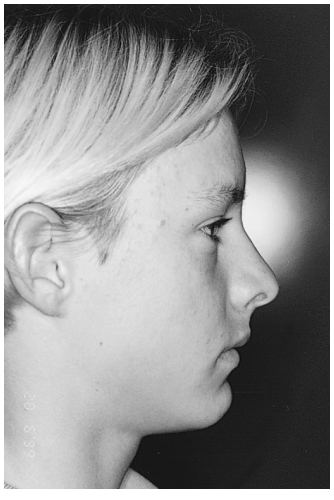


Figure 6c. Post-treatment facial profile.

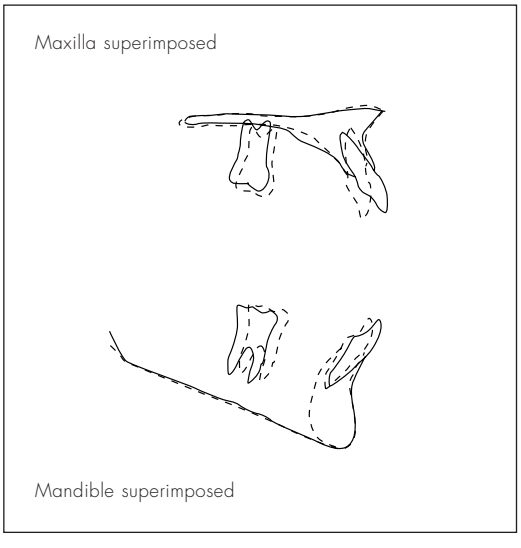


Figure 9. Pre- and post-treatment superimpositions.

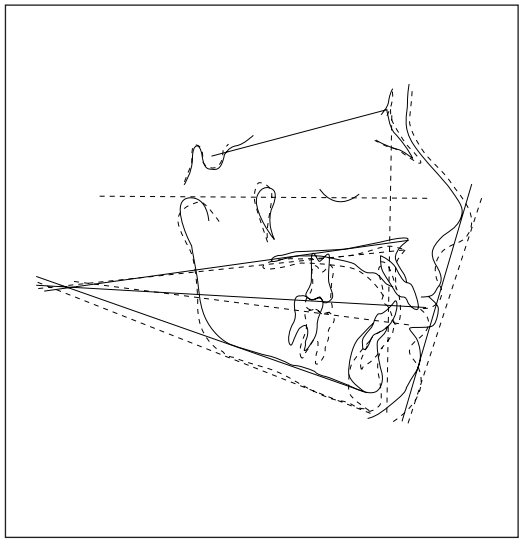
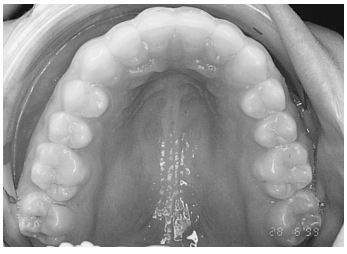


Figure 10. Maxillary and mandibular superimpositions.

Figure 5c.



Figures 5d and e. Post-treatment maxillary and mandibular views.

Figure 5e.

December 1996 (6 months into treatment): All remaining bicuspids were bonded with brackets, the lower archwire anchor bends were replaced with reverse curves and all bicuspid teeth were engaged on the archwires.

May 1997 (11 months into treatment): Space closure had been achieved with the use of power chain and Class II elastic wear.

June 1997 (12 months into treatment): The upper and lower archwires had been changed to 0.022" Straight Special Plus‡, and Class II elastics were worn at night. Patient compliance difficulties were experienced during this period, which delayed progress.

September 1997 (15 months into treatment): The archwires had been changed to full size rectangular stainless steel 0.0215" x 0.028" with a very slight reverse curve. For the correction of tip and torque, uprighting springs were placed on all anterior teeth and the first bicuspids (Figures 4a, b and c).

December 1997 (18 months into treatment): The uprighting springs had been removed, and the midlines had been corrected using diagonal elastic traction from the upper right canine region to the lower left canine region, together with night-time Class II elastic wear.

May 1998 (23 months into treatment): The fixed appliances were removed. Aesthetic recontouring of the incisal edges was carried out. Removable retainers were placed (Begg upper, modified spring aligner lower), with full-time wear for the first six months after debanding.

December 1998 (6 months into retention): The retainers were changed to night-time wear only, and further aesthetic recontouring of the anterior teeth was carried out as the dentition stabilised (Figures 5a, b, c, d and e).

At the time of writing, the retainers were still being worn at night. The growth and positions of the three unerupted third molars is still being assessed.

Discussion

The decision to begin fixed appliance management in the late mixed dentition was vindicated by the favourable growth response as the patient entered his pubertal growth phase. This greatly assisted treatment (Figures 6a, b and c).

Clinical and cephalometric evaluation (Figures 9 and 10) appear to show that most treatment objectives had been achieved within the expected treatment time-frame. It may be argued that more palatal root torque of the upper incisors was desirable; however, due to the previous trauma to these teeth, it was thought best not to extend the torquing mechanics for too long.

The fractured upper left central incisor proved to be the greatest aesthetic challenge. Because it was not possible to restore it, careful planning for its final position was necessary, as well as for the adjacent teeth. Enamel recontouring of the upper anterior teeth was carried out periodically and has eventually led to favourable smile aesthetics.

‡ A.J. Wilcock, Whittlesea, Vic. Australia

Figures 11a, b and c. Pre-treatment study casts.

Figures 12a, b and c. Post-treatment study casts.

Figure 11b.

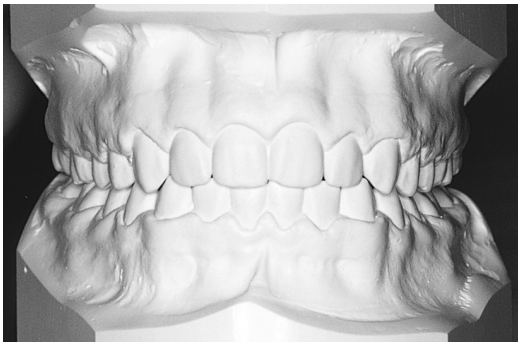


Figure 12b.

Figure 11c.

Figure 12c.

Summary

This case shows a favourable treatment outcome for a moderate Class II division 1 malocclusion, using a non-extraction approach (Figures 11a, b and c). By incorporating Begg mechanotherapy for the early stages and rectangular archwire control during the latter stages of treatment, a pleasing smile (Figure 6b) and a functional occlusion were obtained (Figures 12a, b and c).

This particular bracket system (Tip-Edge) allows the free tipping of the teeth on light round wire, which is crucial for the early bite opening and Class II correction, as required in this case. In addition, the bracket system also, by way of full size rectangular archwires and uprighting springs, has the facility to achieve correction of tip and torque on individual teeth, again as required in this case.

Address for correspondence and reprints:

Dr R. J. Kift
280 High Street,
Maitland N.S.W. 2320
Australia
Email: kift@hunterlink.net.au