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Case Report

Begg appliance management of a moderately crowded Angle Class 11 division 2 malocclusion

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A case is presented that shows Begg appliance management of an Angle Class II division 2 malocclusion. The judicious use of anchorage bends and Class II elastics enabled the successful treatment of the poor posterior and anterior relationships, at the same time addressing the chief complaint of crooked front teeth.
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Introduction

The correction of malocclusions characterised by an increased anterior overbite often presents the clinician with difficulties. The choices between incisor intrusion, molar extrusion, a combination of the two types of tooth movement and a surgical approach need to be weighed carefully and be based upon a sound diagnosis. A case is presented in which a skeletal Class II malocclusion with an anterior deep overbite was treated with fixed appliances to a successful outcome.

History

A male patient aged 14 years 7 months presented with a chief complaint of crooked upper and lower anterior teeth. He had previously attended for routine dental management through government clinics but had received little in the way of definitive care. His medical and dental history were non-contributory, although he reported a mouth-breathing habit and had seen an ENT specialist but was not offered any treatment. No other members of the family reported a previous history of orthodontic treatment and so the patient was ambivalent towards orthodontic care.

Extra-oral examination

The patient had a mesomorphic body type, but at the time of presentation was lacking in physical development. Generally, he displayed a symmetrical facial appearance, with a slight decrease in lower anterior face height and a mild deviation of the chin to the right (Figure 1a). His lips were together at rest. His smile was symmetrical and displayed poor dental aesthetics due to bucccally placed canines and irregular upper incisors. The maxillary dental midline deviated approximately 2 mm to the right, whereas the mandibular midline was coincident with the facial midline.

The patient possessed a convex profile, largely caused by a retrusive mandible (Figure 1b). However, the chin was well developed. The lower lip was slightly everted with a deep sub-labial fold in evidence. The naso-labial angle was mildly acute, but acceptable.

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TMJ assessment

There was no history of pain, clicking or locking revealed in either temporomandibular joint (TMJ). The patient displayed an unrestricted range of mandibular movement, with no interfering balancing contacts. No deviation was detected in the opening or closing pathways.

Intraoral examination

Except for the unerupted lower second molars, the patient was in the permanent dentition (Figures 2a, b and c). The first molars and canines were bilaterally Class II, and an overjet of 4 mm was measured. Of concern was a deep and complete anterior overbite that resulted in trauma to the palatal soft tissues. The curve of Spee was moderately increased. No crossbites were detected, and the periodontal tissues were generally healthy although oral hygiene was only fair.

Model and occlusal analysis

The maxillary arch form was asymmetric and U-shaped, with a high and U-shaped palate (Figure 2d). The mandibular arch form was also asymmetrically U-shaped (Figure 2e). Both arches were moderately crowded in the anterior segments, with the maxillary and the mandibular arch requiring approximately 8mm and 4mm of space, respectively.

A Bolton tooth-size analysis gave an overall ratio of 86.6 per cent and an anterior ratio of 76.9 per cent, indicating 4.0 mm overall maxillary excess, isolated in the buccal segments rather than the incisors.

Table I. Cephalometric values.

	Norm	Start	Finish
Skeletal			
SNA	82	81	81
SNB	80	76	78
ANB	2	5	3
Convexity	2mm	5mm	1mm
Facial Depth	87	93	94
Facial Axis	90	87	89
Dental			
Wits	0mm	2mm	3mm
U1 to NA	22	10	30
U1 to SN	104	92	108
L1 to A-Pog	22	11	35
L1 to MP	91	82	105
U1/L1	135	156	131
Vertical			
GoGnSN	32	28	28
LFH/TFH	55%	52%	54%
FMA	22	19	19
Soft Tissue			
Subnasale-H line	5mm	5mm	6mm
N'-Pog'-FH	91	93	89

Radiographic analyses

Panoramic

The third molars and mandibular second molars were present but unerupted. No pathology was noted.

Handwrist

The first stage of ossification of the hook of the hamate was evident. The epiphysis of the middle phalanx of the third finger was yet to reach the width of the diaphysis, indicating that the patient had not reached peak growth velocity.

Cephalometric analysis

A skeletal Class II relationship due to a retrognathic mandible and an antero-posteriorly well-developed chin was revealed. Vertical proportions indicated that the patient had a slightly reduced lower anterior face height. Both upper and lower anterior teeth were retroclined, which produced an increased inter-incisal angle. The patient's lips were together at rest and slightly everted. Cephalometric measurements of the pre- and post-treatment tracings shown in Figures 1c and 7 are presented in Table I.

Growth estimate

According to all maturity indicators, the patient was entering the early stages of his pubertal growth cycle and had not yet reached peak growth velocity. It was estimated that 80.4 per cent of growth had been completed.

Diagnosis

Skeletal

Angle Class II. Retrognathic mandible with a well-developed chin. The patient also had a slightly decreased lower anterior face height.

Dental

Angle Class II division 2. Overjet: 4mm. Overbite: 100 per cent and traumatically in contact with the palatal soft tissues. A moderate amount of crowding was present.

The malocclusion was therefore classified as an Angle Class II, division 2 type on a skeletal Class II base.

Treatment plan and prognosis

The objectives of treatment were to:
1. relieve the crowding in both arches;
2. align the anterior teeth;
3. correct the midline discrepancy;
4. correct the molar and canine relationships;
5. restore the overbite and overjet relationships;
6. level the curve of Spee.

It was intended to achieve the aims of treatment using Begg Light Wire mechanics as a non-extraction procedure. It was further expected that, with patient cooperation, light Class II elastics and moderate anchorage bends would be sufficient to correct the malocclusion. However, due to the significant nature of the problems, the need for tooth removal would be re-assessed early in treatment, and the prognosis was therefore considered at the outset to be guarded. It was envisaged that, due to the irregularity of the teeth, long term retention would be required.

Treatment progress

In the first instance, light-wire appliances were placed on the first permanent molars and on the upper and lower incisors. Upper and lower stainless steel 0.016" archwires with moderate anchor bends and light (70g) Class II elastics were commenced (Figures 3a, b and c). Irregular teeth were ligated to the archwire and gently moved into alignment. As dental alignment was not an early priority, it was achieved in six months, during which time, overbite, overjet and the molar relationship had almost been corrected. The patient's treatment was reviewed at this time and, in keeping with the great improvement that had been achieved, it was considered that a continuation of the non-extraction treatment plan was appropriate.

Consequently, the buccal teeth were bonded and heavier archwires (0.020") were inserted, and the Class II elastics were continued. Palatal root torque was applied to the upper central incisors, and labial root torque to the upper lateral incisors (Figures 4a, b and c). Labial root torque was also applied to the lower incisors, and tooth uprighting was done on an individual basis. The duration of active treatment was 20 months and, at debanding, upper and lower removable retainers were placed. Post-treatment extraoral photographs (Figure. 6a and b) reveal an improvement in soft tissue balance and a maturation of the facial profile over the treatment period. Post-treatment intraoral views (Figures 5a, b and c) indicate the attainment of treatment goals, and the restoration of a Class I dental pattern with well-aligned arches (Figures 5e and d). The post-treatment tracing is presented in Figure 7. Pre- and post-treatment superimpositions are recorded in Figures 8 and 9. Treatment effects were largely achieved by an improvement in incisor angulation and an elevation of the lower molar. Significant downward and forward growth changes were evident over the treatment period.

Discussion

In an examination of non-extraction treatment of Class II malocclusions treated with the Begg appliance, Meistrell *et al.*[1] determined that occlusal correction was achieved by control of the vertical eruptive pathway of the molars and forward mandibular development. At the same time, maxillary growth was impeded. An analysis of pre- and post-treatment cephalometric films based on conventional superimpositions in the present author's case, indicates that the maxillary position remained essentially unchanged, but that the effects of treatment were a forward displacement of the lower dentition. This was reflected as proclination of the lower incisors and a mesial as well as a vertical change in the lower molars (Figures 8 and 9). The upper incisors were considerably torqued palatally to a more favourable angulation, while the upper molars showed minimal change.

Although moderate anchorage bends were placed, bite opening was largely due to extrusion of the lower molars, rather than any significant intrusion

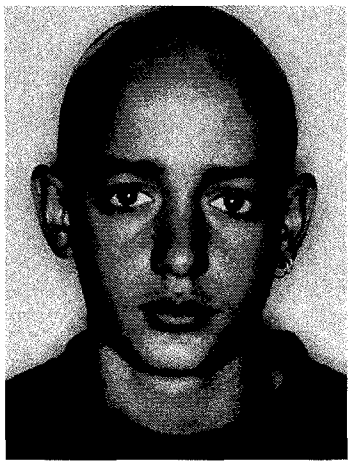


Figure 1a. Pretreatment extraoral frontal view.

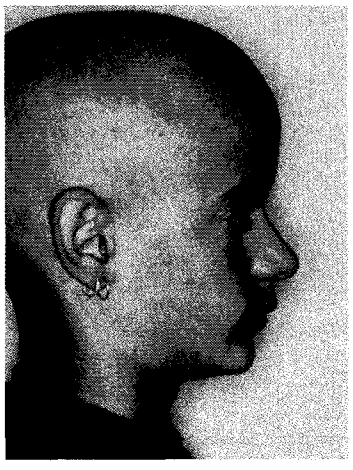


Figure 1b. Pretreatment facial profile.

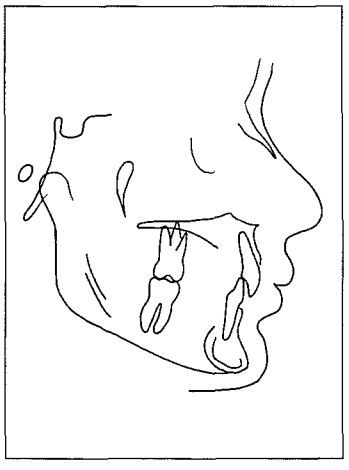
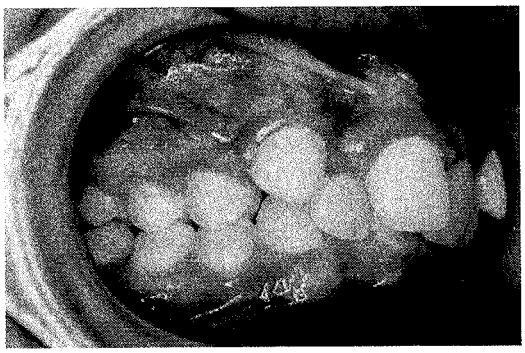
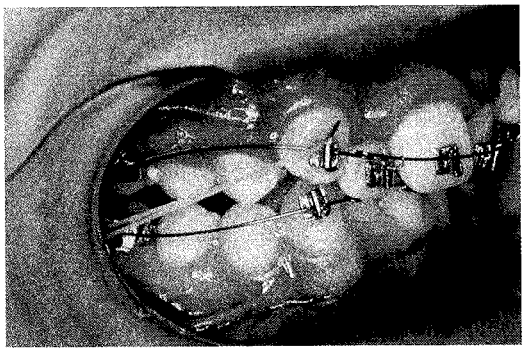


Figure 1c. Pretreatment cephalometric tracing.



Figures 2a, b and c. Pretreatment intraoral views.

Figure 2b.



Figures 3a, b and c. Initial appliances.

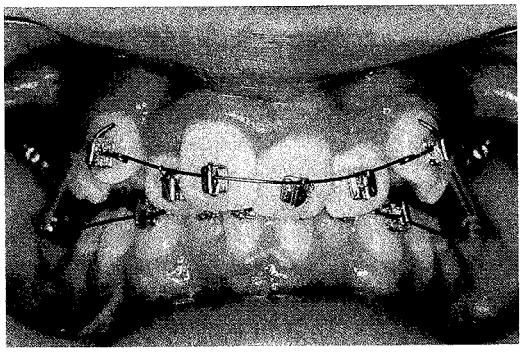
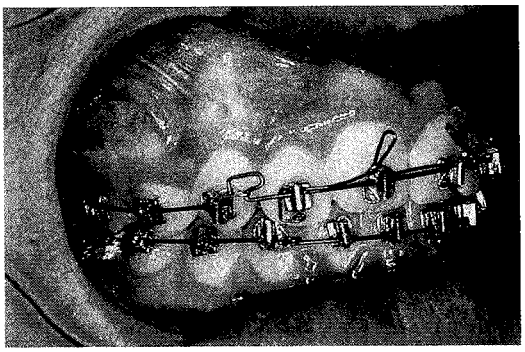


Figure 3b.



Figures 4a, b and c. Stage III torque.

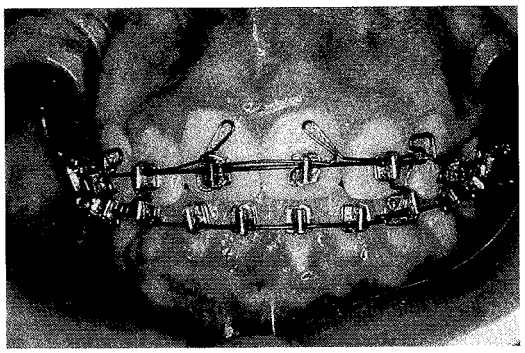
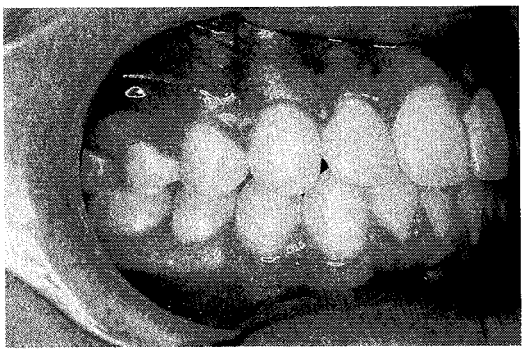


Figure 4b.



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

Figure 5b.

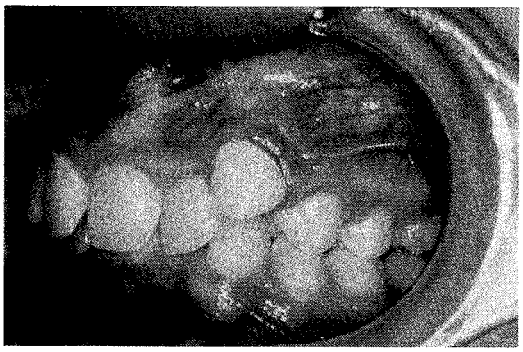
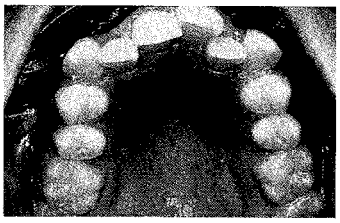


Figure 2c.



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

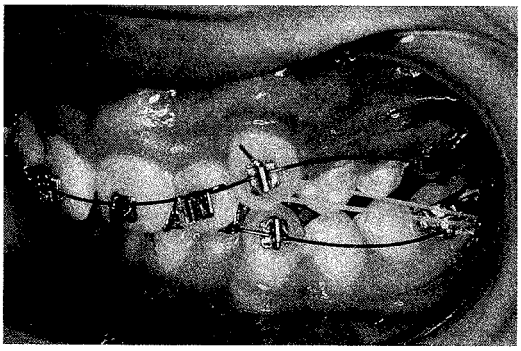
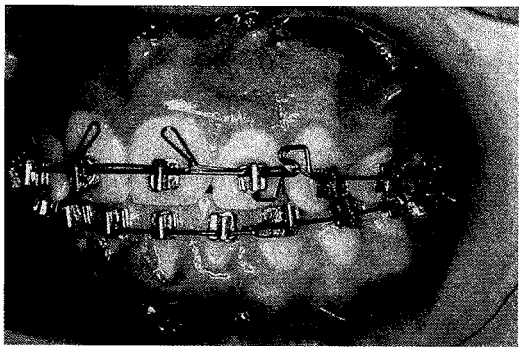


Figure 3c.



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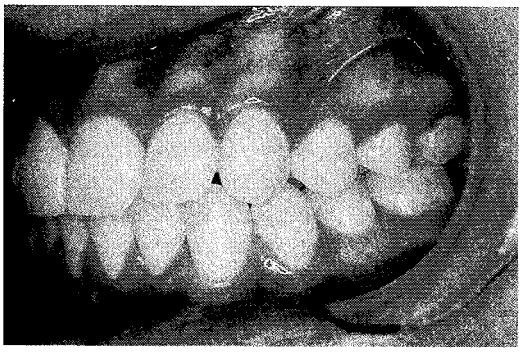

Figure 5c.

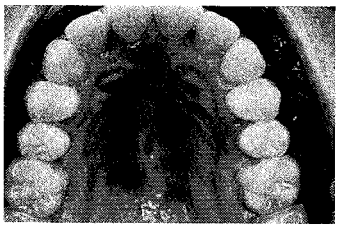

Figure 5d and e. Post-treatment maxillary and mandibular occlusal views.

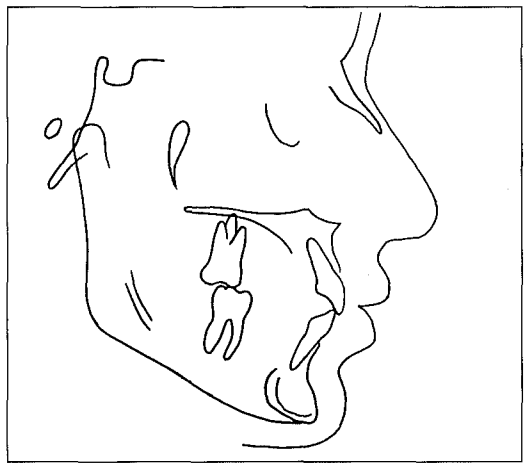

Figure 7. Post-treatment cephalometric tracing.

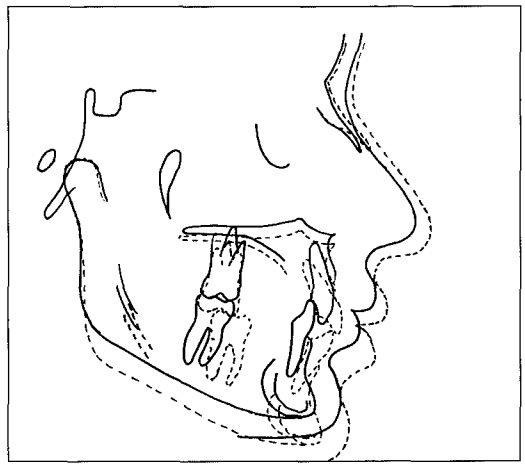

Figure 8. Pre- and post-treatment superimpositions.

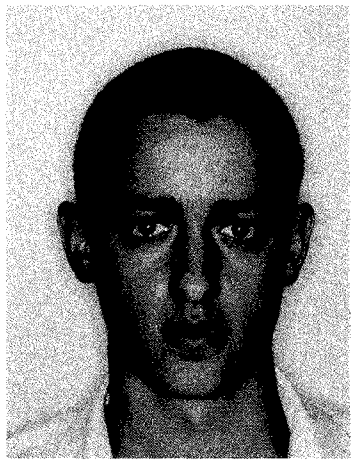

Figure 6a. Post-treatment extraoral frontal view.

Figure 6b. Post-treatment facial profile.

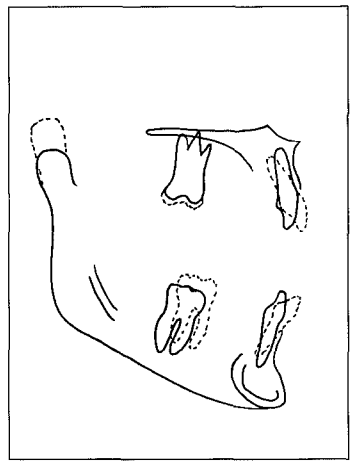

Figure 9. Maxillary and mandibular superimpositions.

of the upper or lower incisors. Correction of the buccal occlusion occurred by mesial movement of the lower molars. Coupled with a subtle forward anterior change in mandibular position, the molar changes led to an improvement in the patient's vertical relationship by an increase in lower facial height. The overall effect was of improved proportions and aesthetics.

The essence of Begg mechanotherapy is an interplay between the anchorage bend in the archwire and Class II elastics. A balance in the applied forces is essential for successful treatment. However, inappropriate use of Class II elastics may result in unwanted treatment effects. As reported by Phillipe[2] and Schumacher *et al.*,[3] the direction and magnitude of the application of elastics can produce excessive extrusive effects on the mandibular molars, as well as an increased mesial tilt. The molar change may then cause a downward and backward rotation of the mandible that increases the mandibular plane angle and worsens the Class II relationship. Limiting undesired molar extrusion may be achieved by varying the magnitude of the elastic force or changing both the vertical and antero-posterior position of the intermaxillary hooks on rigid archwires (Xu *et al.*;[4] Phillipe[2]). However, the present case reveals that molar extrusion may be an advantageous movement that has the potential to increase a patient's deficient vertical proportions and so improve facial aesthetics.

Although lower molar extrusion was a feature of the treatment of this case, there was no significant change evident in the mandibular plane angle. An increase in mandibular size indicated by an increase in Co-Pog length and a substantial increase in ramal height may provide an explanation. It was

also evident that fixed appliance management coincided with the patient's entry into his pubertal growth phase, which greatly assisted treatment. Mandibular superimposition revealed the significant condylar change that occurred during the treatment period.

The use of light Class II elastic traction against initial archwires that had moderate anchorage bends facilitated Class II tipping correction and bite opening of the presented case. The placement of heavy archwires as soon as tooth alignment had been achieved, and the addition of uprighting and torquing auxiliaries corrected tooth angulation while light elastic traction continued. The resulting outcome reveals the advantages of tipping and uprighting mechanics in non-extraction treatment of moderate to severe Class II cases.

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