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CLINICAL SECTION

The William Houston Medal of the MOrth of the Royal College of Surgeons of Edinburgh 2003 and the BOS MOrth Cases Prize 2003

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This paper describes the orthodontic treatment of 2 cases that were presented by the winner of the William Houston Medal of the MOrth of the Royal College of Surgeons of Edinburgh at the June 2003 diet of the examination. The cases were also successful presented for the British Orthodontic Society MOrth Cases Prize 2003.

Key words: Fixed Twin Block, pre-adjusted edgewise appliance, cleft lip

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Introduction

The William Houston Medal of the MOrth of the Royal College of Edinburgh is awarded to the candidate achieving the highest marks in Part II of examination. Five treated cases are submitted as part of this examination and the cases discussed here were two of those presented by the winning candidate in June 2003. The British Orthodontic Society MOrth Cases Prize is held annually and open to those who have passed the Membership in Orthodontics examination during the previous 13 months. The 2 cases discussed were also successfully submitted for the award at the 2003 Bournemouth Conference.

Case report 1

A 14 year old male patient presented complaining of the poor appearance of his 'rolled up' lower lip and spaces between his upper teeth.

Examination revealed a Class II division 1 incisor relationship on a moderate Skeletal II base with mandibular retrognathia. The Frankfort–mandibular planes angle and lower face height were reduced. The lips were incompetent at rest with the everted lower lip trapped behind the upper incisors. The naso-labial angle was within the normal range and the lower lip was on Rickett's E-plane. There were no signs or symptoms of TMD.

Intra-orally the oral hygiene was of a moderate standard with areas of marginal gingivitis. Tooth quality was good with no restorations or carious lesions.

In the maxillary arch the labial segment was spaced and the incisors were proclined. The upper buccal segments were well aligned and also spaced. In the mandibular arch, the labial segment was spaced and the incisors proclined. The lower second premolars were unerupted and short of space. The curve of Spee was increased, measuring 3 mm at its deepest point.

In occlusion, there was an overjet of 10 mm, and the overbite was increased at 7 mm and complete. The centre lines were correct and coincident with the facial midline. The molar relationship on the right was a quarter unit Class II and the canine was a full unit Class II. On the left, the molar was a half unit Class II and the canine a full unit Class II. The maxillary first premolars exhibited a scissor bite (Figure 1).

The Dental Health Component of the IOTN was 5a and the Aesthetic Component was 7.

The OPG radiograph showed all the permanent teeth to be present including the unerupted third permanent molars. No carious lesions were detected and the alveolar bone levels were normal (Figure 2).

Cephalometric analysis confirmed the clinical findings of a moderate skeletal Class II skeletal pattern with an ANB of 6°. The maxillary–mandibular plane angle was reduced at 18° and the lower face height proportion was 51%. The upper incisors were proclined at 124° and the

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Figure 1 Case report 1: pre-treatment extra-oral and intra-oral photographs

Figure 2 Case report 1: pre-treatment panoral radiograph

lower incisors were proclined at 101°. The lower incisors were on the A–Po line. Figure 3 shows the pre-treatment cephalometric radiograph and the cephalometric analysis is presented in Table 1.

The aims of treatment were:

- oral hygiene to an exemplary standard;
- sagittal correction of malocclusion with reduction of overjet and achievement of Class I molar and canine relationships;
- overbite reduction;
- level, align and close space;

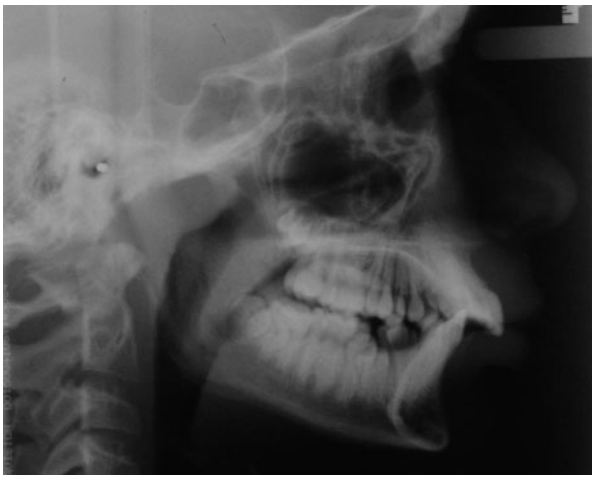
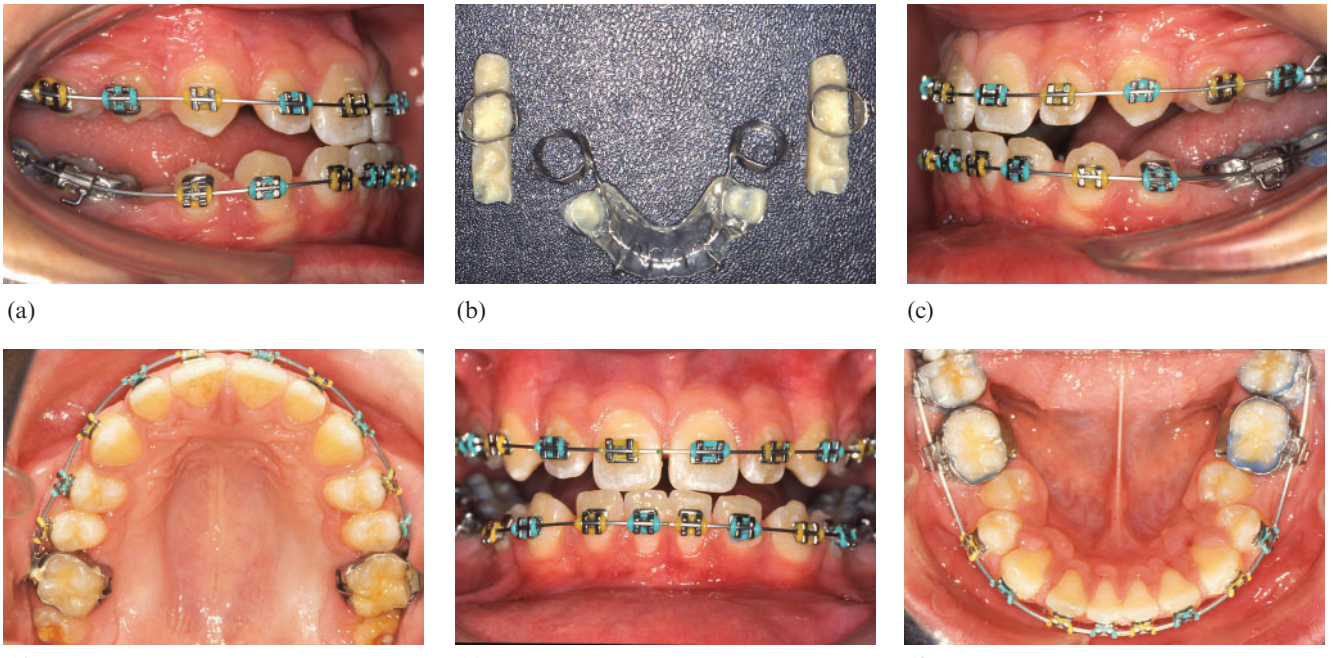


Figure 3 Case report 1: pre-treatment lateral cephalogram

(a) (b)

Figure 4 Case report 1: Fixed Twin Block appliance



(a) (b) (c)

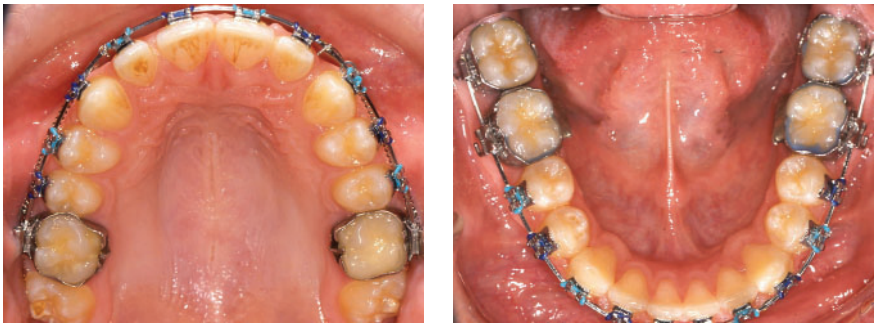
(d) (e) (f)

Figure 5 Case report 1: upper and lower 0.018 × 0.025 Neo-sentalloy archwires

Table 1 Case report 1: cephalometric analysis

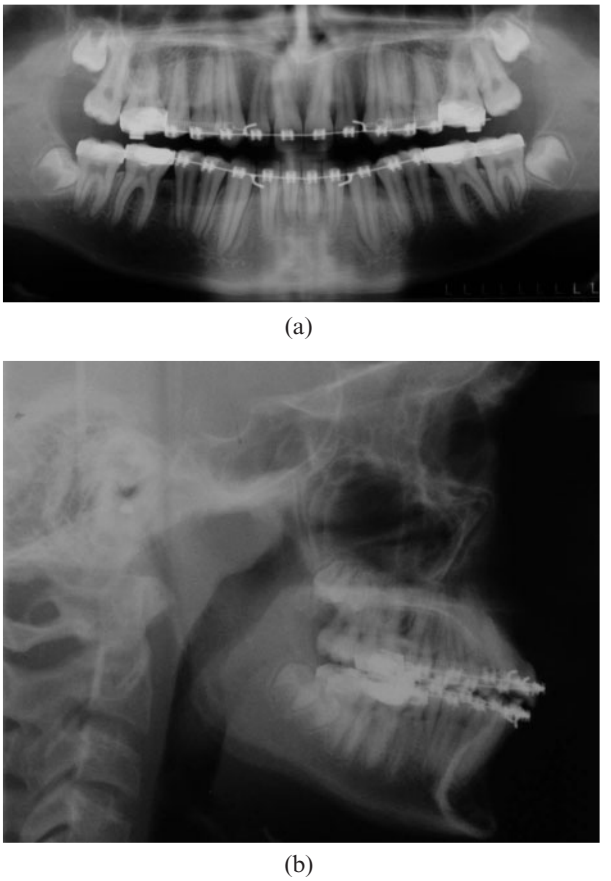
	Pre-treatment	Post-Twin Block	Post-treatment	Treatment change
SNA (°)	81	81	80	−1
SNB (°)	75	79	78	+3
ANB (°)	6	2	2	−4
SN/MxP (°)	11	11	11	0
MMPA (°)	18	18	20	+2
LFH (%)	51	53	52	+1
UI/MxP (°)	124	119	119	−5
LI/MnP (°)	101	107	100	−1
LI/APo (mm)	0	6.5	4	+4
UI/LI (°)	117	116	121	+4

(a) (b) (c)



(d) (e)

Figure 6 Case report: upper and lower 0.019 × 0.025 stainless steel working archwires with bilateral upper NiTi closing coils



(a) (b)

Figure 7 Case report 1: near end of treatment panoral and lateral cephalogram

- achievement of a good functional occlusion, as well as static occlusion.

The treatment plan involved:

- oral hygiene instruction from our hygienist;
- Fixed Twin Block appliance;
- upper and lower pre-adjusted edgewise appliances (0.022 × 0.028-inch slot) with MBT prescription;
- space closure;
- retention.

Active treatment began once the oral hygiene was of a suitable standard. Bands were selected and alginate impressions obtained with these in place to allow the laboratory to construct the Fixed Twin Block appliances. The registration for the Fixed Twin Block appliance was with an edge-to-edge bite with 7–8 mm vertical separation of the premolars. The Fixed Twin Block appliance is shown in Figure 4.

After 3 months of treatment with the Fixed Twin Blocks, the upper arch was bonded with MBT brackets. A 0.016-inch Sentalloy archwire was placed with lacebacks to the upper canines. The Twin Block was reactivated at this stage by a further 4 mm.

After a further 4 months the lower arch was bonded and a 0.016-inch Sentalloy archwire placed with bilateral lacebacks.

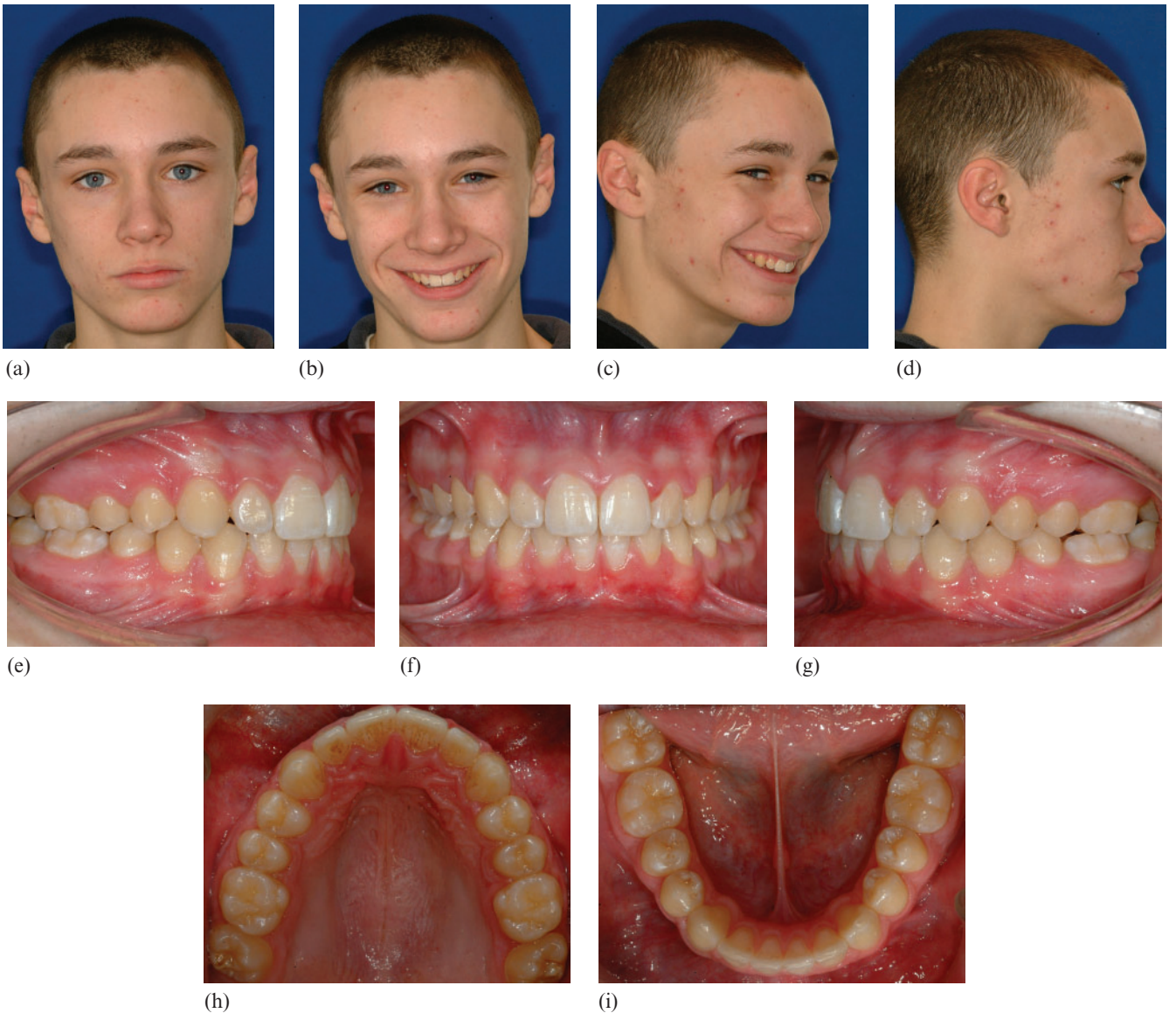


Figure 8 Case report 1: post-treatment extra-oral and intra-oral photographs

The Fixed Twin Blocks were removed 9 months after being fitted and a cephalometric radiograph obtained. The incisor relationship and the buccal segments were over-corrected to a Class III relationship at this stage.

At this stage upper and lower 0.018×0.025-inch Sentalloy archwires were placed and the lower second molars were banded (Figure 5). Thirteen months into treatment, co-ordinated upper and lower 0.019×0.025-inch stainless steel working archwires were placed. Nickel titanium closing coils were used in the upper arch to close space (Figure 6). Near end of treatment radiographs were obtained to assess root paralleling and incisor angulations (Figure 7).

Finishing was achieved using upper and lower 0.014-inch regular stainless steel archwires with extrusion bends to correct marginal ridge discrepancies.

After exactly 2 years of treatment, the appliances were debonded, and upper and lower Essix retainers were fitted (Figure 8).

Case 1 assessment

This young man presented with a moderately severe Skeletal II discrepancy with mandibular retrognathia. There was bimaxillary dental protrusion and the lower lip functioned palatally to the upper incisors.

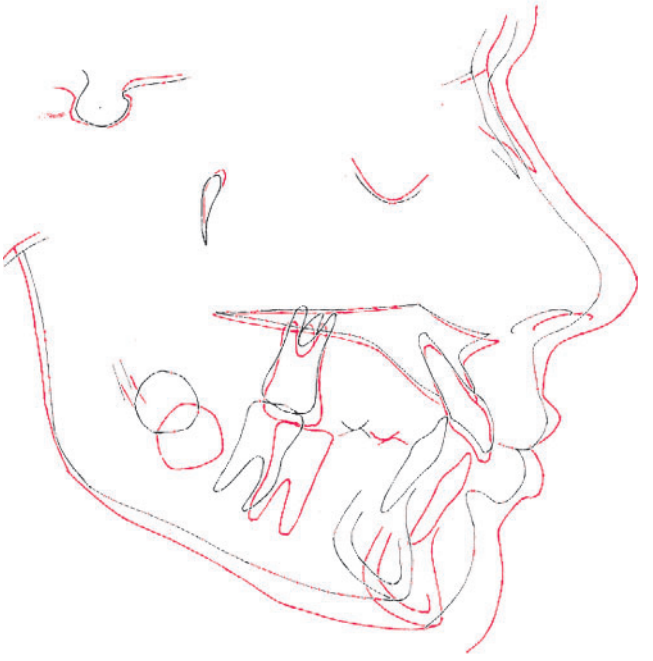


Figure 9 Case report 1: pre-treatment and near end of treatment cephalometric superimpositions

The upper and lower arches were spaced anteriorly; however, there was a shortage of space in the lower buccal segments for the unerupted lower second premolars. Treatment of the malocclusion with functional appliances was an appropriate approach in view of the patients profile and age. Perhaps the only contra-indication was the proclined lower incisors (101°); however, this is within the expected range considering the reduced MMPA (18°). The use of the Fixed Twin Block appliance allowed reduction of the overjet, and correction of the buccal segment relationship in conjunction to the commencement of leveling and aligning. One disadvantage of the Fixed Twin Block appliance is that it is not possible to trim the upper block and remove the clasp from the lower molar, as with conventional Twin Blocks, to aid in reduction of the overbite.

After the functional phase of treatment considerable favorable mandibular growth has occurred with the SNA remaining unchanged, but SNB increasing by 4° to 79°. The lower face height percentage increased during this phase of treatment from 51 to 53%.

The Fixed Twin Block had produced the usual dento-alveolar effects, which were some retroclination of the upper incisors and some proclination of the lowers. Reassessment of the crowding after the functional phase of treatment indicated that there was sufficient space to allow alignment of the now partially erupted lower second premolars and correct the proclination of the lower incisors.

The use of an inclined bite-plane to maintain the sagittal correct was not deemed necessary due to the over-correction achieved. The 0.019×0.025-inch stainless steel working archwires were soon placed and there was scope for the use of Class II elastics to maintain the sagittal correction.

The $-6°$ of torque in the lower incisors of the MBT prescription helped control lower incisor proclination. A cephalogram taken near the end of treatment demonstrates that considerable favorable mandibular growth had occurred, with an increase in SNB and an associated reduction in ANB by $4-2°$.

A small amount of upper incisor retroclination had occurred although the upper incisors remained proclined at the end of treatment at 119°. The inclination of the lower incisors remained virtually unchanged at the end of treatment at 100°; however, they are advanced in relation to the A–Po line. These effects are highlighted by the cephalometric superimpositions shown in Figure 9.

There has been an improvement in the facial profile. Lip competency has been achieved and the lower lip no longer functions behind the upper incisors. A good buccal interdigitation was achieved and a good functional occlusion obtained. The pre-treatment PAR score of 47 had reduced to 5, representing an 89% reduction.

Some demineralization has occurred on the occlusal surface of the lower right first premolar. This may well have been caused by the Fixed Twin Block appliances.

Case report 2

A Caucasian male aged 12 years and 5 months presented after referral by his general dental practitioner

Table 2 Case report 2: cephalometric analysis

	Pre-treatment	Post-treatment	Treatment change
SNA (°)	73	72	−1
SNB (°)	70	69	−1
ANB (°)	3	3	0
SN/MxP (°)	12	12	0
MMPA (°)	29	30	1
LFH (%)	57	58	+1
UI/MxP (°)	96	107	+11
LI/MnP (°)	82	96	+14
LI/APo (mm)	0	3	+3
UI/LI (°)	155	125	−30

Figure 10 Case report 2: pre-treatment extra-oral and intra-oral photographs

complaining of crooked teeth. There was a history of a previous repair of an incomplete cleft of the lip and primary palate, and repaired cleft of the soft palate.

He presented with a Class II division 2 incisor relationship and 4-mm overjet on a Class I skeletal base with a high Frankfort–mandibular plane angle. There was severe upper crowding and moderate lower crowding.

Extra-orally, the lip repair was satisfactory. The lips were incompetent at rest and there was 3 mm of gingival display on smiling with an increased naso-labial angle. There was a high lower lip line and the lower lip was 3 mm behind Rickett's E-plane. No signs or symptoms of TMD were detected.

Intra-oral examination revealed oral hygiene of a moderate standard with some areas of marginal gingivitis. Tooth quality was good, but areas of enamel hypoplasia affected the labial surfaces of the upper left central and lateral incisors.

The maxillary arch had a constricted 'V' shape and was severely crowded. There was a notch in the primary palate between the left lateral incisor and canine. The left lateral incisor was rotated mesiolabially by 90° and

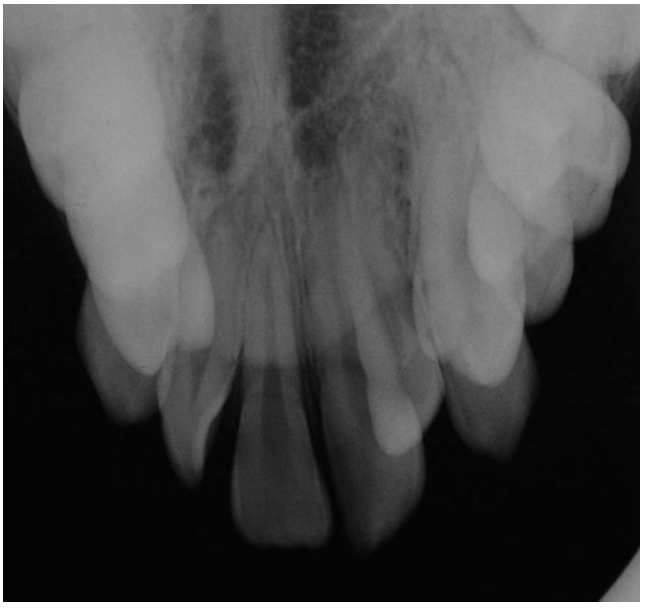


Figure 11 Case report 2: pre-treatment anterior occlusal radiograph

Figure 12 Case report 2: pre-treatment panoramic radiograph

the upper right canine was buccally excluded. The upper right lateral incisor was positioned palatally and the central incisors were retroclined. The buccal segments were well aligned.

In the lower arch there was moderate crowding and a retroclined lower labial segment. The curve of Spee was increased and measured 3 mm at its greatest depth. The overbite was increased and complete at 5 mm. The upper dental centreline was displaced by 2 mm to the right and the lower by 1 mm to the left of the mid-facial axis. The molar relationship was Class I on the right and the canine was ½ unit Class II, on the left the molar and canine were both ¼ unit Class II. Crossbites affected the upper first premolar and lateral incisor on the right and the lateral incisor, both premolars and first molar on the left. On closing there was a 1-mm anterior displacement from initial contact on the maxillary right lateral incisor (Figure 10).

The Dental Health Component of the IOTN was 5p and the Aesthetic Component was 9.

Radiographic examination confirmed the presence of all the permanent teeth. No loss of bony continuity was obvious on the anterior occlusal radiograph (Figure 11) and the alveolar bone levels were normal. No caries were detected (Figure 12).

Cephalometric analysis confirmed the Class I skeletal pattern with an ANB of 3°, however both SNA and SNB were over 2 standard deviations less than mean values at 73 and 70°, respectively. Both the MMPA and lower face height percentage were slightly increased, but within the normal range. The upper and lower incisors were considerably retroclined and the inter-incisal angle was increased. Figure 13 shows the pre-treatment cephalometric radiograph and the cephalometric analysis is presented in Table 2.

A space analysis was carried out using the study models and lateral cephalogram. The arch length discrepancies were 7 mm in the lower and 11 mm in the upper arch. An additional 1 mm of space was required in the lower to level the curve of Spee. Expansion of the upper arch would create 2 mm of space; however, an additional 2 mm of space was required to torque the upright upper incisors. The overall result was a space requirement of 8 mm in the

Figure 13 Case report 2: pre-treatment lateral cephalogram

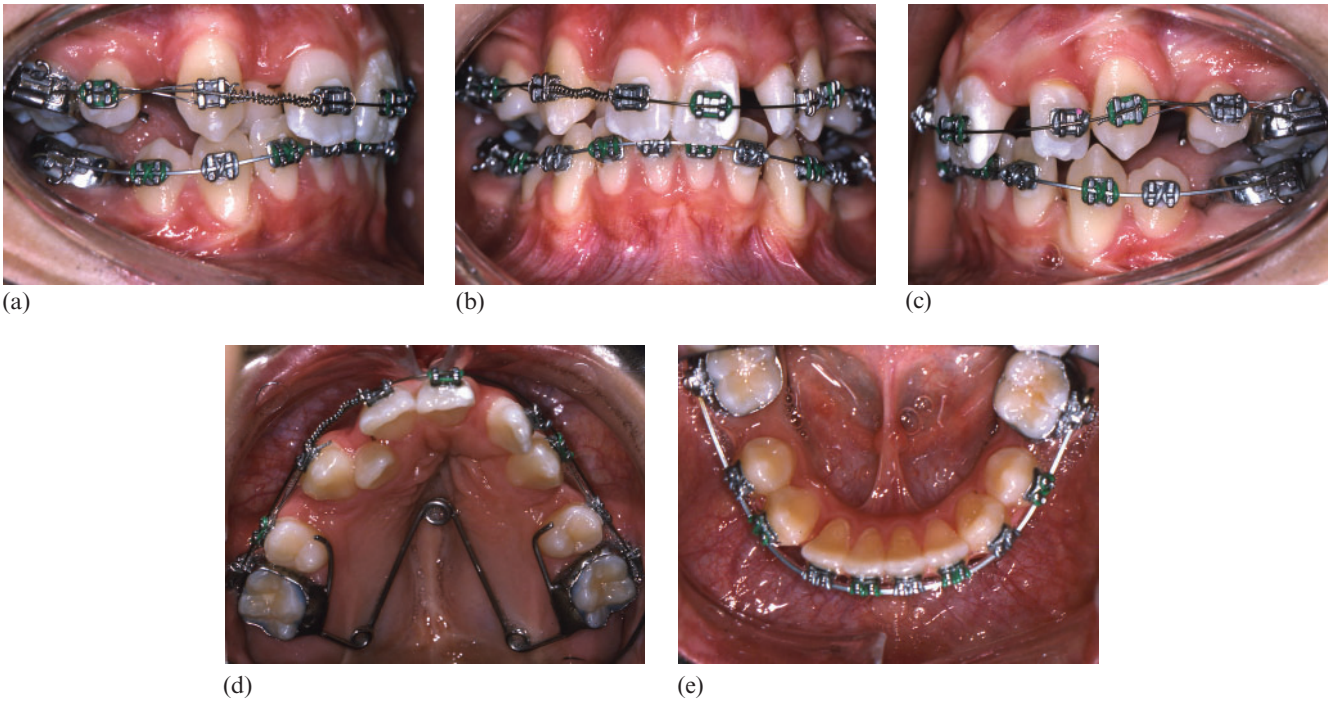


Figure 14 Case report 2: upper 016 stainless steel archwire with NiTi push-coil and lower 18 × 25 Sentalloy archwire

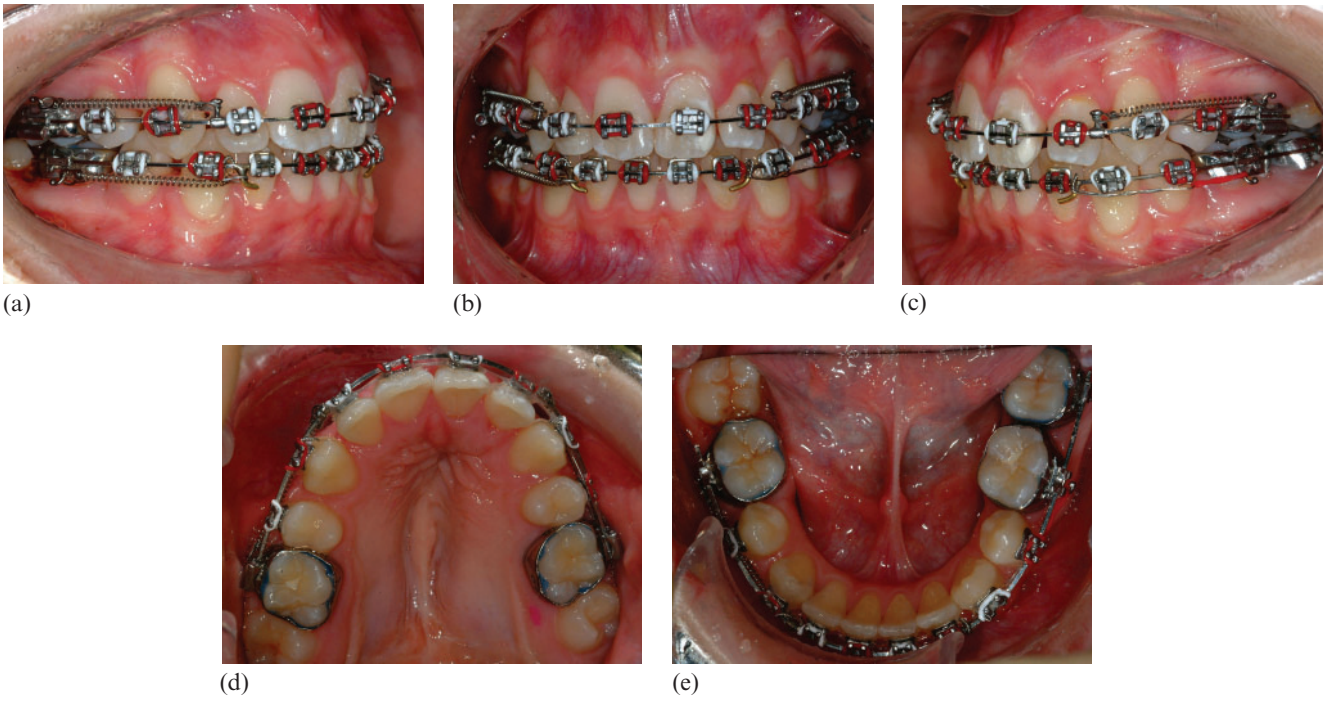
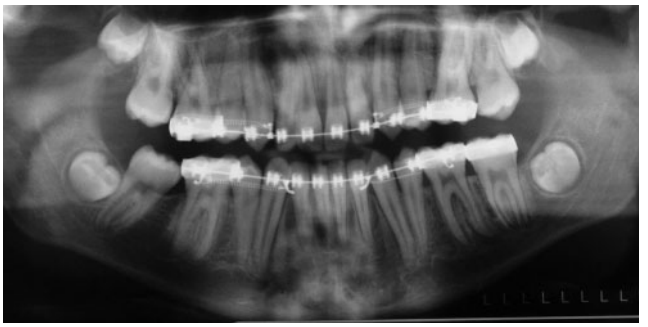
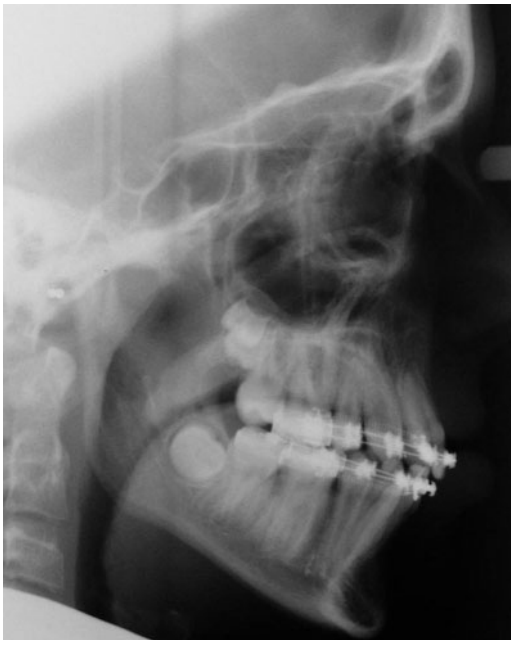


Figure 15 Case report 2: space closure in upper and lower 19 × 25 archwires



(a)



(b)

Figure 16 Case report 2: near end of treatment panoral and lateral cephalogram

lower arch and 11 mm in the upper arch. Extraction of the lower second premolars and upper first premolars would result in a slight excess of space that required mesial molar movement to close. Only a small amount of mesial upper molar movement was allowable; consequently, anchorage reinforcement was indicated.

The aims of treatment were:

- oral hygiene to an exemplary standard;
- relieve crowding;
- correction of the crossbites;
- reduce the overjet and overbite;
- correct the center lines;
- obtain a Class I molar, canine and incisor relationship;
- achieve a good functional occlusion as well as static occlusion.

The treatment plan was:

- oral hygiene instruction;
- extraction of 14, 24, 35 and 45;
- trihelix to expand;
- high pull headgear;
- upper and lower pre-adjusted edgewise appliances (0.022×0.028-inch) with Roth prescription;
- retention.

Once the oral hygiene was of the required standard the general dental practitioner was requested to extract the upper first premolars and the lower second premolars. The trihelix, and upper and lower pre-adjusted edgewise appliances were fitted, and upper and lower 0.014-inch Sentalloy archwires placed with lacebacks to all 4 canines.

One month later, after the upper first molar had de-rotated slightly high-pull headgear was fitted with 500 g force per side to be worn 12 hours per day. The patient proved to be extremely co-operative and compliance with the headgear wear was so good that this was discontinued 6 months after it had been fitted.

A 0.016-inch round stainless steel upper archwire was placed after 4 months to allow the use of nickel titanium push coil to open space for the palatally positioned right lateral incisor (Figure 14). When adequate space had been created the right lateral incisor was picked up using a 0.014-inch Sentalloy 'piggy-back' archwire. The lower left second molar was banded 7 months into treatment upper and lower 0.018×0.025-inch Sentalloy wires were placed. Coordinated 0.019×0.025-inch stainless steel working archwires were fitted 11 months after treatment commenced. Nickel titanium closing coils were used to close space (Figure 15). Near end of treatment radiographs were obtained to assess root paralleling and incisor angulations (Figure 16). Several brackets were repositioned.

Eruption of the lower right second molar was delayed and the tooth had a mesial tip once it erupted. The tooth was therefore bonded and a rectangular 0.018×0.025 Sentalloy used for initial alignment. Towards the end of treatment the upper left second molar was bonded due to its poor position. A lower 0.016-inch round stainless steel archwire, with second order bends, allowed final detailing. Light Class II traction was used to improve the buccal segment relationship and interdigitation (Figure 17).

Treatment was completed after 26 months. An upper bonded canine-to-canine retainer was used in

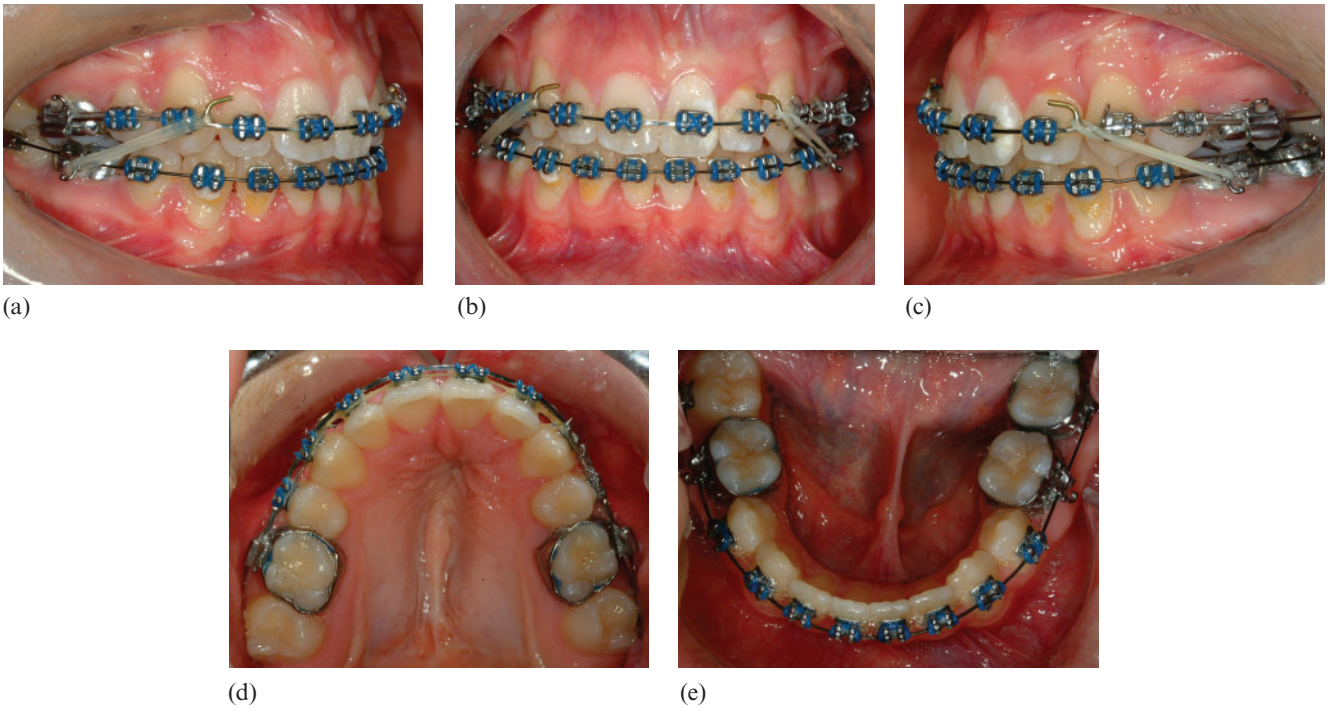


Figure 17 Case report 2: final detailing using lower 016 stainless steel archwire and light class II elastics

conjunction with upper and lower Hawley retainers (Figure 18).

Case 2 assessment

The presence of the incomplete cleft of the lip, primary palate and soft palate, and the subsequent surgical repair are the primary factor in the development of this patients' malocclusion. This has distorted the upper arch and compounded the tooth size/arch length discrepancy.

The trihelix allowed differential expansion, with a greater buccal movement in the premolar region than across the molars. This allowed correction of the bilateral crossbites.

Careful space analysis revealed that there was a requirement for high-pull headgear, which was used for a short period to reinforce the anchorage in the upper arch. The patients' compliance with this aspect of treatment facilitated the excellent occlusal result that was produced.

The severity of crowding indicated that extractions were necessary. The extraction of the lower second premolars and upper first premolars provided enough space for relief of this crowding, and facilitated the correction of the molar and canine relationships.

Cephalometrically, there has been a reduction in SNA with treatment. This is probably due to a combination of factors including the torquing of the upper incisors (from 96 to 107°) and possibly some headgear effect. Growth has been downwards and backwards, with a slight increase in the maxillary mandibular plane angle and the vertical face height percentage. The upper incisors have been torqued during treatment and the lower incisors were proclined; consequently, the inter-incisal angle increased to 125°. The overall effects of treatment are shown in the cephalometric superimpositions (Figure 19).

Long-term retention is indicated as the potential for relapse is high. There was no obvious enamel demineralization.

Acknowledgements

I would like to thank all of the consultants at Chesterfield Royal Hospital and the Charles Clifford Dental Hospital, Sheffield for the excellent clinical and academic teaching I received. I would like to particularly thank Mr Jonathan Sandler and Dr Philip Benson for supervising the 2 cases.

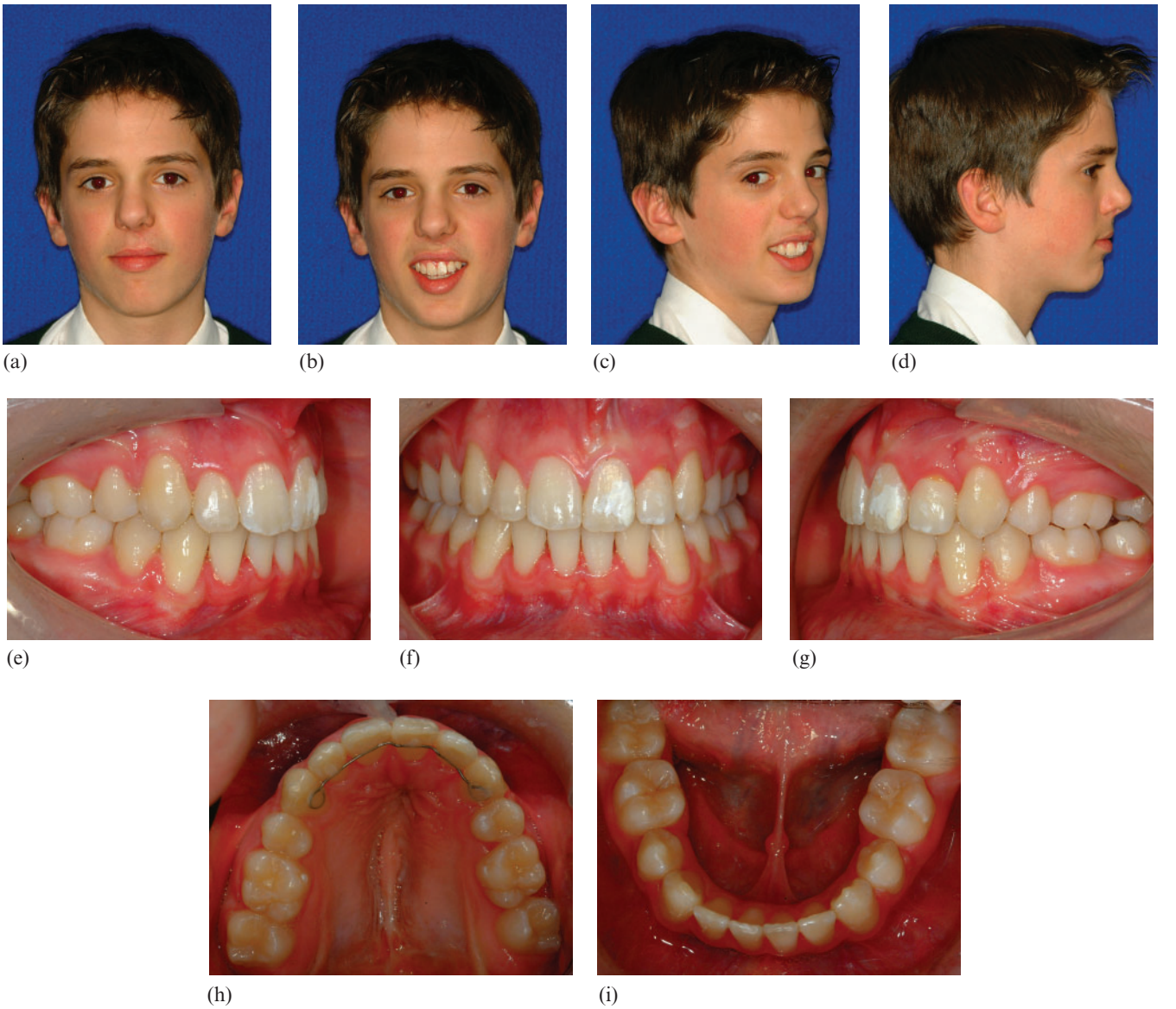


Figure 18 Case report 2: post-treatment extra-oral and intra-oral photographs

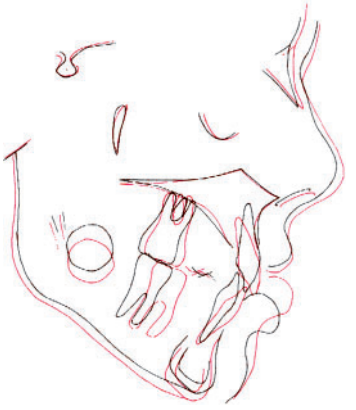


Figure 19 Case report 2: pre-treatment and near end of treatment cephalometric superimpositions