

**CLINICAL
SECTION**

The William Houston Gold Medal Prize in the M.Orth. Exam of the Royal College of Surgeons of Edinburgh Held in Edinburgh, 2000

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Introduction

This award was established in Edinburgh, and is a gold medal and certificate awarded to the candidate with the highest overall mark in the Part II of the examination. The prize is only awarded if the examiners believe the candidate's performance is of a sufficiently high standard.

As part of the examination, which includes clinical cases, diagnostic tests, and oral examinations, the candidate must present five personally treated, fully documented cases on which the candidate is examined orally. Details of two of the treated cases are presented in this paper.

Case Report 1

An 18-year-old Caucasian female was referred by her General Dental Practitioner complaining about 'the gap between her front teeth' and that 'her front teeth stuck out'.

On extra oral examination, she presented with a moderate Class II skeletal base, a reduced Frankfort mandibular planes angle, and lower anterior face height. There was no apparent facial asymmetry. Soft tissue examination revealed incompetent lips with the lower lip trapped frequently behind the upper incisors. The nasolabial angle was slightly increased and the labio-mental fold deepened (Figure 1a–d).

Intra-oral examination revealed a full permanent dentition, with good oral hygiene and dental condition. The mandibular arch form was symmetrical and rounded, with the lower labial segment well aligned and mildly proclined. The buccal segments were well aligned with the lower right second premolar rotated disto-lingually. The

maxillary arch form was symmetrical and rounded, with the upper labial segment proclined and spaced with a midline diastema of 3 mm. There was a prominent upper labial fraenum, which exhibited blanching on retraction of the upper lip. The buccal segments were generally well aligned with the upper second molars displaced palatally and mesio-palatally rotated (Figure 2a–e).

In occlusion, the incisor relationship was a Class II division 1 with an overjet of 11 mm to the mesial incisal edge of the upper central incisor, and an increased and complete overbite. The centrelines were coincident and with the mid-facial axis. The buccal segment relationships were more than a full unit Class II on the molars and a full unit Class II on the canines bilaterally. There were no cross bites and no displacements detected on assessment of the functional occlusion.

The panoramic radiograph revealed the presence of the complete dentition including all four third molars. There was a suspicion of occlusal caries in the occlusal of the lower right first molar and this was referred to the General Dental Practitioner for investigation before commencement of the treatment. The upper standard midline occlusal radiograph revealed notching in the midline, which may have been indicative of a fraenal attachment. The cephalometric analysis (Figure 3) confirmed a moderate Class II skeletal base with the maxilla being prognathic and the ANB at 8 degrees. The vertical proportions were reduced with the mandibular maxillary planes angle at 19 degrees and the lower anterior face height at 50%. The upper incisors were proclined at 129 degrees and the lowers mildly proclined at 103 degrees, although this was within normal limits for the reduced mandibular maxillary planes angle. The inter-incisal



Fig. 1 Extra-oral photographs.



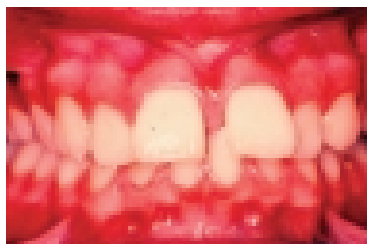
(d)

Table 1 Case 1. Cephalometric values

	Pre-treatment	Post-treatment
SNA (°)	90	89
SNB (°)	82	82
ANB (°)	8	7
MMPA (°)	19	23
LAFH/TAFH (%)	50	53
UI/Mx.P (°)	129	100
LI/Mnd.P (°)	103	105
Inter-incisal angle (°)	108	138
LI/A.Po line (mm)	0	2
LI/Ricketts E line (mm)	+1	-2.5
Witts (mm)	7	4



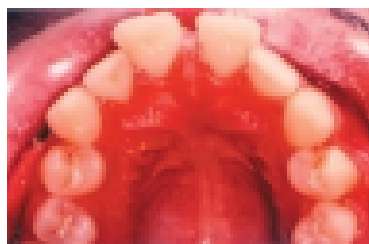
(a)



(b)



(c)



(d)



(e)

Fig. 2 Intra-oral photographs.

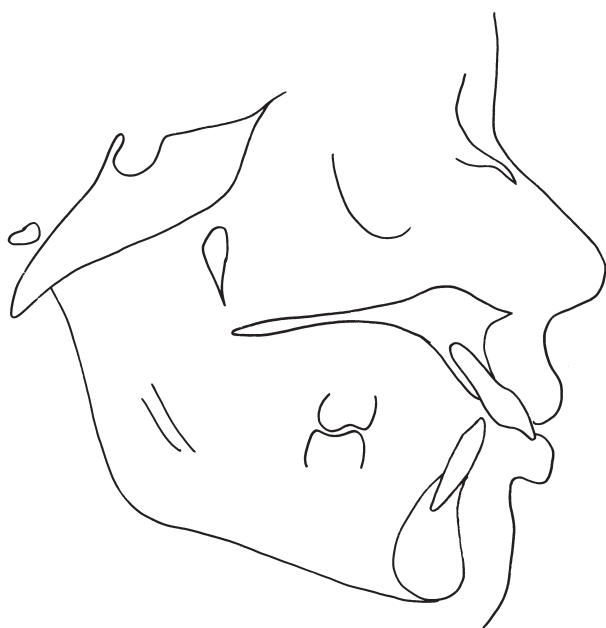


Fig. 3 Pre-treatment cephalometric tracing.

angle was reduced at 108 degrees. The Witts analysis (7 mm) also suggested a moderate Class II skeletal base. The cephalometric analysis is presented in Table 1.

The Dental Health Component of the Index of Orthodontic Treatment Need (IOTN) was 5a, as the overjet was greater than 9 mm, while the Aesthetic Component was 9. The pre-treatment weighted Peer Assessment Rating (PAR) score was 39.

The aetiology of the presenting malocclusion was multifactorial, due to the anteroposterior and vertical skeletal factors, the incompetent lips and lower lip trap, the proclination of the incisors and the fraenal attachment.

The aims of the treatment were:

1. Alignment and co-ordination of the arches
2. Achievement of a Class I incisor, canine and molar relationship using orthodontic treatment alone to camouflage the underlying skeletal discrepancy
3. Achievement of a Class I incisor correction within a stable soft tissue environment, with the lower lip acting labially to the upper incisors.

The patient may have benefited from a joint orthognathic and orthodontic approach, but she did not want to undergo surgery, and was keen to try orthodontic camouflage even if there was a compromise result or permanent retention involved. Her complaint was one of dental aesthetics, rather than facial appearance.

The treatment plan was:

1. Selection of bands for a transpalatal arch (TPA) attached to the upper second molars.
2. Fit of the TPA and extraction of the upper first molars.
3. Placement of bands on the lower first molars and Tip Edge brackets to the incisors and canines in both arches.

Rationale for treatment

The lower arch was well aligned with mildly proclined incisors, but was treated on a non-extraction basis accepting the fact that, although every effort to maintain the lower labial segment would be made, there may be some forward movement. Extraction in the lower arch would have risked retroclination of the lower labial making the Class II relationship worse, and making correction of both the anteroposterior and vertical problems more difficult.

In the upper arch, rather than mid-arch extractions and resulting Class II molar relationship, a first molar extraction pattern was chosen. The molars were already more than a full unit Class II and, therefore, headgear support, as well as extractions would have been necessary. This would have been difficult in an adult patient where the third molars were near eruption. A decision was made to extract the upper first molars and increase the anchorage with a transpalatal arch. Once the incisors were overcorrected and the premolars in a Class I relationship the TPA could be removed and the second molars guided into a Class I relationship with the lower first molars. The upper third molars should erupt favourably distal to the upper second molars. Class III elastics could be used in order to close the spaces in the upper arch and this would also help to minimize the forward movement of the lower labial segment.

Treatment

The treatment time was 27 months and was completed in 26 visits with no breakages or failed appointments.

The stages described by the Tip Edge system Stage I commenced with the aims to align the labial segments, correct rotations, create Class I buccal segments and create an edge-to-edge incisor relationship (Figure 4a–h). This took seven months and Stage II took 3 months to pre-Stage III.

The aims of Stage II were to maintain the Class I correction and to close residual spaces. This enables the

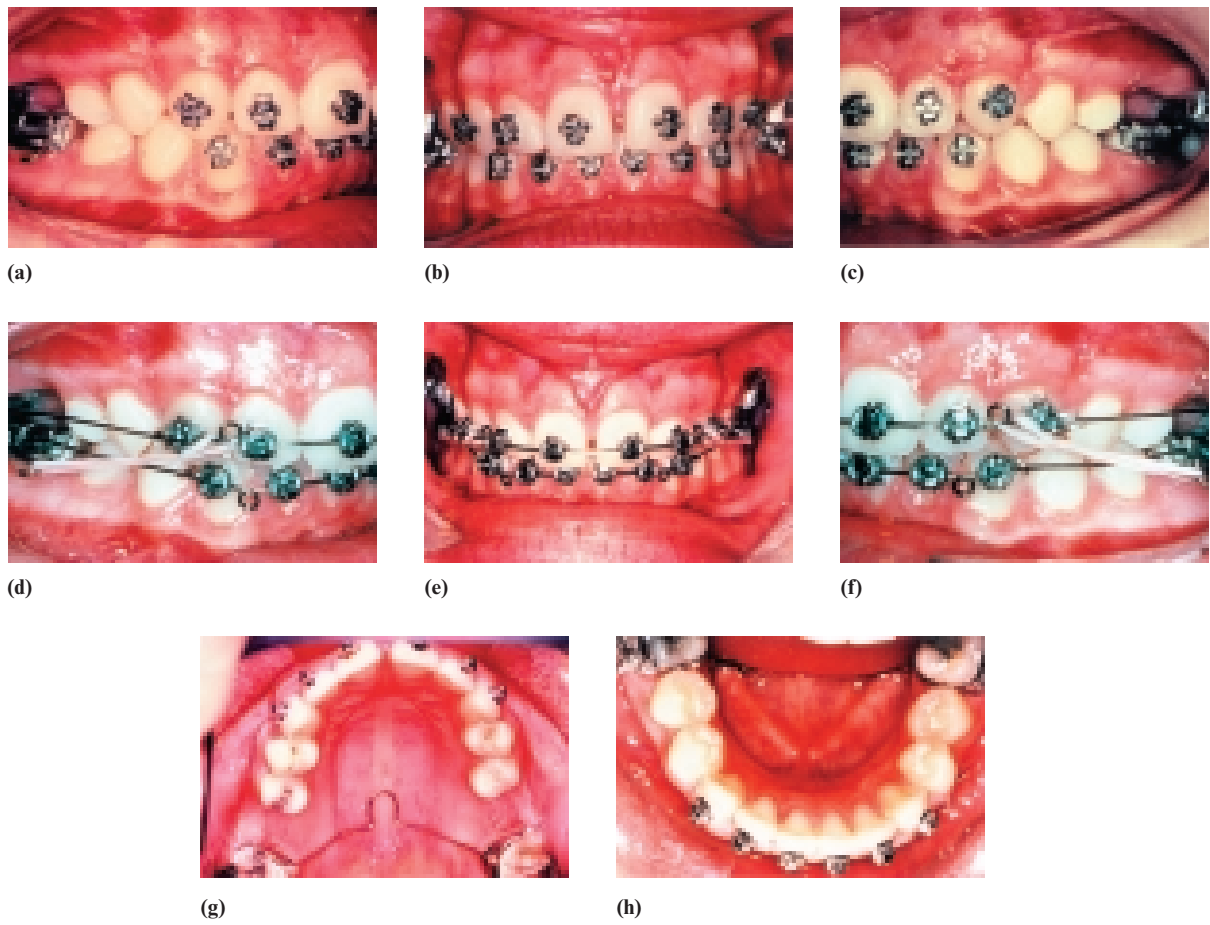


Fig. 4 Mid-treatment photographs.

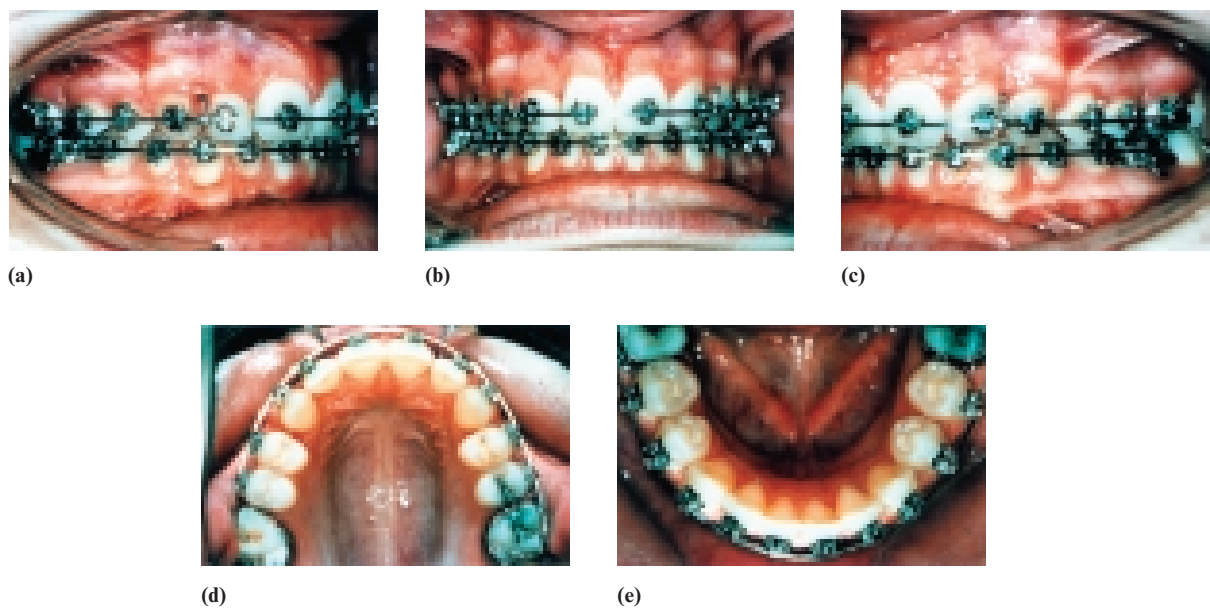


Fig. 5 Mid-treatment photographs.

Stage III preparation allowing placement of co-ordinated stainless steel archwires so that final inclination and angulation and detailing of Stage III can proceed.

Stage III (Figure 5a–e) took 10 months, and a final cephalometric radiograph was taken to determine the final upper and lower labial segment anteroposterior positions. An inverted pre-torqued co-ordinated archwire was placed in the upper arch to achieve the final upper incisor torque. This took a further 4 months until debond.

At debond bonded retainers were placed, and impressions taken for upper and lower Hawley retainers taken. The patient declined the offer of a fraenectomy, but is happy to have a permanent retainer to maintain the closure of the diastema.

Treatment changes

There were no marked skeletal effects as is to be expected when treating an adult patient. There was a slight increase in the vertical dimension.

The upper incisors had been retroclined from 129 to 99 by mid-Stage III (Figure 6). However, there has been significant torquing of the upper labial segment, since the final radiograph was taken. Inverted pre-torqued archwires were placed after the final radiograph was taken to give increased torque to the upper labial segment. This was a favourable treatment effect, which enabled control of the upper incisors by the lower lip, as well as a reduction of the overjet. The torque control of the upper incisors allowed a favourable inter-incisal angle to be established. The buccal segments show no extrusion but the upper second molar has a more distal position than the original position of the upper first molar.

In occlusion the overjet is 3 mm with a Class I incisor relationship and well interdigitating buccal occlusion. The canines are mildly over torqued and upright.

The cephalometric changes during treatment were primarily dental changes. In the anteroposterior dimension there was a 1 degree change in the ANB. Changes to SNA and SNB during the treatment were attributed to the change in the incisor position, which has affected A and B points. The upper incisor change of 30 is due to tipping and torque of the upper labial segment to 100 by mid-Stage III of treatment. The lower incisors have proclined by 2 to 105 degrees. The lower incisor has moved forward in advance of A–pogonion line by 2 mm. The facial height and maxillary mandibular planes angle are both increased slightly (Figure 7).

Superimposition of ANS–PNS @ ANS shows that

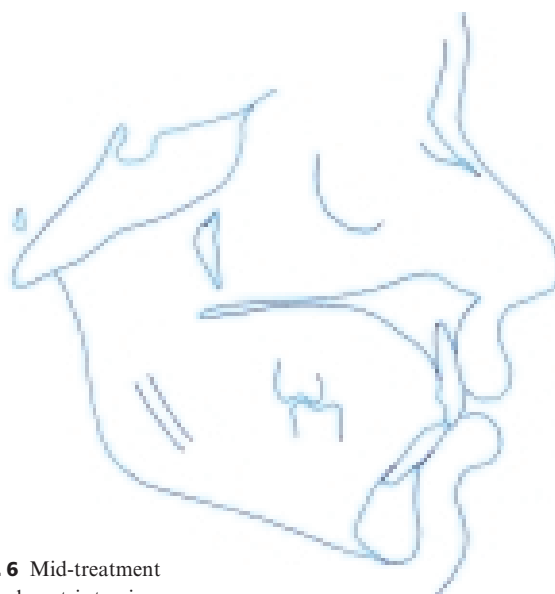


Fig. 6 Mid-treatment cephalometric tracing.



Fig. 7 At or end of treatment cephalometric tracing.

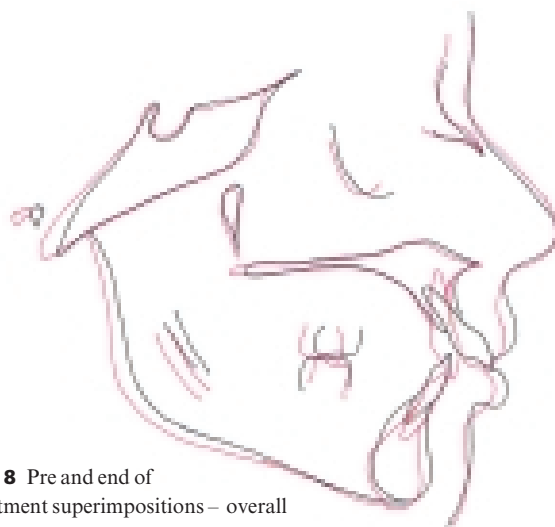


Fig. 8 Pre and end of treatment superimpositions – overall superimposition on Sella-Nasion line at Sella.



Fig. 9 Pre and end of treatment superimpositions – Maxillary superimposition on ANS-PNS@ANS.



Fig. 10 Pre and end of treatment superimpositions – Mandibular superimposition on Björks structures.

the overjet has been corrected by tipping of the upper incisors. The upper second molar finished distal to the original position of the upper first molar. There was little extrusion of the upper posterior segment or incisors (Figures 8–10).

Superimposition of the mandible on Björks structures shows forward movement and intrusion of the lower labial segment. The buccal segments show no extrusion.

The most striking soft tissue effect is the post-treatment lower lip control of the upper incisors. Although the lips remain apart at rest the lower lip covers the incisal third of the upper incisors. This was not possible pre-treatment.

Prognosis

The patient was 18 years old at the start of treatment and had previously been offered a joint orthodontic and orthognathic correction of her malocclusion, which she had declined.

The upper incisors have been retroclined, diastema closed and the lowers proclined slightly and bonded retainers have been provided. The upper third molars

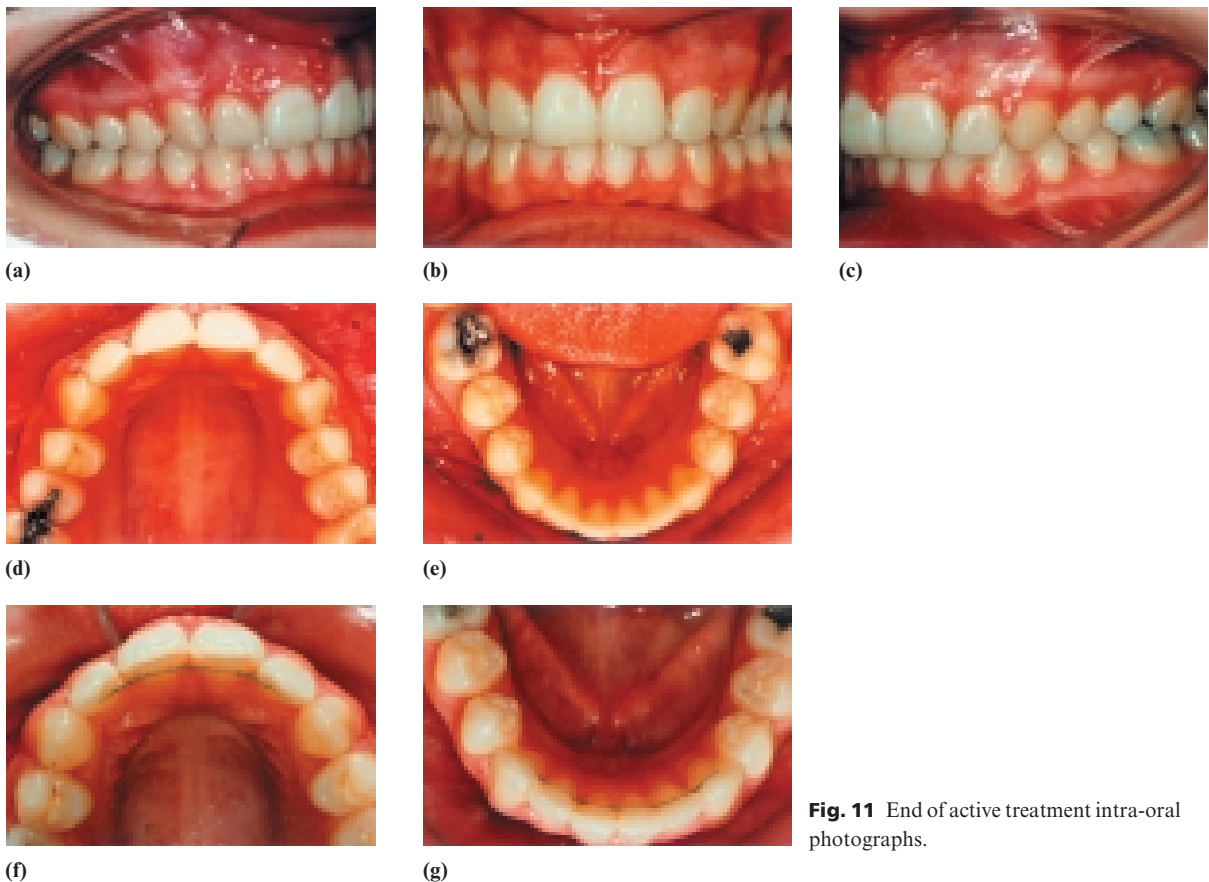


Fig. 11 End of active treatment intra-oral photographs.



Fig. 12 End of active treatment extra-oral photographs.

have erupted into a good position and the lowers continue to be monitored.

The overall well interdigitated Class 1 corrected occlusion is expected to remain stable within the retention restrictions applied (Figures 11a–g and 12a–d).

Occlusal indices

IOTN	Pre-treatment DHC	5a
	Pre-treatment AC	9
PAR	Post-treatment DHC	2g
	Pre-treatment PAR	39
	Post-treatment PAR	2
	% Reduction of PAR score	95%

Case report 2

A 12-year-7-month-old female Caucasian patient was referred by her General Dental Practitioner, complaining that her top teeth were crooked and stuck out.

She presented with a Class I skeletal pattern and increased Frankfort mandibular planes angle. There was no apparent asymmetry. She showed increased anterior dental height and high lip line relative to the gingival level on smiling. The lips were competent and the nasolabial angle increased due to an upturned nasal tip (Figure 13a–d).

Examination revealed a late mixed dentition with good oral hygiene and gingival health. The mandibular arch form was symmetrical and rounded, with the lower labial segment clinically upright. Buccal segments showed mild premolar rotations and spaces distal to the canines. The upper labial segment showed moderate crowding (7 mm) with the upper lateral incisors palatally placed. The upper incisors were moderately proclined. The buccal segments were moderately crowded with the canines buccally placed and the upper left first premolar mesiodistally rotated (Figure 14a–e).

In occlusion, the incisor relationship was Class II division 1, with an overjet of 5 mm. The overbite was increased slightly and incomplete. The upper dental centreline was to the right of the mid-facial axis and the lower was coincident with the mid-facial axis. The molar relationship was $\frac{3}{4}$ Class II bilaterally and the canine relationship was $\frac{1}{2}$ Class II bilaterally.

Bilateral crossbites of both the upper first permanent molars and second deciduous molars was present, but



(a) (b) (c)

Fig. 13 Extra-oral photographs.



(d)

Table 2 Case 2. Cephalometric values

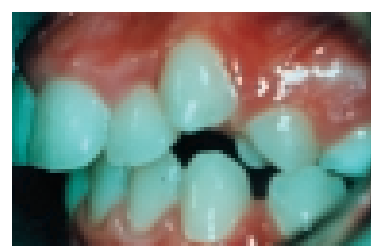
	Pre-treatment	Post-treatment
SNA (°)	81	80
SNB (°)	79	78
ANB (°)	2	2
MMPA (°)	36	35
LAFH/TAFH (%)	60	57
UI/Mx.P (°)	112	108
LI/Mnd.P (°)	90	92
Inter-incisal angle (°)	129	126
LI/A.Po line (mm)	3	2
LI/Ricketts E line (mm)	-2	-0.5
Witts (mm)	4	1



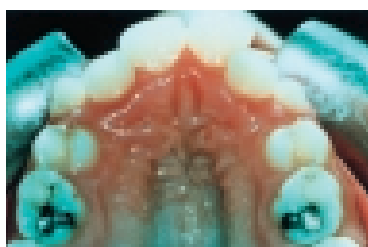
(a)



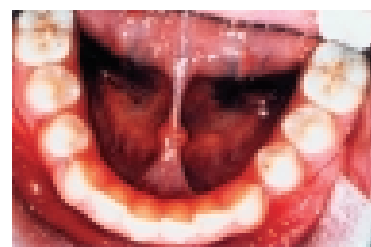
(b)



(c)



(d)



(e)

Fig. 14 Intra-oral photographs.



Fig. 15 Pre-treatment cephalometric tracing.

no associated mandibular displacement detected. No adverse signs or symptoms related to the temporomandibular joint were found on examination. The panoramic radiograph revealed the presence of the complete dentition including all four third molars. The upper standard midline occlusal radiograph revealed normal root morphology and development.

Cephalometric analysis (Figure 15) confirmed a moderate Class I skeletal base with SNA and SNB within normal limits. The vertical proportions were increased with the mandibular maxillary planes angle at 38 degrees and the lower anterior face height at 60%. The upper incisors were proclined at 112 degrees and the lowers within normal limits, but lying in advance of the A-pogonion line. The Witts analysis was -4 mm. The cephalometric analysis is presented in Table 2.

The Dental Health Component of the Index of Orthodontic Treatment Need (IOTN) was 4d, as there severe contact point displacements greater than 4 mm, and the Aesthetic Component was 8. The pre-treatment weighted Peer Assessment Rating (PAR) score was 33.

The presenting malocclusion was the result of transverse and vertical discrepancies. The crossbites were due to the transverse discrepancy and the reduction in overbite as a result of the reduced vertical dimension. The crowding in the upper labial segments may have been due also to the narrow upper arch.

The aims of the treatment were:

1. Alignment and co-ordination of the arches.
2. Achievement of Class 1 incisor, canine, and molar relationship.
3. Correction of overjet, overbite, and centreline discrepancy.
4. Detailing of the buccal segment interdigitation.

The treatment plan was:

1. Distal movement of the upper first permanent molars using high pull headgear.
2. Removable quad helix to expand the upper arch.
3. Andrews pre-adjusted edgewise appliance (0.022 × 0.028-inch slot) using:
 - -6° brackets on the lower labial segment;
 - supertorque brackets with an additional 10° labial crown torque on the upper labial segment;
 - inverting the upper lateral incisor brackets.
4. Place lacebacks to all four quadrants in initial levelling and aligning. Place light pushcoil between upper central incisors and the canines on that side to create space to align the lateral incisors, and use auxiliary nickel titanium archwire under the stainless steel base archwire for upper lateral initial alignment.
5. Once level and aligned, and able to fit stainless steel archwire, remove quad helix using archwires to maintain the correction of the transverse in the upper buccal segment.
6. Reduce overbite, overjet and correct centreline.
7. Detail and finish.
8. Retention.

Rationale for treatment

The patient was keen to undertake treatment, willing to wear headgear and keen for a non-extraction approach if possible. Space alignment in the upper arch therefore would be from distal movement, expansion of the upper arch and small forward movement of the lower labial segment.

High pull headgear helps with the maintenance and control of the vertical and was maintained throughout the treatment. The removable quadhelix was also chosen for the ability to control the torque of the upper first molars during the expansion that, had it not been controlled, may have allowed the palatal cusps to drop and so increasing the vertical dimension further.

Compliance was assessed prior to bond-up. The headgear used was the Nitom headgear and safety features as recommended in the BOS guidelines.

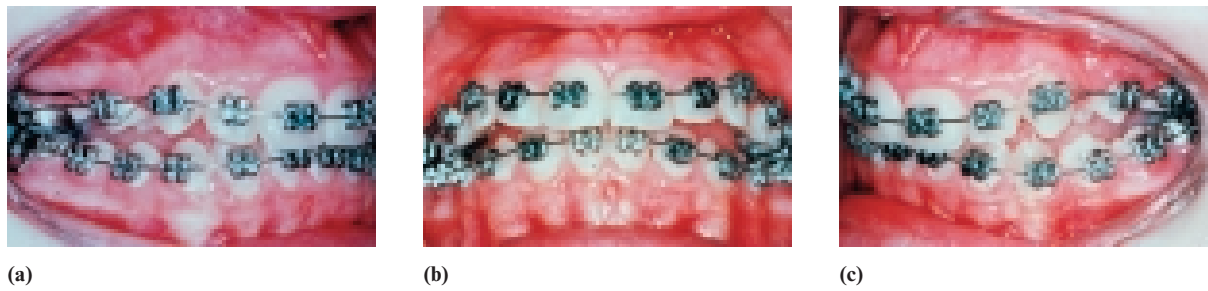


Fig. 16 Mid-treatment photographs.

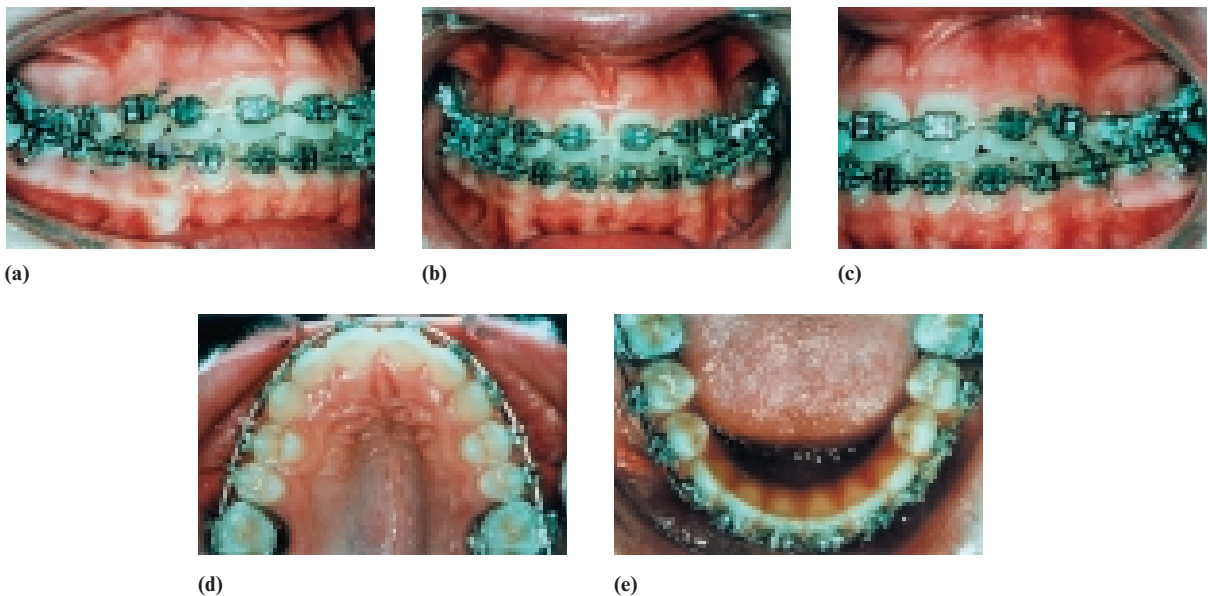


Fig. 17 Mid-treatment photographs.

The -6° lower incisor brackets were chosen to minimize the forward movement of the lower labial segment. The additional 10° brackets for the upper incisors were chosen to aid final incisor torque and the laterals inverted to increase labial root torque as they were initially palatally placed.

Treatment

The treatment time was 26 months during which there were 26 visits, of which 2 were for breakages and there was one failed appointment.

There were 7 months from the commencement of the treatment with headgear and quadhelix to achieve distal movement and crossbite correction (Figure 16a–c). Five months later the quadhelix was removed and the transverse dimension maintained with stainless steel archwires. The remaining 12 months were for bracket

repositioning, buccal root torque to the upper buccal segments, and finishing and detailing of the final occlusion (Figure 17a–e).

At debond an upper bonded retainer was placed for retention of the upper lateral incisors and upper and lower removable retainers were also placed—a Begg with labial acrylic in the upper and a Hawley retainer in the lower.

Treatment changes

The skeletal effects during treatment are due to growth of the mandible in a downward direction (Figure 18). The maxilla has been restricted due to wear of the high pull headgear. Superimposition on SN at sella indicates a vertical growth pattern (Figure 19).

The upper incisors have been retroclined and moved backwards, the lower incisors have proclined and lie



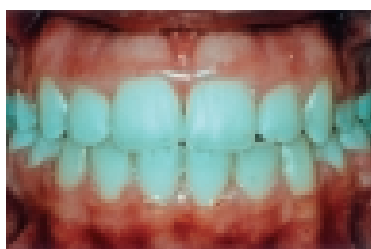
Fig. 18 At or end of treatment cephalometric tracing.



Fig. 19 Pre and end of treatment superimpositions – overall superimposition on Sella-Nasion line at Sella.



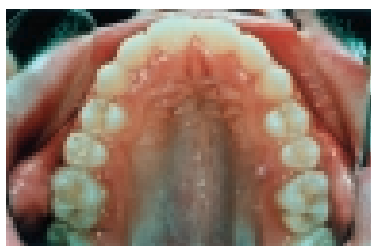
(a)



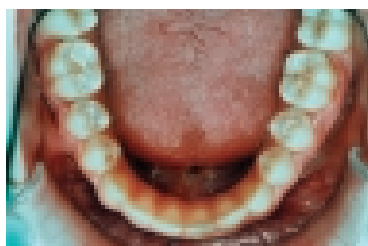
(b)



(c)



(d)



(e)

Fig. 20 End of active treatment intra-oral photographs.

2 mm in advance of the A–pogonion line. There has been an improvement in the edge centroid relationship of the incisors and the overbite has been maintained. In the transverse dimension the bilateral crossbites have been corrected and a Class I molar and canine relationship exists.

There has been maturation of the soft tissues resulting in a pleasing facial profile. The minimal change of the lower lip to the Ricketts E plane results from growth of the nose and the chin. Improvement in the amount of gingival show during smiling is considerable (Figures 20a–e and 21a–d).



Fig. 21 End of active treatment extra-oral photographs.

Prognosis

The patient was nearly 15 years of age at the completion of her active treatment and, although there was some vertical skeletal growth during treatment, the occlusal result should remain stable. There is an adequate over-bite, but this may reduce if growth is adverse.

The prognosis for the stability of the crossbite correction and arch expansion is favourable because of the interdigitating final occlusion with controlled buccal root torque, although prolonged part-time retention would be advisable.

The lower labial segment has been maintained although with further growth mild imbrication may re-establish

and, therefore, prolonged part-time retention is advised. Prognosis for the long-term stability of the upper lateral incisors is unpredictable, even though there is good labial root torque and alignment. A bonded palatal retainer has been provided.

Occlusal indices

IOTN	Pre-treatment DHC	4d	
	Pre-treatment AC	8	
	Post-treatment DHC	2g	
PAR	Pre-treatment	PAR	33
	Post-treatment PAR	2	
	% Reduction of PAR score	94%	

Acknowledgements

I would like to thank the clinical supervisors who helped and encouraged me through my training at the Liverpool University Dental Hospital and Countess of Chester Hospital. In particular, Miss Harrison who supervised the first case presented, Mr Morris who supervised the second case, and Mr Rudge, the course organizer.

