

**CLINICAL
SECTION**

Forestadent® Young Specialist Prize (1999)

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Abstract

Index words:

Class II treatment, growth modification, mandibular surgery, Twin Block.

This paper describes the clinical orthodontic treatment of the three cases that were awarded the 1999 Forestadent® Young Specialist Prize. There are two Class II division 1 cases treated by different treatment modalities and a Class II division 2 case complicated by a palatally ectopic maxillary canine. These case reports demonstrate the three main treatment modalities available to the orthodontist for treating skeletally-based malocclusions, i.e. growth modification, orthodontic camouflage, and a combined surgical-orthodontic approach.

Received 10 May 2002; accepted 24 October 2002

Introduction

The Forestadent® Young Specialist Prize is awarded following the submission of case records of three treated cases displayed in the Clinical Demonstrations section at the annual British Orthodontic Conference. This award is given to support a visit to an overseas centre or conference. Cases should have been treated by the orthodontic practitioner within the first 12 years of gaining their initial orthodontic qualification. The three successful cases presented for the award during the 1999 Conference in Glasgow will now be described.

Case Report 1

This shy 9-year old schoolgirl was referred by her general dental practitioner. She was concerned about the prominence of her upper anterior teeth and was being teased at school about her dental appearance (Figure 1a–g). There was a history of previous trauma to both her upper permanent central incisors.

Extra-oral assessment

She presented with a moderate Skeletal II dental base relationship associated with significant mandibular retrognathia. Clinically, her lower anterior face height was reduced and her Frankfort mandibular (F–M) planes angle (26 degrees) was within the normal range.

She exhibited moderate lip incompetence with the lower lip contacting palatal to the upper permanent incisors. She showed three-quarters of her upper incisors at rest, and had an acceptable 'smile line' and a convex facial profile. She had a normal labio-mental fold and nasolabial angle with a slightly upturned nose. The upper lip had a normal relationship to the Ricketts' aesthetic 'E' line, while her lower lip was behind this reference line. The upper lip length was reduced at 16 mm.

Intra-oral examination

All permanent teeth were present clinically except for all four permanent second molars. She was dentally advanced for her age with the maxillary canines partially erupted. Her oral hygiene was fair, but needed improvement.

In the lower arch, there was mild crowding with the lower incisors slightly retroclined and at 2 mm behind the A–Po reference line. There were mesio-lingual rotations affecting some of the lower dentition and an increased curve of Spee present.

The upper arch was mildly spaced with markedly proclined incisors and significant disto-palatal rotations of both upper first premolars. There was a mild median diastema of 1 mm. There was an increased reverse curve of Spee.

In occlusion, the incisor relationship was a Class II division 1 with a greatly increased overjet of 11 mm and the overbite increased, but incomplete. The upper centre

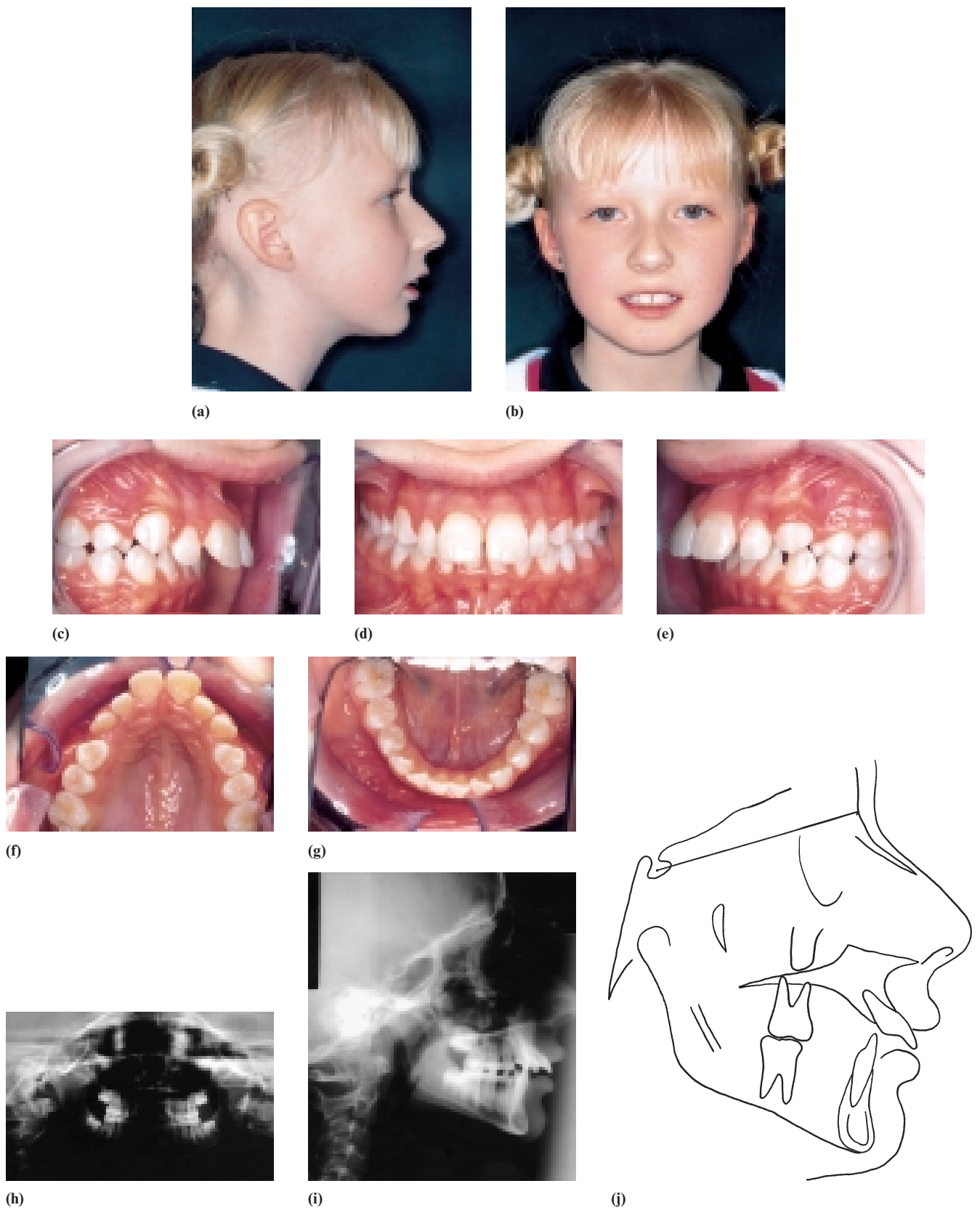


Fig. 1 (a–j) Case report 1: pre-treatment records. (a,b) Extra-oral views. (c–g) Intra-oral views. (h) Panoramic radiograph. (i) Lateral skull radiograph. (j) Cephalometric tracing.

line was correct, while the lower centre line was 2 mm to the left. The buccal segments were three-quarters Class II on both sides. Both left and right lateral excursion movements exhibited a group function tendency with non-working side interferences involving the rotated upper first premolars.

The Dental Health Component (DHC) score on the Index of Orthodontic Treatment Need (IOTN)¹ was 5a due to an increased overjet greater than 9 mm. The pre-treatment weighted Peer Assessment Rating (PAR)² score total was 49.

Special investigations

Radiographs. The panoramic radiograph (Figure 1h) showed there to be only upper permanent third molars present with both lower third molars absent. An upper anterior occlusal radiograph revealed the previously traumatized upper central incisors to be sound with open apices and large pulps. The lateral cephalogram demonstrated the relative mandibular retrognathia, the incompetent lip pattern, and the procumbent upper central incisors (Figure 1i,j). The upwards cant of the maxillary plane accounted for the slightly increased mandibular–maxillary (M–M) angle.

Aims and objectives of treatment

1. To improve the patient's facial appearance by 'growth modification' to encourage more favourable mandibular growth while restricting maxillary vertical growth.
2. Correction of the antero-posterior arch discrepancy.
3. Improve the lip competence.
4. Levelling and alignment of the buccal segments.
5. Reduction of the upper incisors inclination accompanied by some relative intrusion of the upper labial segment.
6. Reduction of the overjet and overbite with improvement of the inter-incisal relationship.
7. Achievement of a Class I molar relationship bilaterally.
8. Closure of any residual spaces.
9. Establishment of a good functional occlusion—preferably canine guided.
10. Appropriate retention measures upon debonding of the fixed appliances.

Treatment plan

1. Hygienist to improve patient's oral hygiene.
2. Regular recording (4-monthly intervals) of standing height measurements to monitor the patient's general growth trend.
3. Initial phase of 'growth modification' therapy with full-time wear of a Twin Block functional appliance with integral headgear (EOT) support at night-time. No upper labial bow used. Upper incisor capping to control vertical development.
4. A second phase of orthodontic therapy with upper and lower pre-adjusted edgewise fixed appliances (0.022 × 0.028-inch slot Andrews prescription brackets with Roth molar bands) using the 100 per cent Euro-Arch form ± premolar extractions as necessary. The need for permanent extractions will depend on the success of the first 'functional' phase of treatment. Avoid prolonged use of Class II elastics in view of the slightly increased F-M angle.
5. Continue the use of high-pull headgear to the maxilla at the start of the fixed appliance phase to restrain any post-functional forward and downward movement of the maxillary dentition.
6. Upper and lower removable retainers at the debond stage of treatment.
7. Assessment of prognosis of upper permanent third molars.

Treatment progress

Treatment consisted of 23 visits over a 28-month time period. Active treatment commenced with the full-time wearing of a Twin Block functional appliance,³ incorporating upper incisor capping. Standing height measurements were taken at regular intervals using a stadiometer. High-pull safety headgear attached to flying headgear tubes situated in the upper second premolar region was fitted 1 month later for night-time wear only (300 g force each side initially). The upper block was reactivated 4 months into active treatment when the overjet had reduced to 4 mm. This first phase of treatment took 9 months. Mid-treatment records were taken at this point (Figure 2a–c). The Twin Block appliance was withdrawn, but extra-oral traction was maintained for a further 3 months via bands on the upper permanent first molars, whilst the posterior occlusion settled. Pre-adjusted edgewise fixed appliances (0.022 × 0.028-inch slot Andrews prescription brackets with Roth molar bands) were fitted and initial levelling commenced



Fig. 2 (a–c) Case report 1: post-Twin Block intra-oral views. (a–c) Intra-oral views.



Fig. 3 (a–i) Case report 1: post-treatment records. (a–e) Intra-oral views. (f) Panoramic radiograph. (g) Lateral skull radiograph. (h–i) Extra-oral views. (j) Cephalometric tracing. (k) Superimposition of pre-treatment (black) and post-treatment (red) cephalometric tracings on De Coster's line. (l) Maxillary and mandibular superimposition of pre-treatment (black) and post-treatment (red) cephalometric tracings on Björk's reference structures.

with 0.014-inch nickel-titanium with lacebacks in the lower arch. Treatment progressed to 0.018 × 0.025-inch nickel-titanium archwires when all permanent second molars were included. Once upper and lower 0.019 × 0.025-inch stainless steel final working archwires had been ligated, buccal root torque was placed in the upper posterior region and 'light' Class II (green) elastics were used bilaterally for 2 months to cinch the occlusion.

Following debond, upper and lower Hawley removable retainers were fitted (Figure 3a-i).

Case 1 assessment

The main aim of the orthodontic treatment was to enhance the patient's potential for favourable mandibular growth and improve her skeletal and soft tissue

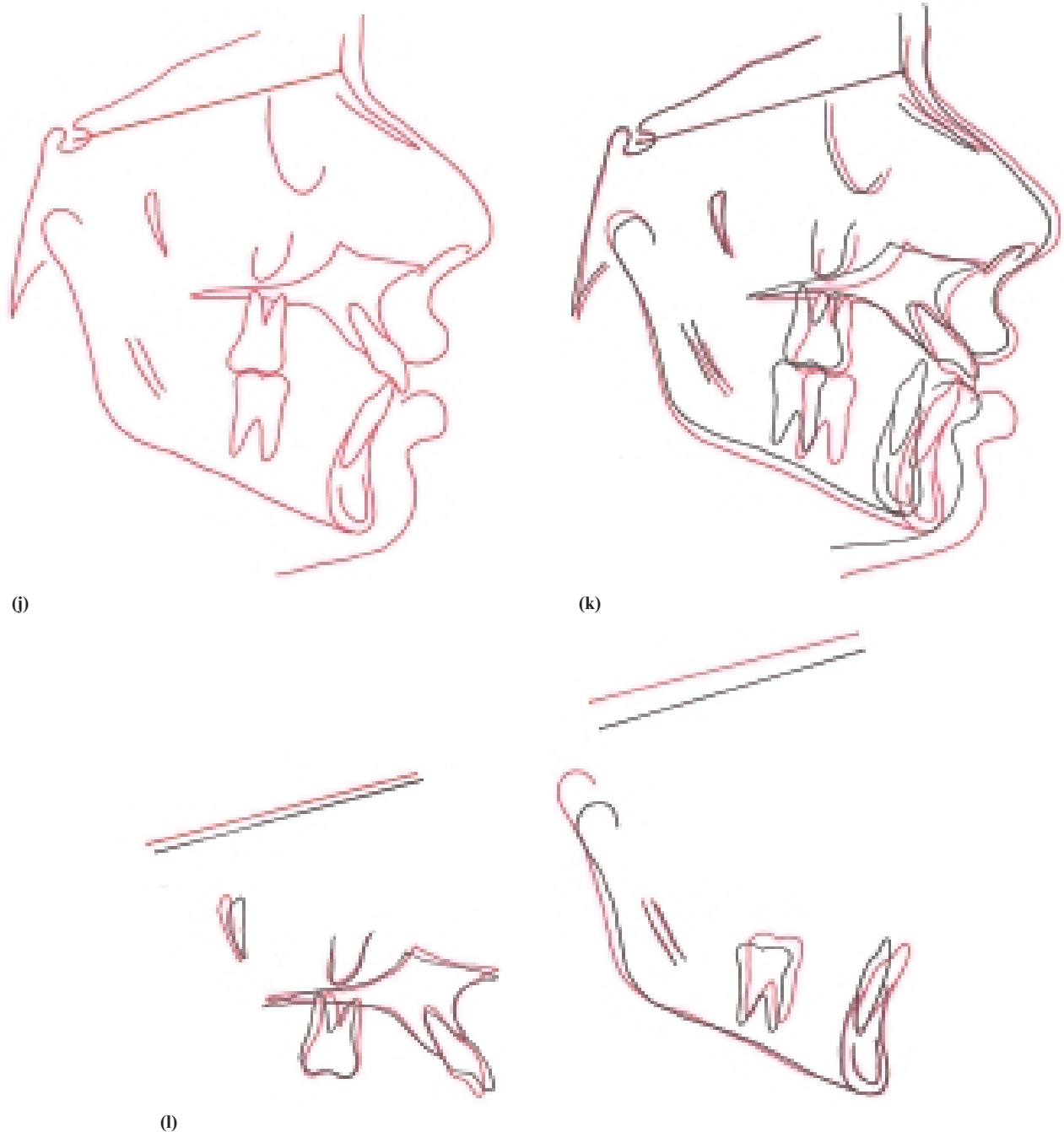


Fig. 3 (Continued).

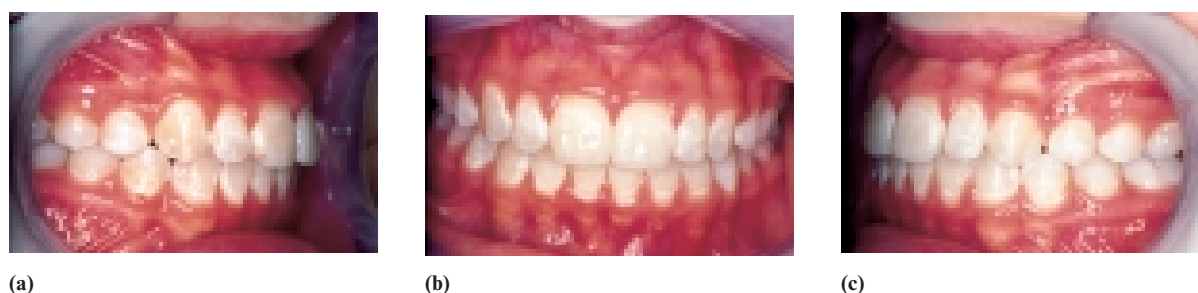


Fig. 4 (a–c) Case report 1: one year post-debond review records. (a–c) Intra-oral views.

profile by ‘growth modification’. It was also important to avoid over-retraction of the upper incisors with respect to future nasal growth and her existing ‘smile line’. The decision to start treatment with a first phase of functional appliance therapy proved to be the correct one.

An appreciable amount of horizontal and vertical mandibular growth has occurred during the treatment period. The facial soft tissue changes are illustrated in the cephalometric superimpositions (Figures 3k,l). The patient’s general growth trend, reflected by the standing height measurements recorded, was not particularly remarkable and she still remains ‘small’ for her peer group. She still has a degree of Skeletal II base discrepancy despite her favourable growth and so some small degree of orthodontic camouflage has been necessary. The final inclination of the upper and lower incisors (112 and 92 degrees, respectively) are both within normal limits (Table 1). The use of extra-oral traction during the functional appliance stage in a non-extraction case of

this nature seems to have prevented the often quoted adverse proclination of the lower incisors.^{4,5}

Both the upper and lower inter-canine widths have been maintained at their original. Arch dimensions have therefore been kept relatively stable. Both left and right lateral excursions of the mandible are now canine-guided with absence of any working/non-working side interferences. Protrusive movements are also normal.

The post-treatment PAR score is 2, which demonstrates that this treated case is in the ‘greatly improved’ category of the PAR nomogram with a 95 per cent reduction in the weighted PAR score. On review at 12 months post-debond, the arch alignment and overjet reduction were remaining stable (Figure 4). The faint diffuse flecks of labial decalcification affecting some teeth, that became evident during the latter stages of the fixed appliance phase, have not developed any further during the retention period.

Table 1 Case report 1. Pre- and post-treatment cephalometric analysis

	Pre-treatment	Post-treatment
SNA	83°	85°
SNB	76°	81°
ANB	7°	4°
FMPA	26°	29°
MxP/MdP	33°	33°
LAFH/TAFH	55%	55%
Mandibular unit length	99 mm	105 mm
Maxillary unit length	85 mm	86 mm
Unit length difference	14 mm	19 mm
UI/Mx.P	124°	112°
LI/Md.P	80°	92°
Inter-incisal angle	124°	121°
LI/A–Po line	–2 mm	+3 mm
Lower lip to ‘E’ line	–1 mm	+1 mm
Wits analysis	+3 mm	–1.5 mm
Holdaway angle	25°	18°

Case Report 2

A 14-year old Caucasian schoolboy was originally referred by his general dental practitioner. His main complaint concerned his crooked and prominent upper anterior teeth (Figure 5a–g). The patient was a regular dental attender with a clear medical history.

Extra-oral assessment

He presented clinically with a moderate Skeletal II dental base due to relative mandibular retrognathia. His F–M angle (20 degrees) was reduced as was his lower face height (64 mm.) He had potentially competent lips with only his upper right permanent central incisor out of lip control. He exhibited a ‘tight’ lower lip with an obtuse naso-labial angle and prominent labio-mental fold.



(a)

(b)



(c)



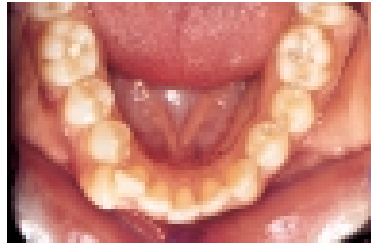
(d)



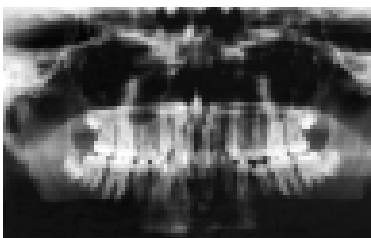
(e)



(f)



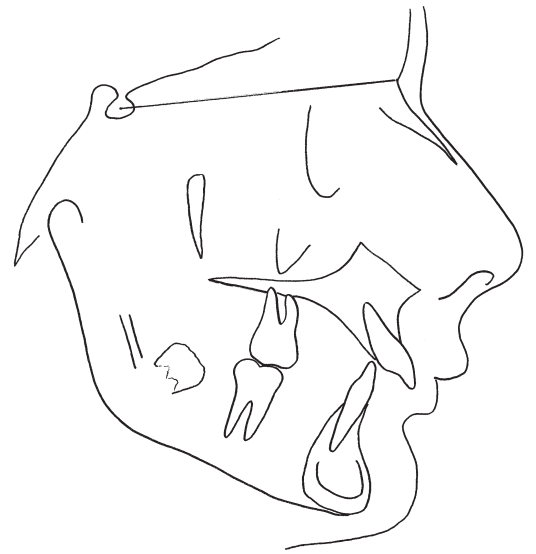
(g)



(h)



(i)



(j)

Fig. 5 (a-j) Case report 2: pre-treatment records. (a,b) Extra-oral views. (c-g) Intra-oral views. (h) Panoramic radiograph. (i) Lateral skull radiograph. (j) Cephalometric tracing.

Intra-oral examination

All permanent teeth were present clinically except for all four permanent third molars. His oral hygiene was fair with no active caries present.

There was severe crowding in the lower arch with a buccally excluded and mesially-inclined lower right canine. There was mild lower incisor crowding present with normally inclined lower incisors. There was an increased lower curve of Spee.

The upper arch was severely crowded with buccally displaced permanent canines, and three of the four permanent incisors were palatally displaced and retroclined due to the adverse lower lip function. The upper right permanent central incisor was proclined and not within lower lip control. Both upper first premolars were mildly rotated in a disto-palatal direction.

This patient had a moderately severe Class II division 1 type malocclusion with some features of a Class II division 2 case. There were significant dento-alveolar compensations present, which were masking the true extent of the patient's Skeletal II discrepancy. The overjet was 3 mm on the left and increased at 9 mm on the right. The overbite was increased and complete to the palatal gingival margins with no signs of trauma. The upper centre line was correct, whilst the lower was 2 mm to the right. The buccal segments were a full unit Class II on both sides. There was a single-tooth scissor-bite tendency affecting the upper left first premolar. Clinical examination of the path of closure revealed an initial slight backward displacement into centric relation.

The Dental Health Component (DHC) score on the IOTN was 5a due to an increased overjet greater than 9 mm. The pre-treatment weighted PAR score total was 55.

Special investigations

Radiographs. The panoramic radiograph (Figure 5h) shows all four permanent third molars developing. No evidence of root resorption or pathology is present. The lateral cephalogram demonstrates the significant low angle Skeletal II base relationship and the relative mandibular retrognathia (Figure 5i,j).

Space requirements. This malocclusion was considered to be in the 'maximum anchorage' category. Space creation by the following methods would be required:

1. Removal of four premolar units.
2. Considerable extra-oral traction (headgear) therapy to restrain further maxillary growth and to achieve 3–4 mm distal movement of the upper first permanent molars. The lower molars would be allowed to move mesially in order to achieve a Class I molar relationship bilaterally.
3. Encourage any remaining mandibular growth potential in a favourable forwards and downwards direction—by a combination of maxillary restraint and overbite reduction.

Aims and objectives of treatment

1. Improvement of the patient's facial appearance by encouraging more favourable mandibular growth.
2. Correction of the antero-posterior arch discrepancy by orthodontic camouflage means.
3. Improvement of the patient's lip competence.
4. Relief of crowding.
5. Levelling and alignment of the buccal segments.
6. Alignment and correct inclination of the labial segments.
7. Correction of the lower centreline shift.
8. Reduction of the overjet and overbite.
9. Achievement of a Class I molar relationship bilaterally.
10. Closure of any residual extraction spaces.
11. Establishment of a good functional occlusion.
12. Appropriate retention measures at completion of active treatment.

Treatment plan

1. Fit URA with FABP and palatal spring for 21 and 22.
2. Extraction of both lower second premolars (35,45).
3. Place lower pre-adjusted edgewise fixed appliance (0.022 × 0.028-inch slot Andrews prescription brackets with Roth molar bands) using the 100 per cent Euro-Arch form.
4. Fit upper transpalatal arches—to maintain arch width and reinforce anchorage.
5. Fit Combi safety extra-oral traction.
6. Extraction of both upper first premolars (14,24) once molars Class I.
7. Place upper pre-adjusted edgewise fixed appliance
8. Upper removable and lower bonded retainers at debond.
9. Regular review during retention phase.

Treatment progress

Treatment consisted of 22 visits over a 27-month time period. Active treatment commenced with the provision of an upper removable appliance incorporating a flat anterior bite plane and a palatal Z-spring to push the two left incisors (21,22) forwards from their retroclined starting positions. The lower pre-adjusted edgewise fixed appliance was fitted following the prescribed lower extractions and initial levelling commenced with 0.016-inch nickel-titanium archwire. Lower second molars were banded at an early stage and treatment progressed

in the lower arch to 0.019 × 0.025-inch stainless steel final working archwire. Meanwhile, the upper removable appliance was discarded after 7 months as good overbite reduction had been achieved. A transpalatal arch was fitted at this stage along with medium-pull 'Combi' safety headgear (350 g force each side). The upper pre-adjusted edgewise fixed appliance was fitted following the prescribed extractions in the upper arch and initial levelling was commenced with 0.016-inch nickel-titanium archwire with the second molars incorporated in the set-up from the start (Figure 6a–f). The bracket on the palatally displaced upper right lateral incisor (12) was

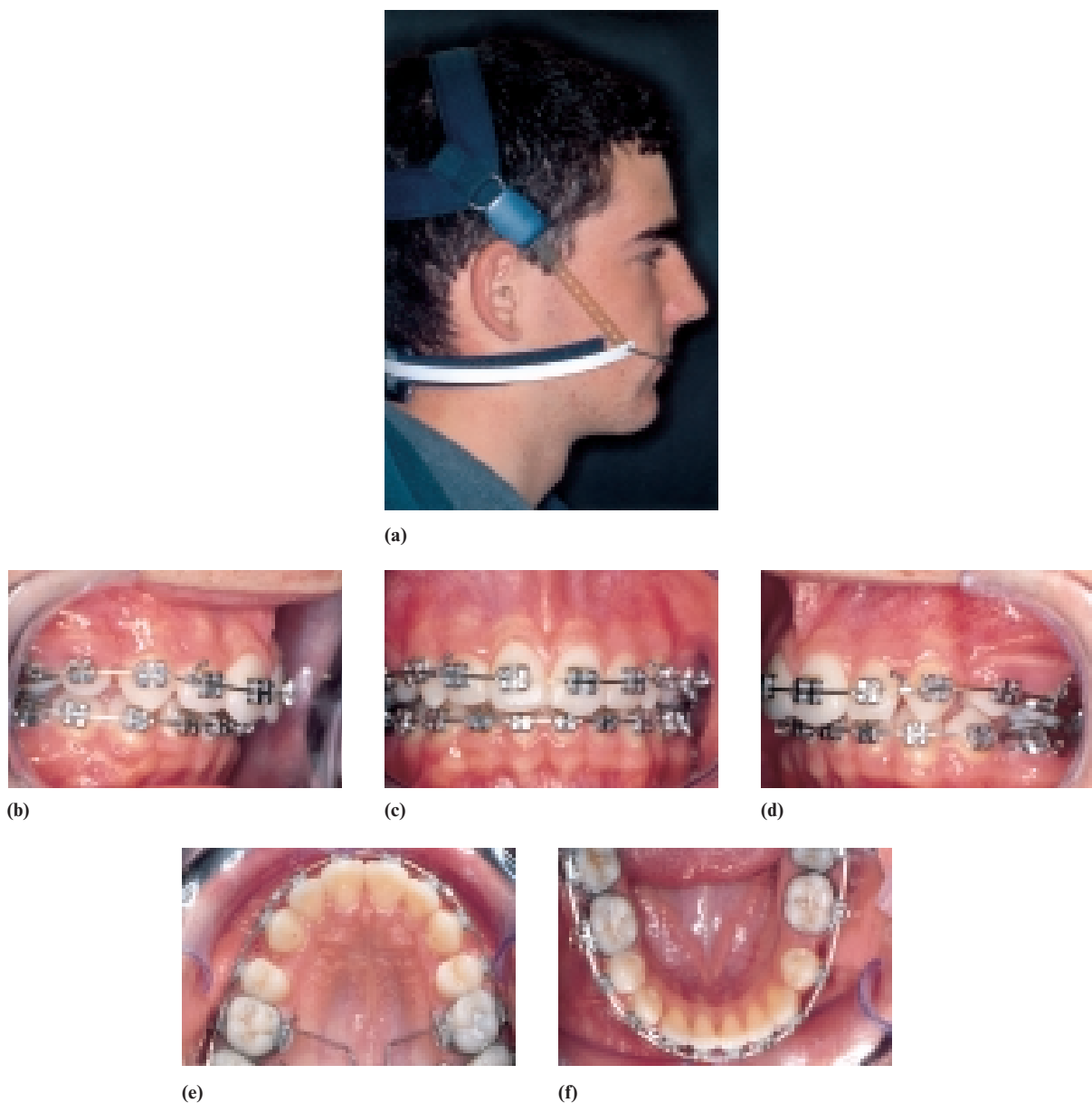


Fig. 6 (a–f) Case report 2: during treatment views. (a) Extra-oral view. (b–f) Intra-oral views.

inverted to give 7 degrees labial root torque. Once the upper 0.019 × 0.025-inch stainless steel final working archwires had been ligated, a bite opening curve was placed and Class II elastics wear started. The transpalatal arch was removed at this stage and the headgear wear reduced to night-time only. Buccal root torque was placed in the upper posterior region and space closing mechanics commenced 3 months later once the overbite was well under control. Following space closure, further

individual labial root torque was placed to over-correct the root position of the upper right permanent lateral incisor. All appliances were removed 3 months later and an upper removable Hawley retainer and lower 0.0175-inch twistflex bonded lingual retainer were fitted (Figure 7a–i). The upper retainer was worn for a period of 6 months full-time followed by a further 3–6 months on a reducing night-time basis. The lower bonded retainer has been left in situ ‘permanently’.

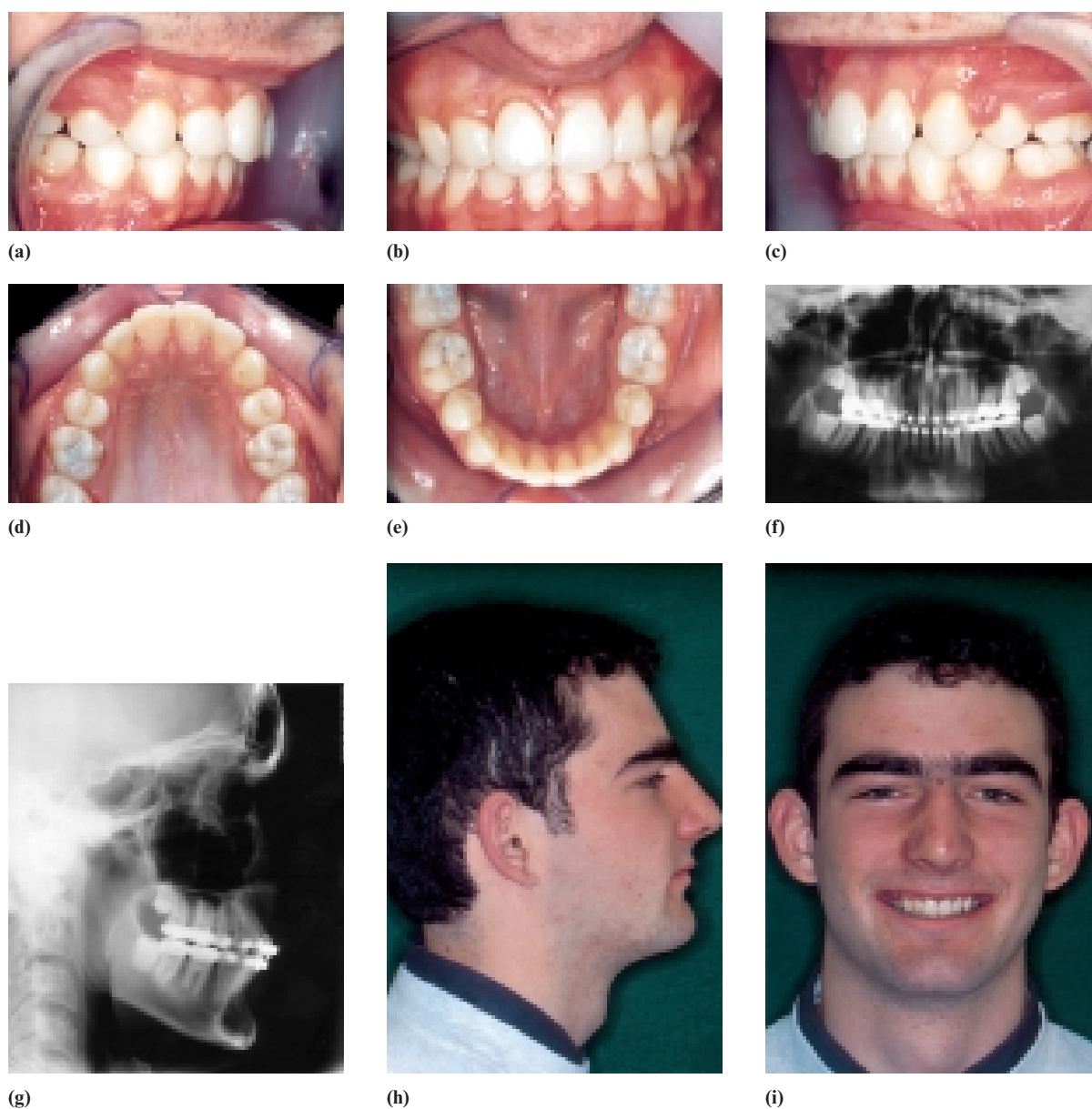


Fig. 7 (a–l) Case report 2: post-treatment records. (a–e) Intra-oral views. (f) Panoramic radiograph. (g) Lateral skull radiograph. (h–i) Extra-oral views. (j) Cephalometric tracing. (k) Superimposition of pre-treatment (black) and post-treatment (red) cephalometric tracings on De Coster's line. (l) Maxillary and mandibular superimposition of pre-treatment (black) and post-treatment (red) cephalometric tracings on Björk's reference structures.

Case 2 assessment

A combination of favourable late facial growth and a well-motivated, co-operative patient enabled a pleasing final result to be achieved. Significant downwards and forwards growth of the mandible assisted overbite reduction and avoided adverse retraction of the upper incisors.

The maxilla/mandible unit length difference, as described by Harvold, has increased from 17 to 23 mm

during treatment (Class I = 25–27 mm). These favourable changes have improved his overall facial balance and have kept pace with his significant nasal growth during the treatment period (Figure 7j–l).

His lips are now fully competent with a less pronounced labio-mental groove present. The Holdaway angle improved from 22 to 12 degrees (Table 2). Both lips are, however, further behind Rickett's 'E' line at the end of treatment due to the marked forward growth of the nose tip. The upper incisors have been kept forwards

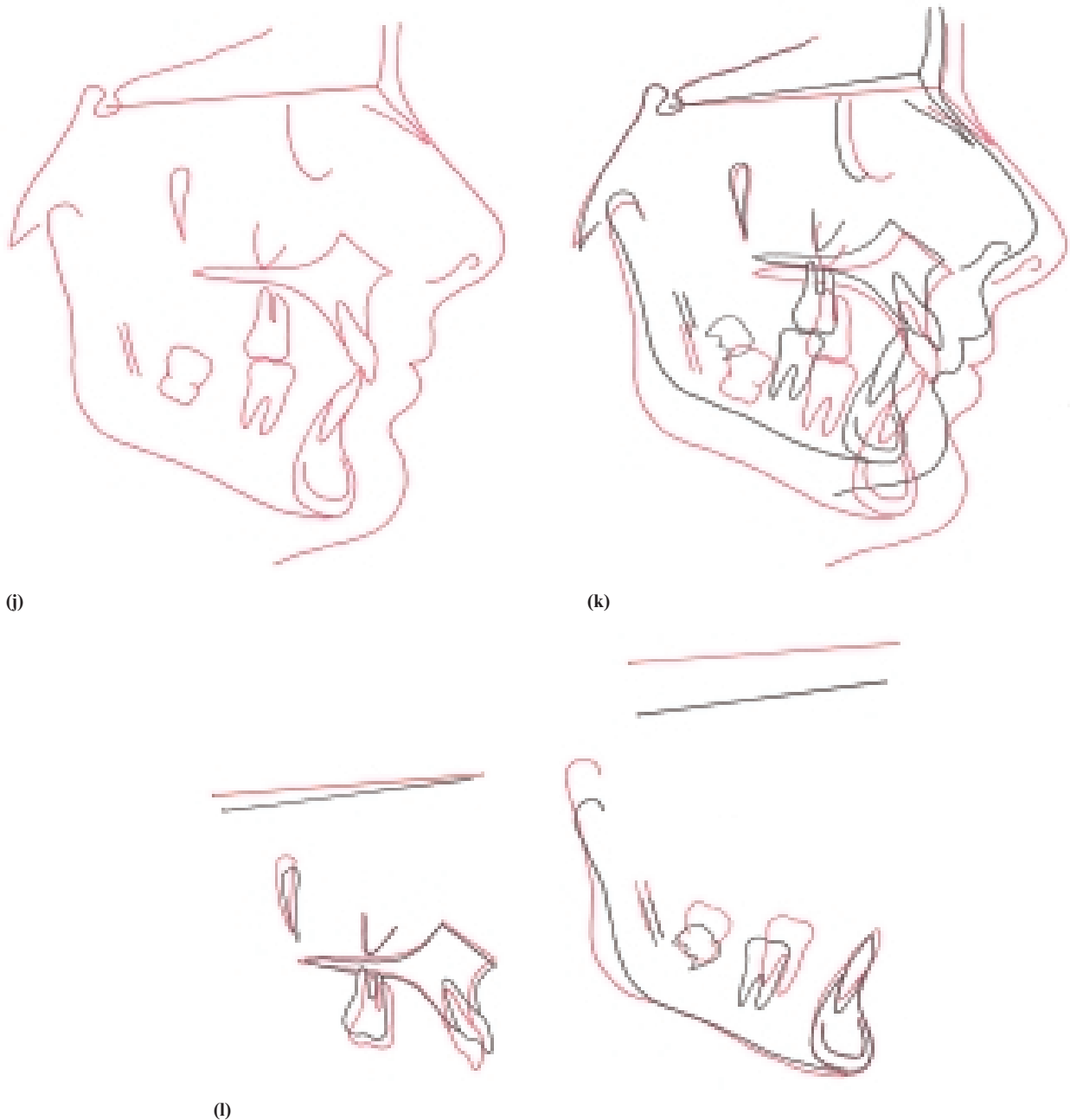


Fig. 7 (Continued).

in the face. Both the upper and lower incisor inclinations are near normal at the end of orthodontic treatment. The lower incisor position in the face has improved. The 'camouflage' orthodontic treatment carried out for this particular patient has not put the long-term stability of the result in jeopardy.

Both left and right lateral excursions of the mandible are now canine guided with absence of any working/non-working side interferences. Protrusive movements are also normal. The permanent third molars were developing well and improved their position during treatment. They should erupt satisfactorily into a functional relationship within the next 12–15 months.

The post-treatment PAR score is 3, which demonstrates that this treated case is in the 'greatly improved' category of the PAR nomogram with a 95 per cent reduction in the weighted PAR score. On review at 28 months post-debond, the arch alignment and overjet reduction were remaining stable though there was a mild increase in the overbite during this time period (Figure

8a–c). The labial gingival tissue associated with the upper right permanent lateral incisor has responded favourably to the additional individual labial root torque placed during the finishing stages (compare with Figure 7b).

Case Report 3

A 16-year-old female was referred by her general dental practitioner concerned about the appearance of her crooked upper anterior teeth which she felt were 'tilting back'. She was a regular dental attender with no relevant medical history and she exhibited good mouth care. The main features of her malocclusion were a severe Class II division 2 type malocclusion on a mild–moderate Skeletal II base with a reduced F–M angle. There was moderate crowding in the maxillary arch with a palatally unerupted permanent canine on the left side and a relatively well-aligned lower dentition (Figure 9a–g).

Extra-oral assessment

She presented clinically with a mild/moderate Skeletal II dental base relationship due to relative mandibular retrognathia and a reduced Frankfort–mandibular planes angle (15 degrees) and reduced lower face height. Her masseteric musculature was well developed.

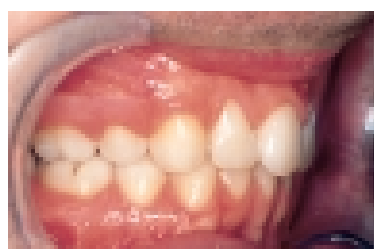
Her lips were competent with a high lower lip line. She had a high, but pleasant 'smile line' with an obtuse nasolabial angle. Her nose tip was slightly upturned. She had a pronounced labiomental fold with a good soft tissue chin point. Both lips were retrusive (5–6 mm) in relation to Ricketts' aesthetic 'E' line.

Intra-oral examination

All permanent teeth were present clinically except for the permanent third molars and an unerupted left maxillary

Table 2 Case report 2. Pre- and post-treatment cephalometric analysis

	Pre-treatment	Post-treatment
SNA	83°	83.5°
SNB	78°	80°
ANB	5°	3.5°
FMPA	20°	23°
MxP/MdP	20°	20°
LAFH/TAFH	52%	56%
Mandibular unit length	121 mm	133 mm
Maxillary unit length	104 mm	110 mm
Unit length difference	17 mm	23 mm
UI/Mx.P	120°	115°
LI/Md.P	90°	92°
Inter-incisal angle	129°	129°
LI/A–Po line	–5 mm	–2 mm
Lower lip to 'E' line	–6 mm	–8 mm
Wits analysis	+4 mm	+3 mm
Holdaway angle	22°	12°



(a)



(b)



(c)

Fig. 8 (a–c) Case report 2: 28 months post-debond review records. (a–c) Intra-oral views.

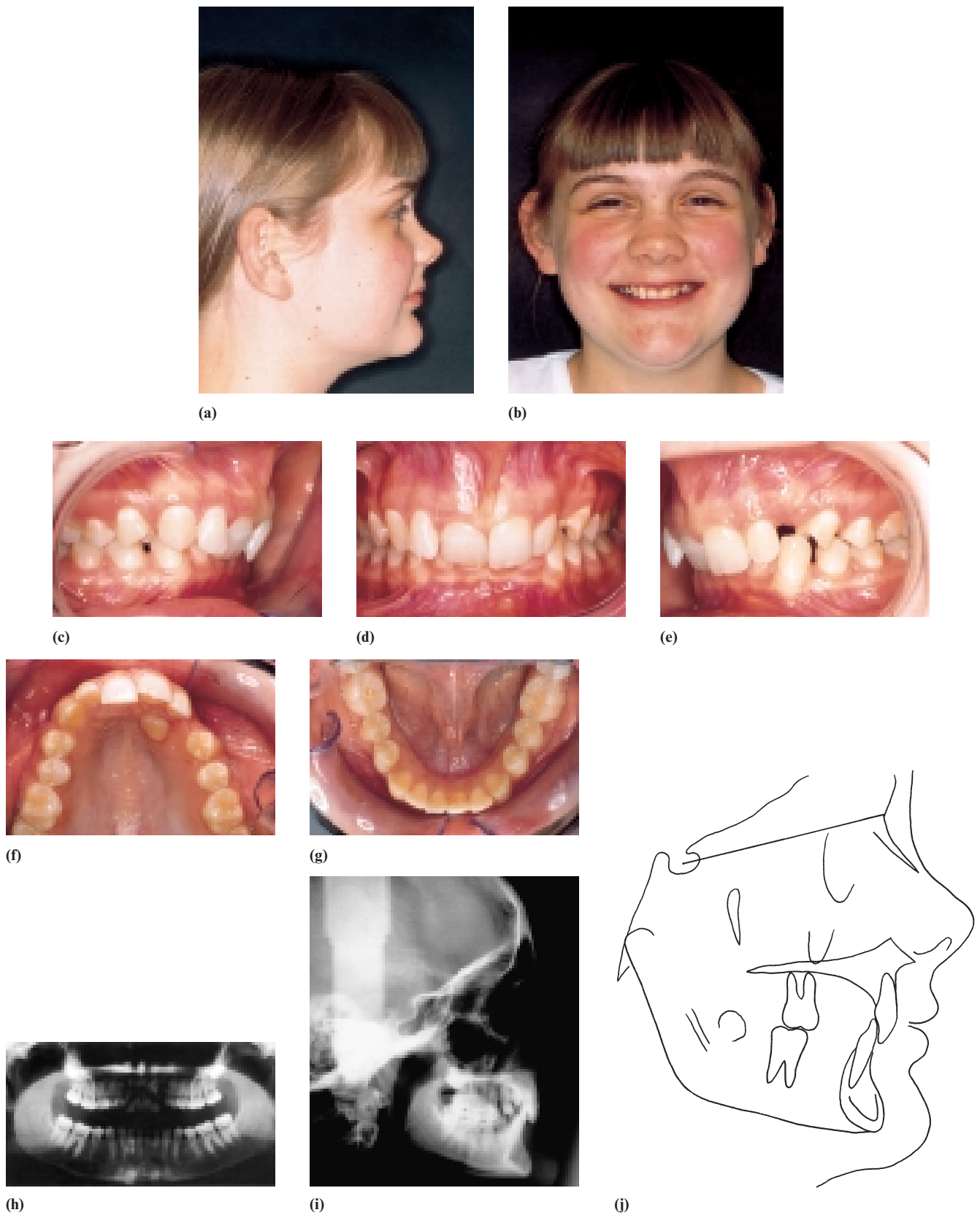


Fig. 9 (a–j) Case report 3: pre-treatment records. (a,b) Extra-oral views. (c–g) Intra-oral views. (h) Panoramic radiograph. (i) Lateral skull radiograph. (j) Cephalometric tracing.

permanent canine. Her oral hygiene was good with no caries evident.

There was mild spacing in the lower arch, which was otherwise relatively well-aligned. The lower central incisors were positioned 6 mm posterior to the A–Po reference line and were upright. There was a marked lower curve of Spee.

The upper arch was moderately crowded (4 mm) with both the upper central incisors and the upper left lateral incisor significantly retroclined. Both upper first premolars were mildly rotated disto-palatally. The upper left permanent canine was unerupted and impacted palatally in close approximation to the roots of the adjacent incisors.

The overjet was slightly reduced at 2 mm with the overbite increased and complete to the gingival third of the upper incisors. The upper and lower centre lines were coincident. The buccal segments were a full unit Class II on both the left and right hand side. The upper left first premolar was in a complete scissor-bite relationship.

The path of closure into centric relation revealed a small backward displacement. Both left and right lateral excursion movements exhibited group function with non-working side interferences at their respective outer limits—involving the permanent upper lateral incisors.

The Dental Health Component (DHC) score on the IOTN was 5i due to the palatally impacted upper permanent canine. The pre-treatment weighted PAR score total was 37.

Special investigations

Radiographs. The panoramic radiograph (Figure 9h) revealed three unerupted permanent third molars. The lower left permanent third molar was absent. There was a palatally unerupted left maxillary canine with its crown tip palatal to the root of the central incisor. The lateral cephalogram (Figure 9i,j) demonstrated the low FMPA value (15 degrees) and gonial angle (119 degrees). The significant retroclination and extrusion of the upper permanent incisors was noted in addition to the increased inter-incisal angle (169 degrees) and lower arch curve of Spee.

Aims and objectives of treatment

1. Improve the patient's presenting A–P profile and vertical relationship.
2. Surgical exposure of palatal canine to enable it to be brought into the line of the arch.

3. Relief of crowding by forward movement of the upper labial segment from its retroclined position.
4. Levelling and alignment of the buccal segments.
5. Alignment and correction of the labial segments.
6. Correct the upper and lower incisor angulations, inter-incisal relationship, and the edge-centroid relationship.
7. Convert the presenting malocclusion to a Class II division 1 type whilst maintaining some degree of lower arch curve of Spee.
8. Mandibular advancement osteotomy to achieve a Class I incisor/molar relationship bilaterally with full overbite reduction.
9. Closure of any residual spaces.
10. Establishment of a good functional occlusion.
11. Appropriate retention measures upon completion of active treatment.

Treatment plan

1. Treat on a non-extraction basis.
2. Refer to oral surgeon for surgical exposure of palatal canine under a day-case general anaesthetic.
3. Correct the ectopic canine position first—fit trans-palatal arch, de-rotate the upper left premolar and use 'sectional' fixed appliance with elastic traction to align [3].
4. Use a lower removable appliance with lower incisor and posterior capping to open the bite, and to facilitate movement of the displaced canine into the arch.
5. Fit upper pre-adjusted edgewise fixed appliance (0.022 × 0.028-inch slot Andrews prescription brackets with Roth molar bands) using the 100 per cent Euro-Arch form.
6. Lower fixed appliance (same prescription as for upper arch) on non-extraction basis.
7. Mandibular advancement osteotomy. Surgical removal of lower third permanent molar at time of osteotomy.
8. Upper removable retainer and lower 0.0175-inch Twistflex 'permanent' retainer.
9. Assessment of upper third permanent molars prognosis—plan for simple extraction once erupted if non-functional.

Treatment progress

Treatment consisted of 24 visits over a 32-month time period. Active treatment commenced following surgical exposure of the palatal canine with the provision of a

transpalatal/Nance button 'combo'. Brackets were bonded on the upper left canine and first premolar. Elastic traction to the transpalatal arch was commenced to start de-rotating the premolar to create space in the arch (Figure 10a). A lower removable bite-opening appliance was fitted which incorporated a soldered hook to enable vertical elastic traction of the partially erupted upper palatal canine. A sectional 0.017 × 0.025-inch stainless steel wire was then used to commence canine traction. After 3 months active treatment, the full upper pre-adjusted edgewise fixed appliance was fitted and initial levelling commenced with 0.014-inch nickel-titanium archwire (Figure 10b,c). Treatment progressed to 0.019 × 0.025-inch nickel-titanium 'rocking horse' archwire, at which point the transpalatal arches were removed (Figure 10d). The lower arch was then bonded up and initial levelling commenced with 0.016-inch nickel-titanium archwire. All second permanent molars were banded and treatment progressed in the upper and lower arches to 0.019 × 0.025-inch stainless steel final working archwires. A 'piggy-back' 0.016-inch nickel-titanium archwire was used to complete alignment of the canine into the arch. Additional individual buccal root torque was placed in the upper archwire to fully correct the canine root position. The pre-surgical phase created an overjet of 9 mm. Planning and preparation for the mandibular advancement osteotomy was completed. Surgical correction was carried out uneventfully under an in-patient general anaesthetic and the patient was dis-

charged home on the second post-operative day. Post-surgical orthodontics to close the resultant posterior open bites and complete the levelling of the lower occlusal plane was completed with 'box' vertical elastics over a 4-month time period. The fixed appliances were removed and an upper removable Hawley retainer and lower 0.0175-inch twistflex bonded lingual retainer were fitted (Figure 11a-i). The upper retainer was worn for a period of 4 months full-time followed by a further 3–6 months on a reducing night-time basis. The lower bonded retainer has been left *in situ* 'permanently' and will remain in place until facial growth has slowed in her late teens.

Case 3 assessment

This patient was a 'late referral' who presented as a 16-year-old schoolgirl concerned about her 'crooked' upper front teeth and missing maxillary permanent canine. She was a regular dental attender and her motivation was good. She had a very anchorage-demanding malocclusion to treat as a result of the combination of a grossly ectopic palatal canine with a significant Class II skeletal discrepancy.

The main aim of her orthodontic treatment was to avoid worsening her facial profile. The combined orthodontic/orthognathic approach carried out has enabled full overbite reduction and an increase in her lower anterior face height. Her facial profile has been main-

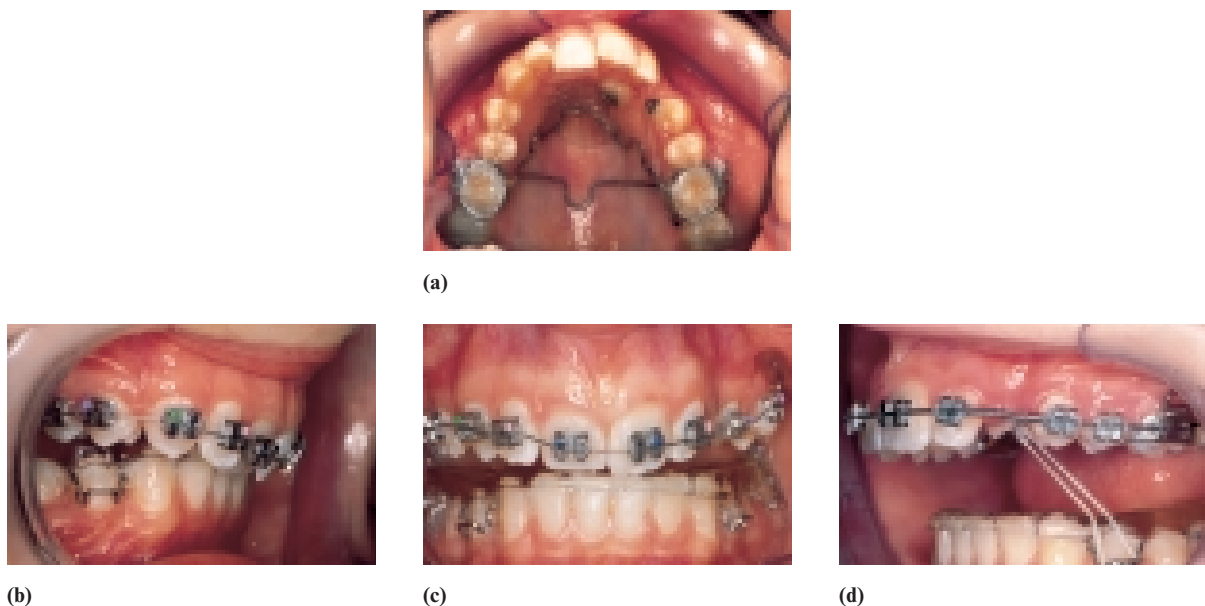


Fig. 10 (a–d) Case report 3: during treatment views. (a–d) Intra-oral views.

tained. A reduction genioplasty was considered as a possible secondary surgical procedure in order to debulk her soft tissue chin region, but this has not, in fact, been required.

Presenting relatively late, at age 16, the patient was not considered a suitable case for growth modification techniques, such as functional appliance therapy. 'Camouflage' orthodontics could have been attempted with extraction of two upper premolar units and this might have achieved a reasonable occlusal result.⁷ The main

drawback to this approach would be the probable deleterious effects on the patient's soft tissue facial profile, i.e. increasing her nasolabial angle and reduction of upper lip support. A Class II molar relationship would have had to have been accepted.

Superimposition of the lateral cephalograms (Figure 7j-l) reveals the significant dental, skeletal and soft tissue changes achieved. The lips have been kept forwards in the face. The lower face height increase has enabled some unfurling of the lower lip to occur. Single jaw

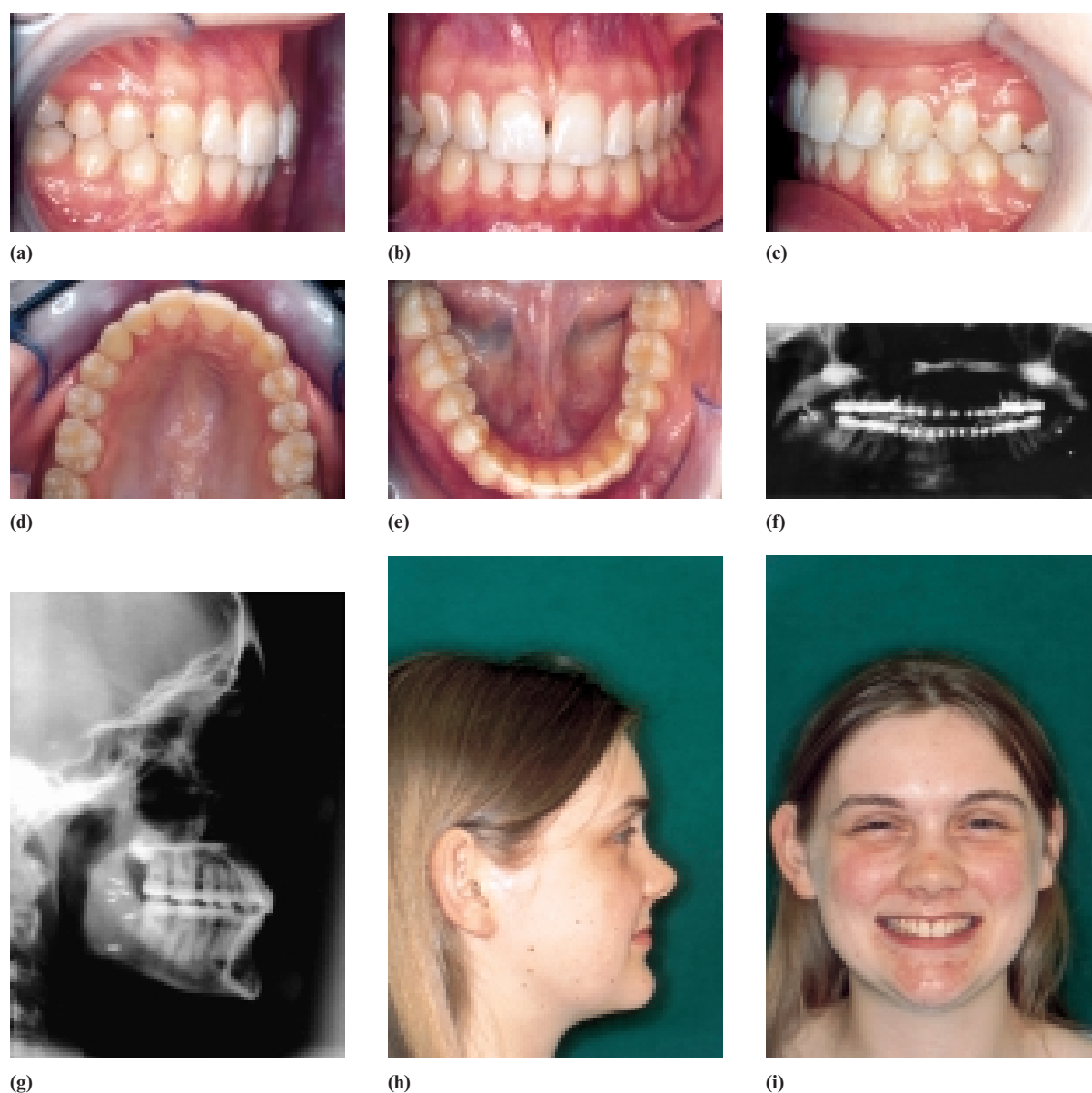


Fig. 11 (a-l) Case report 3: post-treatment records. (a-e) Intra-oral views. (f) Panoramic radiograph. (g) Lateral skull radiograph. (h-i) Extra-oral views. (j) Cephalometric tracing. (k) Superimposition of pre-treatment (black) and post-treatment (red) cephalometric tracings on De Coster's line. (l) Maxillary and mandibular superimposition of pre-treatment (black) and post-treatment (red) cephalometric tracings on Björk's reference structures.

surgery was sufficient for this case as the patient had a pleasing 'smile line' with no evidence of vertical anterior maxillary excess.

The relationship of the upper and lower incisors to the mandibular plane, maxillary plane, A–Po line and the F–M plane has improved considerably with this treatment approach (Table 3). This was an important objective of the overall treatment. A normal edge-centroid

relationship now exists and this should improve the long-term stability of the treated Class II Division 2 malocclusion.⁸

Both left and right lateral excursions of the mandible are now canine-guided with an absence of working/non-working side interferences. Protrusive movements are also normal. The unerupted upper third permanent molars are simply being kept under observation at the

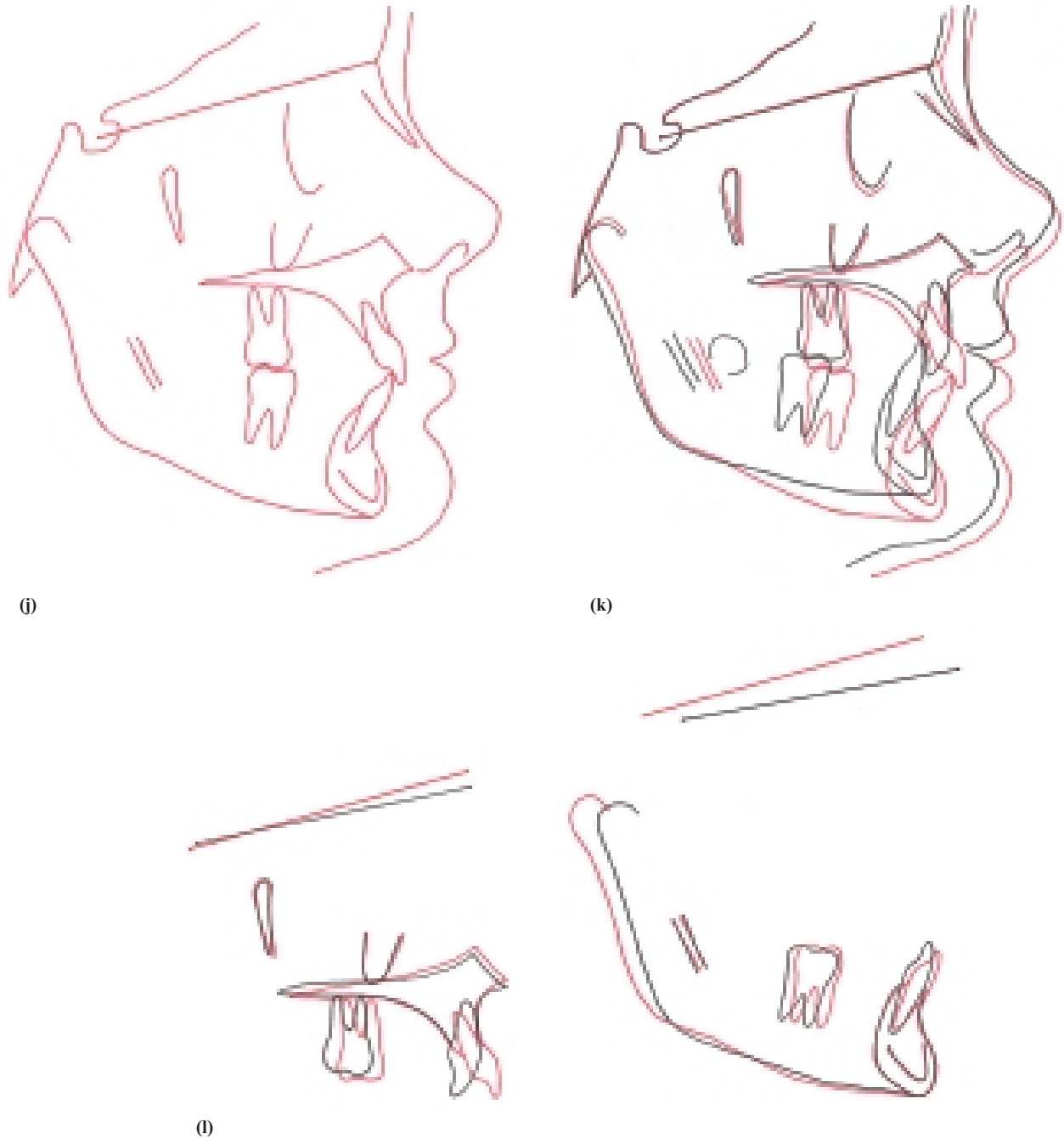


Fig. 11 (Continued).

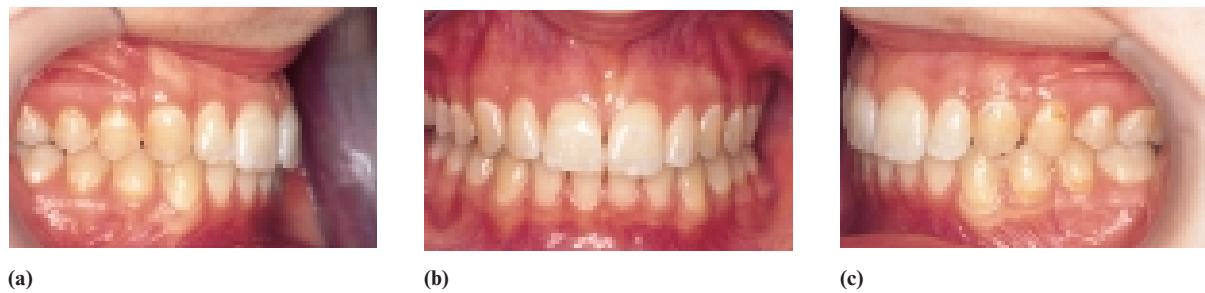


Fig. 12 (a–c) Case report 3: 15 months post-debond review records. (a–c) Intra-oral views.

Table 3 Case report 3. Pre- and post-treatment cephalometric analysis

	Pre-treatment	Post-treatment
SNA	78.5°	77°
SNB	72°	75°
ANB	6.5°	2°
FMPA	16°	23°
MxP/MdP	15°	21°
LAFH/TAFH	52%	54%
Mandibular unit length	110 mm	117 mm
Maxillary unit length	95 mm	95 mm
Unit length difference	15 mm	22 mm
UI/Mx.P	82°	110°
LI/Md.P	94°	100°
Inter-incisal angle	169°	128°
Edge-centroid relationship	-3.5 mm	+3 mm
LI/A-Po line	-6 mm	+1.5 mm
Lower lip to 'E' line	-6 mm	-5 mm
Wits analysis	+4 mm	-1 mm
Holdaway angle	9.5°	9°

moment. They will probably be extracted under local anaesthetic once they have erupted as they will be non-functional.

The post-treatment PAR score was 1, which demonstrated that this treated case is in the 'greatly improved' category of the PAR nomogram with a 97 per cent reduction in the weighted PAR score. On review at 15 months post-debond, the arch alignment and overbite reduction were remaining stable (Figure 12). A localized (Class V) area of cervical decalcification affecting only 24 seemed to be progressing during the retention phase. A yellow/brown discoloration had occurred post-treatment but with no evidence of cavitation. Dietary and oral hygiene advice was reinforced and the patient's

general dental practitioner was informed and advised to monitor this area.

Acknowledgements

I would like to express my thanks to all my work colleagues in the Orthodontic Department of St. James's University Hospital for their support and advice. I would also like to thank Mr Alex Breitenbach (General Manager of Forestadent®) without whom this prize and the associated travel would not have been possible.

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