

Clinical Section

The Orthologic/'A' Company Award 1997

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Introduction

The Orthologic/'A' Company prize is awarded annually and allows the recipient the opportunity to travel to the USA, to attend a postgraduate course and visit the 'A' Company factory in San Diego.

Candidates are invited to present two of their M.Orth. examination cases which are displayed at the Clinical Demonstration section of the British Orthodontic Conference. In order to comply with the regulations, each case must have been treated with multi-band fixed appliances. However, orthognathic cases are not accepted.

The two cases which were successfully submitted for the award at Harrogate in 1997 are described below.

Case Report 1

N.T. was a 13-year-old female who was referred by her general dental practitioner. Her presenting complaint was the poor appearance of her front teeth. She had unsatisfactory oral hygiene when initially examined, although she had been a regular attender at her general dental practitioner. There was no history of any habits and no relevant medical history.

Examination revealed a Class II skeletal pattern with average lower anterior facial height and Frankfort-mandibular planes angle. Lips were full, everted and of normal length with normal gingival exposure on smiling. Examination of the temporomandibular joints revealed no obvious abnormality. (Figures 1a-c).

Intra-oral examination revealed generalized marginal gingivitis and evidence of fluorosis, but no other pathology was evident. The lower arch was severely crowded in the labial segment and the buccal segments were well aligned.

The upper arch was also severely crowded in the labial segment with reasonable buccal segment alignment. (Figures 1d-e).

In occlusion, there was a Class II division 1 incisor relationship with an overjet of 10 mm and overbite of 7 mm with coincident centrelines. The molar relationship was a half unit Class II on the right with a full unit Class II on the left, no crossbites or displacements being evident (Figures 1f-h).

Index of treatment need (IOTN) pretreatment = 5a.

Peer assessment rating (PAR), pretreatment = 46.

Radiographic Investigation

An orthopantomogram confirmed the presence of all teeth, with third molars unerupted and no pathology evident. Using the pretreatment lateral cephalogram (Figure 1i), analysis showed SNA to be 78° and SNB 73°. The ANB value therefore indicated a mild Class II skeletal pattern. However, applying the Eastman correction, the ANB value was more indicative of a significant Class II skeletal pattern. Witt's analysis confirmed this observation with an AO-BO distance of 7 mm and the lower incisor-APo, was -2 mm. All other cephalometric values (Table 1) were within normal ranges.

Space analysis revealed a requirement of 13 mm in the lower arch and 24 mm in the upper arch. The maximum space that could be provided by extraction of all four first premolars was 14 mm in the lower arch and 15 mm in the upper arch. Clearly, there was a significant deficit and favourable growth would be a key factor in achieving full correction of the malocclusion. Bolton analysis indicated a slight mandibular excess.

TABLE 1 Cephalometric analysis of treatment N.T.

	Pretreatment	Post-functional	Post-treatment	Mean + S.D.
SNA (°)	78	78	78	81 ± 3
SNB (°)	73	76	77	78 ± 3
ANB (°)	5	2	1	3 ± 2
SN-maxillary plane (°)	9	10	8	8 ± 3
MMPA (°)	25	26	24	27 ± 4
Lower facial height (%)	55	57	57	55 ± 2
UI-max (°)	112	110	114	109 ± 6
Li-mand (°)	94	100	99	93 ± 6
Li-APo (mm)	-2	3	1	2 ± 2
Overjet (mm)	10	1	2	3 ± 1
Overbite (mm)	7	1	2	3-4
Interincisal-angle (°)	125	125	124	133 ± 10

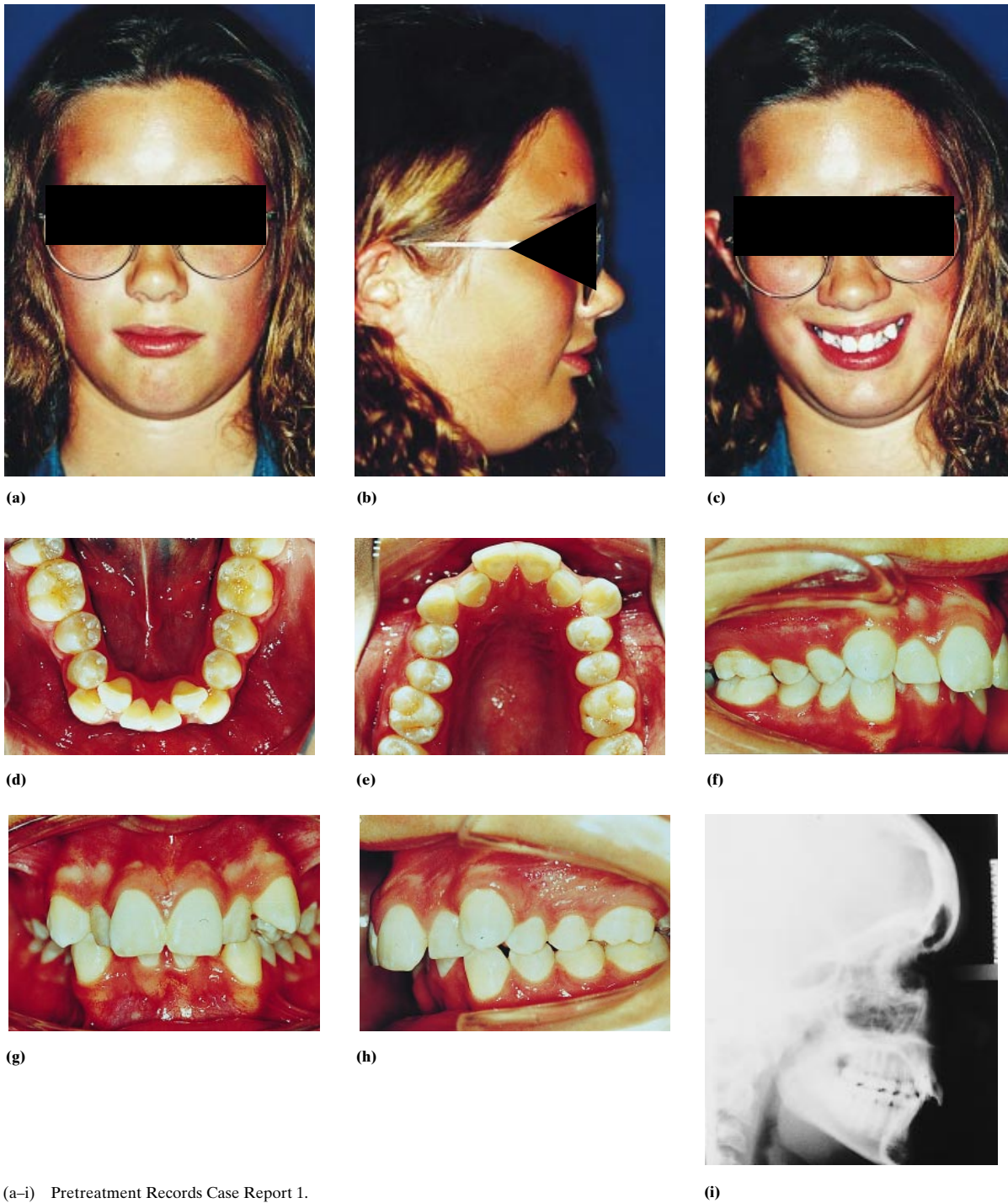


FIG. 1 (a-i) Pretreatment Records Case Report 1.

Aims of Treatment

1. Correction of sagittal discrepancy.
2. Relief of crowding.
3. Level and alignment of the arches.
4. Correction of overjet and overbite.
5. Correction of molar relationship to Class I.

Treatment Plan

1. Extraction of 14, 24, 34, 44.
2. Twin Block functional appliance (modified) to correct the sagittal discrepancy.
3. Upper and lower pre-adjusted Edgewise appliances ('A' Company, Bennett prescription with 0.022 × 0.028-inch slot).
4. Retention (long-term).

The total active treatment time was 21 months, during which time oral hygiene was monitored and the patient instructed to undertake daily fluoride mouthwashes (0.05% NaF). Sagittal correction was achieved using a modified Twin Block appliance (Figure 2) and, due to the degree of crowding, the four premolars were extracted prior to Twin Block placement. Canine retractors were incorporated into the appliance to modify the position of the canines, and to relieve the labial segment crowding in upper and lower arches.

The functional appliance phase of the treatment lasted for 5 months, and achieved an overjet reduction to 1 mm and molar relationship over-correction to a Class III relationship (Figures 3a-e). Bands were placed on 16, 26 and an inclined bite plane was fitted with Plint clips engaging the buccal aspect of the bands.

The clip-over inclined bite plane was worn to maintain the sagittal correction until Class II elastics could be incorporated into the treatment. Initial alignment was undertaken with 0.016-inch martensitic active nickel titanium wire, with lacebacks in all quadrants. The archwire progressed to 0.018 × 0.025-inch martensitic active nickel titanium wire, retaining lacebacks to permit further canine root movement. This was then followed by posted 0.019 × 0.025-inch stainless steel archwire (100 per cent Euro-

form). Space closing mechanics involved placement of traction ligatures and Class II elastics. Lateral open bites were evident following the Twin Block phase of treatment, but these satisfactorily closed on progression through the archwire sequence.

A month prior to debond, functional occlusion was checked, confirming that no interferences were present in lateral excursions and protrusion. The appliances were debonded and a lateral cephalogram was taken to investigate the changes as a result of treatment (Figures 4a-i).

The retention phase was initiated with placement of upper Hawley and lower Barrer appliances worn on a full-time basis for 6 months. This was continued as night time wear from 6 months onwards. The possibility of late lower incisor crowding was discussed with the patient and one of her parents, and she wished to wear the appliance long-term to maintain alignment.

Case Assessment 1

This patient would commonly be regarded as being at the top end of the age range normally considered for functional appliances. Orthognathic surgery could have been considered if sagittal correction had not been achieved.

Superimposition of the pretreatment and post-functional lateral cephalogram (Figure 5) demonstrated significant anterior and vertical growth of the mandible. There was no forward growth of the maxilla detected, however at this stage cephalometric analysis (Table 1) revealed a slight increase in the inclination of the maxilla (Sn-maxillary plane), the maxillary mandibular planes angle (MMPA) and the lower anterior facial height. There was retroclination of the upper incisors and proclination of the lower incisors which, along with the forward movement of the mandible, resulted in the reduction of the overjet and overbite.



FIG. 2 Modified Twin Block Appliance Case Report 1.

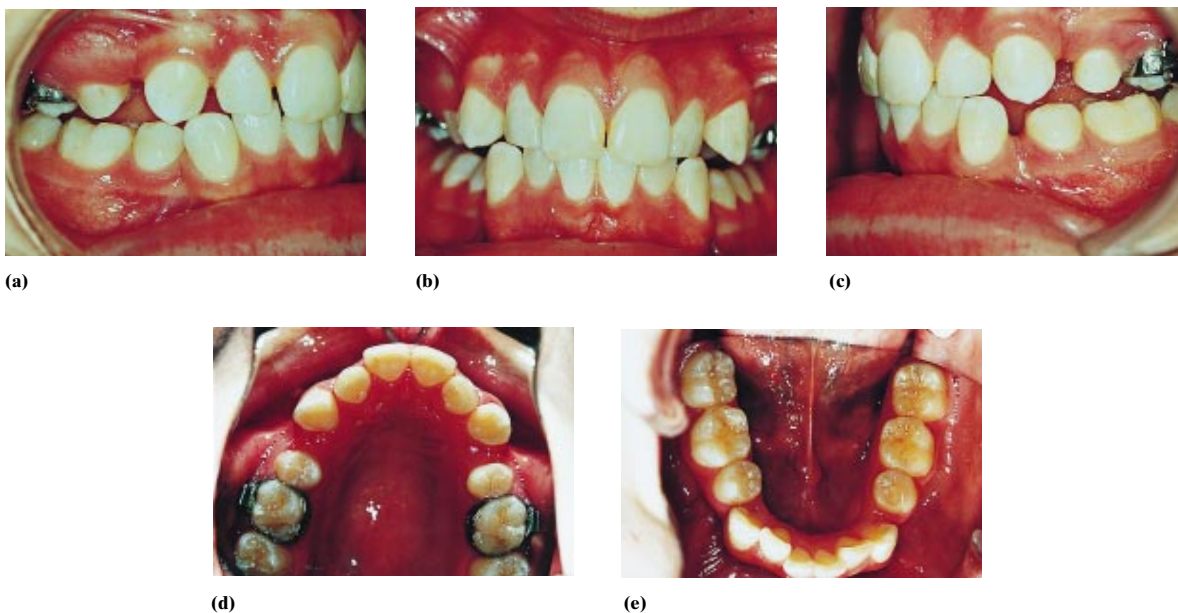


FIG. 3 (a-e) Mid Treatment Records: Case Report 1.



FIG. 4 (a-i) Post-treatment Records: Case Report 1

Following the fixed appliance phase of treatment, superimposition of the pre- and post-treatment lateral cephalograms (Figure 6) demonstrated that the skeletal changes produced by the functional phase of treatment have been maintained. The upper labial segment retroclination seen following the Twin Block phase was reversed with some additional proclination (Table 1). The lower labial segment remained proclined, +1 mm lower incisor-APo.

During treatment, the lower intercanine width increased by 1.5 mm and the upper intercanine width increased by

0.5 mm. The lower intermolar width remained constant whereas the upper intermolar width increased by 1.5 mm.

Post-treatment Peer Assessment Ratio (PAR) = 2

Percentage reduction in PAR score = 96%

Case report 2

H.N. was a 14½-year-old female who was referred by her general dental practitioner, having complained about the



FIG. 5 Cephalometric Superimpositions: Case Report 1. Pretreatment on Post Functional.



FIG. 6 Cephalometric Superimpositions: Case Report 1. Pretreatment on Post-treatment.

appearance of her front teeth. She had no relevant medical history and had been a regular attender at her dentist for general dental treatment.

On examination, she presented with a Class I skeletal pattern with a slightly increased Frankfort-mandibular planes angle and the lower anterior facial height was within normal limits. There was no apparent facial asymmetry and examination of the temporomandibular joints revealed no obvious abnormalities.

Oral hygiene was satisfactory and she had a full permanent dentition which was healthy. In the lower arch, both the lower labial and buccal segments were mildly crowded. There was maxillary arch constriction with severe labial and buccal crowding and the upper incisors were retroclined (Figures 7a-h).

There was a significant anterior displacement from the retruded contact position RCP, into the intercuspal position ICP. In RCP, there was a half unit Class II molar relationship bilaterally, the overjet was 1 mm with no overbite, and the upper centreline was 1 mm to the right. There were bilateral buccal crossbites and 12, 22 were also in crossbite.

Radiographic examination

An orthopantomogram confirmed that all four third molars were present and there was no pathology evident. The lateral cephalogram was taken in the retruded contact position (RCP) and cephalometric analysis (Table 2) demonstrated a Class I skeletal pattern with the maxillary-mandibular planes angle at the upper limit of normal. However both jaws were retrognathic. The sella-nasion to maxillary planes and the lower anterior facial height were within normal limits. Witt's analysis demonstrated an AO-BO discrepancy of -2 mm, suggesting a Class III element (Figure 8).

Peer assessment rating (PAR) pretreatment = 62.

Index of treatment need (IOTN) pretreatment = 4d.

Aims of treatment

1. Correction of the transverse discrepancy.
2. Relief of crowding in the upper and lower arches.

3. Level and alignment of the arches.
4. Maintenance of the overjet and overbite in the retruded contact position.
5. Correction of the molar relationship to Class I.
6. Elimination of the mandibular displacement.

Treatment plan

1. Oral hygiene reinforcement.
2. Rapid maxillary expansion (RME).
3. Extraction 15, 24, 34, 44 (N.B. later revised to 14, 24, 34, 44).
4. Upper and lower pre-adjusted Edgewise appliance ('A' Company 0.022 × 0.028-inch slot, Andrews prescription).
5. Retention.

The patient was given oral hygiene instruction, including the use of fluoride mouthwashes daily (0.05% NaF). RME was undertaken using a Hyrax screw appliance (Figure 9). The patient was instructed to turn the appliance one turn, twice a day and was reviewed on a weekly basis during the expansion phase. Explanation was given prior to treatment regarding diastema creation during the expansion phase and reassurance was given that this would resolve spontaneously during the retention phase.

Following the expansion phase, the screw was secured to prevent movement and the appliance left *in situ* for 3

TABLE 2 Cephalometric analysis of treatment H.N.

	Pretreatment	Post-treatment	Mean ± S.D.
SNA (°)	74.0	74.0	81 ± 3
SNB (°)	73.0	73.0	78 ± 3
ANB (°)	1.0	1.0	3 ± 2
SN-maxillary plane (°)	7.0	8.5	8 ± 3
MMPA (°)	31.5	32.0	27 ± 4
Lower facial height (%)	54.0	55.5	55 ± 2
UI-max (°)	100.0	104.0	109 ± 6
Li-mand (°)	87.0	86.0	93 ± 6
Li-APo (mm)	0	-1.5	2 ± 2
Overjet (mm)	1	2	3 ± 1
Overbite (mm)	0	2	3-4
Interincisal-angle (°)	141	139	133 ± 10

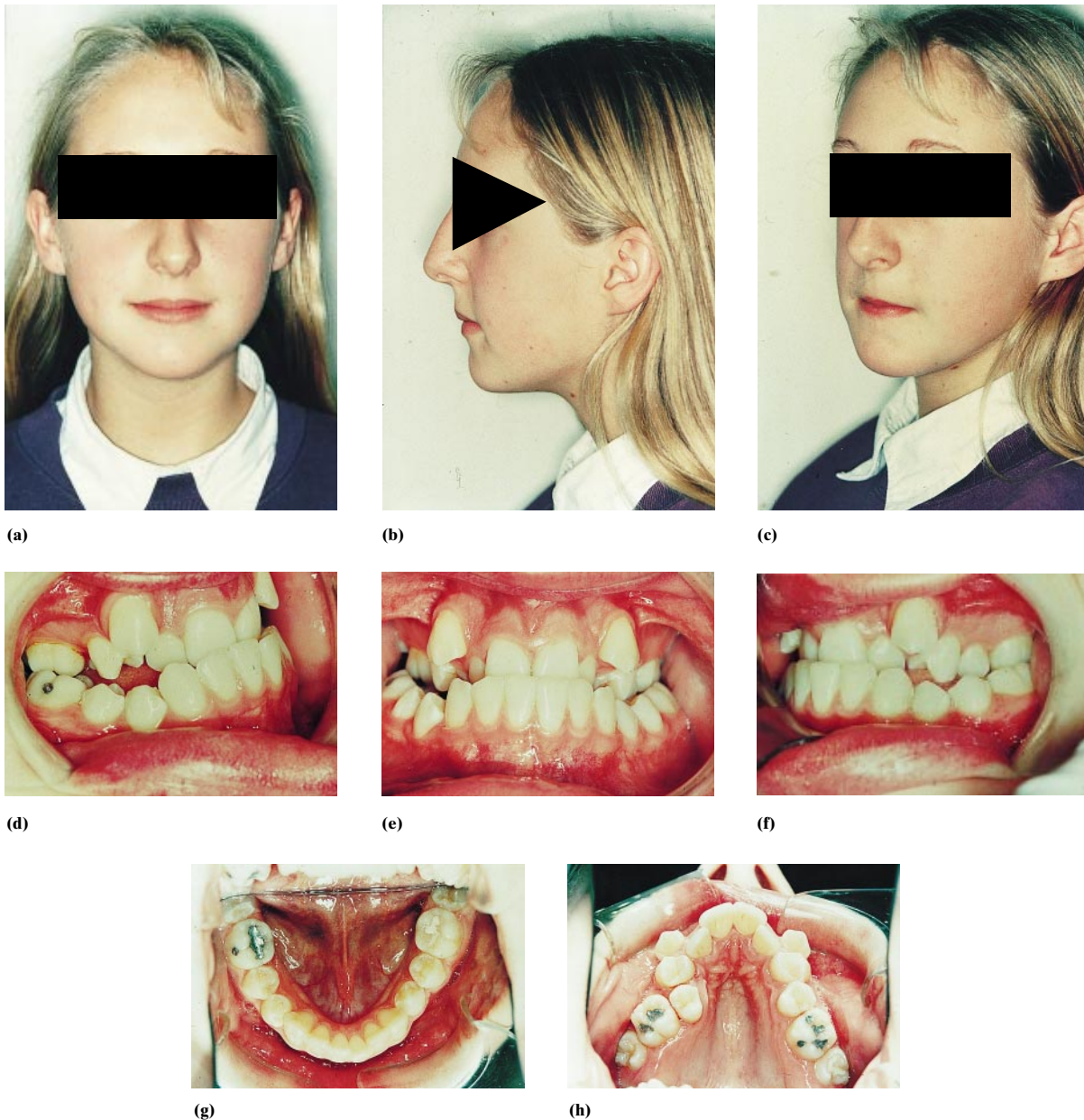


FIG. 7 (a-h) Pretreatment Records: Case Report 2.

months and reviewed at monthly intervals. A palatal arch replaced the Hyrax appliance after 3 months and was fabricated on the same day as removal of the RME appliance. The latter was temporarily cemented between the impression and the palatal arch fitted later that day to ensure no arch contraction occurred. Reassessment following the expansion phase led to removal of all four first premolars (Figures 10a-b).

The entire treatment lasted a total of 30 months. Initial alignment and levelling was obtained using 0.016-inch martensitic active nickel titanium wire and 0.018 × 0.025-inch martensitic active nickel titanium wire. Further alignment of 12, 22 was required which included the use of nickel-titanium pushcoil on 0.020-inch round stainless steel to open space and a 'piggy-back' to aid alignment. The

archwire sequence led to the placement of upper and lower 0.019 × 0.025-inch posted stainless steel arches (100 per cent Euro-Arch form) permitting full archform expression. Progressive buccal root torque in the upper buccal segments was added to combat the buccal flaring resulting from the expansion. This rigid wire also maintained the transverse correction allowing removal of the palatal arch (15 months following cementation).

There was a tendency towards Class III incisor relationship which resulted in placement of a 0.018-inch round stainless steel with loops between the laterals and canines. This allowed light Class III elastics to be used to maintain the overjet and elastic force was used differentially to correct the centreline.

In the upper arch 17, 27 had remained buccally placed



FIG. 8 Pretreatment Cephalogram. Case Report.

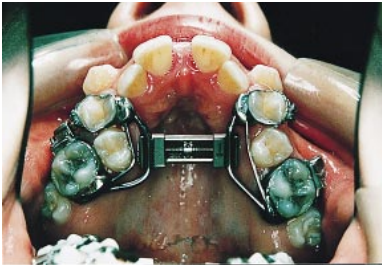


FIG. 9 Hyrax appliance.

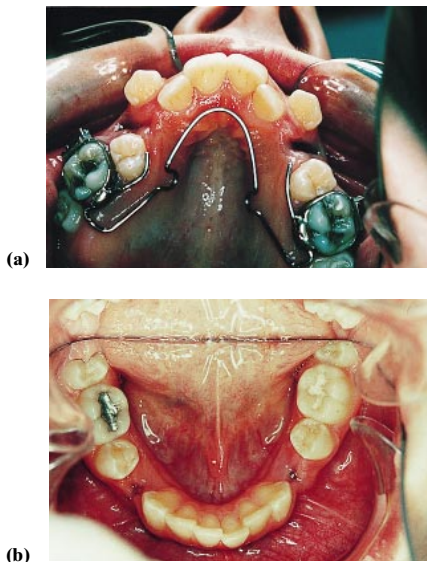


FIG. 10 Post Extraction photographs. Case Report 2.

toward the end of treatment. This was resolved by replacement of the 16, 26 bands with triple tube bands, allowing the main 0.019 × 0.025-inch posted stainless steel arch to be retained, thus maintaining expansion while concurrently aligning the banded 17, 27 with a 0.018 × 0.025-inch martensitic active nickel titanium wire. In view of the overbite,

the bands on 17, 27 were seated slightly occlusally to ensure that no extrusion of the upper second molars occurred.

To facilitate alignment of the upper second molars, a cross-elastic was incorporated from the buccal of 17, 27 to lingual cleats on the bands 36, 46. This had the additional benefit that the lower molars were prevented from tipping lingually on the lower 0.018-inch round stainless steel wire. Buccal interdigitation was improved using box-elastics with a Class III element.

Functional occlusion was checked and recorded during the treatment, prior to debond and post-treatment. Towards the end of treatment, an orthopantomogram and lateral cephalogram were prescribed to evaluate root position and incisor angulation. Slight resorption was noted, and so active tooth movement was stopped and the appliances were debonded (Figures 11a-i).

A lower fixed retainer was placed, with an upper removable retainer maintaining the transverse correction. This was prescribed full-time for 6 months, followed by night-time wear.

Case Assessment 2

Prior to RME, the patient was warned of possible sequelae, e.g. root resorption, diastema formation. The patient was fully compliant with instructions during RME and throughout treatment.

The cephalometric superimpositions of pretreatment and near-end of treatment lateral cephalograms (Figure 12) revealed that relative to the anterior cranial base, there had been significant horizontal and vertical growth of the maxilla and the mandible. With maxillary superimposition, the incisors had proclined and extruded relative to the maxillary basal bone. Relative to the anterior cranial base, there was a slight clockwise rotation of the maxilla causing a tipping of the maxilla anteriorly. Mandibular superimposition revealed a slight retroclination of the lower incisors and lingual bodily movement, and the molars were extruded and moved mesially. Relative to the anterior cranial base there was substantial vertical growth of the body of the mandible with no rotational element.

During the course of the treatment, the upper inter-molar width increased by 6 mm and the lower inter-molar width reduced by 2 mm. The upper and lower inter-canine width increased by 1.5 and 1 mm, respectively.

The possibility of late lower incisor crowding was discussed with the patient and also the need for long-term retention. This was advised for preservation of both the transverse correction and tooth position, although it is hoped that a more superior position of the tongue and good buccal interdigitation will contribute to the stability of the maxillary arch.

Functional occlusion demonstrated canine guidance bilaterally with no interferences and anterior guidance in protrusion with gentle posterior segment disocclusion. The anterior displacement was eliminated and there was no significant slide from RCP to ICP.

Peer assessment rating at the end of treatment (PAR) = 1.

Percentage reduction in PAR score during treatment = 98%.



FIG. 11 (a-i) Post-Treatment Records Case 2.



FIG. 12 Cephalometric Superimposition. Pre and Post-treatment radiographs.

Acknowledgements

I would like to thank my clinical supervisors over the past 3 years at the Chesterfield and North Derbyshire Royal Hospital, and the Charles Clifford Dental Hospital, Sheffield, and to Mr David Smith (Director and General Manager of Orthologic) for making this opportunity possible.

Due to commercial developments since this award was made, it is appropriate to acknowledge continued support of the award by Mr Eckhard Vogel (Omco Europe).