

## Clinical Section

# The B.S.S.O. M. Orth. Prize of the Royal College of Surgeons of England 1996

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### Introduction

This award was established in 1988, the first year in which the Membership in Orthodontics was examined at the Royal College of Surgeons of England. It was presented to the College by the British Society for the Study of Orthodontics. A medal and a certificate are presented to the candidate at the examination with the highest overall mark in Part II of the examination. The prize is only awarded if the examiners believe the candidate's performance is of sufficiently high a standard.

Among the various part of the examination, which include a long clinical case, diagnostic tests, oral examinations and a written paper, the candidate must present three personally-treated, fully documented cases. He or she is then examined orally on each of the presented cases.

### Case report 1

A 14-year 9-month-old patient of Asian descent was referred by his General Dental Practitioner. On presentation, his main complaint was the appearance of his protruding upper lateral incisors. His GDP had previously extracted the lower right first premolar in an attempt to gain some resolution of localized crowding.

On examination, he presented with a Class II division II incisor relationship on a moderate Skeletal II base, due to relative maxillary protrusion and mandibular retrusion. Clinically, he had an increased FMPA, but average lower face height proportion. His lips were habitually competent with some obvious hyperactivity of the mentalis muscle. Both lips were slightly behind Ricketts' aesthetic 'E' line and the nasolabial angle was slightly obtuse.

Intra-oral examination of his dentition revealed that the standard of oral hygiene was good and that he was in the full permanent dentition, with the exception of the previously extracted lower right first premolar and all four third molars. The upper right and left, and lower right first molars had restorations present, with a fracture of the enamel at the distal margin of the restoration in the upper right first molar.

The lower labial segment was well aligned and of normal inclination to the dental base. The lower left

canine was upright and the right was distally angulated. The buccal segments were also well aligned, although there had been some tipping of the lower right canine and second premolar into the first premolar extraction site. Apart from this slight constriction in the lower right premolar region, the lower arch had good form.

The upper labial segment was moderately crowded with both upper central incisors retroclined and both lateral incisors proclined. Both upper canines were distally angulated. The buccal segments were well aligned. Both the lateral incisors and first molars were slightly diminutive relative to their counterparts.

In occlusion the incisor relationship was Class II division II with an overjet of 2.5 mm on both upper central incisors and 7.5 mm on the upper left lateral incisor. The overbite was slightly increased and complete. The upper centreline was correct to the facial midline, whilst the lower centreline was displaced 2 mm to the right. The molar relationship was Class I on the right and a full unit Class II on the left. The canine relationship was three-quarter unit Class II on the left and a full unit Class II on the right (Fig. 1a-i).

The pan-oral radiograph revealed no obvious pathology present and the presence of all four third molar teeth. The lateral cephalogram confirmed that the patient had a moderate skeletal II pattern. Using an Eastman conversion, the ANB difference was 7 degrees and the Wits analysis difference was +5 mm. The upper incisors were retroclined at 94 degrees to the maxillary plane and the lower incisors were, at 96 degrees to the mandibular plane, positioned at the upper limit of the expected normal inclination. The edge-centroid relationship was -1 mm and the inter incisal angle 140 degrees (Table 1)

For case 1 the Dental Health Component (DHC) score on the Index of Treatment Need (IOTN) was 4d with an Aesthetic Component (AC) score of 9 (Brooke and Shaw, 1989). The pretreatment weighted Peer Assessment Rating (PAR) score was 37 (Richmond *et al.*, 1992).

The aims of treatment were:

- (1) to produce arch alignment by orthodontic camouflage accepting the existing skeletal pattern;
- (2) space creation for the relief of crowding and centreline correction by the loss of permanent dental units;
- (3) levelling and alignment of both arches;
- (4) correction of the molar relationship;



FIG. 1 (a-i) Case report 1: pretreatment photographs and lateral cephalogram.

TABLE 1 Case Report 1. Pre and Post treatment cephalometric analysis

	Pre treatment	Post treatment
SNA (degrees)	85	84
SNB (degrees)	76	77
ANB (degrees)	9	7
SNMxP (degrees)	10	10
MxMdP (degrees)	30	30
Wits analysis (mm)	5	4
UI/MxP (degrees)	94	102
LI/MdP (degrees)	96	99
I/I angle (degrees)	140	130
SNI (degrees)	82	81
Edge-centroid relationship (mm)	-1	+2
LI/APo (mm)	+1	+1.5
LAFH/TAFH%	54	56

- (5) correction of the lower centreline;
- (6) correction of the overbite, overjet and axial inclination of labial segments;
- (7) closure of the residual spaces;
- (8) establishment of a good functional occlusion.

Treatment involved the loss of the lower left second premolar and both upper first premolars. Active treatment

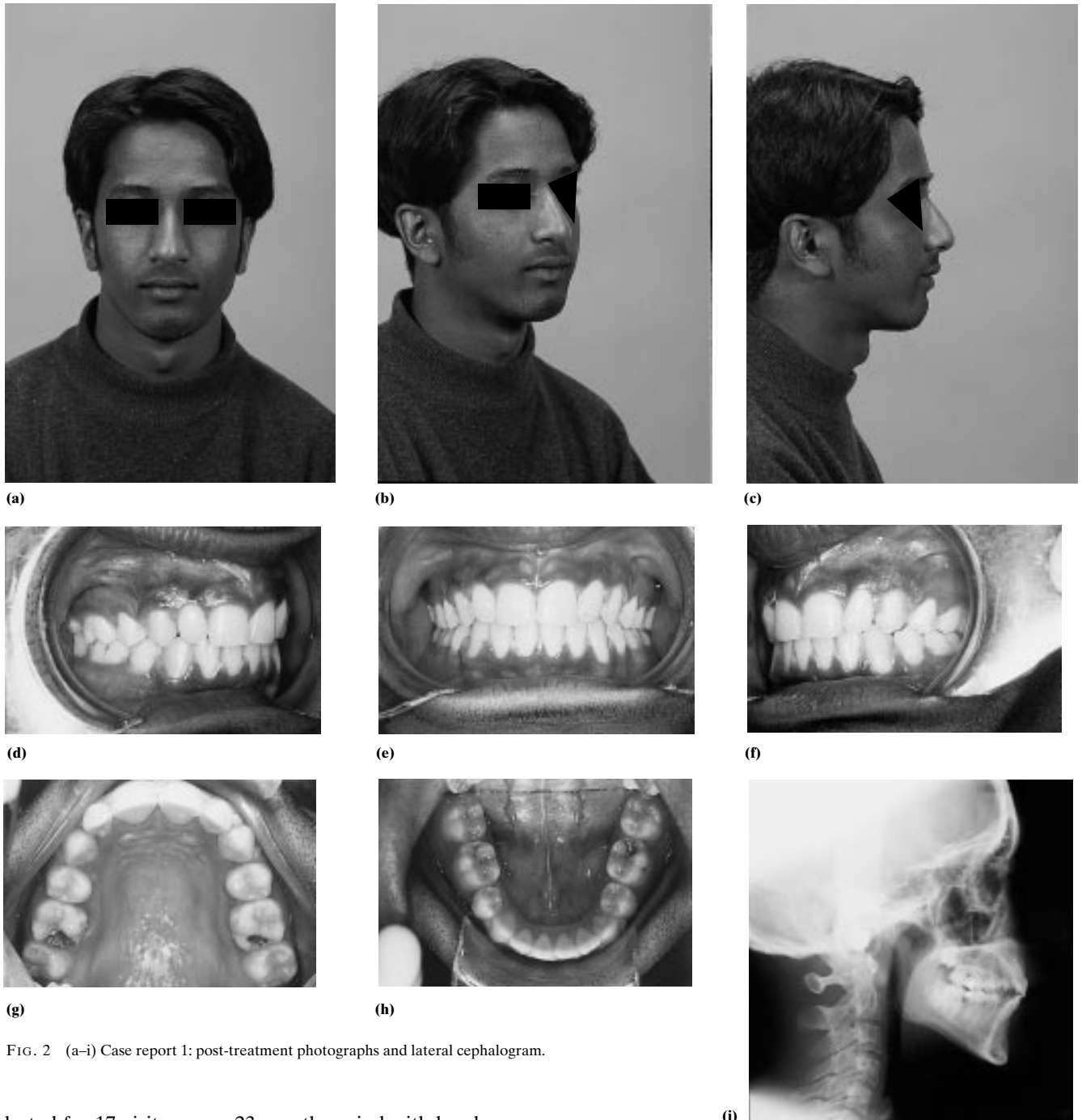


FIG. 2 (a-i) Case report 1: post-treatment photographs and lateral cephalogram.

lasted for 17 visits over a 23-month period with headgear being worn throughout this period. Both upper and lower arches were fitted with pre-adjusted Edgewise appliances (0.022 × 0.030-inch slot, Andrews' prescription) utilising a preformed arch form adapted specifically to maintain the patient's original arch form, whilst addressing the slight constriction in the right premolar region. Combination headgear was fitted with a force of approximately 350 g per side and instructions were given for this to be worn 12–14 hours per day.

Initially, the upper and lower labial segments were not incorporated in the fixed appliance. This was done in order to avoid unnecessary proclination of the upper labial segment before adequate space had been created

for alignment and also to avoid deepening the overbite by extrusion of the lower labial segment as a consequence of the relative distal angulation of the lower canines.

After initial leveling and alignment in both arches using flexible archwires, both upper canines and the lower left canine were retracted over a 4-month period into a Class I relationship using 0.018-inch stainless steel archwires. In the lower arch the centreline was corrected

on an 0.018-inch stainless steel archwire by retraction of the lower left canine, and by allowing the mesial movement of the right canine due to the expression of the tip incorporated in the bracket and the avoidance of a laceback on this side. At this stage both the upper and lower labial segments were incorporated in to the fixed appliance, as were the lower second molars (Fig. 2a-i)

Once the lower centerline had been corrected and full alignment was achieved in the upper labial segment upper and lower 0.019 × 0.025-inch stainless steel archwires were placed. The small amount of overbite reduction necessary was achieved by placing a reverse curve of Spee in the final lower archwire. In the upper arch an 0.021 × 0.025-inch stainless steel archwire was then used in an attempt to gain maximum torque expression in the upper labial segment. After allowing this archwire to express for one visit, increased labial crown torque was added in the upper incisor region over the subsequent two visits. Class II intermaxillary elastics were used to help correct the molar relationship and provide anchorage for the labial crown torque placed in the upper archwire. Final finishing was achieved in the lower arch with an 0.018 × 0.025-inch TMA archwire adjusted to correct the torque in the lower second molars.

Upper and lower Hawley style retainers with acrylated labial bows were fitted and instructions given for a period of 6 months full time wear and 6 months night time wear.

### Case 1 assessment

This case presents an interesting type of Class II division II malocclusion where, instead of the usual mild skeletal pattern, and reduced MM angle and LAFH proportion, the patient presented with a moderate to severe skeletal pattern and increased vertical proportions. This, in turn, was complicated by the diminutive upper laterals and first molars. It was decided to accept his marked Skeletal II pattern as growth modification with a functional appliance was not deemed to be an option because of the patient's relative skeletal maturity and the patient was not concerned enough about the appearance of his profile to consider a combined orthodontic/surgical option.

To correct this malocclusion within the existing skeletal pattern required careful control of anchorage and good patient management skills to encourage prolonged head-gear wear, especially difficult in a 14-year-old male.

Cephalometric superimposition reveals that there was continued vertical growth with little change in the antero-posterior relationship. There was some mild proclination of the lower labial segment relative to the mandibular plane, although SNI and LI/APo remained almost unchanged. In the long term this should mean that stability has not been compromised, as it is believed that maintaining SNI at its pretreatment value is a good post-treatment indicator of stability (Mills, 1968). In order to compensate for the patient's skeletal pattern it was necessary to leave the upper labial segment relatively under torqued and to maintain the lower labial segment at its original inclination. The inter incisal angle had been over-corrected to 130 degrees and the edge-centroid relationship corrected to +2 mm, factors believed to be

important in the long-term stability of Class II division II incisor relationships (Houston, 1989).

The lower inter-canine width was maintained at 28 mm and the lower inter molar width decreased from 44 to 40 mm which reflects the mesial movement of both molars. At the completion of treatment the patient exhibited a mutually protected occlusion with group function on lateral excursions to both right and left. There was an absence of non-working side interferences with anterior guidance on protrusion.

The final PAR score of 4 reflects the fact that the second molars finished in a slightly Class II relationship. This was due to the final under torqued position of the upper labial segment, and the tooth size discrepancy present between the upper and lower first arches. Therefore, this case had a 89 per cent reduction in weighted PAR score and lies in the 'greatly improved' category of the PAR nomogram.

### Case report 2

This 13-year 8-month-old Caucasian female, referred by her GDP, was concerned about the appearance of her upper left lateral incisor which she felt 'sticks in'. She presented with a mild Class III incisor relationship on a mild Class III skeletal base, with a mildly convex facial profile and slightly prognathic mandible. The lower anterior face height proportion was average whilst the FMPA appeared to be slightly reduced. The lips were competent at rest and they lay just behind Ricketts' aesthetic plane. The nasolabial angle was acute.

With the exception of the third molars all the permanent dentition had erupted. The first molars, except for the lower left first molar, were hypoplastic, and deemed to be of poor long-term prognosis. The standard of oral hygiene was excellent.

The lower labial segment was slightly proclined to the dental base and moderately crowded with both lower canines mesially angulated and mesiolabially rotated. The



FIG. 3 Case report 1: pre- (red) and post-treatment (black) cephalometric tracings superimposed on SN at sella.

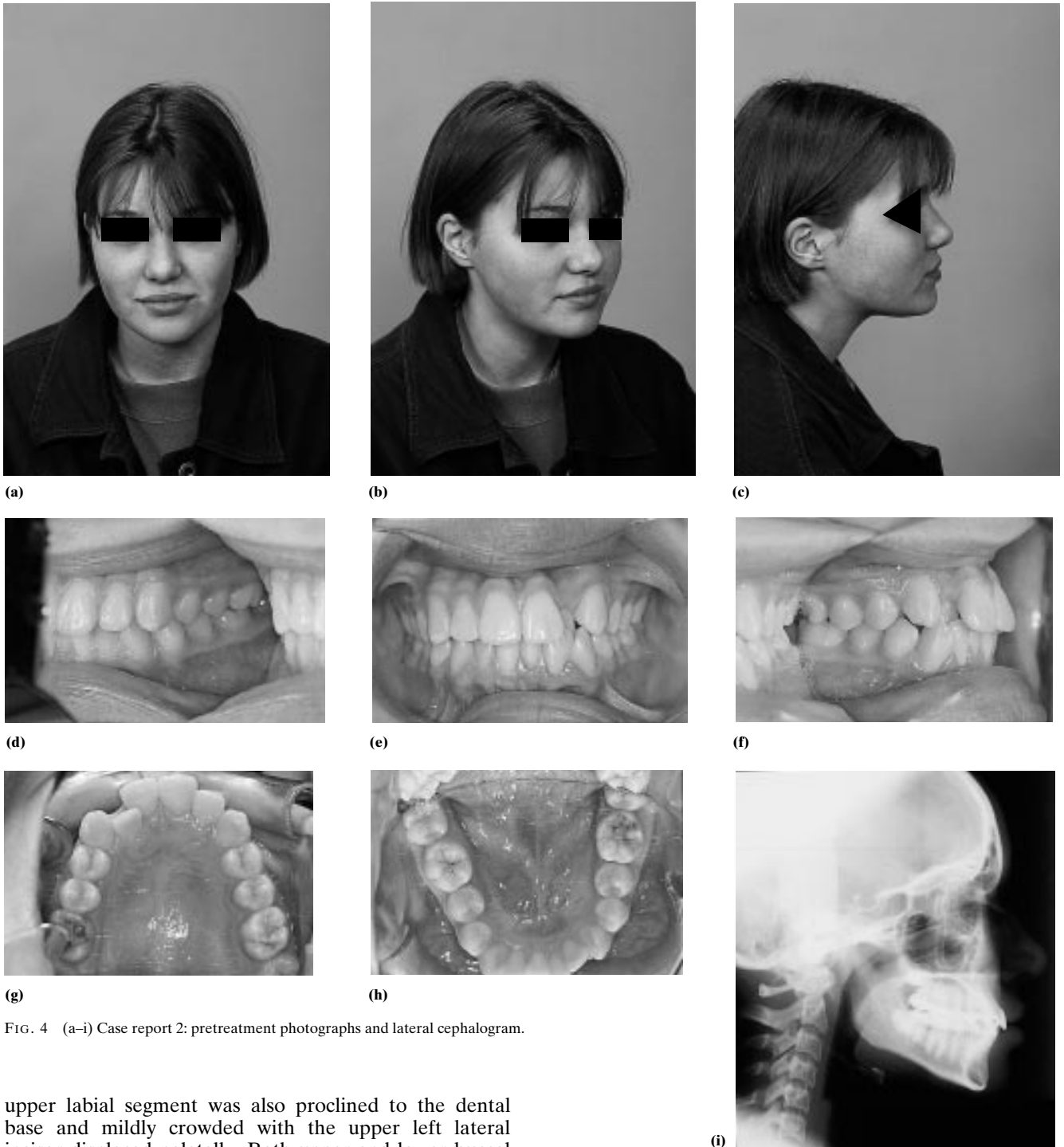


FIG. 4 (a-i) Case report 2: pretreatment photographs and lateral cephalogram.

upper labial segment was also proclined to the dental base and mildly crowded with the upper left lateral incisor displaced palatally. Both upper and lower buccal segments were well aligned.

In occlusion the incisor relationship was Class III with the upper left lateral incisor in cross-bite. There was a small forward displacement due to initial contact on the upper lateral incisor leading to a 1-mm discrepancy between retruded contact position (RCP) and intercuspal position (ICP). In ICP the overjet was 3 mm, and the overbite was complete and slightly reduced. The upper centreline was displaced 1 mm to the left and the molar relationship was Class 1 bilaterally (Fig. 4a-i).

Radiographs confirmed the presence of all four third

molars. Cephalometric analysis confirmed the mild Skeletal III pattern with an ANB difference of 0, following an Eastman correction, and a Wits analysis difference of -5 mm. There was a degree of bimaxillary proclination, the lower incisors having an inclination of 99 degrees to the mandibular plane and the upper incisors 120 degrees to the maxillary plane (Table 2).

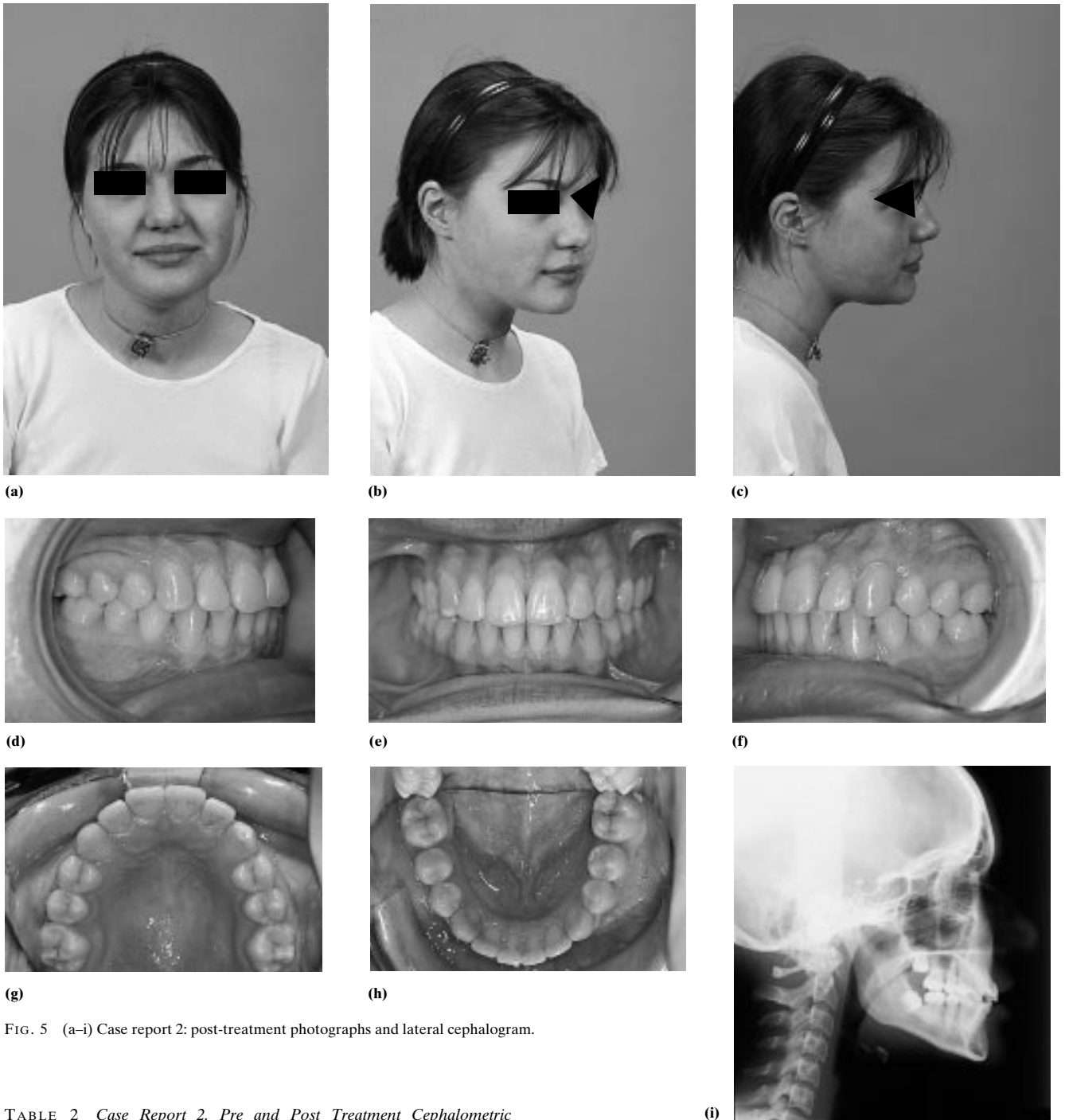


FIG. 5 (a-i) Case report 2: post-treatment photographs and lateral cephalogram.

TABLE 2 Case Report 2. Pre and Post Treatment Cephalometric analysis

	Pre treatment	Post treatment
SNA (degrees)	77	77
SNB (degrees)	79	79
ANB (degrees)	-2	-2
SNMxP (degrees)	9	7
MxMdP (degrees)	24	26
Wits analysis (mm)	-5	-5
UI/MxP (degrees)	120	110
LI/MdP (degrees)	99	100
LI/APo (mm)	+6	+4
LAFH/TAFH %	55	56

The aims of treatment were:

- (1) accept the mild skeletal discrepancy present as, even though this was likely to worsen with growth, it should not preclude orthodontic correction of the malocclusion;
- (2) space creation for the relief of crowding and centre-line correction by the loss of permanent dental units;

- (3) correction of the anterior cross-bite;
- (4) levelling and alignment of both arches;
- (5) maintenance of the molar relationship;
- (6) correction of the centrelines;
- (7) correction of the overbite, overjet and axial inclination of the labial segments;
- (8) closure of residual spaces;
- (9) establishment of a good functional occlusion;

Though rarely the extraction pattern of choice, it was decided that all four first molars should be extracted as they were, to varying degrees, hypoplastic and deemed to be of poor long-term prognosis. Following the extraction of these permanent units, upper and lower pre-adjusted Edgewise fixed appliances (0.022 × 0.030-inch slot Andrews' prescription) were fitted utilizing an arch form adapted to fit that of the patient.

Active treatment consisted of 17 visits over an 18-month period. Initially, both upper and lower labial segments were not included until the buccal segment teeth had been retracted in order to create space for their alignment. Elastomeric chain was used to retract all four second premolars on 0.018-inch stainless steel archwires which had omega loops placed in front of the molar tubes on the second molar bands to minimize any mesial movement or tipping of these teeth.

Once sufficient space had been created to allow labial segment alignment these teeth were bonded and alignment achieved using flexible nickel-titanium archwires. The anterior cross-bite was corrected during this treatment phase without the use of any device to disclude the teeth.

The final working archwires used were 0.019 × 0.025-inch stainless steel and space closure was achieved over a 9-month period with traction ligatures in all four quadrants. At the end of space closure small tip back bends were placed in the final archwires to fully upright the second molars which had slightly tipped mesially during space closure.

Upper and lower removable Hawley style retainers were fitted and instructions given that they should be worn full time for six months followed by night time wear for 6 months. The patient was also placed on long-term review to monitor the development of her third molars (Fig. 5a-i).

### Case 2 assessment

It has been said that extraction of first permanent molars 'doubles the treatment time and halves the prognosis' (Mills, 1987). However, with the advent of the pre-adjusted Edgewise appliance it may sometimes be the case that this is no longer true and, as the above case demonstrates, treatment can be both effective and relatively short.

During treatment there was no significant adverse change in the skeletal relationship. Although there was some continued mandibular growth, the cephalometric

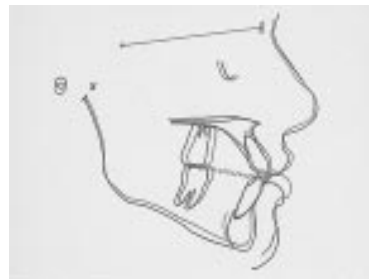


FIG. 6 Case report 2: pre- (red) and post-treatment (black) cephalometric tracings superimposed on SN at sella.

measures of skeletal discrepancy remained unchanged despite the elimination of the anterior displacement that had been present at initial presentation (Fig. 6).

The lower inter canine width remained stable at 25 mm. The lower inter second premolar width increased from 37 to 40 mm reflecting the fact that these teeth were distalised along the line of the arch. In lateral excursions there was canine guidance on both working sides and an absence of non-working side interferences. Protrusive movements were normal.

The post-treatment PAR score was zero. This treated case was therefore in the greatly improved category of the PAR nomogram and represents a 100 per cent (20 to 0) reduction in the weighted PAR score.

### Acknowledgements

I would like to express my gratitude to all my clinical supervisors at the Eastman Dental Institute and Hospital who have so taught me so effectively during my post-graduate training. Special thanks must also go to Dr Nigel Hunt and Mr Khosrow Safinia who supervised the above cases.

### References

- Brooke, P. H. and Shaw, W.C. (1989)**  
The development of an index of orthodontic treatment priority, *European Journal of Orthodontics*, **11**, 309–320.
- Houston, W. J. B. (1989)**  
The incisor edge-centroid relationship and overbite depth, *European Journal of Orthodontics*, **11**, 139–143.
- Mills, J. R. E. (1968)**  
The stability of the lower labial segment, *Dental Practitioner*, **18**, 293–305.
- Mills, J. R. E. (1987)**  
The principles and practice of orthodontics, 2nd edition, Churchill Livingstone, Edinburgh, 123–125.
- Richmond, S., Shaw, W. C., Roberts, C. T. and Andrews, M. (1992)**  
The PAR index (Peer Assessment Rating): methods to determine outcome of orthodontic treatment in terms of improvement and standards, *European Journal of Orthodontics*, **14**, 180–187.