

## Clinical Section

# The William Houston Gold Medal 1996

ROBERT B. LAWSON, B.D.S. (HONS), F.D.S.R.C.S. (EDIN.), M.SC.D. (WALES), M.ORTH. R.C.S. (EDIN.)

Division of Orthodontics, University Dental Hospital NHS Trust, Heath Park, Cardiff CF4 4XY, and The Morningside Orthodontic Practice, 27 Morningside Park, Edinburgh EH10 5HD, U.K.

### Introduction

The William Houston Gold Medal is presented to the candidate achieving the most outstanding and meritorious performance in the M.Orth. examinations of the Royal College of Surgeons of Edinburgh. Five clinical cases are presented by the candidate for the purposes of the examination. Two of these cases are described: the first is a Class III malocclusion with cleft lip and palate; the second is a high angle Class II division 1 malocclusion treated by a combined surgical/orthodontic approach.

### Case Report 1

An 18-year-old Caucasian male presented complaining of the appearance of his upper front teeth. He had a repaired left-sided complete unilateral cleft of lip and palate (Fig. 1a-i). A brief summary of his treatment prior to definitive orthodontic management is listed in Table 1.

Extra-oral clinical examination revealed a mildly convex facial profile with increased lower anterior face height and Frankfort-mandibular plane angle. There was a notable facial asymmetry with nasal deviation to the right and chin deviation to the left. At rest, the lips were incompetent, with a marked restriction of the surgically repaired upper lip. There were no signs or symptoms of TMJ dysfunction or pathology.

Intra-oral examination revealed the previous loss of 14, 34 and 44. All other permanent teeth were present, with the third molar teeth unerupted. Oral hygiene was fair, but there was a lack of attached gingiva in the 22 and 23 region, and 22 displayed microdontia, mild enamel hypoplasia, and a high gingival level, being closely associated with the residual alveolar cleft. There was a 180-degree rotation of 15.

There was mild crowding of the lower labial segment and an increased curve of Spee, with a total arch length

discrepancy of 3 mm. The lower arch had a broad, symmetrical archform. The upper arch had a severe transverse arch constriction associated with the cleft palate repair. There was 10 mm of crowding within the presenting archform, located primarily in the region of the alveolar cleft.

There was a Class III, edge-to-edge incisal relationship, with the upper centreline displaced 3 mm to the right. The buccal segment relationship was half a unit Class III on the right and Class I on the left, with 23, 24, and 25 were in maxillary lingual cross-bite due to the rotated position of the maxillary lesser segment.

Panoramic radiography confirmed the presence of all four permanent third molars. An oblique occlusal of the maxilla, centred on the cleft alveolus, displayed an incomplete bony union of the maxillary segments, in spite of the secondary autogenous bone grafting procedure at 11 years of age. Nevertheless, there was adequate alveolar support for tooth 23. Cephalometric evaluation revealed a mild Class III skeletal pattern, with a bimaxillary skeletal retrognathia. The lower face height and maxillary-mandibular plane angles were increased. There was a retroclination of upper and lower labial segments, with an IOTN score (DHC) of 5p and a pretreatment weighted PAR score of 59.

The aims of treatment were as follows.

1. Mask the transverse, sagittal, and vertical discrepancies of the maxilla by orthodontic camouflage.
2. Relieve crowding in the upper left quadrant.
3. Correct dental centrelines.
4. Produce a non-prosthetic, continuous maxillary dental arch.
5. Produce an aesthetic, Class I, mutually-protected functional occlusion.
6. Maintain these corrections with permanent retention.

The treatment plan was as follows:

1. Transverse expansion and derotation of upper first molars with quad-helix appliance.
2. Reassess upper arch crowding following arch expansion. Mild crowding, but Class I molar relationship suggested extraction of microdont 22 to be appropriate.
3. Upper and lower pre-adjusted Roth prescription fixed appliances to align. The appropriate angulation and inclination prescription requirements for 23 would be dictated by the availability of alveolar bone support for this tooth.
4. Class III elastic traction to correct incisal relationship, primarily by proclination of upper labial segment.

TABLE 1 Summary of treatment of case 1

Age	Treatment
3 months	Lip repair
6 months	Palatal repair
8 years	Pharyngoplasty
11 years 4 months	Secondary autogenous bone grafting of cleft alveolus
12-13 years	Extraction of 14, 34, and 44 with limited orthodontic treatment
17 years 9 months	Lip and nose revision and exposure of upper left canine by apically repositioned flap



FIG.1 (a-h) Case report 1: clinical slides, pretreatment; (i) cephalometric tracing.



FIG. 2 (a-c) Case report 1: clinical slides, in-treatment.

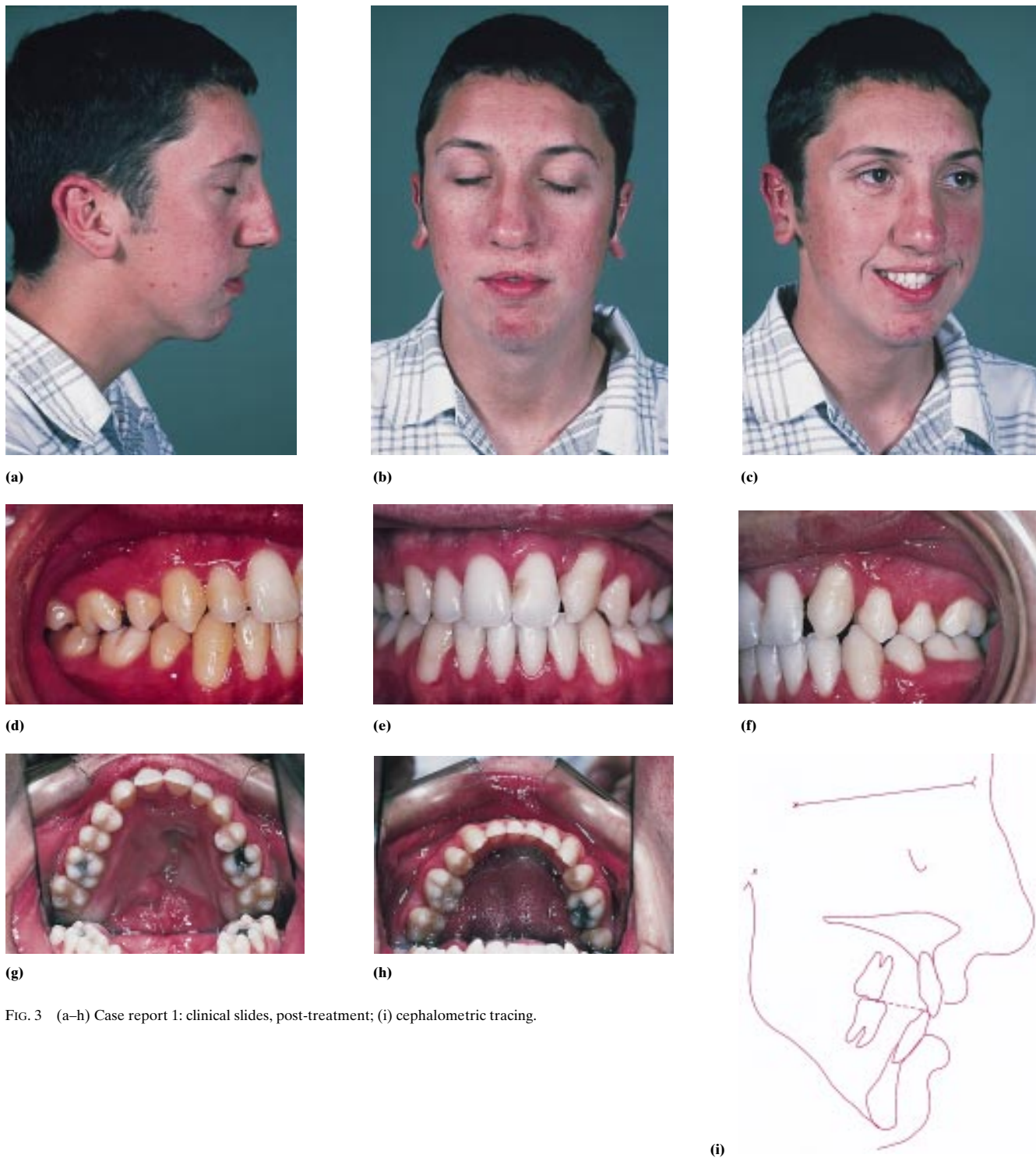


FIG. 3 (a-h) Case report 1: clinical slides, post-treatment; (i) cephalometric tracing.

5. Combination retention in upper arch, with permanent retainer to hold vertical correction and removable Hawley retainer to maintain segment expansion.
6. Re-contouring and composite resin augmentation of upper left canine to mimic lateral incisor.

Treatment consisted of 18 visits over a 27-month period, with the patient frequently failing to attend for scheduled appointments. Following expansion with the quad helix,

alignment proceeded to allow the placement of upper 0.021 × 0.025-inch TMA and lower 0.018-inch steel working archwires. Class III elastics were used to assist the proclination of the upper labial segment, while preventing proclination of the lower labial segment.

Initially, 23 was bonded with an inverted Roth prescription bracket. Prior to the finishing stage of treatment, radiographic examination of the cleft area revealed that there was marked mesial tipping of this tooth



FIG. 4 Cephalometric superimposition.

and limited alveolar bone mesial to its root. The inverted Roth bracket was replaced with a Tip-Edge bracket (Fig. 2a–c). Controlled mesial root uprighting with a sidewinder uprighting spring was effected on a round 0.018-inch steel base archwire, avoiding unwanted torque expression.

An upper Hawley retainer and bonded twistflex retainer involving 21, 23 and 24 were fitted following appliance removal. A lower spring Hawley retainer was used. Tooth 23 was modified by a restorative colleague, who plans to fit a cast bonded retainer 21, 23, and 24 in the near future. The patient was offered a free-gingival graft to 23, which he declined (Fig. 3a–i).

### Case 1 Assessment

Treatment aims were achieved in this case, with significant occlusal and aesthetic improvements. In spite of the limited success of the earlier alveolar bone grafting, the patient now has an intact maxillary arch, with adequate bone support for all teeth present.

The extraction of 22 may seem an unusual treatment decision. It was, however, microdont and had a compromised alveolar support. The alternative of premolar extraction would have yielded an excess of space, while a non-extraction approach would have precluded a good buccal segment interdigitation and not permitted centreline correction.

Cephalometric superimposition reveals that the sagittal corrections have been primarily dental in nature, with a proclination of the upper labial segment. There has been some extrusion of the upper molars due to the prolonged use of Class III elastics, with a resultant slight increase in the lower facial height (Fig. 4, Table 2).

Lower archform has been maintained throughout treatment. However, there has been significant expansion to the upper archform. The severe relapse of the orthodontic treatment in adolescence suggests that there is a high risk of relapse of this treatment. It is hoped that the combination retention regime will maintain the present

TABLE 2 Case report 1. Cephalometric changes

	Pretreatment	Post-treatment
SNA (degrees)	70.5	70.5
SNB (degrees)	69	68.5
ANB (degrees)	1.5	2
A–N perp. (mm)	–6	–6
B–N perp. (mm)	–17	–17.5
Wits analysis (mm)	–1.5	–0.5
MxP/MnP (degrees)	37.5	38.5
LAFH/TAFH (%)	58.5	59
PFH/AFH (%)	57.8	57.3
UI/MxP (degrees)	91.5	102
LI/MnP (degrees)	78.5	82.5
UI/LI (degrees)	152.5	137
LI/A–Po line (mm)	+1.5	+2.5

corrections. The cast bonded retainer connecting 21, 23, and 24 should prevent relapse of alignment and vertical position, whilst helping to maintain archform. The additional use of a removable Hawley retainer will permit archform retention in a manner that can be gradually withdrawn to test stability.

Post-treatment weighted PAR score = 2

Percentage reduction in PAR score = 95%

### Case Report 2

This patient presented at the age of 27 years complaining about the prominence of his upper front teeth (Fig. 5a–i). On examination he had a severe Class II division 1 malocclusion on a Class II skeletal base with greatly increased lower anterior face height and Frankfort-mandibular plane angle. There was a slight deviation of the chin point to the right. Lips were incompetent at rest, with a greatly increased maxillary incisor show and an obtuse naso-labial angle.

All permanent teeth were present with the exception of lower third molars and the 46 which had been lost due to caries. There was generalized marginal gingivitis and caries in 26. Forty-seven showed mesio-lingual rotation and inclination. The lower arch had moderate crowding (5 mm) and a significant curve of Spee. The upper archform was narrow and tapered with mild (2 mm) crowding.

The overjet was greatly increased at 14 mm and there was an increased, but incomplete overbite. The lower dental centreline was shifted 1 mm to the right, but was correct relative to the mandible. The buccal segments showed a full unit Class II relationship bilaterally and the second molars were tending towards maxillary lingual cross-bite. Right lateral excursion was guided by the upper canine and lower lateral incisor, while there was group function on left lateral excursion.

Panoramic radiography showed horizontal impactions of 38 and 48. Cephalometric evaluation confirmed a Class II skeletal pattern with mandibular retrognathia and increased vertical proportions. The upper incisors were slightly proclined and the lower incisors retroclined, positioned some 2 mm behind the A–Po line, and had an IOTN score (DHC) of 5a and a pretreatment weighted PAR score of 41.



FIG. 5 (a-h) Case report 2: clinical slides, pretreatment; (i) cephalometric tracing

The aims of treatment were as follows.

1. Correct sagittal and vertical skeletal discrepancies.
2. Reduction of overjet.
3. Reduction of overbite.
4. Produce a stable Class I, mutually protected, functional occlusion.

5. Maximize facial aesthetics.
6. Correct angulation and inclination of 47 to facilitate prosthodontic restoration of 46 space.

A multi-disciplinary approach was planned, involving input from Orthodontics, Maxillo-facial Surgery and Restorative Dentistry.



FIG 6 (a-h) Case report 2: clinical slides, presurgery; (i) cephalometric tracing.

The treatment plan was as follows.

1. Restoration of 26 and improvement in oral hygiene to resolve gingivitis.
2. Surgical removal of 18, 28, 38, and 48 at least 6 months before orthognathic surgery.
3. Presurgical orthodontics:  
Roth prescription pre-adjusted edgewise appliance;  
expand upper arch;  
level and align arches;

4. Orthognathic surgical correction:  
vertical impaction of maxilla;  
advancement of mandible;  
advancement genioplasty.
5. Post-surgical orthodontics:  
detail occlusion;  
position 47 for prosthodontic restoration of 46.

correct axial inclinations of upper and lower labial segments;  
co-ordinate arches for post-surgical occlusion.

### Video Imaging

Pre-surgical

Surgical Prediction

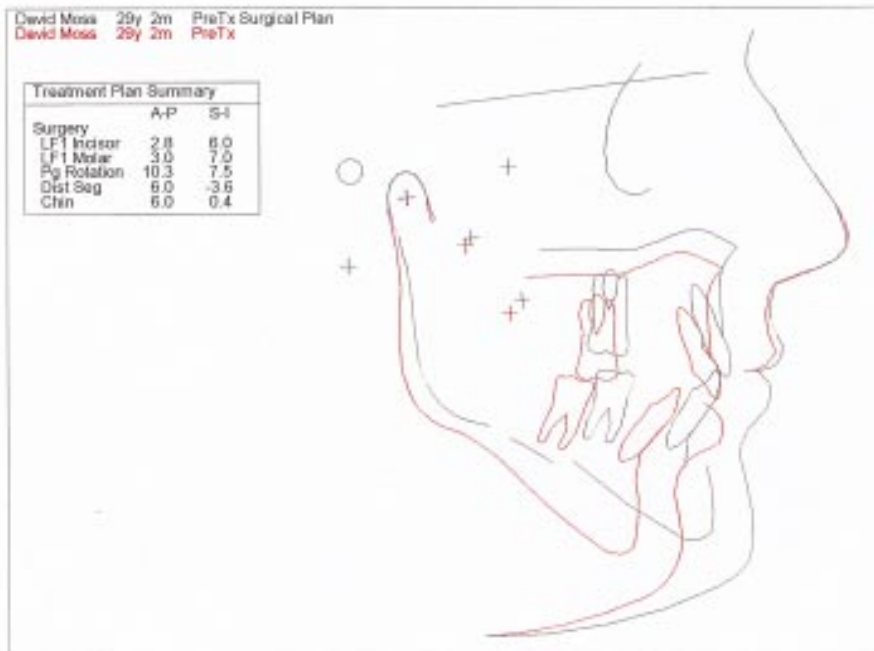
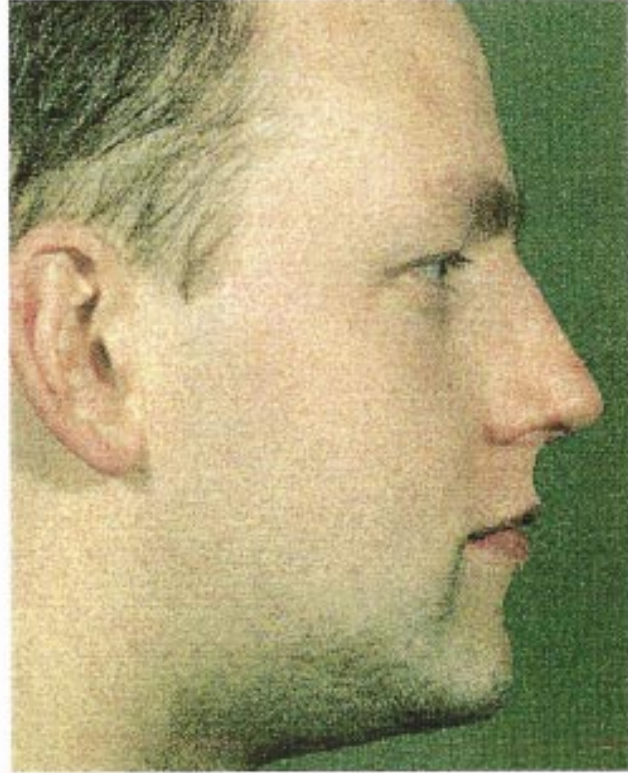
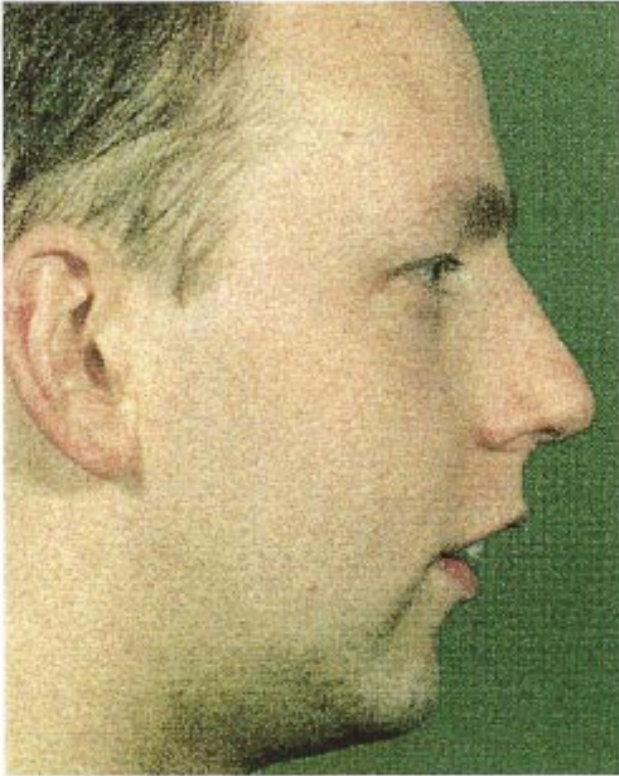


FIG. 7 DFP prediction.



FIG. 8 (a-h) Case Report 2: clinical slides, post-treatment; (i) cephalometric tracing.

6. Restoration of 46 space with fixed-fixed design resin-retained bridge.

The presurgical orthodontics consisted of 14 appointments over 15 months. Upper arch expansion was achieved with archwire expansion and buccal root torque. Passive 0.019 × 0.025-inch stabilizing archwires with surgical hooks were placed pre-operatively (Fig. 6a-i).

Surgical management involved a Le-Fort I maxillary impaction of 7 mm and advancement of 3 mm, along with an asymmetric sagittal split mandibular advancement of 6 mm. An advancement genioplasty of 6 mm was also performed. Rigid internal fixation with Champney plates and lag screws was used. The surgical movements were simulated during the surgical planning on the Dento-facial planner video-imaging package (Dentofacial Software



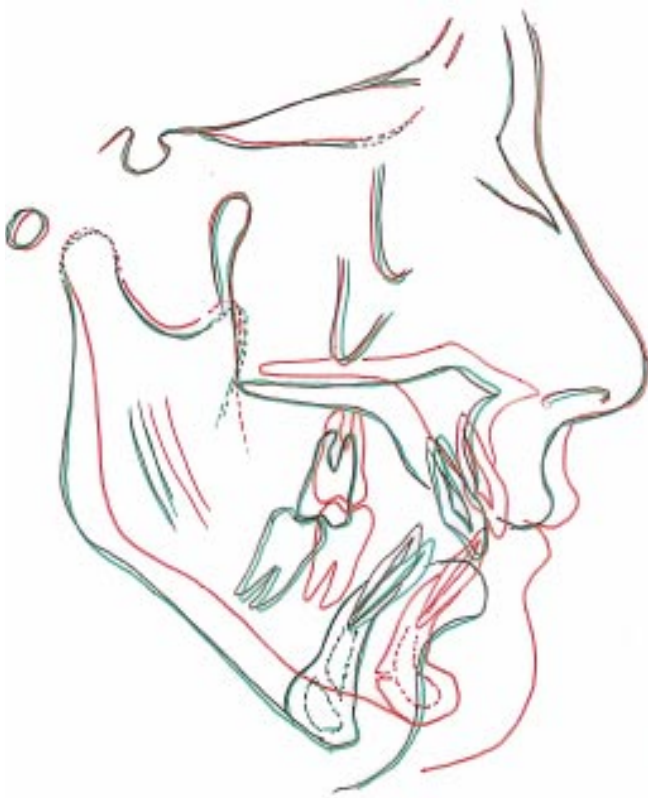


FIG. 9 Cephalometric superimpositions.

Inc., Toronto, Canada; Fig. 7). Post-surgical orthodontics consisted of a further seven appointments over a 6-month period. Finishing bends were placed in 0.016 × 0.022-inch steel archwires and vertical settling elastics used. Transverse cross-elastics were used to facilitate further expansion of the upper arch. Upper Hawley and lower spring Hawley retainers with a rest on 47 were used. The composite restoration on 21 was replaced and the patient referred to a Restorative colleague for construction of a resin retained bridge to replace 46 (Fig 8a-i).

### Case 2 Assessment

The majority of the treatment objectives for this case were achieved. The patient's facial appearance has been significantly altered, with a marked reduction in the vertical facial dimensions. Lip competency has been achieved, and there is now 3-mm upper incisor show at rest, with a pleasing smile line. Profile harmony has been improved and the patient is exceedingly happy with the facial results.

Occlusal goals have broadly been reached. He now has a Class I, well interdigitating static occlusion, with overjet and overbite fully corrected. Functional goals have been

TABLE 2 Case report 2. Cephalometric changes

	Pre-treatment	Pre-surgical	Post-treatment
SNA (degrees)	81	81	84
SNB (degrees)	73	73	80
ANB (degrees)	8	8	4
A-N perp. (mm)	+4	+4	+7
B-N perp. (mm)	-10.5	-10.5	+2.5
Wits analysis (mm)	+6	+4	-3.5
MxP/MnP (degrees)	39	39	27
LAFH/TAFH (%)	58	58	57
PFH/AFH (%)	58	58	62
UI/MxP (degrees)	112	109	110
LI/MnP (degrees)	83	90	95
UI/LI (degrees)	127	118	125
LI/A-Po line (mm)	-3.5	-0.5	+2

achieved. There is, however, a residual cross-bite tendency on the lower right second molar tooth. This proved necessary in obtaining adequate parallelism for placement of a resin retained prosthesis, without necessitating increased tooth preparation. The asymmetric mandibular advancement may also have contributed to this cross-bite tendency. With retrospect, this could perhaps have been avoided by employing a more aggressive expansion of the upper arch, such as with a quad-helix appliance prior to arch alignment. Nevertheless, the current position of 47 does provide a stable natural occlusal contact for both 17 and 16.

Final cephalometric values approach the norm for Caucasians (Fig. 9, Table 3). He does now have slightly increased SNA and SNB values, but both the maxilla and mandible are well positioned relative to the nasion perpendicular reference line. Notably, the lower incisors have slightly increased their angulation relative to the mandibular plane from immediately pre- to post-op. This is probably due to the alteration in the mandibular plane that followed the advancement genioplasty. Nevertheless, the lower incisor position remains within the normal range.

The patient is currently wearing removable retainers on a full time basis. Approximately 3 months post-debond, it is planned to restore the edentulous space for 46 with a resin-retained bridge, at which point the lower retainer shall be modified. The retainers will then be worn part time for a further 9 months before gradually withdrawing retention to test stability. It is not envisaged that any of the rigid internal fixation plates will require removal.

Post-treatment weighted PAR score = 3

Percentage reduction in PAR score = 95%

### Acknowledgments

I would like to thank my clinical supervisors at Cardiff Dental Hospital and Prince Charles Hospital, Merthyr Tydfil, for their excellent teaching and guidance throughout my postgraduate orthodontic training.