Journal of Orthodontics/Vol. 27/2000/119–125

Clinical Section

The William Houston Gold Medal 1998

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Introduction

The William Houston Gold Medal is presented to the candidate achieving the most outstanding and meritorious performance in the M. Orth. Examination of the Royal College of Surgeons of Edinburgh. The candidate presents five clinical cases for the purposes of the examination. Two of these cases are described.

Case Report 1

E.T., 12.5-year-old caucasian male, was referred by the region's Principal Dental Surgeon for orthodontic assessment. On presentation, his main complaint was the appearance of his prominent upper anterior teeth. The patient related that he was being teased regularly at school about his dental appearance. The medical history was unremarkable. There was a history of regular dental attendance and there was no history of digit sucking.

Extra-oral clinical examination revealed a retrognathic facial type, a convex profile and a slightly reduced lower anterior facial height. Transversely, there was no apparent facial asymmetry. The lips were incompetent in repose. The temporomandibular joints were asymptomatic and silent, and there was a normal range of mandibular movement.

Intra-oral soft tissue examination revealed a mild generalized marginal gingivitis, but no other pathology was evident. Examination of the dentition revealed the presence of all the permanent teeth apart from the third permanent molars. The dentition was of good quality with low caries experience.

Examination of the dental arches revealed a V-shaped upper arch. The upper labial segment was proclined and spaced with a median diastema of 1 mm. The lower arch was U-shaped. The lower labial segment was proclined and spaced, with an increased curve of Spee.

In occlusion, there was a Class II division 1 incisor relationship, with an overjet of 9 mm measured on the right central incisors. The overbite was increased and complete to the palatal mucosa. The molar relationship was a full unit Class II bilaterally, while the canine relationship was a ½ unit Class II on the right and a full unit Class II on the left. No crossbites or displacements were evident. The upper centre line was coincident with the facial midline, while the lower centre line was to the left of the upper by 1 mm. $\underline{2\,1}\,|\,\underline{1\,2}$ yielded a positive response to vitality testing with $2\,1\,|\,1\,2$ ethyl chloride (Figure 1a–i).

The panoramic radiograph revealed no obvious pathology and the presence of all four third permanent molar teeth. Cephalometric analysis (Table 1) demonstrated the presence of a mild Skeletal II relationship, with proclined upper and lower incisors, an average maxillo-mandibular plane angle, and a slightly reduced lower anterior facial height. The maxillary occlusal radiograph revealed very slight blunting of the apex of $\underline{|1}$.

Pretreatment IOTN (Dental health Component) = 4a
Pretreatment weighted PAR score = 25

TABLE 1 *Case report 1: pre-, intermediate, and post-treatment cephalometric analysis*

	Pre-	Inter-	Post-
SNA (°)	78	78	78
SNB (°)	74	75	75
ANB (°)	4	3	3
Adjusted ANB (Eastman conversion, °)	5·5	4·5	4·5
U.I./Mx.P (°)	118	105	105
L.I./Md.P (°)	97	101	99
U.I./L.I. (°)	116	121	128
Mx.P/Md.P (°)	27	29	28
LAFH/TAFH (%)	54·4	55·7	54·7
Wits appraisal (mm)	4	3	3

Aims of Treatment

1. To improve oral hygiene.
2. To optimize the potential for favourable mandibular growth, and to improve the patient's skeletal and soft tissue profile by functional appliance therapy.
3. To level and align the arches, and close anterior spacing.
4. To correct the centre line discrepancy.
5. To reduce the proclination of the upper incisors, while accepting some degree of lower labial segment compensation for the skeletal pattern.
6. To establish a normal overbite.
7. To establish a normal overjet.
8. To establish a Class I buccal segment relationship bilaterally.

Treatment Plan

Phase 1.

1. Refer the patient to the dental hygienist for oral hygiene instruction.
2. Frankel II functional appliance.
3. Re-assess on completion of functional appliance therapy.

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FIG. 1 (a–i) Case report 1: pretreatment records.

Treatment Progress

Phase 1. A Frankel II appliance was fitted to aid sagittal correction. Compliance with appliance wear was excellent, and the overjet was reduced from 9 to 2.5 mm over a 5-month period. A full unit molar correction was also achieved bilaterally during this time. Having achieved the desired sagittal correction, the patient continued to wear the appliance night only for a 3-month period.

Phase 2. Given the favourable response to functional appliance therapy, the treatment plan was as follows:

1. Upper and lower pre-adjusted Edgewise appliances on a non-extraction basis.
2. Review the need for anchorage reinforcement.
3. Retain with an upper Hawley and lower spring retainer.
4. Monitor third permanent molar development.

Treatment Progress

Phase 2. During the second phase, the case was treated on a non-extraction basis with upper and lower pre-adjusted

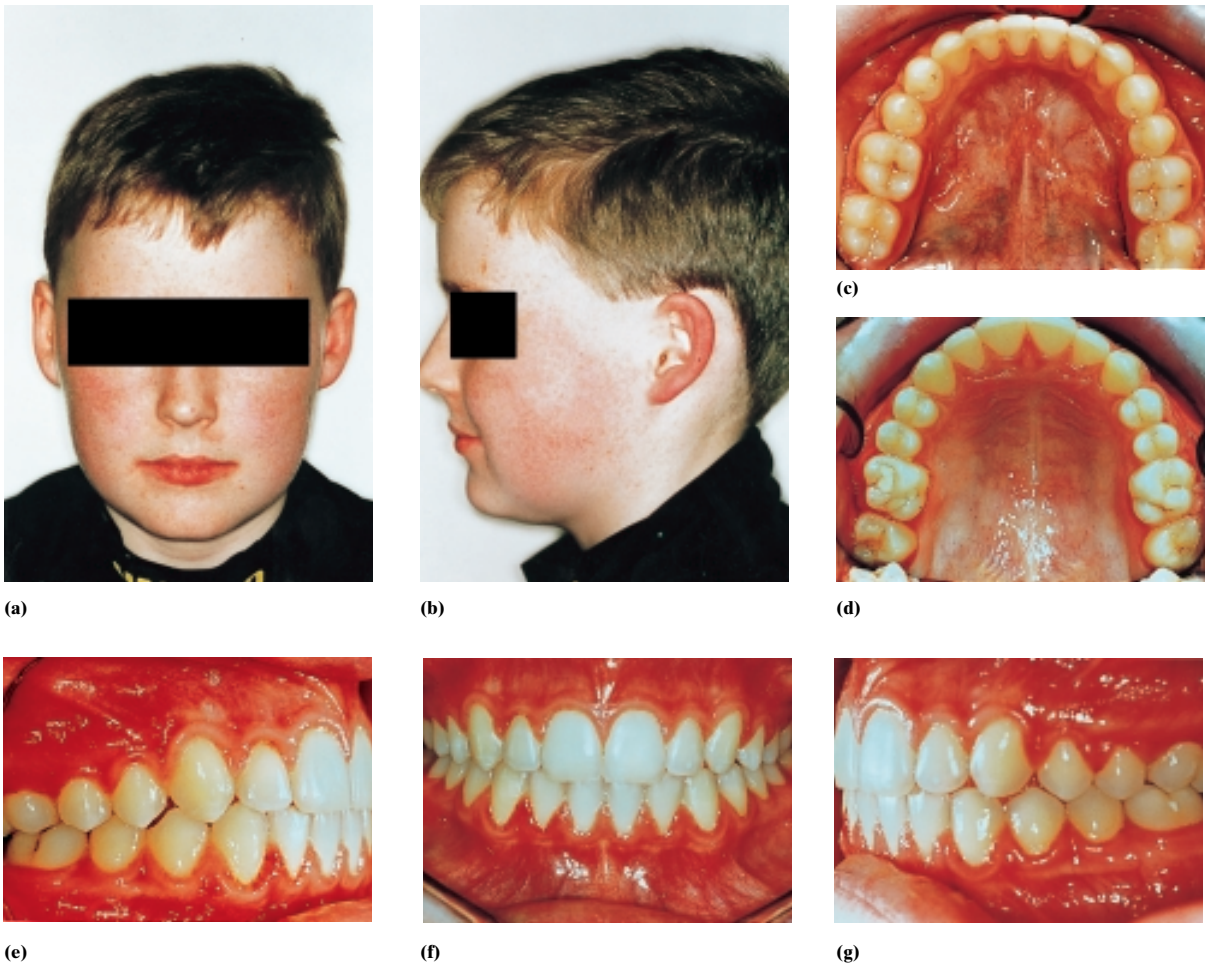


FIG. 2 (a–g) Case report 2: post-treatment records.

Edgewise fixed appliances (0·022 × 0·028-inch slot; Andrews' prescription brackets with Roth prescription molar bands). Active fixed appliance treatment consisted of 10 visits over a 14-month period, using super elastic nickel titanium arch wires initially and proceeding to stainless steel working arch wires. All four second permanent molars were incorporated in the appliance at an early stage. Given the bilateral Class I molar relationship, following the success of functional appliance therapy, it was decided to monitor the anchorage requirements during the fixed appliance phase. During treatment it became apparent that anchorage reinforcement was necessary and to this end, cervical-pull headgear was fitted, with a force of approximately 400 g per side and instructions were given for this to be worn 12–14 hours per day. Patient compliance with the wear of the headgear was good. The archwire sequence ultimately led to the placement of upper and lower 0·019 × 0·025-inch posted stainless steel archwires, incorporating accentuated and reverse curves of Spee, respectively. Residual spaces were closed in a conventional manner using intra arch elastomeric chain. Prior to debond, functional occlusion was checked, confirming that no interferences were present in lateral excursions and protrusion. An upper Hawley and lower spring retainer were fitted at debond. The retainers were prescribed full-time for 6 months, followed by night time wear. (Figure 2a–g).

Case Assessment 1

Overall, the treatment aims have been achieved, both in terms of addressing the patient's aesthetic concerns and in establishing a good functional occlusion.

Patient compliance with the functional phase of therapy was excellent, and this reduced the anchorage requirements during the fixed phase of treatment. Patient co-operation during the fixed appliance phase was good; oral hygiene, however, was an occasional problem which needed addressing.

Cephalometric superimposition of the pre-treatment and intermediate lateral skull tracings (Figure 3) demonstrates that the response to functional appliance therapy was largely dental in nature with some degree of favourable mandibular growth. During the functional phase, there was retroclination of the upper incisors and proclination of the lower incisors, and this in conjunction with the small amount of favourable mandibular growth, led to the observed reduction in overjet and overbite.

FIG. 3 Case report 1: cephalometric superimposition.

Post-treatment cephalometric analysis demonstrates that the retroclination of the upper incisors produced by the functional appliance phase of therapy has been maintained. As a corollary, there has been some reduction in the proclination of the lower incisors. Nonetheless, post-treatment cephalometric superimposition (Figure 3) reveals that the lower incisors have been proclined during treatment by 2 degrees. Consequently, the prognosis for long-term stability of the lower labial segment must be guarded. The patient has been advised accordingly and is aware that long-term retention will be necessary in order to reduce the risk of undesirable post-treatment change. Post-treatment, the upper incisors are rather upright at 105 degrees and could have benefited from further palatal root torque during the finishing phase.

The developing third molars appear to be favourably positioned for eruption.

Post-treatment weighted PAR score = 1
% Reduction in weighted PAR score = 96%
(greatly improved)

Case Report 2

VC, an 11·5-year-old caucasian female, was referred by the region's Principal Dental Surgeon for orthodontic assessment. The patient's presenting complaint was concern regarding the appearance of her upper anterior teeth, in particular, the instanding upper right permanent lateral incisor. She had no relevant medical history and had been a regular attender for general dental care.

Extra-oral clinical examination revealed an orthognathic facial type and a straight profile. The lower anterior facial height was within normal limits. Transversely, there was no apparent facial asymmetry. The lips were competent in repose. The temporomandibular joints were asymptomatic and silent and there was a normal range of mandibular movement.

Intra-oral soft tissue examination revealed no apparent pathology. Oral hygiene was good. Examination of the dentition revealed the presence of all the permanent teeth, apart from the upper right second premolar and the third permanent molars. $\frac{7\ |\ \ }{5\ |\ 5}$ were only partially erupted. The upper right second deciduous molar was retained and exhibited no obvious mobility. The dentition was of good quality. Local enamel opacities were apparent on the cuspal one third of the buccal face of $\underline{3}\,|\,\underline{3}$.

Examination of the dental arches revealed a U-shaped upper arch with constriction posteriorly. The upper labial segment was slightly proclined and moderately crowded, $\underline{2}\,|$ being positioned palatally. The lower arch was U-shaped. The lower labial segment was upright and mildly crowded.

In occlusion there was a Class I incisor relationship, with an overjet of 2 mm measured on the right central incisors. The overbite was normal. The molar relationship was ½ unit Class II on the right and Class I on the left. The canine relationship was almost a full unit Class II on the right and a half unit Class II on the left. There were bilateral buccal crossbites involving $\frac{6\,4\,|\ \ 6}{6\,4\,|\ \ 6\ \ \ \ 2\,|}$ and $\underline{2}\,|$ were also in crossbite.

The path of mandibular closure was direct with no apparent displacement from the retruded contact position (RCP) into the intercuspal position (ICP). The lower centre line was coincident with the facial midline, while the upper centre line was to the right of the lower by 1·5 mm. $\frac{2\,1\,|\,1\,2}{2\,1\,|\,1\,2}$ yielded a positive response to vitality testing with ethyl chloride (Figure 4 a–h).

The panoramic radiograph confirmed the presence of all four third permanent molars and the upper right second premolar. No pathology was evident. Cephalometric analysis (Table 2) demonstrated a mild Skeletal III relationship, with a reduced maxillo-mandibular plane angle, slightly proclined upper incisors and upright lower incisors.

Pretreatment IOTN (Dental Health Component) = 4d
Pretreatment weighted PAR score = 42

Aims of Treatment

1. To expand the maxillary arch and correct the bilateral buccal crossbite.
2. To relieve the crowding.
3. To align the arches.

TABLE 2 *Case report 2: pre- and post-treatment cephalometric analysis*

	Pre-	Post-
SNA (°)	83	83
SNB (°)	81	83
ANB (°)	2	0
Adjusted ANB (Eastman conversion, °)	1	−1
U.I./Mx.P (°)	112	115
L.I./Md.P (°)	90	91
U.I./L.I. (°)	138	134
Mx.P/Md.P (°)	20	19
LAFH/TAFH (%)	55·1	55·5
Wits appraisal (mm)	−5·5	−7·0

FIG. 4 (a–h) Case report 2: pretreatment records.

4. To correct the crossbite $\frac{2|}{2|}$.
5. To maintain the overjet.
6. To maintain the overbite.
7. To establish a Class I buccal segment relationship bilaterally.

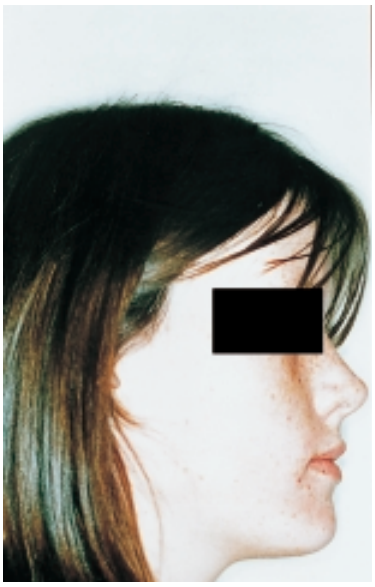
Treatment Plan

Phase 1.
1. Rapid maxillary expansion (RME) initially.
2. Re-assess.

Treatment Progress

Phase 1. During the first phase of therapy, a banded rapid maxillary expansion appliance incorporating a Hyrax screw was fitted. The patient was instructed in the method of activation of the appliance and was advised to turn the screw one turn (0·25 mm) twice daily. Expansion proceeded well, the patient having been reviewed at weekly intervals during the expansion phase. Having achieved the desired amount of transverse expansion, the midline screw was secured with brass wire and sealed with cold cure acrylic and the appliance was left *in situ* for a period of 3 months.

(a)

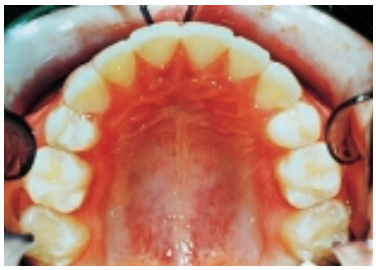


(b)

(c)

(d)

(e)



(f)

(g)

(h)

FIG. 5 (a–h) Case report 2: post-treatment records.

Phase 2. The treatment plan on reassessment was as follows:

1. Transpalatal arch.
2. Extract $\underline{5|5}$ $\underline{5|5}$.
3. Upper and lower pre-adjusted Edgewise appliances.
4. Retain with an upper Hawley and lower spring retainer.
5. Monitor third molar development.

Treatment Progress

Phase 2. During the second phase, the case was treated on an extraction basis involving the loss of the four second premolars. Upper and lower pre-adjusted Edgewise appliances were fitted (0·022 × 0·028-inch slot; Andrews' prescription brackets with Roth prescription molar bands). $\underline{2|}$ was not bonded initially. A transpalatal arch was fitted for anchorage control. Active fixed appliance therapy consisted of 20 visits over a 23-month period. Initial alignment was completed with super elastic nickel titanium arch wires. Following initial alignment, an 0·018-inch stainless steel arch wire was placed in the supper arch. A combination of push-pull mechanics, was then utilized to (i) create space for $\underline{2|}$ and (ii) aid upper centre line correction.

Having created sufficient space, $\underline{2|}$ was bonded, with the bracket inverted to reverse the torque. Labial movement of $\underline{2|}$ was instigated by attaching elastomeric thread from the bracket to the working archwire.

Secondary alignment was completed in the upper arch with super elastic nickel titanium archwires. $\overline{7|7}$ were incorporated into the appliance in the later stages of treatment. The archwire sequence ultimately led to the placement of co-ordinated 0·019 × 0·025-inch posted stainless steel archwires. Residual spaces were closed in a conventional manner using elastomeric chain.

During the finishing phase, an 0·021 × 0·025-inch TMA archwire was fitted in the upper arch to improve torque control $\underline{2|}$. A discrepancy persisted in the vertical relationship of $\overline{7\ 6|6\ 7}$ and this as addressed by fitting a 0·018-inch stainless steel archwire incorporating step-up bends $\overline{7|7}$. Prior to debond, functional occlusion was checked, confirming that no interferences were present in lateral excursions and protusion. An upper Hawley and lower spring retainer were fitted at debond. The retainers were prescribed full-time for 6 months, followed by night only wear. (Figure 5)

Case Assessment 2

Overall, the treatment aims have been achieved in this case, yielding significant aesthetic and occlusal benefits.

Patient compliance was good during both phases of therapy thus facilitating treatment progress.

Despite the considerable care taken to improve torque control, both during the course of active therapy and during the finishing phase, it is considered that $\underline{2|}$ could have benefited from further labial root torque. The patient has been advised that long-term retention will be necessary to aid stability of the corrected tooth position.

Cephalometric superimposition of the pre- and post-treatment lateral skull tracings (Figure 5h) demonstrates that there has been some continued mandibular growth, with resultant change in the cephalometric measures of skeletal discrepancy. At this stage, however, the patient appears to have completed the majority of her growth, rendering further significant change in skeletal relationship unlikely. Occlusal stability should be aided further by the positive overbite and the solid interdigitation of the buccal segment teeth. Post-treatment, the upper incisors are proclined at 115 degrees. However, this is acceptable in that it allows some degree of compensation for the underlying Skeletal III pattern.

The third permanent molars appear to be well positioned for eruption.

Post-treatment weighted PAR score = 2
% Reduction in weighted PAR score = 95%
(greatly improved)

Acknowledgements

I wish to express my gratitude to Mr T. G. McNamara, Consultant Orthodontist, who supervised the treatment of the above cases.