

CLINICAL SECTION

Optident Prize 2000

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Abstract

This paper describes the orthodontic treatment of two cases, which were awarded the 2000 Optident prize.

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Introduction

The Optident prize is held annually at the British Orthodontic Conference and entry is open to those who have passed their Membership in Orthodontics examination during the 13 months prior to the Conference. The prize is awarded to the person showing the best M.Orth. cases, judged on difficulty, clinical management, and documentation. The two cases successfully submitted for the award during the 2000 Brighton Conference are described.

Case report 1

An 11-year-old Caucasian male was referred by his General Dental Practitioner regarding his Class II malocclusion and increased overjet. The main features of his malocclusion were mandibular retrognathia, a high Frankfort mandibular planes angle, an increased overjet, and previous trauma to his maxillary central incisors.

Extra-oral assessment

He presented with a moderate Class II skeletal pattern with mandibular retrognathia, an increased Frankfort mandibular planes angle, and an increased lower anterior face height. Soft tissue assessment revealed lips of normal length, incompetent at rest, with the upper lip on the 'E' plane and the lower lip 5 mm behind. He had a marked labiomental fold and the nasiolabial angle was average.

Intra-oral examination

The patient was in the permanent dentition with the exception of mandibular second and all third molars. He had minimal restorations in both maxillary first molars and mesial-incisal composite restorations of the maxil-

lary central incisors following trauma 14 months previously. These teeth were asymptomatic and of good prognosis. His oral hygiene was poor with generalized marginal gingivitis.

In the mandibular arch there was imbrication of the lower labial segment, the mandibular canines were upright and the buccal segments reasonably well aligned. In the maxillary arch the upper labial segment was spaced, with both central incisors mesiolabially rotated. The maxillary canines were mesially angulated and the buccal segments reasonably well aligned.

In occlusion, the incisor relationship was Class II division 1 with an overjet of 11 mm and an incomplete overbite of 5 mm. The centre lines were correct and coincident with the facial midline. The molar and canine relationships were a full unit II on the right and $\frac{3}{4}$ unit II on the left. There were no crossbites and no mandibular displacement (Figure 1).

The Dental Health Component score on the Index of Treatment Need was 5a due to an increased overjet greater than 9 mm. The pre treatment weighted Peer Assessment Rating was 32.

Special investigations

Radiographs. The panoramic radiograph revealed a full complement of teeth, with root length and bone levels within normal limits. The lateral cephalogram indicated a skeletal Class II pattern with mandibular retrognathia. SNA was 82 degrees and SNB was 76 degrees with an ANB of 6 degrees. Wit's appraisal confirmed a skeletal Class II pattern with AO 5 mm ahead of BO. The maxillary mandibular planes angle was increased and the lower anterior face height was slightly increased. The lower incisors were retroclined at 81 degrees and the upper incisors slightly proclined at 114 degrees. Cephalometric analysis is presented in Table 1.



Fig. 1 Case report 1: pre-treatment photographs.

Table 1 Case report 1: pre-treatment, post-functional, and post-treatment cephalometric analysis

	Pre-treatment	Post-functional	Post-treatment
SNA (°)	82.0	82.0	81.0
SNB (°)	76.0	79.0	79.0
ANB (°)	6.0	3.0	2.0
MMPA (°)	33.0	33.0	35.0
SnMx plane (°)	3.0	3.0	3.0
LATH/TAFH (%)	56.0	58.0	58.0
UI/Mx plane (°)	114.0	107.0	105.0
LI/Mn plane (°)	81.0	86.0	87.0
I/I angle (°)	132.0	134.0	133.0
LI/Apo (mm)	-4.0	2.0	2.0
Wits (mm)	5.0	1.0	1.0

Vitality tests. Both maxillary central incisors were vital to ethyl chloride and electric pulp test.

Space requirements. Bolton analysis revealed 3.3 mm maxillary excess overall and 1.7 mm maxillary excess anteriorly.

Aetiology

The aetiology of this malocclusion is a combination of both genetic and environmental factors. The Class II skeletal base relationship is inherited, and this has resulted in Class II buccal segments and an increased overjet. Soft tissue factors such as lower lip trapping behind the upper incisors have resulted in their proclination and contributed to retroclination of the lower incisors.

Aims of treatment

- Sagittal correction of the malocclusion.
- Level and align the arches.
- Achieve good buccal segment inter-digitation with a Class I molar and canine relationship.
- Correction of the overjet and overbite.
- Space closure.
- Achieve a good functional occlusion.
- Retain

Treatment plan

- Oral hygiene instruction.
- Modified Twin Blocks combined with headgear.
- Inclined clip-over bite plane.

- Upper and lower pre-adjusted Edgewise fixed appliances.
- Retention.

Rationale

Twin Blocks were used for sagittal correction of the malocclusion. High pull headgear was fitted for vertical maxillary restraint and to prevent an increase in lower anterior face height. An inclined clip-over bite plane was used to maintain the sagittal correction during the transition from functional to fixed appliances. Pre-adjusted Edgewise appliances were used for arch alignment and levelling, space closure, and buccal inter-digitation.

Treatment progress

Treatment was started with modified Twin Blocks incorporating torquing spurs to the maxillary central incisors and high pull headgear attached to flying headgear tubes situated in the maxillary second premolar region (Figure 2). The Twin Blocks were worn full time and the headgear, with a force of 400 g per side, was



Fig. 2 Case report 1: modified Twin Blocks and headgear.



Fig. 3 Case report 1: post-Twin Blocks photographs.

worn 14 hours per day. This phase of treatment took 10 months. Once the buccal segment relationship and overjet had been overcorrected (Figure 3), all four first molars were banded and an inclined clip-over bite plane was fitted to maintain the sagittal correction during the transition into fixed appliances. Pre-adjusted Edgewise brackets (0.022×0.028 -inch slot, MBT prescription) were bonded to both arches with lacebacks to all canines. Initial levelling was commenced with 0.016-inch Sentalloy, progressing to 0.018×0.025 -inch Sentalloy, when the mandibular second molars were included. When upper and lower 0.019×0.025 -inch stainless steel wires were ligated, space closure with nickel titanium closing springs was commenced and correction of the 1.5-mm centre line discrepancy was carried out using a blue Class II elastic on the left side (Figure 4). A mid-treatment lateral cephalogram showed that the upper incisor inclination to the maxillary plane had reduced by 9 degrees from the initial 114 degrees; therefore, additional palatal root torque was applied to the maxillary incisors. An upper 0.014-inch stainless steel with finishing bends was used to correct the angulation of both central incisors. Following debond an upper Hawley retainer and a lower Barrer retainer were fitted (Figure 5).

Case 1 assessment

Sagittal correction has occurred as a result of growth modification and dentoalveolar movement. Cephalometric superimposition revealed maxillary horizontal restraint and a small amount of vertical development, and in the mandible there has been both horizontal and vertical mandibular growth or repositioning, as well as a forward rotation. Dentoalveolar movements have included retroclination of the upper labial segment, proclination of the lower labial segment and eruption and forward bodily movement of the lower molars (Figure 6).

As a result of treatment, the patient's facial appearance has greatly improved with the mandible less retro-

gnathic and his lips now competent at rest. The intra-arch alignment has improved, the overjet and overbite has been reduced to normal levels and the buccal segment relationship has been corrected to Class I molar and canine relationship. The inter-canine width has been maintained at 26 mm throughout treatment. Post-treatment, the patient exhibited good functional occlusion with canine guidance on right and left lateral excursions, and incisal guidance on protrusion. There were no non-working side interferences during function. The prognosis of this case is good because of good buccal inter-digitation to retain the antero-posterior correction throughout the remaining growth period and overjet reduction should be retained by lip competency.

The post-treatment PAR score is 2, which demonstrates a 93.8 per cent reduction in weighted PAR score.

Case report 2

A 16-year-old Caucasian male was referred by his General Dental Practitioner because of his buccally placed maxillary canines. The main features of his malocclusion were maxillary hypoplasia, reduced overjet and overbite, buccally placed maxillary canines, and bilateral crossbites.

Extra-oral assessment

He presented with a mild Class III skeletal pattern with maxillary hypoplasia and paranasal flattening, an average Frankfort mandibular planes angle, and lower anterior face height. Soft tissue assessment revealed lips of normal length, competent at rest, both behind the 'E' plane. He had an average nasiolabial angle.

Intra-oral examination

He was in the full permanent dentition with the exception of all third molars. He had invaginated maxillary incisors with palatal restorations in these teeth. His oral hygiene was poor with marginal gingivitis.

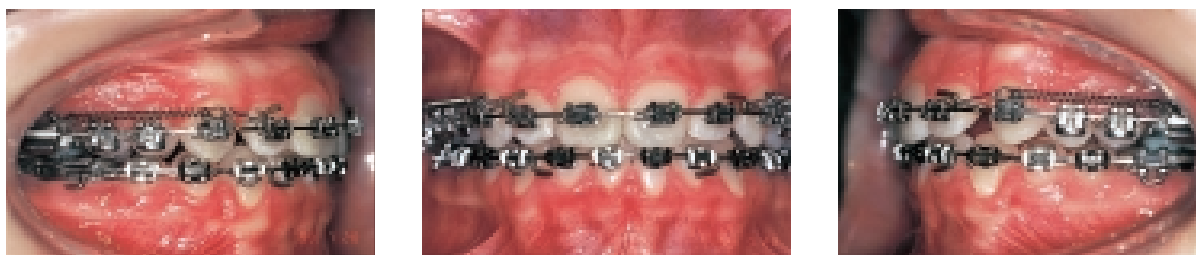


Fig. 4 Case report 1: pre-adjusted Edgewise appliances.



Fig. 5 Case report 1: post-treatment photographs.



Fig. 6 Case report 1: pre-treatment (black) and post-treatment (red) cephalometric tracings superimposed on SN at sella.

In the mandibular arch there was imbrication of the lower labial segment, the mandibular right canine was upright and the left canine distally angulated, with the buccal segments reasonably well aligned. In the maxillary arch, there was severe crowding of the upper labial segment, the lateral incisors were instanding and the canines buccally placed. The maxillary canines were mesially angulated and the buccal segments reasonably well aligned. The maxillary arch was narrow and the mandibular arch was broad resulting in bilateral cross-bites.

In occlusion, the incisor relationship was Class III with an overjet of 0 mm and an overbite of 0 mm. The centre lines were correct and coincident with the facial midline. The molar relationship was Class I bilaterally and the canine relationship a ½ unit II on the left and a ¼ unit II on the right. There were crossbites affecting all the incisors, premolars and first molars with no mandibular displacement (Figure 7).

The Dental Health Component score on the Index of Treatment Need was 4d, due to a contact point displacement greater than 4 mm between the left maxillary lateral incisor and canine. The pre-treatment weighted Peer Assessment Rating was 48.

Special investigations

Radiographs. The panoramic radiograph revealed a full complement of teeth, with normal root length and bone levels within normal levels. The maxillary incisors were invaginated. The lateral cephalogram indicated a skeletal Class III pattern with maxillary hypoplasia. SNA was 79 degrees and SNB was 80 degrees with an adjusted ANB of 0 degrees. Wit's appraisal confirmed a skeletal Class III pattern with BO 2.5 mm ahead of AO. The maxillary mandibular planes angle was slightly decreased and the lower anterior face height was slightly increased. The lower incisors were normally inclined at 93 degrees and the upper incisors slightly proclined at 116 degrees. Cephalometric analysis is presented in Table 2.

Space requirements. Space analysis was performed after maxillary expansion, and was based on measurements made on study models and the lateral cephalogram. Arch length discrepancies were 3 mm in the mandibular arch and 10 mm in the maxillary arch. Also 1 mm of space per arch was required to level the occlusal curves and 2 mm of space was required to constrict the mandibular arch. The maxillary incisors are already proclined to compensate for the Class III pattern, therefore, to correct the reversed overjet 6 mm of space is required to retrocline the lower labial segment. This results in a space requirement of 12 mm in the mandibular arch and 11 mm in the maxillary arch. Extraction of 4-second premolars results in a slight excess of space, which will be closed by mesial movement of the buccal segments.

The Bolton analysis revealed 2.7 mm maxillary excess overall and 1.5 mm maxillary excess anteriorly, primarily due to large maxillary canines. This is of benefit in Class III camouflage cases as proclination of the maxillary

Table 2 Case report 2: pre-treatment and post-treatment cephalometric analysis

	Pre-treatment	Post-treatment
SNA (°)	79.0	77.0
SNB (°)	80.0	79.0
ANB (°)	-1.0	-2.0
MMPA (°)	23.0	23.0
SnMx plane (°)	9.0	9.0
LATH/TAFH (%)	57.0	57.0
UI/Mx plane (°)	116.0	115.0
LI/Mn plane (°)	93.0	91.5
I/I Angle (°)	127.0	128.0
LI/Apo (mm)	4.0	4.0
Wits (mm)	-2.5	-2.5



Fig. 7 Case report 2: pre-treatment photographs.

incisors to compensate for the underlying skeletal pattern will allow a positive overjet.

Aetiology. The aetiology of this malocclusion is likely to be a combination of both genetic and environmental factors. The Class III skeletal base relationship is inherited and this has resulted in a reduced overjet. The crowding is due to dentoalveolar disproportion and, as a result, the maxillary canines have been displaced buccally. A low tongue position may have contributed to the broad mandibular arch and the narrow maxillary arch, and the resultant bilateral crossbite.

Aims of treatment

- Correct the bilateral crossbite.
- Relieve the crowding.
- Level and align the arches.
- Achieve good buccal inter-digitation with a Class I molar and canine relationship.
- Correction of the overjet and overbite.
- Space closure.
- Achieve a good functional occlusion.
- Retain.

Treatment plan

- Oral hygiene instruction.
- Surgically assisted rapid maxillary expansion.
- Removable quad helix.
- Extraction all four second premolars.
- Upper and lower pre-adjusted Edgewise fixed appliances.
- Retention

Rationale

In view of the patient's age surgically assisted RME was required to correct the bilateral crossbite. Extraction of all four second premolars was required to relieve the crowding and allow retraction of the lower labial segment to correct the reduced overjet and overbite. Pre-adjusted Edgewise appliances were used for arch alignment and levelling, space closure and buccal interdigitation.

Treatment progress

A rapid maxillary expansion appliance incorporating bands on the maxillary first molars and first premolars,

and a Hyrax expansion screw was cemented prior to surgery. Under a general anaesthetic, the maxillofacial surgeons performed Le Fort I and mid-palatal bone cuts without down fracture of the maxilla (Figure 8). The screw was turned four turns in theatre, then one turn twice a day for 3 weeks then finally sealed with glass ionomer for 3 months. The maxillary inter-molar width was expanded from 48 to 54 mm (Figure 9). Pre-adjusted Edgewise brackets (0.022×0.028 -inch slot, Roth prescription) were bonded to both arches excluding the maxillary lateral incisors, with lacebacks to all canines. Initial levelling was commenced with 0.016-inch Sentalloy, progressing to 0.018 \times 0.025-inch Sentalloy

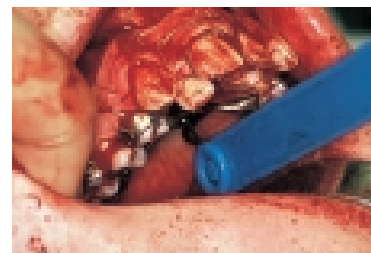


Fig. 8 Case report 2: surgically-assisted rapid maxillary expansion.

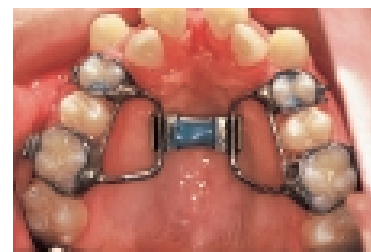
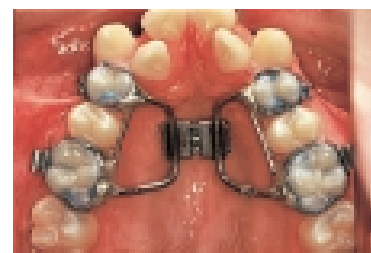


Fig. 9 Case report 2: expansion achieved with RME.



Fig. 10 Case report 2: post-treatment photographs.

when the mandibular second molars were included. Space was created for the maxillary lateral incisors using push coil and nickel titanium closing springs to retract the maxillary canines. When there was sufficient space the maxillary lateral incisors were bonded (the brackets inverted) and picked up with a 0.014-inch Sentalloy piggy back on a 0.018-inch stainless steel base arch. When upper and lower 0.019 × 0.025-inch stainless steel wires were ligated space closure was completed with nickel titanium closing springs and yellow Class II elastics. Mid-treatment radiographs were taken, the lateral cephalogram showed that both the upper and lower incisors had uprighted, and the panoramic radiograph showed that the brackets on the upper left and both lower first premolars required repositioning to achieve root paralleling. Following debond upper and lower 0.0175-inch multi-strand stainless steel retainers were bonded to the lingual surfaces of the upper and lower labial segments (Figure 10).

Case 2 assessment

Surgically-assisted rapid maxillary expansion was used to correct the bilateral cross bite. The upper inter-molar width increased from 48 to 52 mm. Extraction of all 4-second premolars provided space for alignment, constriction of the mandibular arch, buccal segment relationship correction, and retraction of the lower labial segment to increase the overjet and overbite. Cephalometric superimposition revealed very slight backward rotations of the maxilla and mandible, otherwise there has been little skeletal and dentoalveolar change.

During treatment the patient's facial appearance has changed very little. Intra-orally the alignment has improved, he now has a positive overjet and overbite, and the bilateral posterior crossbite has been corrected. Canine guidance is now present on right and left lateral excursions and incisal guidance is present on protrusion, and there are no non-working side interferences during function. The prognosis of the case is reasonable due to



Fig. 11 Case report 2: pre-treatment (black) and near end of treatment (blue) cephalometric tracings superimposed on SN at sella.

buccal inter-digitation to retain the crossbite correction, the positive overbite to retain the overjet, and bonded retainers to maintain the intra-arch alignment.

The post treatment PAR score is 2, which demonstrates a 95.8 per cent reduction in weighted PAR score.

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I would like to thank all my clinical supervisors at Chesterfield Royal Hospital and the Charles Clifford Dental Hospital, Sheffield, for their excellent teaching and guidance throughout my training. In particular, to Mr Jonathan Sandler who supervised these two cases.

