

Varying treatments of Class II malocclusions: Two case reports

Sameh Malek

BDS (Hons), FRACDS
Postgraduate Student, Discipline of Orthodontics

Morris Rapaport

BDS, MDSc
Lecturer, Discipline of Orthodontics,

M. Ali Darendeliler

BDS, PhD, DipOrth, CertifOrth,
PrivDoc (TR) PrivDoc (Ge)
Professor and Chair,
Discipline of Orthodontics,
Faculty of Dentistry,
University of Sydney
Australia

The two cases presented here were granted the Australian Orthodontic Board TP (Australia) Postgraduate Clinical Award at the 17th Australian Orthodontic Congress in Brisbane.

Two female patients, JH aged 13 years 5 months and CN, aged 13 years 10 months, presented at the Sydney University Orthodontic Clinic, Australia. Patient JH complained that her lower teeth were "too far back behind her top teeth". She was treated using the Speed Appliance. Patient CN complained that her teeth were "crooked". The main point of interest of her case is the mechanics used following the extraction of her four first molar teeth. Both patients were keen to improve their appearance.

Aust Orthod J 2001; 17:103–14

Introduction

Two female patients, JH aged 13 years and 5 months and CN aged 13 years and 10 months, sought treatment at the Sydney University Orthodontic Clinic. Both patients were in good health and were in the permanent dentition stage of their dental development, with a full complement of teeth. Patient CN had heavily restored upper and lower first molars that intermittently caused her pain. Patient JH was pre-menarchial, and patient CN was seven months post-menarchial at the start of treatment. Both patients were well motivated to have their malocclusions corrected.

Case 1 (JH)

Facial evaluation (Figures 1 a, b and c)

Frontal analysis revealed that JH had a round-to-ovoid symmetrical facial shape, with well-proportioned vertical thirds. Her nose deviated to the left and the bridge was broad. The intra-orbital area was flat and she had a shallow nasolabial fold.

The patient's lips were competent, and the upper lip was long and flat. Her chin was normal and coincident with the mid-sagittal plane when the teeth were in centric occlusion. She exposed 2 mm of gingiva on smiling.

Profile analysis showed a mesofacial appearance, with a convex lower third. She had a straight nose without a dorsal hump, and the nasolabial angle was normal by Asian standards. The nasolabial fold was flat, the lips competent and the mentolabial fold normal. Throat length was normal.



Figures 2a to e. Case 1: JH Pretreatment intra-oral photographs.



Figure 2b.



Figures 1a, b and c. Case 1: JH Pretreatment extra-oral frontal view, at rest.



Figure 1b. Pretreatment frontal view, smiling.



Figure 1c. Pretreatment facial profile.

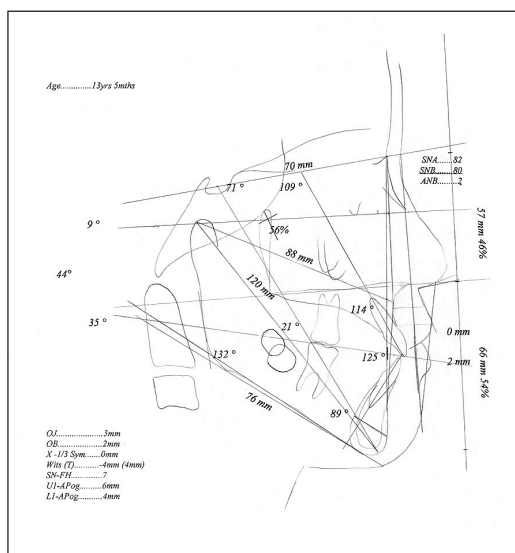


Figure 6a. Case 1: JH Initial cephalometric tracing.

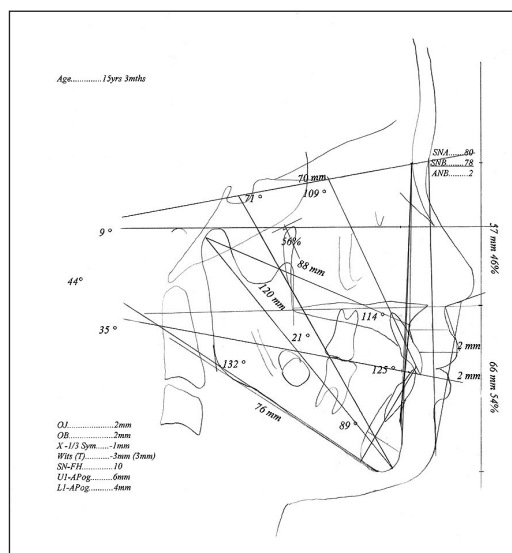


Figure 6b. Case 1: JH Post-treatment cephalometric tracing.



Figure 2c.

TMJ assessment

Patient JH was found to have no signs or symptoms of temporo-mandibular joint dysfunction after auscultation, palpation and functional evaluation. Her maximum jaw opening was recorded at 50 mm without deviation.

Intra-oral examination (Figures 2a to e)

Mild chronic marginal gingivitis was evident but localised to the maxillary and mandibular anterior region. The attached gingiva and the frenal attachments were normal and did not appear to interfere with function.

The upper dental midline was 1 mm to the right of the mid-sagittal plane and the lower dental midline coincident with it. The depth of the Curve of Spee was 3 to 4 mm, the overjet 5 mm and the overbite 3 mm.

Functional analysis demonstrated canine rise during lateral excursion of the mandible, and protrusive movement showed normal incisal guidance.

The left buccal occlusion was a half-unit Class II, and the right buccal occlusion a quarter-unit Class II.

Model analysis

There was only 1 mm of space deficiency in both the maxillary and mandibular arches, and there was no significant Bolton's discrepancy.

Radiographic evaluation

Orthopantomographic evaluation (Figure 3)

The OPG radiograph revealed normal development, including the as yet unerupted third molars. No bony pathology was evident.

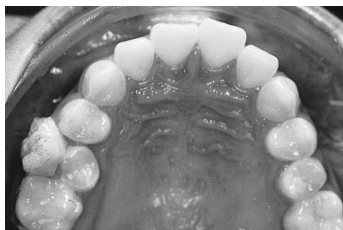


Figure 2d.

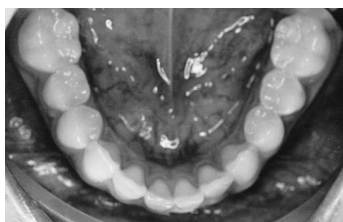


Figure 2e.



Figure 3. Case 1: JH Pretreatment OPG.

Cephalometric evaluation

The apical base relation revealed a Class I skeletal pattern, with normal Wits and ANB values (ANB = 2). The upper and lower anterior facial heights and the growth direction as indicated by the Y-axis were normal.

Dentally, the inclinations of the upper and lower incisors with respect to their apical bases were within the normal range.

The soft tissues appeared harmonious, with the upper lip being on the S-line (the line tangential to the soft tissue chin drawn to Columella). The lower lip protruded 2 mm relative to the S-line. There were 3 mm of lip strain with competent lips.

Problem list

1. Class II (1/2 unit) molar and canine relationship on the left-hand side.
2. Canine relationship on the right-hand side, tending to Class II.
3. Overjet of 5 mm.
4. The maxillary midline was 1 mm to the right of the mid-sagittal plane.



Figures 4a to e. Case 1: JH Post-treatment intra-oral photographs.



Figure 4b.



Figure 5a. Case 1: JH Post-treatment extra-oral frontal view, at rest.

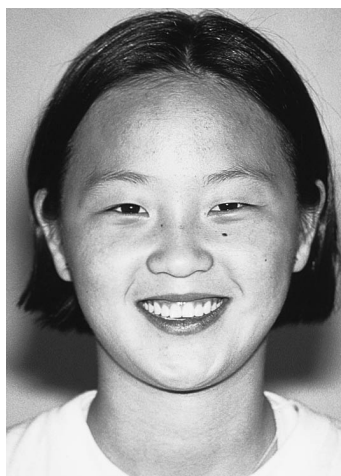


Figure 5b. Post-treatment frontal view, smiling.



Figure 5c. Post-treatment facial profile.

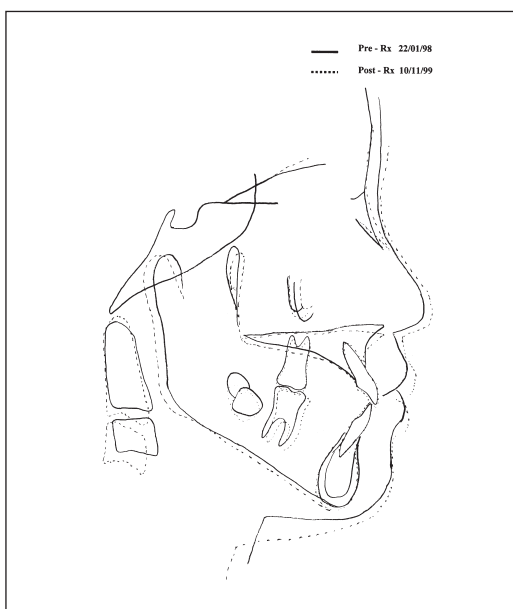


Figure 6c. Case 1: JH Overall superimposition.

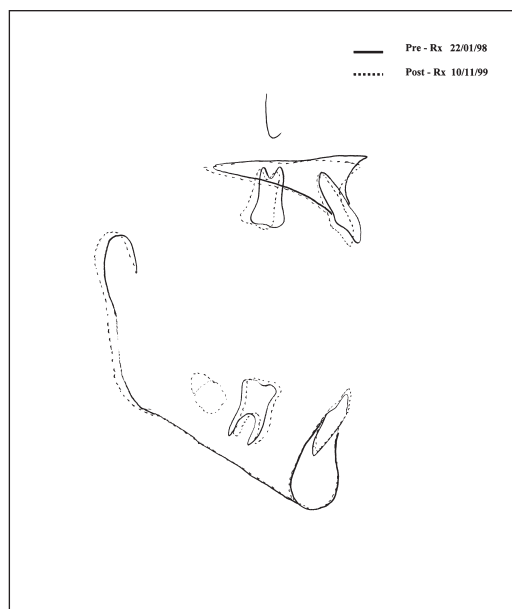


Figure 6d. Case 1: JH Regional superimpositions.



Figure 4c.

Diagnosis

Patient JH had an Angle Class II division 1 subdivision malocclusion that was Class I on the right-hand side on a skeletal Class I base. The overjet of 5 mm was slightly larger than normal, and the overbite was 3 mm. The maxillary dental midline was 1 mm to the right of the mid-sagittal plane and the mandibular midline was coincident with it. The patient was still undergoing rapid but decreasing pubertal growth.

Treatment plan

It was decided that non-extraction treatment with full fixed Speed appliances would be instigated. The mild space deficiency was overcome by archwire expansion. It was intended that after levelling, aligning and coordinating the arches, a Class I relationship on the left-hand side would be obtained by using unilateral Class II elastics.

Treatment progress and discussion

The appliance was directly bonded to all upper and lower teeth from first molar to first molar. Later, second permanent molars were bonded as well. The archwire sequence was as follows:

1. 0.016" Speed supercable.
2. 0.018" stainless steel with sectionals of 0.014" NiTi as auxiliary archwires from 16 to 14 and 26 to 24 (this allowed for alignment of 15 and 25 along with light Class II elastics wear).
3. Upper and lower 0.016" x 0.022" Cu NiTi, which maintained the alignment and enabled placement of continuous archwires from second molar to second molar.
4. The next and final archwires used were 0.019" x 0.025" TMA reverse curve.



Figure 4d



Figure 4e.

Several detailing appointments followed and the patient was debanded after 18 months of treatment. Retention appliances consisted of a lower fixed lingual arch of 0.018" stainless steel extending from 33 to 43, and an upper Begg retainer.

At the end of treatment, the upper lip was slightly protrusive to the S-line (2 mm) and the lower lip was slightly protrusive to the S-line (2 mm).

Cephalometric examination revealed the upper incisor inclination as favourable, with normal protrusion 6 mm (3 to 7 mm) to the A-Pog line. The lower incisors were 89 degrees to the mandibular plane and 3 mm ahead of the A-Pog line (1 to 3 mm being the normal value), confirming their appearance of being in harmony with their apical base and with normal protrusion (Table I).

In the anteroposterior plane, a Class I relation of molars and canines had been achieved. In the vertical plane, the lower incisors were not quite occluding with the upper incisors, but a half a millimetre of settling could be anticipated as no habit or obstruction to settling was anticipated. Tooth 15 was slightly mesiopalatally rotated and exhibited excessive mesial root tip, resulting in a marginal ridge discrepancy. The anterior teeth appeared flared because of their bulbous shape (stripping may have reduced this). Tooth 22 was rotated and because of its shape was not ideally aligned palato-labially; this was not addressed and adequately compensated for during treatment. The lower inter-canine width had been slightly expanded and, therefore, a bonded lower fixed lingual cuspid to cuspid was fitted.

Table I. Case 1: JH Cephalometric values.

	START	NORM	FINISH	NORM
SNA°	82°	81 ± 4°	80°	82 ± 4°
SNB°	80°	78 ± 4°	78°	79 ± 2°
ANB°	2°	3.5 ± 2.40	2°	2.6 ± 2.4°
S-Go' / N-Me (Jarabak %)	58%	62%	56%	64%
N - ANS	52mm	55 ± 3°	57mm	56 ± 2mm
ANS - Me	67mm	65 ± 4°	66mm	67 ± 4mm
N-ANS / ANS-Me %	44%, 56%	46%, 54%	46%, 54%	45%, 55%
SN - PP	5°	8 ± 3°	9°	8 ± 2°
PP - MP	35°	26 ± 5°	35°	23 ± 4°
SN - MP	40°	34 ± 6°	44°	31 ± 3°
SN - OP	18°	15 ± 4°	21°	15 ± 3°
Gonial Angle	130°	126 ± 6°	132°	122 ± 4°
1/ - SN	109°	104 ± 6°	105°	103 ± 7°
1/ - PP	113°	112 ± 6°	114°	111 ± 6°
/1 - MP	89°	93 ± 6°	89°	92 ± 9°
1/1	121°	129 ± 8°	125°	134 ± 13°
1/ - N Pog	7mm	84°	6mm	64mm
OJ	3mm		2mm	
OB	2mm		2mm	
1/3 of symphysis width	5mm		5mm	
X distance	5mm		4mm	
X - 1/3 sym.	0mm		-1mm	
Y Axis	69°	67 ± 5°	71°	68 ± 4°
S -N	69mm	76 ± 3mm	70mm	77 ± 4mm
Go' - Me	72mm	73 ± 4mm	76mm	78 ± 3mm
Co - Gn	117mm	119 ± 5mm	120mm	122 ± 5mm
Co - A	85mm	92 ± 3mm	88mm	94 ± 3mm
L difference	32mm	27mm	32mm	28mm
Nasolabial angle	90°	90°	90°	90°
S Line U,L	0mm, 2mm	0,0mm	2mm, 2mm	0,0mm
Basic upper lip thickness	13mm	15mm	15mm	15mm
Upper lip strain	13mm	14mm	15mm	14mm
H angle	10°	10 ± 4°	11°	104
Wits (True)	-4mm (4mm)		-3mm (3mm)	
U1 - APog	6mm	3-7mm	6mm	3-7mm
L1 -APog	4mm	1-3mm	3mm	1-3mm



Figure 7a. Case 2: CN Pretreatment extra-oral frontal view, at rest.



Figure 7b. Pretreatment frontal view, smiling.



Figure 7c. Pretreatment facial profile.

Occlusally, canine guidance was achieved with no cuspal interferences during lateral excursive movements. There were considerable simultaneous light cusp-to-fossa contacts in occlusion, with less than 1 mm of slide from centric relation into maximum contact. By the time fixed appliances were removed, a Class I occlusion with no symptoms of mandibular dysfunction and no signs of excessive tooth wear or occlusal trauma was present. Thus, a functional occlusion had been achieved at the end of active treatment. This would need to be reassessed at regular intervals for a few years before it could be confidently said that a stable improvement had been achieved.

The patient had a pleasing smile at the end of active treatment. There was a slight discrepancy between the heights of the clinical crowns of the upper central incisors; however, it had self-corrected by the time of the first recall appointment.

Case 2 (CN)

Facial evaluation (Figures 7a to c)

Frontal analysis of patient CN revealed an ovoid/tapering and symmetrical facial shape, with the vertical thirds in proportion. The bridge of the nose was broad, with a flat intra-orbital area. The alar width was wide but normal by Asian standards. There was normal display of the nares. The nasolabial fold was shallow and the lips were competent. The chin was normal and coincident with the mid-sagittal plane in centric occlusion. When smiling, the upper lip uncovered 90 per cent of the upper central incisor crowns.

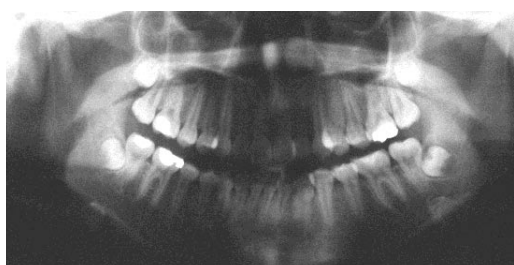


Figure 9. Case 2: CN Pretreatment OPG.

Profile analysis revealed that the patient had a convex facial profile and a convex lower third, due to slightly protrusive but competent lips. She had a straight nose without a dorsal hump. The infra-orbital area was deficient. The nasolabial angle was normal and the nasolabial fold was flat. The mentolabial fold was normal with a normal throat length.

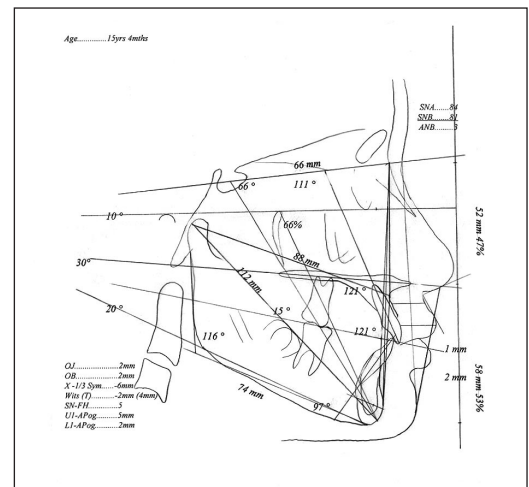
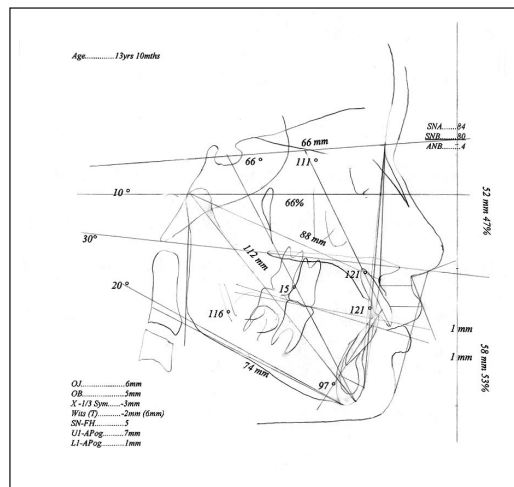
TMJ assessment

The patient reported no symptoms of TMJ dysfunction. Her maximum jaw opening was recorded at 40 mm without deviation.

Intra-oral examination (Figures 8a to e)

Periodontally, there was mild localised chronic marginal gingivitis associated with the maxillary and mandibular anterior teeth. The frenal attachments were normal and did not appear to interfere with function.

The upper and lower dental midlines were coincident with the mid-sagittal plane. The depth of the Curve of Spee was 2 mm. Overjet and overbite were both 4 mm.



In left and right lateral excursions of the mandible, there was group function (that is, guidance by the buccal teeth). In protrusion, the central incisors provided anterior guidance.

Model analysis

The space deficiency in the maxillary arch was 5 to 6 mm, and 4 mm in the mandibular arch. There was no significant Bolton's discrepancy.

Radiographic evaluation

Orthopantomographic evaluation (Figure 9): The OPG radiograph revealed normal development, including the as yet unerupted third molars. There was no bony pathology evident.

Bitewings: Inter-proximal and occlusal caries were present on the 46. Deep restorations were evident on all first molars.

Cephalometric evaluation: Skeletally, the cranial base had a decreased inclination and a decreased

length compared with cephalometric norms. The posterior facial height was slightly increased and the lower anterior facial height was decreased.

The direction of growth appeared normal as indicated by the Y-axis; however, the gonial angle was reduced. The apical base relationship suggested a Class I skeletal pattern, with normal Wits and ANB values.

Dentally, the upper incisors had a normal inclination to the cranial base but increased inclination in relation to the palatal plane. The interincisal angle was normal and normal to N-Pog as well. The lower incisors had an increased inclination to the mandibular plane.

The overall soft tissue profile was convex and the nasolabial angle was normal at 95 degrees. The upper and the lower lips were protrusive relative to the S-line and the lips were competent.



Figure 8c.

Diagnosis

Patient CN had an Angle Class II (1/2 unit) dental malocclusion on a Class I skeletal base. There was an increased overjet and overbite, both of 4 mm. The maxillary and mandibular midlines were coincident with the mid-sagittal plane. She was seven months post-menarche.

Problem list

1. Class II (1/2 unit) cusp molar relationship.
2. Overjet of 4 mm.
3. Overbite of 4 mm.
4. Moderate crowding (5 to 6 mm) in the upper dental arch.
5. Mild crowding (4 mm) in the lower dental arch.

Treatment plan

It was decided to extract all four first molars because of their poor long-term restorative prognosis and the pain symptoms reported. After levelling, aligning and coordination of the arches with fixed Edgewise appliances, the Class I relationship was to be obtained by the use of Class II elastics.

Treatment progress and discussion

The upper and lower teeth were fully bonded with Edgewise appliances using the direct bonding technique. The archwire sequence was as follows:

First: 0.017" x 0.025" Cu NiTi in the maxillary arch and 0.016" round Niti in the mandibular arch. The reason a relatively large dimension 0.017" x 0.025" Cu NiTi was chosen as the initial upper archwire is because it is capable of delivering light torque, thereby increasing the likelihood of bodily movement. The aim was to reduce the "round tripping" of incisors and canines by simultaneously moving crowns and roots into alignment, rather than tipping the crowns but having the roots move in the opposite direction, only to be torqued back later.



Figure 8d.



Figure 8e.

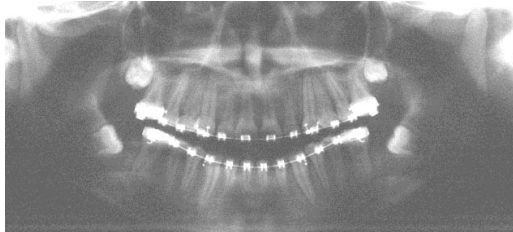


Figure 10. Case 2: CN Pre-deband OPG.

Second: The lower archwire was increased in dimension to 0.019" x 0.025" TMA with bite opening curves whilst using 5/16" 3.5 oz Class II elastics. Mildly activated power-chain was used across the lower extraction sites from 37 to 33 and from 47 to 43. Because of the denser bone in the mandible, it was assumed that closure of the lower first molar extraction sites would take longer than closure of the maxillary first molar extraction sites. Therefore, intra-arch elastic force across the 16 and 26 sites was used much more sparingly in the upper than in the lower. Care was taken to ensure that opposing second molars moved mesially at similar rates and remained in occlusion. Otherwise, as Dr R. P. Begg warned, lower second molars not opposed by upper second molars can over-erupt and be prevented from further mesial movement by the distal surface of the upper second molar acting as a barrier when teeth are in occlusion. To keep the rate of extraction space closure similar in both arches, elastic tie-backs from canines to second molars operated more on the lower dental arch. As a consequence, there may have been more strain on the lower anchorage and excessive



Figures 11a to e. Case 2: CN Posttreatment intra-oral photographs.



Figure 11b.



Figure 12a. Case 2: CN Post-treatment extra-oral frontal view, at rest.



Figure 12b. Post-treatment frontal view, smiling.



Figure 12c. Post-treatment facial profile.

uprighting of the lower anterior teeth. Careful monitoring of the overjet was therefore required at every appointment to ensure no increase occurred. If it had occurred, the patient would have been requested to increase the time spent wearing Class II elastics. The overjet did not increase, however, and this remained only a theoretical problem.

Measures were taken to maintain anterior anchorage and prevent excessive retraction of the lower incisors during closure of the first molar extraction sites. Bite-opening curves were maintained in the lower 0.017" x 0.025" TMA wire to provide a moment of force to procline the lower incisors and thereby counterbalance the retracting force of the intra-arch elastics. Lower molar tip and lingual roll were controlled not only by having rectangular tubes on the molars so that some root torque could be expressed, but also by archwire expansion and the use of reverse curve.

A further measure of control was sought during space closure by replacing the TMA wires with:

Third: Upper and lower 0.019" x 0.025" stainless steel archwires.

Several detailing appointments followed and the patient was debanded after eighteen months of treatment. Upper and lower Hawley retainers were issued.

Aesthetic appraisal now showed that both lips were slightly ahead of the S-line: the upper by 1 mm and the lower by 2 mm.

Cephalometric analysis showed that the upper incisor inclination was favourable, with normal protrusion of 5 mm (3 to 7 mm) to A-Pog line. The lower incisors were at 97 degrees to the mandibular plane, with normal protrusion of 3 mm (1 to 3 mm) to A-Pog line (Table II).

Dentally, a Class I relation of both molars and canines was achieved during treatment. Vertically, lower incisors occluded with the upper incisors.



Figure 11c.

Teeth 14 and 24 remained slightly mesiopalatally rotated and teeth 34 and 44 also remained slightly mesiolingually rotated. The anterior teeth appeared flared because of their bulbous shape. Further stripping may have allowed more consolidation. There was a rotational error of tooth 21 and also a labiolingual alignment error due to the shape of the tooth that was not addressed or compensated for during treatment. The lower inter-canine width was maintained.

Appraisal of the post-treatment occlusal dynamics showed less than 1 mm of slide between centric relation and centric occlusion. Laterotrusive movements exhibited no lateral interferences with the canines providing rise or guidance. At this stage, there was no evidence of excess tooth wear so it appears that a functional occlusion was achieved. A slight marginal ridge reduction of the upper anterior teeth facilitated a closer occlusion with the lower anterior teeth.

After debanding, scaling, cleaning and oral hygiene instruction, there was an overall improvement in gingival health, and the height of gingival margins above the upper central incisors evened out, which contributed to improved smiling aesthetics.

Third molars require monitoring in order to assess whether or not a second orthodontic phase will be needed.

Address for correspondence and reprints:

Professor M. Ali Darendeliler
Faculty of Dentistry
The University of Sydney
United Dental Hospital
Level 2, 2 Chalmers Street,
Surry Hills NSW 2010,
Australia
Email: darendel@dentistry.usyd.edu.au

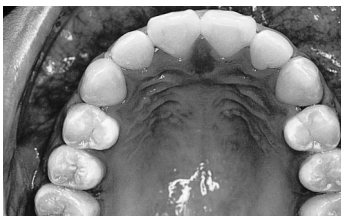


Figure 11d.

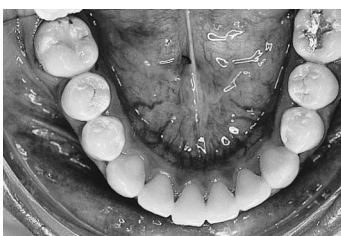


Figure 11e.

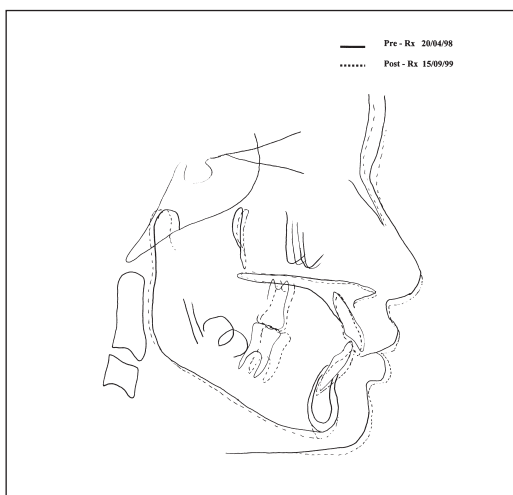


Figure 13c. Case 2: CN Overall superimposition.

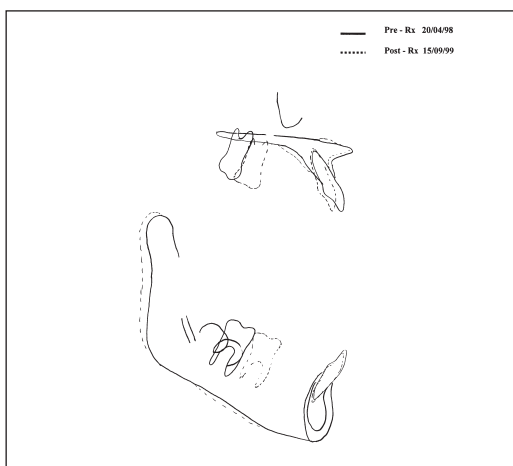


Figure 13d. Case 2: CN Regional superimpositions.

Table II. Case 2: C N Cephalometric values.

	START	NORM	FINISH	NORM
SNA°	84°	81 ± 4°	84°	81 ± 4°
SNB°	80°	78 ± 4°	81°	78 ± 4°
ANB°	4°	3.5 ± 2.4°	3°	3.5 ± 2.4°
S-Go' / N-Me (Jarabak %)	66%	62%	66%	62%
N - ANS	52mm	55 ± 3mm	51mm	55 ± 3mm
ANS - Me	58mm	65 ± 4mm	58mm	65 ± 4mm
N-ANS / ANS-Me %	47%,53%	46%, 54%	47%,53%	46%, 54%
SN - PP	10°	8 ± 3°	11°	8 ± 3°
PP - MP	20°	26 ± 5°	20°	26 ± 5°
SN - MP	30°	34 ± 6°	31°	34 ± 6°
SN - OP	15°	15 ± 4°	18°	15 ± 4°
Gonial Angle	116°	126 ± 6°	116°	126 ± 6°
1/ - SN	111°	104 ± 6°	107°	104 ± 6°
1/ - PP	121°	112 ± 6°	118°	112 ± 6°
/1 - MP	97°	93 ± 6°	101°	93 ± 6°
1/1	121°	129 ± 8°	121°	129 ± 8°
1/ - N Pog	9mm	84mm	6mm	84mm
OJ	6mm		2mm	
OB	5mm		2mm	
1/3 of symphysis width	4mm		4mm	
X distance	1mm		-2mm	
X - 1/3 sym.	-3mm		-6mm	
Y Axis	66°	67 ± 5°	65°	67 ± 5°
S -N	66mm	76 ± 3mm	67mm	76 ± 3mm
Go' - Me	74mm	73 ± 4mm	78mm	73 ± 4mm
Co - Gn	112mm	119 ± 5mm	114mm	119 ± 5mm
Co - A	88mm	92 ± 3mm	89mm	92 ± 3mm
L difference	24mm	27mm	25mm	27mm
Nasolabial angle	90°	90°	90°	90°
S Line U,L	1mm,1mm	0,0mm	1mm,2mm	0,0mm
Basic upper lip thickness	13mm	15mm	14mm	15mm
Upper lip strain	13mm	14mm	15mm	14mm
H angle	14°	104°	14°	104°
Wits (True)	1mm (6mm)		-2mm (4mm)	
U1 - APog	6mm	3-7mm	5mm	3-7mm
L1 -APog	2mm	1-3mm	3mm	1-3mm