

Comprehensive treatment commenced in the mixed dentition and completed in the permanent dentition: an “early treatment” malocclusion

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The management of a ten-year-old female with an Angle Class II division 1 malocclusion is followed for nearly ten years, through active treatment, until follow-up some years later. Note is made of: the duration of the overall active treatment period; the need for considerable patient cooperation; the fact that the lower incisors did not move forward on their underlying bone while still moving forward in relation to the APo line; and the fact that, in this instance, the third molars were chosen as appropriate teeth for extraction.
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Introduction

This case report concerns prolonged orthodontic treatment provided for a prepubertal mesofacial female (age 10–11), who presented with an Angle Class II Division I malocclusion in the mixed dentition, with a deep anterior overbite, significant lower space loss and drifting of the lower teeth to the right. Her treatment included:

1. Early control of lower space, and initial bite opening with a utility arch.
2. An upper utility arch and cervical-pull face-bow headgear to hold the upper arch back as the lower moved forward with growth.
3. Upper and lower fixed appliances to detail, with right-side Class II elastics. Total active treatment time was 39 months (Age 14–2).
4. Upper and lower removable retainers, worn full-time for the first eleven months following debanding, then at night for a further twenty-seven months. All third molars were surgically extracted during the formal retention period. The follow-up assessment was at 79 months after debanding (Age 20–9).

History and aetiology

The patient and her family presented requesting a second opinion. Her general dentist had placed a bracket on the lower right lateral incisor, planning to use a removable plate with an elastic device to align the tooth. There was considerable localised lower crowding and a tendency towards an underlying Class II malocclusion. The dentofacial patterns of both mother and uncle indicated that most of her occlusal problems were probably of genetic origin. The general dentist had extracted the two lower deciduous cuspids; it is unlikely that the extractions would have had either a positive or a negative effect upon the presenting situation. Pretreatment records are presented in Figures 1a–j. Selected lateral cephalometric measurements are presented in Table I.

Specific problems

1. Considerable early loss of space in the lower right corner, with consequent drifting of the lower arch to the right. The OPG radiograph showed the lower right first bicuspid erupting ahead of the lower right cuspid, and blocking it.
2. Class II molars right side; tendency to Class II left side; 6 mm overjet; deep anterior overbite with lower incisors impinging upon palatal gingival margins; upper and lower incisors upright; lower arch appeared to be "locked in".
3. Maxilla itself in good antero-posterior position, but the patient showed an excessive amount of upper gingival tissue upon smiling.
4. Reasonable prepubertal profile, but there was a deep mento-labial fold because of the incisal overbite and overjet.

Specific objectives of treatment

1. Relieve lower crowding by holding spaces as succeeding buccal teeth erupted.
2. Use space gained in lower arch to move the lower centre line to the left.
3. Having reduced the overbite, hold the maxilla and its dentition back as the mandible moved forward with growth. Correct the Class II buccal relationships and the overjet.
4. Limit the eruption of the upper incisors as much as possible during treatment to reduce gingival exposure.
5. Limit lower incisor eruption when levelling the lower arch.
6. Aim to treat without premolar extractions because of the facial pattern and good upper lip profile, the expected favourable mandibular growth direction, the good pretreatment upper anterior tooth positions and no obvious space problem in the upper arch. The decision to extract the premolars was to be formally reassessed with new radiographs, once the lower permanent buccal teeth had erupted.

Treatment progress

The provision of space for the eruption of the lower right buccal teeth was successful. The parents were originally told that this space-holding phase would take approximately eighteen months; in fact, it was twenty-three months before all the permanent buccal teeth had erupted. The loose lower right first deciduous molar was lost within the first month of the utility arch being fitted. Since the space was being held, the first premolar could then erupt,

relieving the pressure on the canine, so that the lateral incisor could in turn move labially. After nine months, a cervical-pull face-bow headgear was fitted to the upper first molars. After sixteen months, the upper utility arch was fitted and Class II elastic wearing was commenced on the right side. After twenty-three months, new radiographs were taken. Records taken during this first part of active treatment are presented in Figures 2a–f. Progress cephalometric measurements are presented in Table I. Progress cephalometric superimpositions are shown in Figure 3.

During the first phase of treatment, the patient went through her prepubertal growth spurt. An assessment of the case at this stage established that there had been favourable growth and good control of her face; the upper and lower incisor positions had improved, although the bite still needed to be opened further, and it appeared that the lower incisors could still be moved forward in relation to the facial structures as the patient continued to grow. The molar relationship on the right side was still approximately 4 mm Class II. After these progress records had been assessed, it was suggested to the parents that the case should be completed without premolar extractions, although, even at that stage, it was considered unlikely that the arches could accommodate thirty-two well-aligned teeth in the long-term.

The final detailing phase was commenced when the remaining buccal teeth were banded and bonded, so that overlay wires and then continuous wires could be used. Class II elastics continued to be worn on the right side, until the fixed appliances were removed. The patient cooperated very well all through treatment and, despite the fact that her active treatment dragged on for a long time, she and her family remained enthusiastic to the end. Full records taken at the end of active treatment (Age 14-2) are presented in Figures 4a–j. Cephalometric measurements taken on debanding are shown in Table I. Cephalometric superimpositions taken on debanding are presented in Figure 5.

Results achieved with active treatment

As expected, the patient and her family were very happy with both the dental and facial results of treatment. Her overbite, overjet, upper and lower centre lines and buccal occlusion were all now within normal limits. Space had been found for the alignment of all teeth from second molar to second molar, without premolar extractions and keeping the tooth positions within acceptable dimensional limits. The upper right cuspid was not totally occluded and there was still some hint of a centreline discrepancy.

Table 1. Lateral cephalometric summary.

Measurement		Norms	PreTx Age 10-11	Progress Age 12-10	Deband Age 14-2	Follow-Up Age 20-9
NSBa	(degrees)	130	133	133	134	135
SNA	(degrees)	82	82	82	80	80
A to N Perp	(mm)	0	-2	-2	-3	-3
N to ANS (perp)	(mm)	M 60 F 5 6	53	56	57	57
SNB	(degrees)	79	77	78	77	76
Po to N Perp	(mm)	-2	-10	-7	-8	-10
Fac Axis	(degrees)	90	94	94	93	91
Fac Angle	(degrees)	86	84	87	86	85
ANB	(degrees)	3	5	4	3	4
Convex of A	(mm)	+2	+3	+2	+1	+2
Po to NB	(mm)	+2	+4	+5	+4	+4
Me to ANS (perp)	(mm)	M 76 F 67	58	62	65	67
% Face Ht		45/55	48/52	47/53	47/53	46/54
MP to FH	(degrees)	26	25	24	27	29
MP to SN	(degrees)	32	32	31	34	35
U1 to NA	(degrees)	22	16	20	18	20
U1 to NA	(mm)	+4	+3	+2	+3	+4
L1 to NB	(mm)	M + 6 F + 3	+3	+2	+4	+5
L1 to NB	(degrees)	25	14	18	25	26
Int.incis ang		129	145	140	133	130
L1 to APO	(mm)	+1	-2	-3	+1	+2
L1 to APO	(degrees)	22	13	19	28	28
L1 to MP	(degrees)	M 95 F 92	87	89	94	95
Lower lip to E-plane	(mm)	-2	-1	-2	-3	-2

The first half of treatment coincided with the prepubertal growth spurt. This, coupled with excellent cooperation, assured that a good facial result was achieved as well. Little growth occurred during the final detailing phase; although the mandibular plane angle did increase a little with final bite opening and Class II correction. Despite the maxilla being held back, the upper lip curve was still good. The OPG radiograph taken at debanding showed that the roots were quite well paralleled. The lower intercanine, first premolar and first molar widths had increased approximately 1.5, 4.0 and 1.5 mm, respectively, from the time of the progress models (all buccal teeth erupted) until debanding.

Evaluation at debanding

At the debanding stage, the prognosis for stability was good. Treatment had been performed during a time of significant growth. The Class II buccal relationships and the overjet had been managed by holding the upper arch back; not simply by tipping the lower teeth forward. For that reason, considerable in-built stability might be expected.

Most of the space for the lower alignment and centre line correction had been found within the arch by holding the E-spaces, and with mainly premolar expansion. With the use of Class II elastics on the right side, the lower first molar had now come forward to match the position of the contra-lateral tooth. There had been some backward rotation of the mandible during the detailing phase, when less growth had occurred; consequently, it was important that the occlusion be held until post-treatment skeletal change was considered complete. The planned extraction of the third molars would be undertaken to provide more flexibility within the arch; not because of an obvious relation between the presence of third molars and late lower incisor crowding, but because it had already been decided that these arches would not accommodate thirty-two well-aligned permanent teeth. The lower incisors had moved forward in relation to the APo line, but not significantly on their underlying bone. Instead, the lower dento-alveolus seemed to have been "freed-up" so that it moved forward with the underlying basal mandibular growth.



Figures 1a-c. Pre-treatment (Age 10-11).

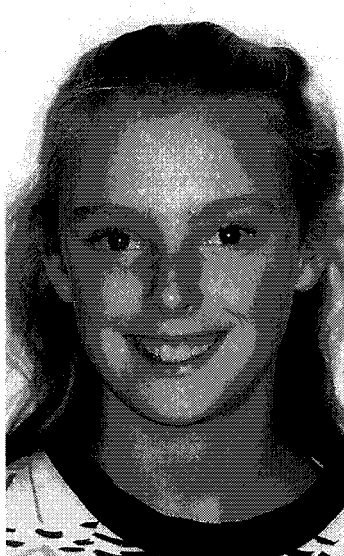


Figure 1b



Figure 1c



Figures 4a-c. At de-banding (Age 14-2).



Figure 4b

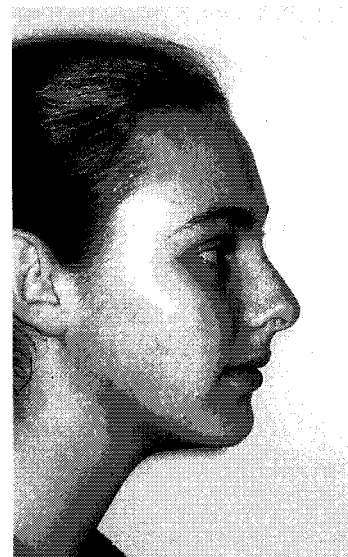


Figure 4c



Figures 6a-c. At follow-up (Age 20-9).

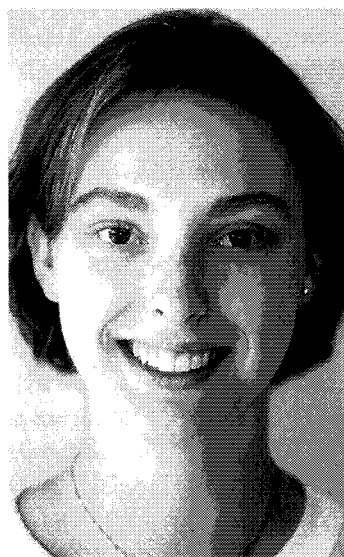


Figure 6b



Figure 6c

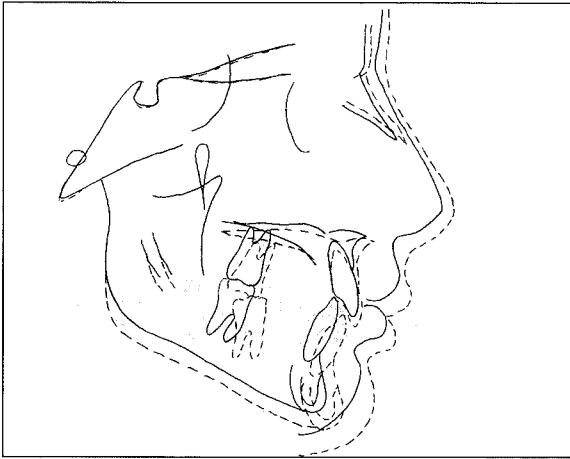


Figure 3a
Progress lateral cephalometric superimpositions (Age 12-10).
Solid: Pre-treatment. Dashed: Progress.

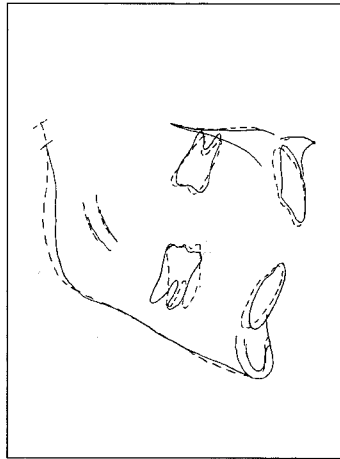


Figure 3b

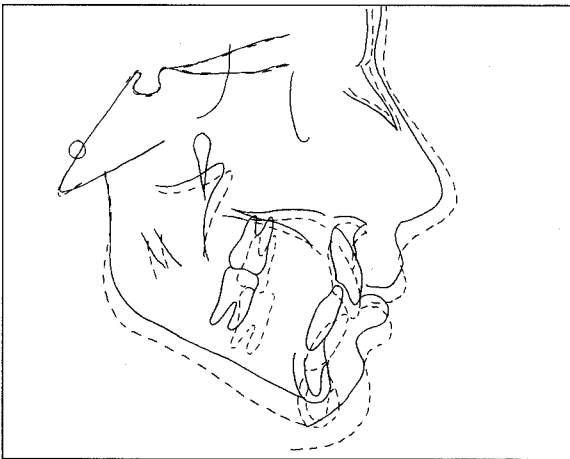


Figure 5a
De-band lateral cephalometric superimpositions (Age 14-2).
Solid: Pre-treatment. Dashed: De-band.

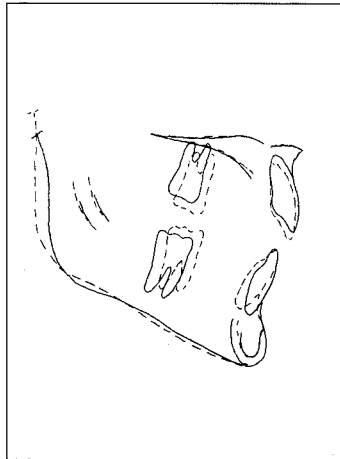


Figure 5b

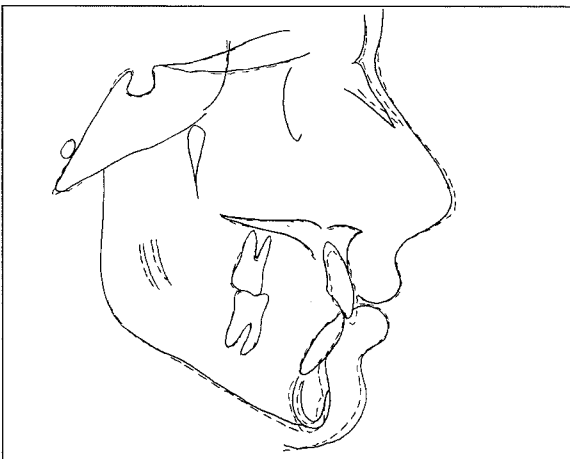


Figure 7a
Follow-up lateral cephalometric superimpositions (Age 20-9).
Solid: De-band. Dashed: Follow-up.

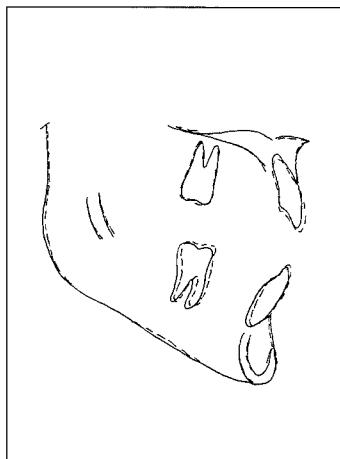


Figure 7b



Figure 1d. Pre-treatment (Age 10-11).



Figure 1e. Pre-treatment (Age 10-11).

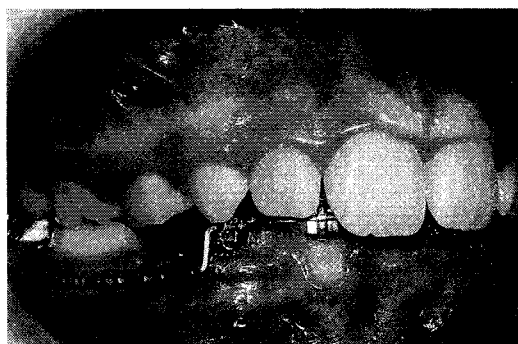


Figure 2a. Progress.

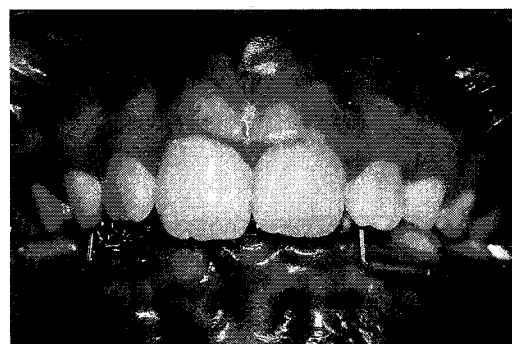


Figure 2b. Progress.

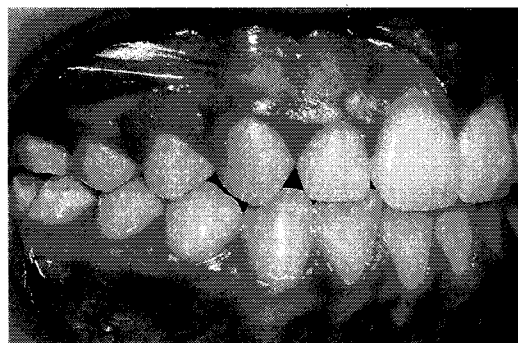


Figure 4d. At de-banding (Age 14-2).

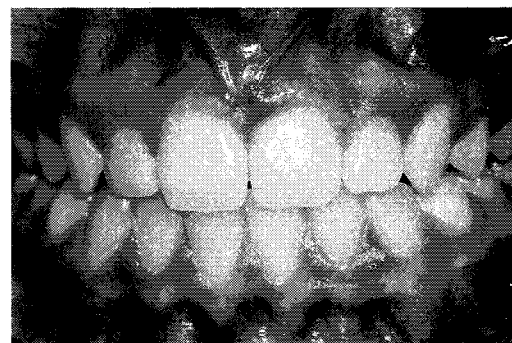
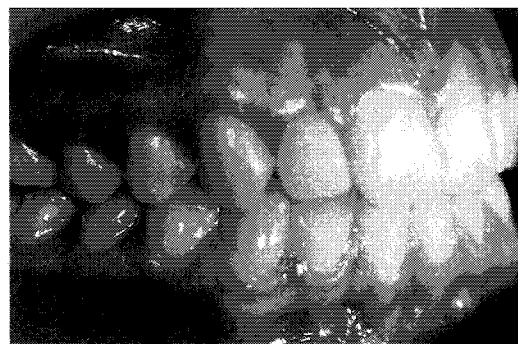


Figure 4e. At de-banding (Age 14-2).



Figures 6d-6h. At follow-up (Age 20-9).

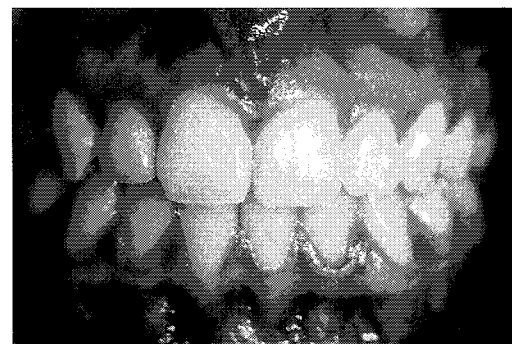


Figure 6e. At follow-up (Age 20-9).

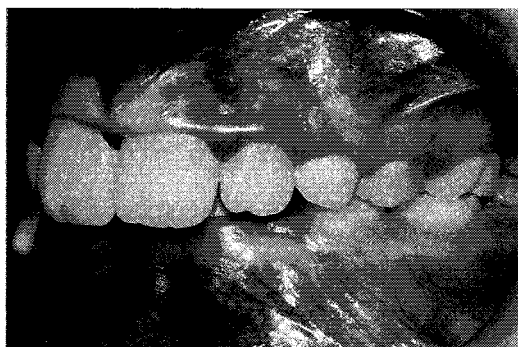


Figure 1f. Pre-treatment (Age 10-11).



Figures 1g (top) & 1h (bottom).
Pre-treatment (Age 10-11).

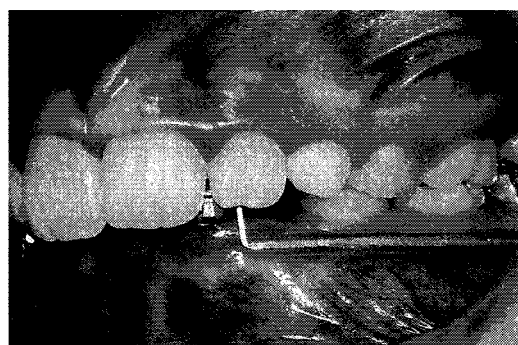


Figure 2c. Progress.

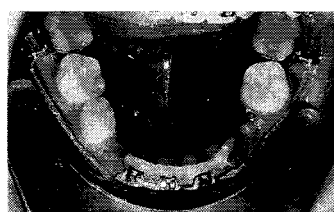


Figure 2d. Progress.

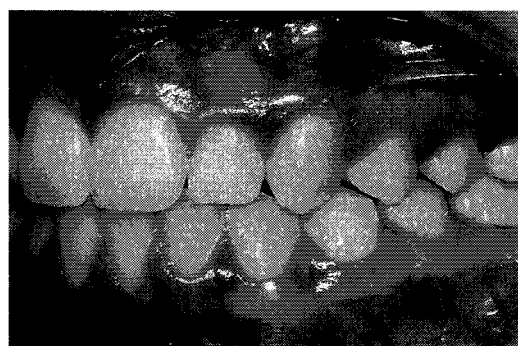
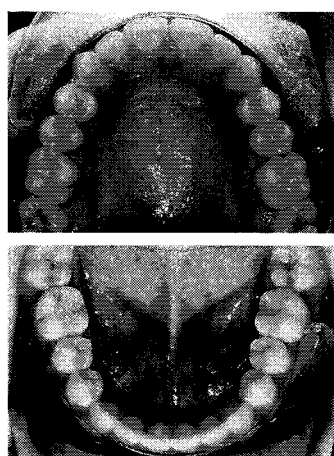


Figure 4f. At de-banding (Age 14-2).



Figures 4g (top) & 4h (bottom). De-banding.

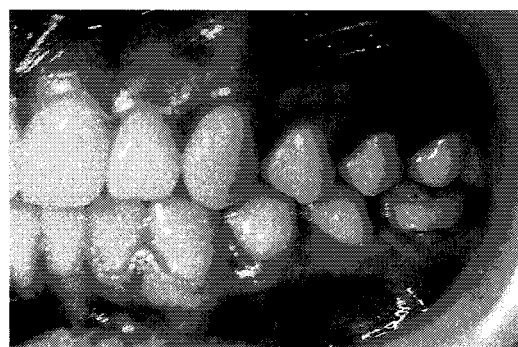


Figure 6f. At follow-up (Age 20-9).



Figures 6g & 6h. At follow-up (Age 20-9).



Figure 1i. Pre-treatment (Age 10-11).



Figure 1j. Pre-treatment (Age 10-11).

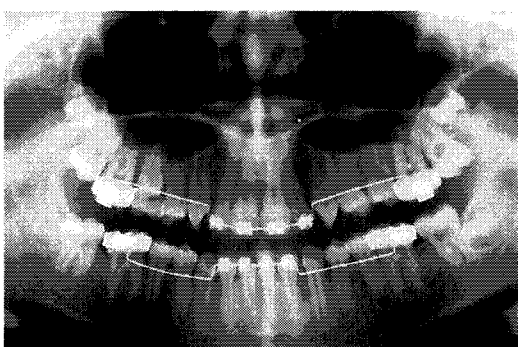


Figure 2e. Progress.



Figure 2f. Progress.



Figure 4i. At de-banding (Age 14-2).

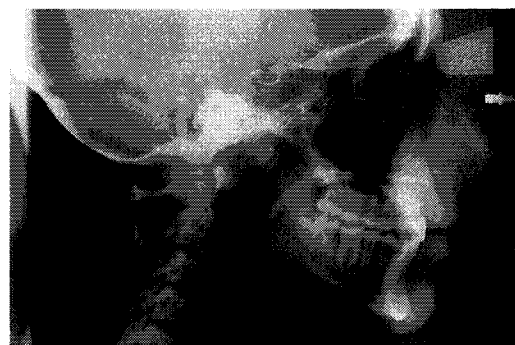


Figure 4j. At de-banding (Age 14-2).



Figure 6i. At follow-up (Age 20-9).



Figure 6j. At follow-up (Age 20-9).

At the debanding assessment, the author considered that, if the same case had presented again, there would have been two treatment choices. The first would have been to provide exactly the same long treatment over again, using growth and the E-spaces. (Despite the fact that a good result was achieved, active treatment ran for thirty-nine months.)

A second choice would have been to leave the case, allowing all the permanent buccal teeth to erupt. A couple of years later, the upper arch would have been well-aligned; however, the overjet, the overbite, the centreline problems, the asymmetric Class II relation and the crowding would all still have been evident. Treatment would then probably have involved the use of upper and lower fixed appliances, over approximately a twenty-four month active period. It is likely that extraction of two upper first premolars, the lower right second premolar and the lower left first premolar would have been requested, so that the occlusion could be detailed, affecting the upper tooth and lip positions as little as possible. Since much of the growth spurt would then have passed, the fact that the lower teeth would have been further back on their underlying bone and the upper teeth, consequently, further back in the face, would have to have been accepted. Nevertheless, this would have been a reasonable plan had the patient presented for treatment two to three years later.

With hindsight, and given the patient's co-operation and family support, the author would have been happy to treat this patient in exactly the same way again, despite the extra twelve to eighteen months in active treatment. Had there been any doubt about co-operation or growth, the balance would certainly have tipped back towards the extraction plan.

Follow-up evaluation six and a half years after debanding (Age 20-9)

Full-time retention was reduced to night-time only at age 15-1. The impacted third molars were surgically extracted at age 16-9. The patient then chose to cease all retention, at age 17-4. Records taken at the follow-up assessment are shown in Figures 6a-j. Final cephalometric measurements are included in Table I. Final cephalometric superimpositions are shown in Figure 7.

Even without ongoing retention, alignment of the upper and lower teeth is still very good, despite the fact that considerable space had to be found, within the lower arch especially. The lower intercanine distance has remained unchanged from that measured at debanding, although the first premolar and molar widths have each reduced approximately 1 mm during the retention and follow-up period. The cephalometric superimpositions show that the mandible has continued to rotate backwards during

the post-treatment period, and that there has been continued eruption of the upper and lower incisors, and the lower first molars to compensate for this backward rotation. The overbite has also deepened again somewhat. While the buccal relations on the left side are still well occluded, there has been a reversion of approximately 2 mm of those on the right side towards Class II; this is consistent with the minor centreline discrepancy that has also re-appeared (it was probably never completely corrected). With the continued backward rotation, it is not surprising that there has been some reversion towards the original interarch relationship; at this stage, however, it would be hoped that there would be little, if any, further change.

During the follow-up period, there has been some minor addition to the soft tissue of the nose but, overall, the post-treatment backward mandibular rotation has not resulted in any clinically apparent deterioration of the lateral profile. The patient and family are still very happy with the results of treatment. Nothing seen in this follow up assessment has made the author change the comments made in the debanding evaluation. If this patient were to present again for treatment at the same age and under similar conditions, it is likely that she would be treated in exactly the same way; mainly to protect her upper anteroposterior tooth and lip positions, while allowing positive change to take place in the lower dento-alveolar and lip regions.

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