

Treatment of a severe Class III skeletal discrepancy at an appropriate age

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The 13-year-old female patient presented for correction of a severe Class III malocclusion with a Class III skeletal pattern. This was considered an appropriate age for treatment as earlier treatment may have been subject to relapse because significant facial growth may have occurred after treatment, and because treatment at a later age may have required orthognathic surgery. Initially, maxillary expansion was provided to widen the maxilla and to free the circum-maxillary sutures. Maxillary protraction headgear was worn to perform sagittal skeletal improvement. Fixed orthodontic appliances were placed to align the dentition and Class III elastics were used to improve intercuspation and stability. Patient cooperation was crucial for success. The skeletal changes provided rewards that included significantly improved facial and dental appearance, while avoiding orthognathic surgery.

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Introduction

This case is presented to illustrate how orthodontic treatment in conjunction with growth modification can obviate the necessity of surgical correction of a severe Angle Class III malocclusion, even if the underlying skeletal discrepancy also is severe.

Medical and dental history

A 13-year-old female was referred for assessment and treatment of a severely underdeveloped midface and a crowded Angle Class III dental malocclusion. The patient's main concern was her poor facial and dental aesthetics, especially the ectopic upper right cuspid.

Clinical examination

The patient presented with mild facial asymmetry, with the chin point to the right-hand side (Figures 1a, b and c). In profile, the midface was underdeveloped with infra-orbital flatness. The upper lip was thin with an obtuse nasolabial angle, while the chin was prominent with a full lower lip.

Intra-oral examination showed an Angle Class III malocclusion in the permanent dentition (Figures 2a, b and c). All teeth were in crossbite, with the exception of the upper right cuspid. A mandibular shift could not be detected during closure.

Radiographic examination

The panoramic radiograph confirmed that all of the permanent teeth were forming. The crowns of the third molars had commenced calcification but appeared as if they would become impacted.

The cephalometric analysis indicated a Class III skeletal pattern, with severe maxillary retrusion (Table I, and Figure 3).



Figure 1a. Pretreatment facial frontal view.



Figure 1b. Pretreatment facial frontal view, smiling.



Figure 1c. Pretreatment facial lateral view.



Figure 2a. Pretreatment intra-oral right buccal view.



Figure 2b. Pretreatment intra-oral centre view.

Diagnosis

A severe Class III skeletal discrepancy, with maxillary retrusion. The malocclusion in the permanent dentition was Class III, with anterior and bilateral posterior crossbites. Severe crowding was present in the underdeveloped maxilla.

Treatment plan

Midface dentofacial orthopaedics.

1. Expand the maxilla using a modified Haas-type of expander with a double midline expansion screw.
2. Protract the maxilla with night-time reverse-facemask therapy, using elastic forces that are increased to the limit of patient tolerance.

Fixed orthodontics

1. Align the maxillary teeth, as space becomes available.
2. Coordinate the arches.

Retention

1. Place upper and lower removable retainers for orthodontic retention.
2. Modify the upper Hawley-style retainer with four Adams clasps and soldered facemask hooks, distally opening, for ongoing night-time mid-face orthopaedic retention.

Occlusal equilibration

Occlusal equilibration, and tooth reshaping as required.

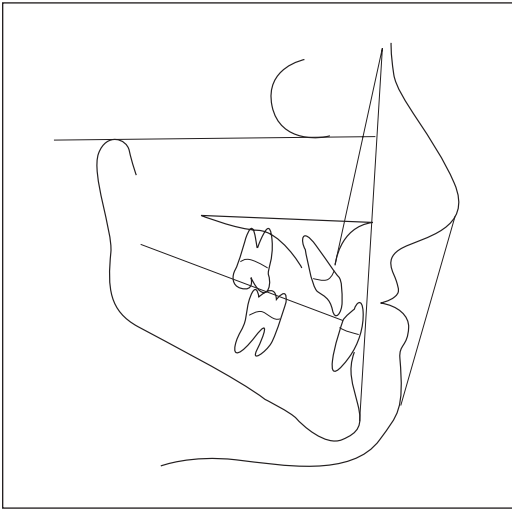


Figure 3. Pretreatment cephalometric tracing.

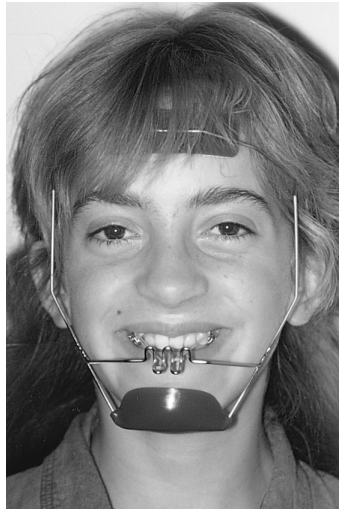


Figure 4. Reverse-pull facemask following initial dentofacial orthopaedics.



Figure 2c. Pretreatment intra-oral left buccal view.



Figure 5. Palatal expander with reverse-pull facemask hooks.

Wisdom teeth

Assess the need for the removal of wisdom teeth.

Treatment progress

Midface dentofacial orthopaedics

November 1994: The Haas-type of fixed palatal expander was cemented. It incorporated soldered reverse-pull facemask hooks on the buccal aspect of the first maxillary premolar bands as well as on the double midline expansion screw. The expansion was performed three times per week. The reverse-pull facemask was activated with 200 gm elastics and was worn for approximately ten hours per night.

February 1995: Expansion was terminated and photographic records were obtained (Figures 4 and 5).

Fixed orthodontics

March 1995: Fixed maxillary appliances were bonded. The initial archwire included an expansion nickel titanium coil to gain space for the maxillary right permanent cuspid. The palatal expander was kept in place for retention of the expansion, and the maxillary protraction force from the reverse-pull facemask was increased to the limit of patient tolerance.

May 1995: The reverse-pull facemask treatment was terminated at this time, concluding the six months of active midface dentofacial orthopaedics. The hooks were removed for comfort, but the expander was continued as a means of retention of the maxillary expansion.



Figure 6a. Post-treatment facial frontal view.



Figure 6b. Post-treatment facial frontal view, smiling.



Figure 6c. Post-treatment facial lateral view.



Figure 7a. Post-treatment intra-oral right buccal view.



Figure 7b. Post-treatment intra-oral centre view.

October 1995: The maxillary expansion appliance was removed. The maxillary first permanent molars were banded; the maxillary first premolars were bonded as was the mandibular arch, including the mandibular first permanent molars. 0.016" super elastic nickel titanium arch wires were placed in both arches.

March 1996: A maxillary 0.016" x 0.022" stainless steel archwire was placed with soldered brass hooks between the maxillary lateral incisors and cuspids. The night-time wear of the reverse facemask was restarted, with 200 gm elastics to the soldered hooks. The wearing of Class III elastics was commenced on a full-time basis.

October 1996: An incisor overjet of 3 mm had been established, with 3 mm over-correction of the posterior crossbites.

January 1997: An ideal overjet and overbite had been achieved. Class III triangle elastics were commenced to improve the buccal intercuspation and stability.

Retention

May 1997: The fixed appliances were removed, and modified retainers were fitted, to be worn continuously. The reverse facemask treatment was continued at night.

Occlusal equilibration

Minor incisal recontouring was performed, but an occlusal equilibration was not necessary.

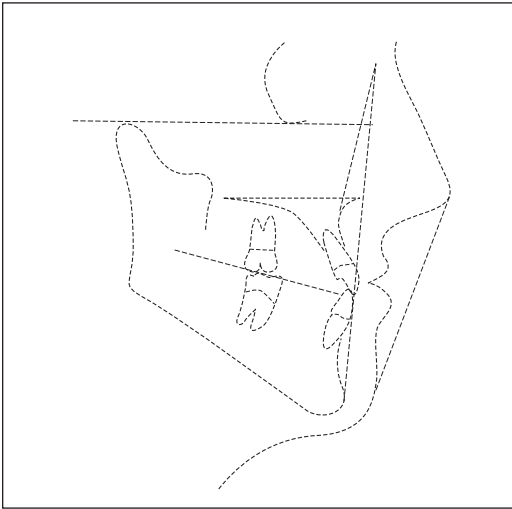


Figure 8. Post-treatment cephalometric tracing.

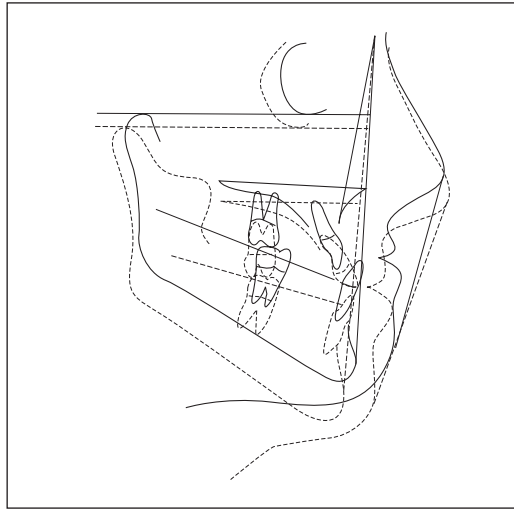


Figure 9. Superimposition of pre- and post-treatment cephalometric tracings.



Figure 7c. Post-treatment intra-oral left buccal view.

Wisdom teeth

At the time of writing these teeth were still to be reassessed.

Results

The post-treatment cephalometric analysis shows an improvement in the antero-posterior positioning of the maxilla, with an increase in facial height (Table I, Figures 9, 10a and 10b). The maxilla has been widened by 12 mm at the second premolars. The incisor overjet and overbite has been corrected, but there is still a degree of underlying dental compensation (upper incisor proclination and lower incisor retroclination) to compensate for the remaining degree of the Class III skeletal discrepancy. There is the possibility of

mild root resorption on the distal aspects of the lower first molars. The wisdom teeth are continuing to calcify with the possibility of becoming impacted in the next few years. There is good root alignment, especially where space was created in the region of the upper right cuspid.

The occlusion is Class I, although tending half a cusp Class II on the right-hand side (Figures 7a, b and c). There is still a degree of distal and buccal tipping of the maxillary second molars.

The soft tissue profile has improved, particularly in reference to upper-lip fullness (Figures 1c and 6c). Both hard and soft tissue changes are shown in Figures 11 and 12.

Discussion

This case is presented to highlight the possibilities of bringing about gross midface change by using heavy orthopaedic forces at the appropriate time of the early teenage growth spurt. The changes were due to a combination of good mechanics, timing and biological response, and the cooperation of the patient.

The concept of this treatment program assumes that the young developing midface possesses a high degree of biological plasticity. In this particular case, a combination of transverse and sagittal orthopaedic forces mobilised the circum-maxillary sutures. In contrast, the mandible resists most therapeutic forces, due to both its hinged joint and the closure of the anterior mandibular symphysis soon after birth.



Figure 11. Pretreatment facial 45° view, smiling.



Figure 12. Post-treatment facial 45° view, smiling.

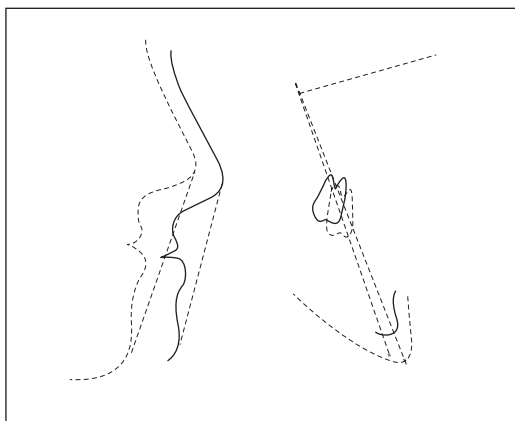


Figure 10a. Pre- and post-treatment cephalometric tracings; profile superimposition and Nasion basion at CC.

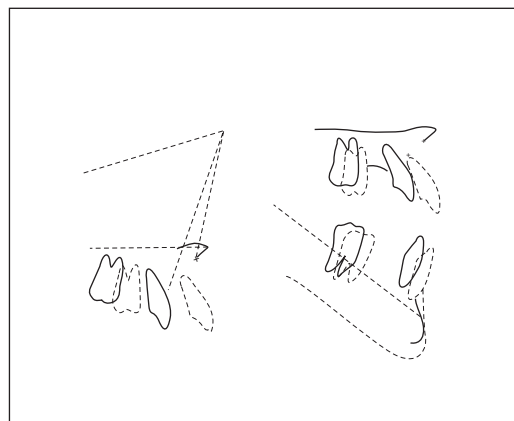


Figure 10b. Pre- and post-treatment cephalometric tracings; Nasion basion at nasion profile, and maxillary plane at ANS and Corpus axis at PM.

The case still exhibits a degree of dental compensation, which is illustrated in the tracing of the post-treatment lateral cephalometric radiograph (Figure 8); but assuming that the present growth pattern continues, the treatment results negate the need for surgical intervention at a later age. The maxillary changes are a combination of A Point advancement, maxillary expansion and proclination of the upper incisors (Table I). As expected, there has been minimal change in mandibular dental and skeletal positions beyond the anticipated growth.

Summary

This case provides an example of an interesting alternative to the orthognathic surgical intervention form of treatment that is usually used after the cessation of growth to correct a severe Class III malocclusion. The treatment outcome illustrates one of the options available to orthodontists for correction of a Class III malocclusion.

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Table I. Cephalometric values

Ricketts' Analysis		PreTx	Norm	Clin Dev		PostTx	Norm	Clin Dev	
Cranial Relations									
<i>Cranial Structure</i>									
Ant. cranial base	(mm)	53.7	58.8	-2.1	**	53.7	59.4	-2.3	**
Post facial ht	(mm)	60.7	54.8	1.8	*	64.0	54.8	2.8	**
Cranial deflect	(dg)	25.3	27.3	-0.7		24.7	27.3	-0.9	
Porion location	(mm)	-46.6	-38.6	-3.6	***	-48.3	-38.6	-4.4	***
Ramus position	(mm)	64.4	76.0	-3.9	***	67.2	76.0	-2.9	**
<i>Mx Position</i>									
Maxillary depth	(dg)	78.7	90.0	-3.8	***	83.3	90.0	-2.2	**
Maxillary height	(dg)	61.8	54.9	2.3	**	60.4	55.2	1.7	*
SN-Palatal Plane	(dg)	1.2	1.6	-0.1		-0.7	1.2	-0.5	
<i>Md Position</i>									
Facial depth	(dg)	87.5	88.1	-0.2		86.5	88.3	-0.6	
Facial axis	(dg)	90.1	90.0	0.0		87.7	90.0	-0.7	
Mandibular plane	(dg)	27.2	24.4	0.6		29.5	24.2	1.2	*
Total facial ht	(dg)	59.0	60.0	-0.3		62.5	60.0	0.8	
Facial taper	(dg)	65.3	68.0	-0.8		63.9	68.0	-1.2	*
Mx/Md Relations									
<i>Maxilla</i>									
Convexity	(mm)	-8.5	1.0	-4.7	***	-3.2	0.9	-2.0	**
<i>Mandible</i>									
Corpus length	(mm)	80.0	72.7	1.7	*	81.5	73.8	1.7	*
Mandibular arc	(dg)	35.3	29.4	1.5	*	30.0	29.8	0.1	
<i>Maxilla/Mandible</i>									
Lower facial ht	(dg)	42.3	45.0	-0.7		52.0	45.0	1.7	*
Dental Relations									
<i>Mx Dentition</i>									
Mx 1, to APo	(mm)	-4.0	3.5	-3.3	***	5.9	3.5	1.0	*
Mx 1, to FH	(dg)	100.7	111.0	-1.7	*	123.4	111.0	2.1	**
Mx 6, to PTV	(mm)	4.3	16.4	-4.0	***	9.0	17.1	-2.7	**
<i>Md Dentition</i>									
Md 1, to APo	(mm)	3.0	1.0	0.8		2.3	1.0	0.6	
Mx 1, inclination	(dg)	23.6	22.0	0.4		18.8	22.0	-0.8	
Md 1, extrusion	(mm)	2.0	1.2	0.4		0.2	1.2	-0.5	
Hinge axis angle	(dg)	74.7	90.0	-3.8	***	77.9	90.0	-3.0	***
<i>Mx/Md Dentition</i>									
Interincisal angle	(dg)	152.4	130.0	3.7	***	127.2	130.0	-0.5	
Molar relation	(mm)	-9.3	-3.0	-6.3	***	-3.4	-3.0	-0.4	
Incisor overjet	(mm)	-5.1	2.5	-3.1	***	3.9	2.5	0.5	
Incisor overbite	(mm)	6.0	2.5	1.8	*	2.0	2.5	-0.2	
Aesthetic Relations									
Lower lip E-plane	(mm)	-4.7	-2.0	-1.3	*	-4.5	-2.0	-1.3	*