

Correction of unilateral posterior crossbite through the use of RME and multibracket appliances

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Problems in the transverse plane of space are seen primarily as posterior crossbites, which may be due to displacement of teeth relative to their supporting bone (dental crossbite), or to a narrow maxilla or wide mandible (skeletal crossbite). It is important to specify, in the sense of the location of the anatomic abnormality, why the crossbite exists.

Where a maxillary lingual crossbite is apparent, maxillary expansion may be considered as part of a treatment aiming to coordinate the maxillary and mandibular arches. For the correction of maxillary skeletal constriction, rapid maxillary expansion procedure (RME) is indicated.

In this case report, the evaluation of P-A cephalograms before, after RME, and after active treatment will serve as a focus.

General clinical picture

The patient was a normally developed girl aged 10 years 7 months at the time of initial records. She had a convex profile with right unilateral posterior crossbite, midline discrepancy, and crowding (Figs. 1 and 2). Her chief complaints were maxillary high canines and a posterior crossbite in the right side.



Fig. 1. Pretreatment facial photographs.

Diagnosis

The patient had a right unilateral posterior crossbite of skeletal origin due to narrow palatal vault; there was also an anterior crossbite of the upper and lower lateral incisors. The mandibular dental midline was 1.3 mm to the right of the maxillary dental midline. The upper canines were blocked labially out of the arch form because of a 14.0 mm arch length deficiency. There was no crowding in the lower arch (Fig. 2).

The cephalometric analysis of the lateral headplate revealed a slightly retrognathic mandible with average morphology and normal positioned maxilla. The upper incisors to SN relationship of 98.7° indicated linguoversion of the maxillary incisors. An IMPA angle of 98.5° revealed slight lower incisor protrusion (Fig. 3 and Table I).

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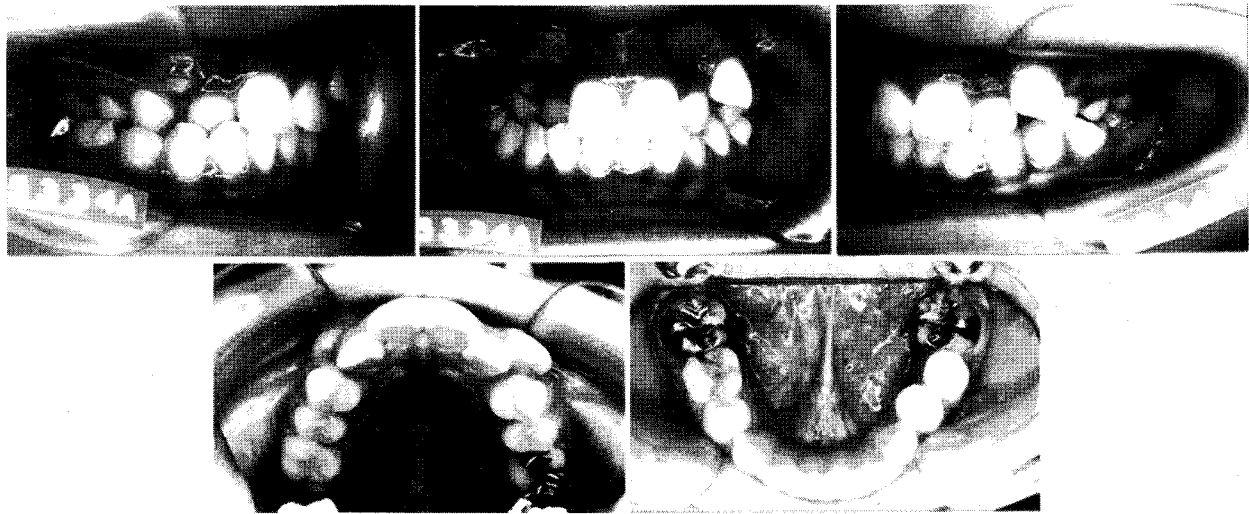
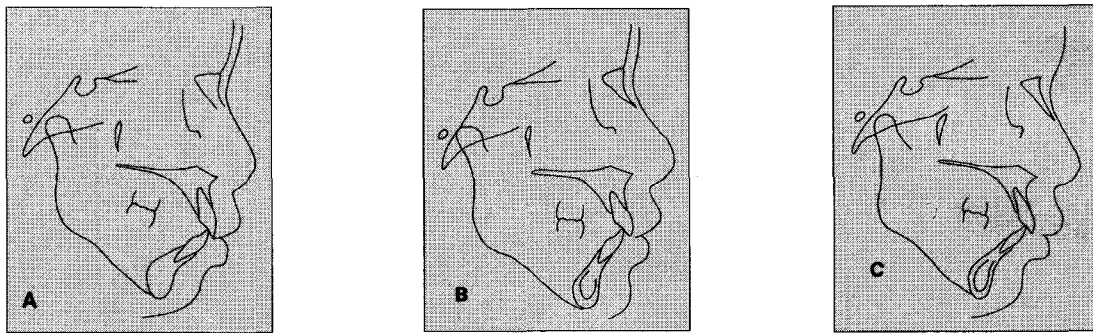


Fig. 2. Pretreatment intraoral photographs.



A. Pretreatment at 10 years 7 months B. Posttreatment at 13 years 7 months C. 5-year posttreatment at 18 years 7 months

Fig. 3. Lateral cephalogram tracings.

Table I. Summary of cephalometric analysis

Measurement	A	B	C
Skeletal			
SNA	78.4	76.9	77.6
SNB	72.0	70.8	72.3
ANB	6.4	6.1	5.3
FMA	33.5	33.7	32.9
NPo-FH	81.2	81.6	82.5
Dental			
Overbite	2.6	2.3	2.4
Overjet	3.4	3.8	3.2
I/-SN	98.7	99.6	105.1
IMPA	98.5	95.1	94.5
Interincisal	119.0	119.9	116.1
Soft tissue			
↑ lip to E-line	4.5	2.0	4.4
↓ lip to E-line	6.0	2.0	4.2

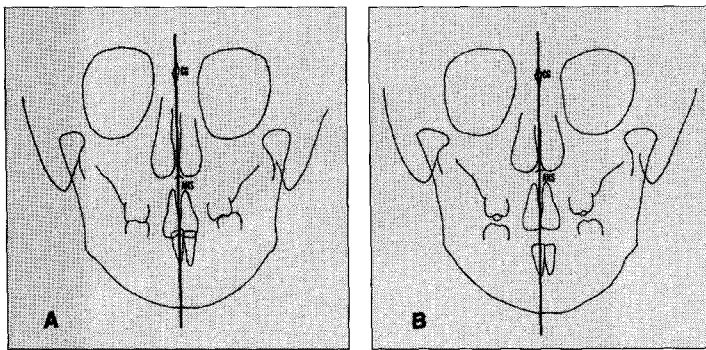
The evaluation of the frontal headplate revealed that the lower dental midline was deviated 1.7 mm to the right of the facial midline in both habitual occlusion and postural rest position. This is the case in which the mandibular midline shift is present in both occlusion and rest position (Fig. 4 and Table II).

During the clinical examination, it could not be determined whether there were prematurities and resultant shift.

Treatment objectives

The treatment objectives were as follows:

1. Correction of the unilateral posterior crossbite.



A. In habitual occlusion B. In postural rest position

Fig. 4. Pretreatment frontal cephalogram tracings. CG, crista galli; ANS, anterior nasal spine.

Table II. The mandibular dental midline in relation to the facial midline

	Habitual occlusion	Postural rest position
A	not coincident	not coincident
after RME	coincident	not coincident
B	coincident	coincident

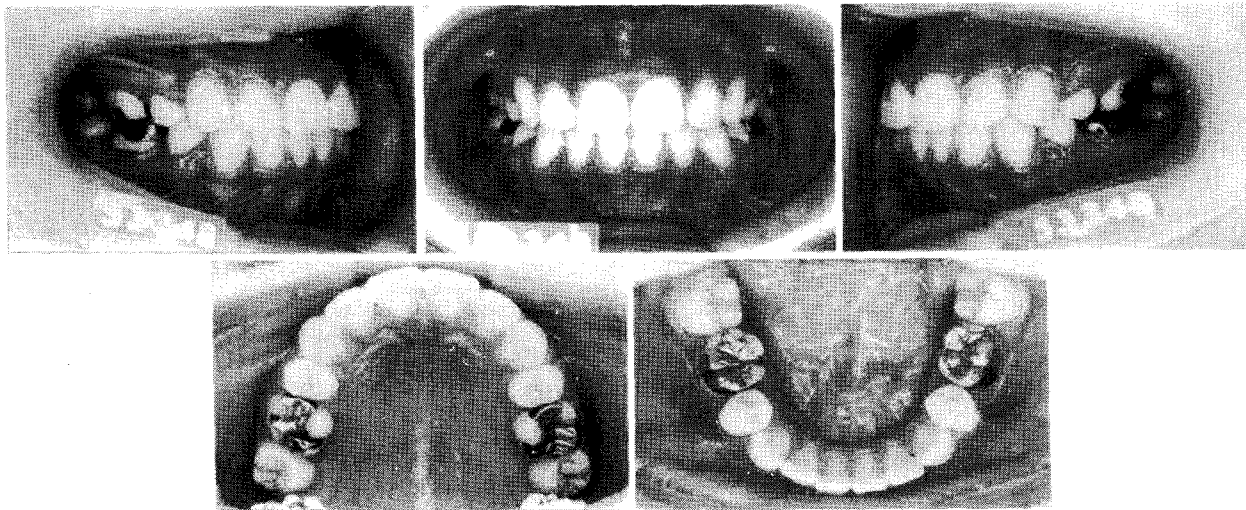


Fig. 5. Posttreatment intraoral photographs.

2. Correction of the maxillary high canine.
3. Establishment of a functional Class I occlusion.

Treatment plan

Instead of slow maxillary expansion, rapid maxillary expansion procedure (RME) was selected to correct the posterior crossbite. The primary reason was that RME procedure led to an increase in the upper arch transverse dimensions by mainly skeletal alterations associated with dental alterations. After RME, extraction of the four first premolars was the extraction pattern chosen. Removal of the four first premolars

would relieve severe crowding of the maxilla and achieve a Class I occlusion.

Treatment progress

Initially, the posterior crossbite was corrected by means of an RME appliance of the Hyrax type. The activations of the jackscrew were started immediately after the appliance was cemented in place. The parents were instructed to activate a 1/4 turn in the morning and a 1/4 turn in the evening, thus performing 1/2 turn of the screw per day. The active period of activations was 14 days. After correction of the posterior crossbite,

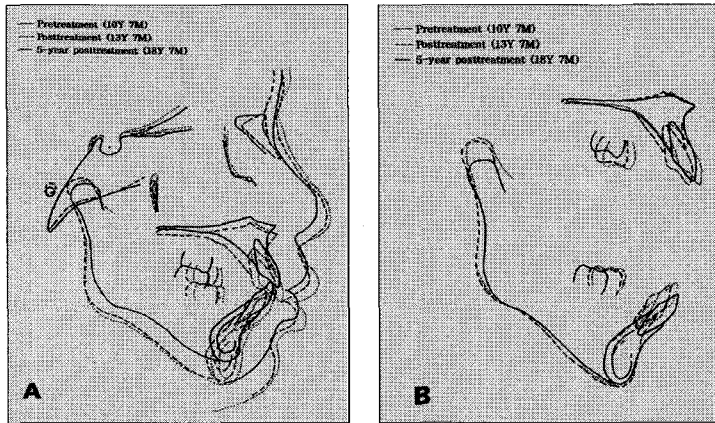
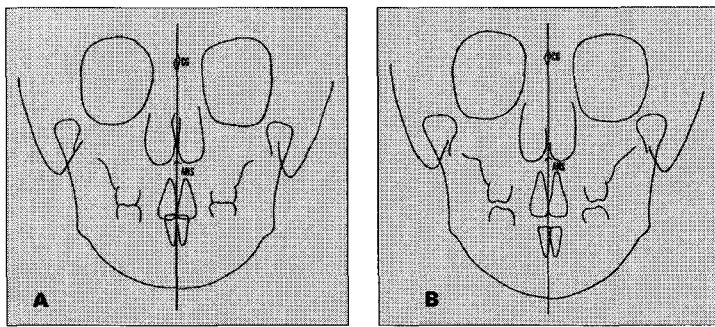
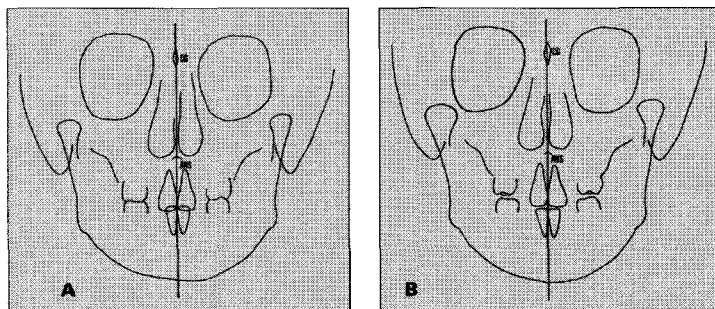


Fig. 6. A. Superimposition of the pretreatment, posttreatment, and 5-year posttreatment cephalograms on SN-plane registered at sella.
 B. Regional superimposition of the pretreatment, posttreatment, and 5-year posttreatment cephalograms.



A. In habitual occlusion B. In postural rest position
Fig. 7. Frontal cephalogram tracings after RME.



A. In habitual occlusion B. In postural rest position
Fig. 8. Posttreatment frontal cephalogram tracings.

the appliance was retained in place for 5 months.

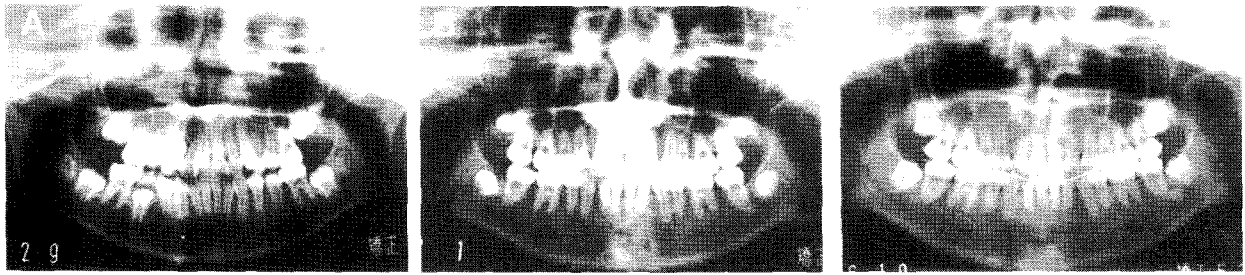
After RME, lateral and frontal headplates were taken to appraise the alterations promoted by the RME procedure.

Four first premolars were extracted and 0.018×0.025-inch edgewise preadjusted appliances were banded and bonded. Initial leveling and alignment treatment through the round wire sequence proceeded without incident and required 6 months. Since maximum anchorage was required for the maxilla, upper canine retraction was done with high pull J-hook headgear. Upper canine retraction with high pull J-hook required 5 months. After completing upper canine retraction, 0.016×0.022-inch stainless steel closing loop arches were placed to retract maxillary four anterior and mandibular six anterior teeth. Spaces were closed with the assistance of Class II elastics and high pull J-hook. Active lingual root torque was placed in the incisor section of the lower closing loop arch wire. Complete space closure required 6 months. The 0.017×0.025-inch arch wires were then replaced and final detailing, involving 7 months treatment time, was completed. The patient was cooperative and treatment progress was good. All bands and appliances were removed after 24 months of treatment.

Treatment results

The teeth in habitual occlusion demonstrated a Class I canine and molar relationship with both the upper and lower midlines in line with each other. There was good posterior interdigitation with a 3.6 mm overjet and 2.3 mm overbite. The slightly excessive overjet was due to a previous maxillary tooth size discrepancy of 1.9 mm. An analysis of the models showed good arch form and symmetry relative to the apical bases. All the extraction sites in both arches were closed (Fig. 5).

The lateral headplate and superimpositions revealed that the growth pattern of maxilla and mandible was vertical. Dentally, the maxillary molars advanced bodily for 2.5 mm, whereas the mandibular



A. Pretreatment at 10 years 7 months B. Posttreatment at 13 years 7 months C. 5-year posttreatment at 18 years 7 months

Fig. 9. Panoramic radiographs.



Fig. 10. 5-year posttreatment facial photographs.

molars advanced bodily for 4 mm. This had permitted a Class I posterior occlusal relationship (Fig. 6).

The frontal headplates immediately after RME revealed that in habitual occlusion, the lower dental midline was in line with the upper dental and facial midlines and in rest position, the lower dental midline was not (Fig. 7 and Table II).

The frontal headplates after 24 months of active treatment revealed that the lower dental midline was in line with the upper dental and facial midlines in both habitual occlusion and rest position (Fig. 8 and Table II).

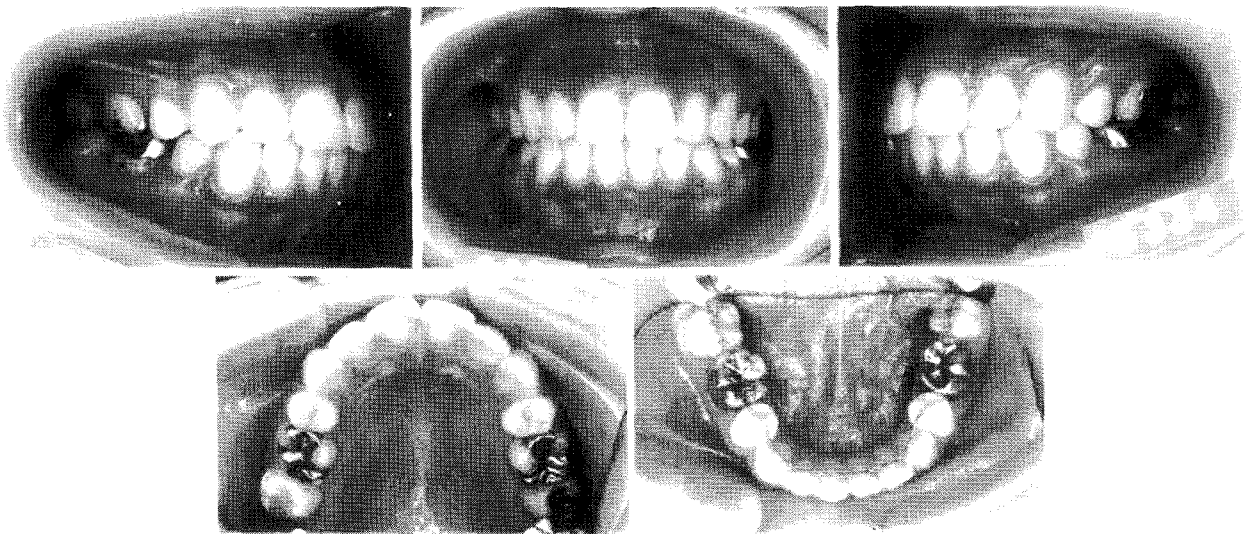


Fig. 11. 5-year posttreatment intraoral photographs.

The panoramic radiograph showed good approximation of roots in extraction sites. Some root resorption was evident both in the upper and lower anterior segments (Fig. 9).

Retention

The areas of major concern for relapse were maintenance of the maxillary arch width and the closed extraction sites. A maxillary circumferential retainer was placed and a fixed lower 2nd bicuspid-to-2nd bicuspid retainer was bonded lingually. The patient wore the maxillary retainer on a full-time basis for 1 year. During the second and third years of retention, the retainer was worn on a nighttime basis. During the fourth and fifth years of retention, the retainer was worn 1 night a week. The mandibular fixed retainer has been placed for 5 years. Retention will continue in this manner.

Discussion

The unilateral posterior crossbite was successfully corrected, and the midlines were coincident. The primary goal of a symmetric, functional Class I occlusion was achieved.

The lower dental midline in rest position shortly after RME was not in line with the upper dental and facial midlines but the lower midline in rest position after active treatment was in line with the upper dental and facial midlines (Figs. 7, 8 and Table II). It is suggested that during 24 months of active treatment, the muscles which determine the position of the mandible have been adapted to the new position.

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