

# Early interception of mandibular shifting: A longitudinal approach from deciduous through mixed and permanent dentitions

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## ABSTRACT

A Class II malocclusion with a unilateral posterior crossbite in the late deciduous dentition is a challenging type of malocclusion to intercept. The objective is to analyze the long-term changes in a patient with a skeletal Class II division 1 malocclusion. A 5-year-old female child who was referred from a pediatric dentist came for consultation. Correction of posterior crossbite involves expansion of the maxillary arch with the aim of removal of occlusal interferences and elimination of the functional shift of the mandible. The treatment comprised three stages: (1) Expansion of the maxillary arch was performed with a modified Haas palatal expander and the clinical procedures thus resulted in improved facial symmetry and satisfactory functional occlusion in the mixed dentition (8 years 10 months). (2) Distalization of maxillary first molars was done with a Kloehe type headgear and a lip bumper was placed in the mandible to maintain the arch perimeter (12 years). (3) A 0.022 inch × 0.028 inch standard edgewise fixed appliance was used for comprehensive orthodontic treatment and the objectives were accomplished (14 years 5 months). The results showed great improvements in function and esthetics, and posttreatment stability was good after 7 years and 5 months.

## Key words

Headgear, interception, mandibular shifting, palatal expansion

## INTRODUCTION

Class II malocclusion is the most common sagittal discrepancy in orthodontics,<sup>[1]</sup> and an early approach with functional appliances is frequently used to improve the development of the facial skeleton and simplify the subsequent therapy with fixed appliances.<sup>[2]</sup>

Mandibular retrognathism was reported to be the most contributing factor in skeletal Class II development,<sup>[3]</sup> and functional appliances have been used to improve the sagittal position and growth of the mandible.<sup>[4]</sup> Koehn cervical headgear has been used for more than 50 years as an efficient method of treatment to correct Class II malocclusion in the late mixed and early permanent dentition.<sup>[5]</sup>

In mixed dentition, children might develop esthetically unfavorable malocclusion and for this reason, they might be exposed intentionally and repeatedly to acts of physical or psychological violence by one person or a group of people (bullying) and might cause victims to feel pain, anxiety, and low self-esteem, which significantly affects their psychosocial development.

Posterior crossbite is the most prevalent malocclusion in deciduous dentitions,<sup>[6]</sup> and it should be treated as soon as possible. Early treatment will intercept and correct the adverse effects of malocclusion and will establish a suitable environment for further growth of the maxillary and mandibular bones.<sup>[7]</sup>

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Generally, in a front view, human faces have a small degree of asymmetry.<sup>[8]</sup> The term asymmetry is used to make mention to inequality between homologous elements, modifying the balance between structures.<sup>[9]</sup>

In many cases, the etiology of facial asymmetry remains unknown, and for this reason, it is termed asymmetry of development, and such idiopathic asymmetries are common in the overall population but are not seen at an early age, appearing gradually throughout craniofacial development.<sup>[10]</sup>

Class II division 1 malocclusion has small dental and skeletal maxillary dimensions on the transverse plane,<sup>[11]</sup> and the treatment of this malocclusion should comprise previous maxillary expansion.<sup>[12]</sup> The treatment of unilateral posterior crossbites generally involves symmetric expansion of the maxillary arch, removal of selective occlusal interferences, and elimination of the mandibular, functional shift.<sup>[13]</sup>

The Class II division 1 malocclusion treatment comprises one or two phases. In a 2-phase treatment, the first phase is carried out in mixed dentition with the potential application of maxillary, functional orthopedics, followed by a corrective phase in the early permanent dentition.

Therefore, this case report presents the diagnosis and demonstrates the efficacy of the mechanics to correct skeletal transverse and anteroposterior discrepancies and to gain arch length in the maxillary and mandibular arch without extracting any tooth. The results of the treatment and its stability are assessed with a long-term follow-up of 7 years and 5 months.

## DIAGNOSIS AND ETIOLOGY

A female child aged 5-year 4-month-old came to the orthodontic clinic for consultation referred by her pediatric dentist. The health history and examination of the head and neck were unremarkable. Intraoral examination revealed a primary dentition with unilateral posterior crossbite. Sagittal relationship of deciduous molars was distal step on the right side and mesial step on the left; deciduous canines demonstrated a Class II relationship on the right side and Class I on the left. Mandibular midline deviated 3.0 mm to the right with a posterior crossbite manifested clinically as unilateral when viewed in centric relation, confirming the true unilateral posterior crossbite [Figure 1].

Radiographic findings included a lateral cephalometric analysis that showed a skeletal Class II malocclusion (ANB, 9°; SNA, 84°; SNB, 75°) and a vertical growth tendency (Frankfort-mandibular plane angle, 38°; Y-axis, 63°) [Table 1].

## Treatment objectives

The correction of unilateral posterior crossbite involves palatal expansion, exclusion of occlusal interferences, and elimination of mandibular shift. Such early intervention will correct and prevent an inadequate facial growth development and a forthcoming occlusal discrepancy in the permanent dentition.

A crossbite in the primary dentition should be corrected as early as a child's cooperation can be obtained. The interceptive treatment of the unilateral crossbite was performed in two phases. Because of the young age of the patient, a fixed appliance was considered to be the most suitable option. A Haas type appliance was constructed and fixed on the second deciduous molars.

## Treatment alternatives

The decision was to (1) intercept and correct the malocclusion as soon as possible and (2) postpone the correction of the unilateral crossbite in mixed dentition. The biomechanics of maxillary expansion was limited to a slow expansion. Alternatives of expanders: 'W' arch, quad helix, Haas, hyrax with bands, or acrylic bonded without bands into the occlusal.

## Treatment progress

The treatment comprised three phases. The initial phase involved palatal expansion with a Haas type expander that remained for 5 months to increase the stability of the results.



**Figure 1:** At 5 years 3 months. Pretreatment photographs, panoramic and cephalometric radiographs, and cephalometric tracing

At age 12 years, the maxillary first molars were distalized using a KloeHN type headgear, and in the lower arch, a lip bumper was placed to gain arch length and slightly upright the molars. Once a Class I molar relationship was achieved, a fixed appliance was used to align, level, and retract the anterior teeth.

Headgear and lip bumper mechanics continued for 10 months. It was recommended that the KloeHN appliance should be worn for 12–14 h/day to maintain the Class I molar relationship and achieve sufficient arch length in the mandibular arch.

At age 12 years, a 0.022 inch × 0.028 inch edgewise fixed appliance was bonded. Alignment and leveling of both arches were achieved with 0.014 inch to 0.020 inch archwires. Rectangular 0.018 inch × 0.025 inch and 0.019 inch × 0.025 inch finishing wires were used. After removal of the fixed appliance, a wraparound-type retainer and a bonded canine-to-canine lingual retainer were placed.

Cervical traction was used until the end of the treatment to maintain the Class I molar correction during maxillary incisor retraction. The active treatment lasted for 25 months.

### TREATMENT RESULTS

The expansion of the maxillary arch was sufficient to correct the unilateral posterior crossbite into a normal form, and the midline deviation was minimized. Lip competence was improved, and the perioral muscle tension disappeared [Figure 2]. Overjet and overbite worsened with a Class II molar relationship on both sides [Figure 3].

At the end of the treatment, esthetic and functional results were achieved. The occlusion was finished

with Class I canine and molar relationships. Overbite and overjet were ideal. The patient’s facial appearance was improved significantly with a straight profile. The cephalometric analysis [Table 1] and the superimposition show marked improvement in the soft and hard tissues and the occlusion and esthetics [Figure 4].

The teeth were well aligned, and a Class I molar relationship was established. Superimposition of tracings showed that her profile was greatly improved, and her

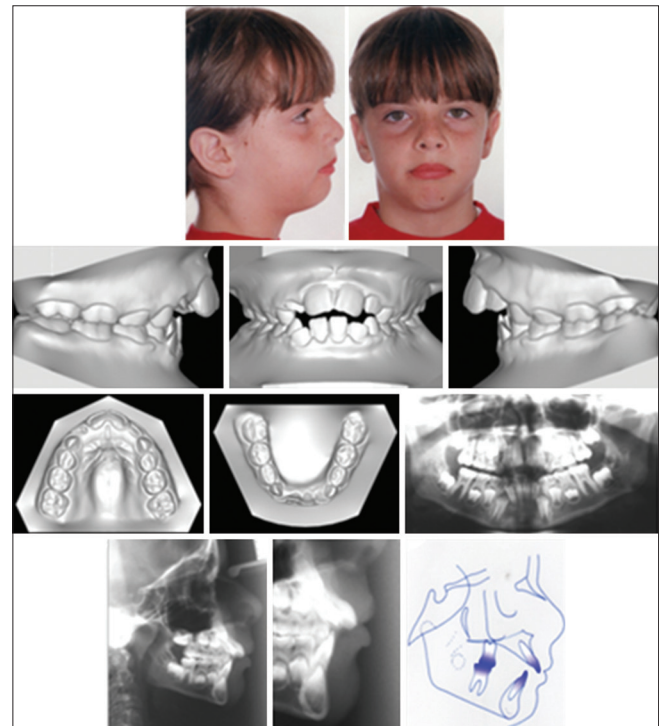
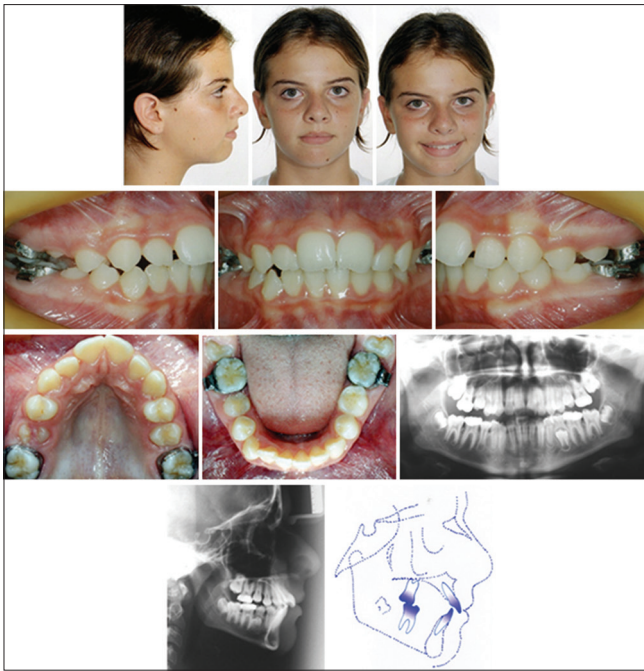


Figure 2: At 8 years 10 months. Progress photographs, panoramic and cephalometric radiographs, and cephalometric tracing

Table 1: Cephalometric measurements					
Measurements	Pretreatment 5,3	Progress 8,10	Progress 12,0	Posttreatment 14,5	Follow-up 21,9
SNA angle (°)	84	82	80	80	81
SNB angle (°)	75	75	76	77	77
ANB angle (°)	9	7	4	3	4
AO-BO (mm)	4	2	2	1	1
Facial angle (°)	73	83	83	83	83
Convexity (°)	19	8	9	7	7
GoGn-SN) (°)	38	38	34	33	30
FMA	32	28	27	25	24
Y Axis (°)	63	63	62	62	63
1-NA (mm)		7	7	6	7
1-NA (°)	16	30	33	26	27
1-NB (mm)		5	7	7	8
1-NB (°)	6	26	28	28	31
IMPA (°)		96	98	101	104
Interincisal angle (°)		117	117	123	120
Z angle (°)	62	65	70	70	71



**Figure 3:** At 12 years. Progress photographs, the use of Kloehn cervical headgear in the maxilla and lip bumper in the mandible, panoramic and cephalometric radiographs, and cephalometric tracing

lips were much less strained and had a better contour than before. A significant counterclockwise rotation and considerable growth of the mandible and distalization of the maxillary first molars were achieved because of the Kloehn cervical headgear [Figure 4]. The skeletal and dental measurements showed remarkable changes [Table 1].

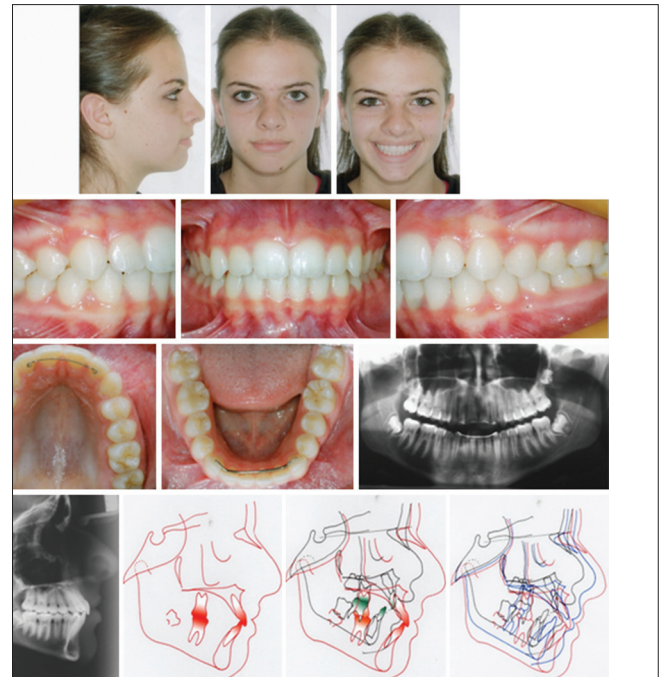
At the age of 21 years and 9 months, and after 7 years 5 months of follow-up, everything is all right, except for a slight facial asymmetry [Figure 5]. A slight midline deviation to the right remained during the entire treatment, but the patient is very satisfied with the clinical and occlusal results, and she is now a dentist.

## DISCUSSION

Preventive and early treatment in orthodontics is still the subject of continuous debate and controversy regarding cost-effectiveness and functional and psychosocial benefits.<sup>[14]</sup>

The success of an early approach is limited to the degree of cooperation of young children.<sup>[7]</sup> Without early treatment, it will result in facial asymmetry and temporomandibular disorders (TMDs) in adulthood<sup>[6]</sup> and deviation from normal facial esthetics.<sup>[15]</sup>

The general practitioner and pediatric dentist must be able to diagnose unilateral posterior crossbites successfully and provide treatment or referral to benefit



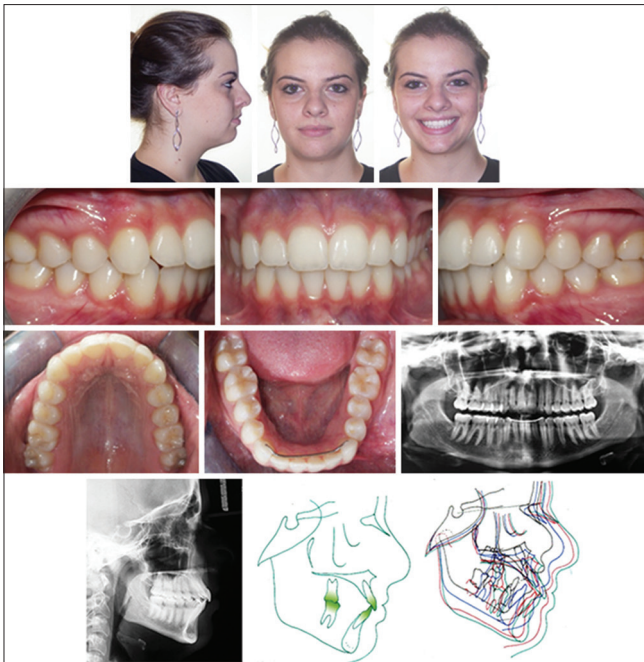
**Figure 4:** At 14 years 5 months. Posttreatment photographs, panoramic and cephalometric radiographs, cephalometric tracings, and superimpositions. Black: initial; blue: progress; red: final

from early treatment,<sup>[13]</sup> but this case was treated by an orthodontist. When a patient has a dental midline deviation or an asymmetric occlusion is observed, the clinician must check for skeletal asymmetries, dental asymmetries, and functional shifts and a functional shift of the mandible.<sup>[16]</sup> The clinician must also verify if the mandible is in a centric position. These are important first steps in correctly diagnosing any type of asymmetry.

Depending on the patient's age and the severity of the condition, asymmetrical extractions,<sup>[17]</sup> asymmetric intermaxillary elastics,<sup>[18]</sup> and asymmetrical mechanics<sup>[19]</sup> or surgical interventions<sup>[20]</sup> are highlighted and tend to yield good results in correcting facial asymmetries. When the asymmetry is more severe, the condition is typically rendered noticeable, which negatively affects facial and smile esthetics.<sup>[16,19]</sup>

Therefore, its etiology should be carefully investigated to achieve an adequate treatment plan, always with the agreement of patient and parents. In Class II subdivision cases, the position of the maxilla relative to the cranial base was more forward and downward and was wider on the Class II side than on Class I.<sup>[21]</sup> The patient in the present case report is a dentist and is satisfied with her face.

It has been reported that after expansion, a "spontaneous" correction of the Class II malocclusion takes place as a result of a forward posturing of the mandible,<sup>[12]</sup> but maxillary expansion did not predictably improve



**Figure 5:** At 21 years 9 months follow-up. Superimposition of tracings in pretreatment, posttreatment, and follow-up phases showing a great amount of growth among the four periods. Black: initial; blue: progress; red: final; green: follow-up

Class II molar relationships and indicated neither mandibular shift nor supplementary growth after rapid maxillary expansion.<sup>[22]</sup> In the present clinical case, the headgear was used to distalize the maxillary first molars and it provided growth response with significant counterclockwise rotation, and considerable growth of the mandible and a marked restriction of the entire maxilla occurred due to the orthopedic force of the Kloehn cervical headgear.

Early correction of posterior crossbites may help prevent signs and symptoms of TMD. Some researchers have shown a correlation between posterior crossbite and the signs and symptoms of TMD<sup>[23]</sup> although other studies were unable to find a causal link.<sup>[24]</sup> Therefore, crossbite may be a cofactor in the identification of patients with TMD, but its role should not be overstated.

As pointed out before, the success of early treatment, however, is limited by the ability of a young child to cooperate with the pediatric dentist or orthodontist. This case demonstrates a successful correction of a posterior crossbite in the primary dentition using a Haas type palatal expander.

The mandible showed normal growth and attained a favorable relationship with the maxilla.<sup>[25]</sup> The Kloehn cervical headgear was efficient in correcting the skeletal Class II relationship, and primarily, the correction

occurred as a result of the anterior mandibular growth. In the present clinical case, the Class II correction with Kloehn cervical headgear was found to be stable during the postretention period.

Most patients with Class II malocclusions have some sort of skeletal discrepancy. Growth modification and optimal treatment timing are the factors of considerable clinical interest. The objectives of growth modification and Class II treatment are achievable by combining dentoalveolar with skeletal changes in the patient described in this case report.

## CONCLUSION

The outcomes of the orthodontic treatment were a great improvement of function, well-balanced facial profile, acceptable occlusion, adequate overbite and overjet, and long-term stability at 7 years and 5 months follow-up.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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