

## Treatment of a pseudo Class III relationship in the mixed dentition: A case report

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الهدف من هذا المقال هو وصف لحالة مريض لديه اطباق من الصنف الثالث تمت معالجته باستخدام جهاز القوس الشفوي المعكوس. يعتبر هذا الجهاز سهل الصنع وفعالاً ويبد التحمل من قبل المريض. يوصى بالعلاج المبكر لحالات الصنف الثالث. لكن من المهم التفريق بين سوء الاطباق الصنف الثالث الحقيقي والصنف الثالث الزائف مع التأكيد على ذلك.

This article describes a case report in which a Class III patient was successfully treated with an inverted labial bow appliance. The appliance is easy to make, efficient and well tolerated by the patient. Early treatment of Class III conditions is recommended. The importance of differentiating between true Class III and pseudo Class III malocclusions is emphasized.

### INTRODUCTION and LITERATURE REVIEW

Clinicians are continually confronted with Class III malocclusion during permanent and mixed dentition phases.<sup>1-5</sup> The proper time to treat a Class III malocclusion has been a subject of controversy.<sup>5-7</sup> The question is whether or not interceptive therapy should be contemplated during the primary dentition stage or should it be deferred until the mixed dentition when the permanent first molars and several permanent teeth have erupted or after the growth period has ended. Optimal timing for treatment has been addressed by many authors directly or indirectly.<sup>2-7</sup>

When dealing with Class III malocclusion, confusion may arise as three types of malocclusions can have the same appearance<sup>1,8</sup> true skeletal Class III malocclusion, the simple anterior crossbite, and the pseudo Class III malocclusion. Each has a distinct etiology which serves to differentiate them. In a true Class III malocclusion as described by Angle,<sup>9</sup> the lower first molar is mesially positioned relative to the upper first molar. This relationship may result from a skeletal discrepancy which is

characterized by mandibular protrusion and a normal maxilla, or maxillary retrusion and a normal mandible, or a combination of maxillary retrusion and mandibular protrusion.<sup>8,10</sup> The dental components are usually characterized with proclined maxillary incisors and retroclined mandibular incisors to achieve dentoalveolar compensation.<sup>8,10</sup> In the second type of Class III malocclusion, a simple anterior crossbite is usually the result of linguoversion of one or more maxillary incisors without any forward mandibular movement,<sup>1</sup> or true skeletal component.

In pseudo Class III malocclusion, Moyers<sup>11</sup> suggested that it is a positional mal-relationship with an acquired neuromuscular reflex pattern of mandibular closure. Pseudo Class III malocclusion is usually characterized by Class I or mild Class III skeletal relationship, retroclined maxillary incisors with upright positioned lower incisors on the basal bone, incisors in an edge to edge relationship in centric relation (CR), and an anterior cross bite in centric occlusion (CO).<sup>1,8</sup> Graber *et al.*<sup>12</sup> attributed the incisor interference to the retroclined upper incisors and proclined lower incisors. During habitual closure to achieve maximum intercuspation, the lingually inclined maxillary incisors glide down the lingual surfaces of the mandibular incisors,<sup>1</sup> so as to disengage the incisors and bring the posterior

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teeth into full occlusion. This results in a forward displacement of mandible and an anterior crossbite.

Class I molar relationship can exist in both centric relation and centric occlusion, or there may be a shift from Class I to a Class III molar relationship on mandibular closure.<sup>11</sup> Lee<sup>13</sup> pointed out that the molar relationship could be a Class I at CR and Class III at CO. On the other hand, Lin<sup>14</sup> reported that pseudo Class III malocclusion showed molar Class I relationship at CO.

When comparing extra-oral photos of patients with pseudo Class III malocclusion, their profiles appeared quite normal at centric relationship and slightly concave at centric occlusion.<sup>13,15</sup> Lin<sup>14</sup> and Turley<sup>16</sup> reported that pseudo Class III malocclusion showed some degree of hereditary tendency. When treating these cases, elimination of the early incisal interference should be the main treatment objective. Orthodontic treatment should be undertaken as soon as possible to avoid adverse effect on the facial skeleton growth. The treatment can be accomplished by means of removable or fixed appliances. Turley<sup>6</sup> recommended managing these cases with orthopedic treatment with palatal expansion and a custom protraction headgear. Tsai<sup>7</sup> suggested the use of rapid palatal expansion and standard edgewise appliances to treat an anterior crossbite in a 7-year-old patient. Rabie and Gu<sup>8</sup> have described a simple method for the early treatment of pseudo Class III malocclusion in the mixed dentition with fixed appliances.

This case report is intended to illustrate a way to deal with pseudo Class III malocclusion by using a modified inverted labial bow appliance described by Wang in 1996.

## CASE HISTORY AND DIAGNOSIS

A male patient aged 9 years and 6 months, presented with a chief complaint of the lower anterior teeth overlapping the upper teeth.

The clinical examination revealed a convex profile with a symmetrical face. Class III molar and canine in centric occlusion with the incisors in anterior crossbite, deep bite and fair oral health (Fig. 1). In centric relation (CR), the incisors were in an end-to-end relationship resulting in no overbite and a posterior open bite. The upper right central incisor was unerupted due to the presence of two supernumerary teeth. Tooth size discrepancies demonstrated



**Fig. 1.** Pre-treatment facial and intra-oral photographs.

crowding of -8mm in the upper arch and -2mm in the lower arch.

The panoramic radiograph (Fig. 2) demonstrated normal bone and tooth development except for the upper right central incisor (due to the two supernumerary teeth present). Although a functional forward displacement was present from CR to CO, no sign of temporomandibular joint dysfunction was detected. The hand and wrist radiograph indicated that the patient was in a stage before the period of maximum growth spurt (SMI= 1) and the rate of growth was smallest.

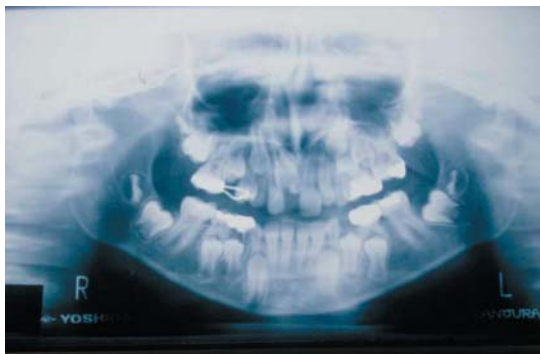


Fig. 2. Pre-treatment radiographs

The lateral cephalometric radiograph analysis (Fig. 2) is shown in Table 1 and illustrates a mild skeletal Class III relationship and retained maxilla with a normal position of the mandible

Table1. Cephalometric analysis

VARIABLES	Pre-treatment 9.5 years	Post-treatment 10 years	Two year post treatment 12 years	Norms
<b>Skeletal anteroposterior relationship and skeletal vertical relationship</b>				
ANB	-0.5°	1°	3°	3° ± 2
SNA	76°	77°	80°	80° ± 3.9
SNB	77°	76°	77°	76.8° ± 3.7
Saddle angle	122.5°	124°	124°	123° ± 5
Ant. cranial base length	71 mm	71 mm	77 mm	66 mm ± 2.8
Post.cranial base length	33 mm	34 mm	36 mm	31.6 mm ± 2.3
SN-MP	28°	30°	32°	35.6° ± 5
Gonial angle	125°	125°	125°	125° ± 5
Ramus height	42 mm	44 mm	50 mm	38.9 mm ± 3
<b>Dental and soft tissue relationship</b>				
UInc- MXpl	87.5°	114°	123°	109° ± 6
UInc- NA	-2 mm	+3 mm	+6 mm	3.5 mm ± 2
LInc- Mnpl	83°	90°	105°	91° ± 6.9
LInc- NB	+2 mm	+3 mm	+7 mm	3.6 mm ± 2
Inter-incisal angle	167°	135°	114°	130° ± 9.6
Upper lip-EL	-3 mm	-3 mm	-2 mm	-2.4 mm ± 1.7
Lower lip-EL	-4 mm	-3 mm	-2 mm	-2 mm ± 1.5
Nasiolabial angle	128°	129°	132°	110.9° ± 8.5

relative to anterior cranial base. There was a tendency of a horizontal growth pattern with skeletal deep bite, an increase in posterior cranial base, and maxillary and mandibular length. The dental relationship suggested severe retrusion of upper central incisors, with mild retraction of lower incisors. The soft tissue relation showed retruded upper and lower lips with an obtuse nasio-labial angle.

Diagnosis was a pseudo Class III with functional anterior crossbite and with an impacted upper right central incisor due to the presence of two unerupted supernumerary teeth.

### Treatment Objectives

1. To eliminate CR – CO discrepancy and anterior crossbite.

2. To correct Class III and establish Class I canine relationship.
3. To allow eruption of upper right central incisor.
4. To achieve normal overjet, and reduce deep bite.
6. To resolve crowding.

### Treatment Plan

The plan was divided into two stages; the first was directed towards correction of the functional crossbite to enhance facial growth and avoid accentuating the Class III discrepancy, in addition to facilitating the eruption of the right upper central incisor. After eruption of the permanent teeth, the second stage of treatment would be initiated with fixed orthodontic appliances for occlusal adjustment and resolving the crowding problem.

### Treatment Progress

The patient was referred to the maxillofacial surgeon to remove the supernumerary teeth. The orthodontic treatment was conducted by the use of a removable appliance with an inverted labial bow appliance.<sup>3</sup> (Fig. 3)



Fig. 3. Inverted labial bow appliance.

An upper impression was taken with an edge to edge construction bite. The removable appliance was made of an inverted labial bow and acrylic on the lower incisors, Adams clasps on molars for retention, Z-spring against upper incisors to move them labially, and a posterior bite plane to elevate the bite. The inverted labial bow and Z-spring were activated

and the appliance was placed inside the mouth. The patient was asked to wear the appliance full time except during eating. Oral hygiene instructions were given, and the appliance was checked and activated every four weeks.

After three months, the crossbite was completely corrected with a satisfactory posterior interdigitation. The patient was instructed to wear the appliance as a night time retainer for three months. Patient was kept under observation and checked every three months, until completion of permanent teeth eruption occurred, which took about two years. The sequence of planned treatment was to start fixed appliances after the eruption of the permanent teeth, but patient declined due to his satisfaction of the result of the first stage of treatment. He was referred to extract the wisdom teeth.

### RESULTS

The facial and intraoral photographs (Fig. 4) showed an improved facial profile. The crossbite was corrected with good posterior interdigitation. All CR - CO shifts were eliminated and centric occlusion and centric relation were coincident. A positive overjet was established and deep bite was reduced. Class I canine occlusion was achieved. The maxillary incisors were proclined producing a better upper lip prominence. The upper right central incisor had not yet erupted as at this phase of treatment.

The post-treatment cephalometric radiograph (Fig. 5) illustrated changes in skeletal relation toward Class I skeletal relationship, with slight protrusion of the maxilla and retrusion of the mandible by 1°. There was an increase in ramus height which was reflected on the maxillary-mandibular plane angle. The upper incisors were proclined and the mandibular incisors were upright over basal bone (Table 1).

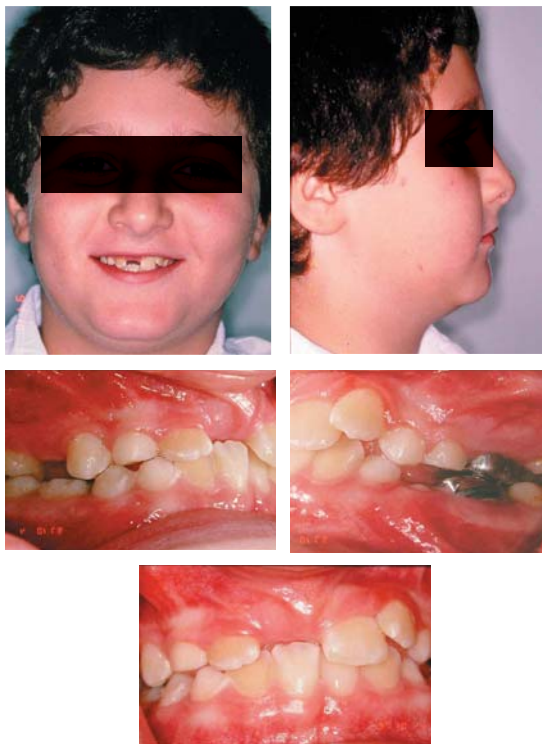


Fig. 4. Post-treatment facial and intra-oral photographs

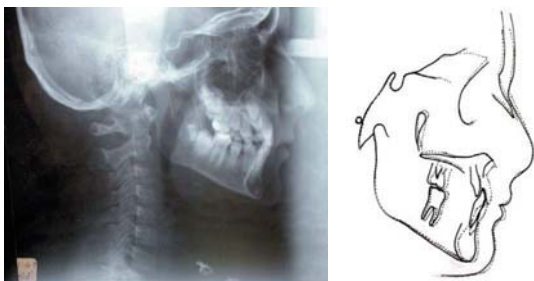


Fig. 5. Post-treatment radiograph and pre-treatment (solid lines) and post-treatment (dashed lines) cephalometric superimposition.

Two years post treatment photographs (Fig. 6), the radiographs (Fig. 7) revealed the eruption of permanent dentition including the right upper central incisor and a stable occlusion. There was mild anterior crowding in both upper and lower arches. The skeletal relationship was improved to normal range. An increase in the nasiolabial angle and a protrusion of upper and lower incisors were accomplished.

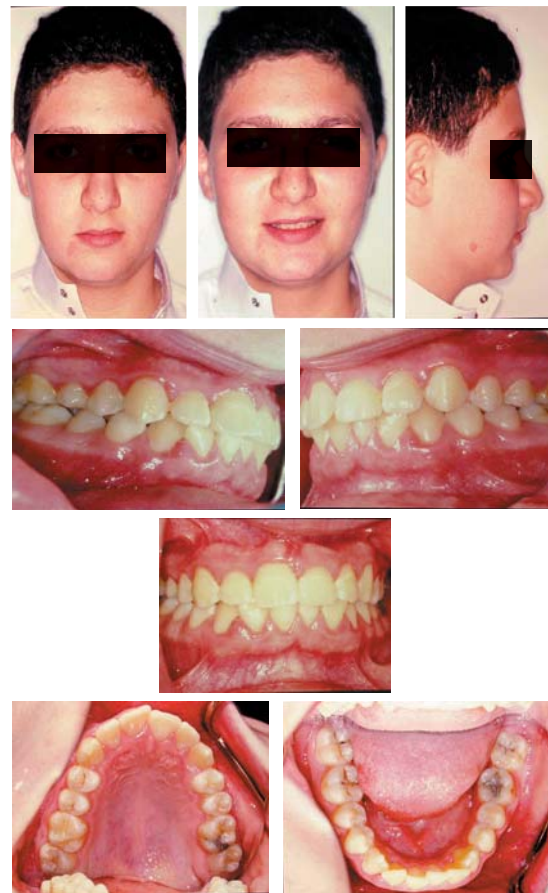


Fig. 6. Two years post-treatment facial and intra-oral photographs

## DISCUSSION

Many authors have recommended early treatment of Class III malocclusion which exhibited dental and skeletal components that tend to become worse with age. They believe that early intervention is an advantage in the early mixed dentition, as well as in the deciduous dentition. Advantages include correcting anterior crossbite to allow normal dental base development and subsequent favorable skeletal growth, preventing habits such as bruxism, eliminating traumatic occlusion, and reducing the length of treatment time with fixed appliance.<sup>17</sup> The optimum period for treatment suggested is between the ages of 6-9 years.<sup>5,12,18</sup>

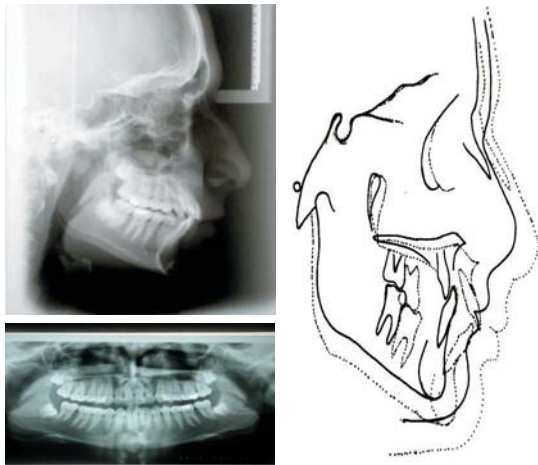


Fig. 7. Two years post-treatment radiographs and cephalometric superimposition.

Several clinicians however still avoid early correction of the pseudo Class III in the deciduous dentition because of poor stability and unfavorable experiences with behavior of young patients.<sup>16</sup> Some practitioners prefer to wait for permanent maxillary incisors to erupt before starting treatment due to the natural tendency of the teeth to erupt in a lingual position during dental arch development.<sup>19</sup>

The various therapies suggested for the correction of an anterior crossbite and which may correct skeletal problems in young patients include face mask therapy,<sup>20</sup> chincaps<sup>5</sup> and functional appliances.<sup>21</sup> Other alternative treatments include fixed<sup>13</sup> and / or removable appliances<sup>4</sup>, which are effective methods of treating a Class III incisor malrelation.

Before any treatment, it must be first established that the malocclusion is treatable. As a general rule, if the patient cannot make contact of the upper and lower incisors on closure, there is no possibility of successful appliance treatment and surgical correction may be considered.

The inverted labial bow appliance was used in this case and it proved to be a highly effective interceptive treatment for Class III cases, which are not severe

enough to require orthognathic surgery (ANB angle is more than  $-2^\circ$ ). When the mandible closes, the appliance exerts a lingually directed force against the lower anteriors, with the Z-spring against the upper anteriors, thus producing a reciprocal movement. Clinical experience shows the appliance is comfortable and easily adapted and accepted by the young patient. The disadvantage is that the success of treatment will depend on patient cooperation.

In the described case, reduced SNA and normal SNB angles were present. This finding is similar to that of Guyer *et al.*<sup>10</sup> who reported that the maxilla was retruded in 25% of the cases. This patient presented with an increased maxillary and mandibular length, which indicated a tendency to a skeletal Class III that could be worsened if not treated early. Upper incisors were protruded and lower incisors were upright, which with other clinical features, distinguish pseudo Class III type of malocclusion.

The post-treatment records indicated that the forces were transferred to the mandible and maxilla producing forward movement of the maxilla (SNA =  $77^\circ$ ), and backward movement of mandible (SNA =  $76^\circ$ ) (upper incisor - maxillary plane =  $114^\circ$ ). Two years post-treatment revealed improvement in skeletal relationships due to growth improvement of the maxilla, that occurred after correction of the Class III malocclusion (ANB =  $3^\circ$ , SNA =  $80^\circ$ , and SNB =  $77^\circ$ ).

For retention, the appliance is preferable to be used, although the developmental changes that occur in the incisor region (normal overbite) maintain the stability of the results.

## CONCLUSION

1. It is important to distinguish a pseudo Class III from a true Class III malocclusion.

2. In this reported case, a functional Class III patient was successfully treated with inverted labial bow appliance.
3. At the end of the treatment, the correction of anterior crossbite and elimination of the mandibular displacement were obtained.
4. Anterior crossbite should be corrected once recognized to allow for normal dental base development and subsequent favorable skeletal growth.

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