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Early Management of Pseudo-Class III Malocclusion in a Growing Child with a Reverse Twin Block Appliance: A Case Report

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ABSTRACT

Background: Pseudo Class III malocclusion is characterized by an anterior crossbite with functional forward mandibular displacement. This malocclusion can prevent maxillary sagittal development, and if not intervened upon promptly, can develop into a skeletal class III malocclusion. Therefore, it is essential to avoid this malocclusion as early as possible. **Case Report**: A 9-year-old male child presented with the chief complaint of prominent lower teeth. Intra-oral examination showed crossbite anterior, presence of crowding, and malposition 21,22. Right molar relation class 1 and left class III, maxillary space discrepancy 6.4 mm, skeletal Class I, patient in growth and development period. Treatment was performed using a functional appliance, a reverse twin block, with additional bilateral expansion on the maxilla and a Z-spring on teeth 21 and 22. **Conclusion:** Management of pseudo-class III in growing children with reverse twin block has shown success in correcting the crossbite anterior, tooth malposition, and increasing the maxillary arch width.

Keywords: Pseudo Class III, Reverse Twinblock, crossbite

1. Introduction

Pseudo Class III malocclusion is characterized by a poor relationship between the maxilla and mandible, the mandible appears more functionally advanced than the maxilla.[1,2] The characteristic of this malocclusion is the presence of an anterior crossbite, where the lower incisors bite in front of the upper incisors in a central position. In this condition, the maxillary incisors often show retroclinization, while the mandibular incisors tend to proclinize.[3] Pseudo Class III malocclusion is quite common during child development. The prevalence among children, especially at the age of 6-12 years, is estimated to reach 5.8%.[4]

The etiology of pseudo Class III malocclusion involves several factors: dental, functional, and skeletal. Dental factors can be caused by Ectopic eruption of maxillary central incisors or canines, and Premature loss of deciduous molars. Abnormal position of the tongue, neuromuscular problems, Airway or nasal-respiratory problems can cause functional factors. A Slight transverse maxillary discrepancy can cause a skeletal factor.[5]

Pseudo Class III malocclusion among children and adolescents, where delays in diagnosis and intervention can lead to the accumulation of more serious orthodontic problems, including periodontal damage and changes in tooth growth patterns over time.[6] Therefore, it is essential to diagnose and intervene as early as possible to prevent more severe problems later in life, such as the transition to a proper Class III malocclusion.[7,8] These interventions may include the use of orthodontic appliances such as functional appliances, which can help guide jaw growth and restore the ideal occlusal relationship.[9]

The Reverse Twin Block (RTB) is one of the functional appliances that can be used in pseudo-class III cases. The use of RBT can effectively improve the occlusion relationship by repositioning the anterior teeth[10]. RTB is designed to push the mandible into a posterior position by pressing the lower jaw into a more appropriate position, thus facilitating the improvement of the tooth relationship and supporting better maxillary growth. The use of this appliance is very effective in young patients who are still in the growth phase, where bone growth stimulation can be maximized, and improves functional and aesthetic problems.[11,12]

2. Case Report and Case Management

2.1. Case Report

A 9-year-old male patient presented with a chief complaint of protruding lower anterior teeth. His father exhibited similar dental characteristics, suggesting a possible hereditary component. The patient had no history of deleterious oral habits and no significant medical background, eliminating functional or systemic factors as potential etiologies. Clinical examination revealed a straight facial profile with balanced proportions and symmetrical features, indicating no significant skeletal asymmetry (Figure 1). This initial assessment highlighted the importance of evaluating both genetic and environmental factors in diagnosing malocclusions in growing patients. The absence of harmful oral habits suggested that the condition was more likely related to skeletal or dental discrepancies rather than functional habits, which guided further diagnostic steps and treatment planning.

Figure 1. Extraoral view of the patient before orthodontic treatment, showing a straight profile and symmetrical facial proportions.

Intraoral examination revealed an anterior crossbite involving teeth 53, 12, 21, 22, and 63, indicating a marked disruption in the anterior occlusal relationship. The maxillary arch exhibited an ovoid but asymmetrical form with evident crowding, which contributed to the compromised dental alignment. Tooth 21 was noted in labioversion, while both teeth 21 and 22 were displaced palatally, creating further disharmony in the anterior segment and exacerbating the malocclusion.

The posterior occlusal analysis demonstrated a Class I molar relationship on the right side contrasted by a Class III molar relationship on the left side, revealing an asymmetrical occlusal pattern. This discrepancy between the right and left posterior segments suggests an imbalance in occlusal development, which may impact both functional and esthetic outcomes if left untreated. The presence of such asymmetry highlights the need for careful diagnostic evaluation to differentiate between dental and skeletal contributions to the malocclusion.

Additionally, dental caries were identified on teeth 54, 64, 74, and 75, underscoring the necessity for preventive and restorative interventions either before or in conjunction with the planned orthodontic treatment (Figure 2). The coexistence of malocclusion and active carious lesions emphasizes the importance of an interdisciplinary approach, combining restorative dentistry and orthodontics to achieve comprehensive oral rehabilitation and to restore both function and esthetics effectively.

Figure 2. Intraoral photographs of the patient before orthodontic treatment: (a) frontal view showing anterior crossbite; (b) maxillary occlusal view demonstrating asymmetrical arch form and crowding; (c) left lateral view with Class III molar relationship; (d) mandibular occlusal view; and (e) right lateral view showing Class I molar relationship.

The overjet was measured at 1 mm, while the overbite was recorded at 2 mm, both indicating a relatively shallow anterior occlusal relationship. Model analysis utilizing Moyers' method revealed a significant maxillary space discrepancy of 6.4 mm, suggesting insufficient arch length to accommodate the developing dentition and highlighting the need for space management as part of the treatment plan. This crowding in the maxillary arch was consistent with the clinical findings of malalignment and anterior crossbite, further reinforcing the diagnosis of pseudo-Class III malocclusion with underlying dental arch discrepancy.

Radiographic evaluation using an orthopantomogram (OPG) confirmed that the patient was in the mixed dentition stage, displaying both erupted permanent teeth and developing tooth buds. All permanent tooth germs were present and exhibited normal developmental patterns without evidence of agenesis or pathological findings, supporting a favorable prognosis for comprehensive orthodontic correction (Figure 3). These findings underscore the importance of early intervention in managing space discrepancies and malocclusion in growing patients. The combination of clinical, model, and radiographic assessments provided a comprehensive overview of the patient's dental development, enabling precise treatment planning aimed at harmonizing arch relationships and preventing future complications associated with crowding and crossbite.

Figure 3. Panoramic radiograph of the patient before orthodontic treatment, showing mixed dentition status with complete permanent tooth buds and no pathological findings.

Cephalometric evaluation revealed a skeletal Class I relationship, as indicated by an ANB angle of 1°, reflecting a relatively balanced anteroposterior jaw relationship. However, both the maxilla and mandible were slightly retruded relative to the cranial base, with SNA measured at 78° and SNB at 77°, suggesting mild posterior positioning of the skeletal bases. Despite the overall skeletal Class I classification, Wits' appraisal demonstrated a –2 mm value, indicating a skeletal Class III tendency, likely contributing to the observed anterior crossbite and supporting the diagnosis of pseudo-Class III malocclusion.

Vertical growth assessment showed a mandibular plane angle (FMA) of 25°, consistent with a vertically balanced growth pattern and favorable facial proportions. Evaluation of growth potential using Cervical Vertebrae Maturation (CVM) analysis indicated stage 3, confirming that the patient was in an active period of growth and development. This stage is particularly advantageous for interceptive orthodontic treatment, as skeletal and dental corrections can be effectively guided during this phase of maturation (Figure 4). These findings underscore the importance of combining cephalometric and growth assessments to differentiate between skeletal and dental components in malocclusion diagnosis. The presence of favorable growth potential provides an optimal opportunity for early orthopedic and orthodontic intervention to correct the malocclusion and promote proper jaw alignment during the developmental phase.

Figure 4. Lateral cephalometric radiograph of the patient before orthodontic treatment, demonstrating a skeletal Class I relationship with mild maxillary and mandibular retrusion and confirming active growth status through CVM stage 3 assessment.

The diagnostic findings confirmed a case of pseudo-Class III malocclusion, characterized by an anterior crossbite and a disharmony in the maxillomandibular relationship. The condition was accompanied by the malposition of teeth 11, 21, and 22, which contributed to the compromised anterior occlusion and arch symmetry. The maxillary arch exhibited a discrepancy in both shape and space, further complicating the occlusal relationship and emphasizing the need for early interceptive intervention.

This combination of anterior dental malposition and maxillary arch deficiency highlighted the functional nature of the malocclusion rather than a purely skeletal Class III pattern. The presence of a pseudo-Class III etiology suggested that timely functional correction could redirect maxillary growth, restore the occlusal relationship, and prevent the progression to an accurate skeletal Class III malocclusion. Consequently, the diagnosis underscored the importance of a comprehensive treatment plan that addressed both dental alignment and transverse maxillary development to achieve a balanced occlusal and skeletal outcome.

2.2. Case Management

The treatment objectives for this case were primarily aimed at correcting the anterior crossbite and facilitating proper maxillary development during the patient's active growth phase. Early intervention was critical to prevent the progression of the pseudo-Class III malocclusion into an actual skeletal discrepancy as the patient matured. The selected treatment approach sought to harmonize the dental and skeletal components by promoting forward maxillary growth, eliminating functional mandibular shifts, and establishing a stable occlusal relationship. This strategy also emphasized maintaining the patient's natural growth potential while achieving a balanced dental arch form and improved esthetics.

To achieve these objectives, a functional appliance—specifically a reverse twin block (RTB)—was chosen due to its ability to correct anterior crossbites effectively in growing patients. The RTB was combined with bilateral maxillary expansion to address the transverse discrepancy and create sufficient space for proper tooth alignment. A Z-spring was incorporated to actively reposition teeth 21 and 22, which were palatally displaced, ensuring proper anterior alignment as the occlusion was corrected (Figure 5). The appliance was prescribed for 12–14 hours of daily wear over an 8-month treatment period, leveraging the patient's growth to produce both dental and skeletal changes.

Close monitoring was an essential component of the treatment protocol. Follow-up visits were scheduled every three weeks to evaluate progress and implement necessary adjustments. These included activation of the expansion screws to maintain transverse arch development, adjustment of the labial bow and Z-spring to guide anterior tooth movement, and progressive posterior bite reduction to facilitate the correction of the anterior crossbite. This systematic approach ensured continuous adaptation of the appliance to the patient's evolving dentofacial condition, maximizing treatment efficiency and outcomes.

The combination of functional correction, transverse expansion, and targeted anterior tooth movement yielded significant improvements in occlusion and esthetics. The anterior crossbite was fully resolved, the maxillary arch was successfully expanded and aligned, and a functional Class I occlusion was achieved. These results demonstrated the effectiveness of the RTB appliance, particularly when combined with adjunctive components such as the Z-spring and maxillary expansion, in managing pseudo-Class III malocclusions in growing patients. This treatment underscores the importance of early interceptive orthodontics in guiding craniofacial development and preventing more invasive interventions later in life.

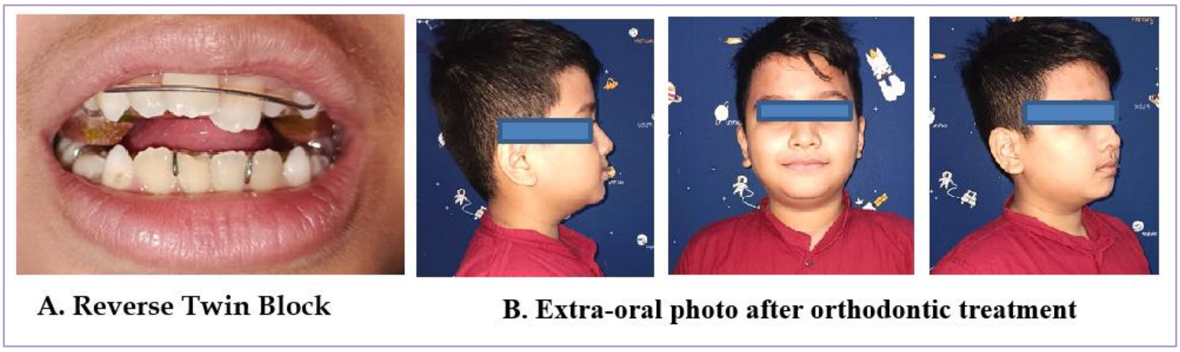

Figure 5. (A) Intraoral view of the reverse twin block appliance used in treatment. (B) Extraoral photographs of the patient after orthodontic treatment, showing improved facial profile and occlusal correction.

Figure 6 shown the Post-treatment intraoral assessment demonstrated remarkable improvements in occlusal relationships and overall dental alignment. The anterior crossbite, which was present before treatment, was completely corrected, resulting in a well-balanced anterior occlusion with ideal overjet and overbite. The maxillary occlusal view revealed a broader, well-expanded arch with improved symmetry and adequate spacing to accommodate the eruption of permanent teeth. The left and right lateral views showed the establishment of functional Class I molar and canine relationships on both sides, ensuring stable posterior occlusion. The mandibular occlusal view reflected coordinated arch alignment and enhanced arch form, contributing to a harmonious dental relationship between the upper and lower arches. These outcomes highlight the success of the treatment protocol using the reverse twin block appliance combined with maxillary expansion and Z-spring activation. The approach effectively addressed both the skeletal and dental components of the pseudo-Class III malocclusion, achieving functional stability and esthetic enhancement in a growing patient.

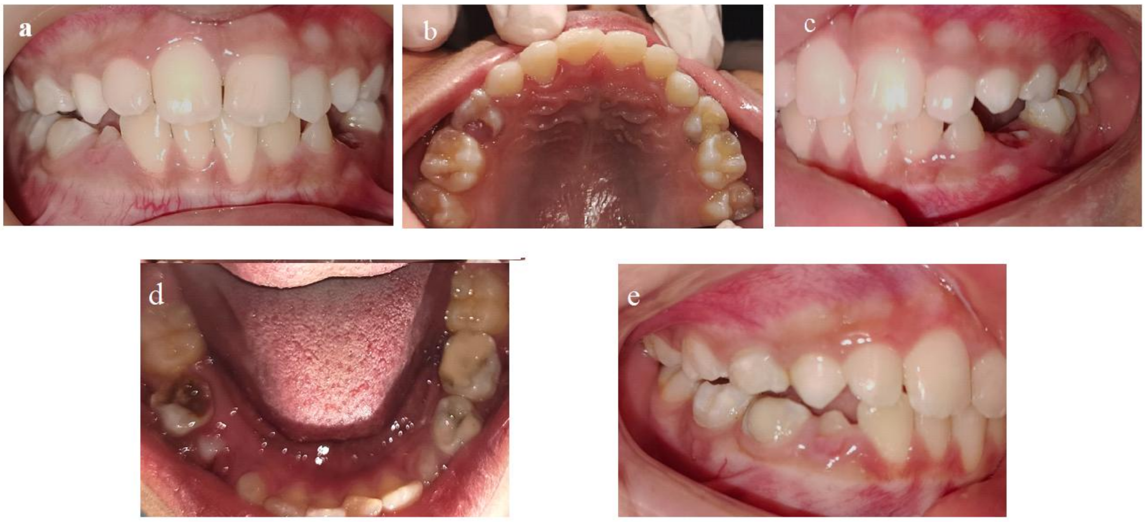

Figure 6. Intraoral pgraphs of the patient after orthodontic treatment: (a) fronafronto-view demonstrating correction of the anterior crossbite and establishment of proper overjet and overbite (b) maxillary occlusal view showing improved arch symmetry and alignment (c) left lateral view with normalized posterior occlusion (d) mandibular occlusal view indicating stable alignment of the lower arch and (e) right lateral view displaying balanced molar and canine relationships.

The post-treatment lateral cephalometric radiograph highlights the substantial skeletal improvements achieved through the use of the reverse twin block appliance combined with maxillary expansion. The maxilla exhibited notable anterior repositioning, which contributed to the correction of the anteroposterior relationship between the maxilla and mandible. Favorable modifications in the ANB angle and Wits appraisal confirmed the shift from a pseudo-Class III malocclusion to a more harmonious skeletal Class I relationship. This change emphasizes the impact of early functional orthopedic intervention during active growth periods.

Dental changes were also evident, with the maxillary incisors showing proper alignment and inclination following the correction of the anterior crossbite. The establishment of an ideal overjet and overbite restored functional occlusion, enhancing masticatory efficiency and providing a more stable anterior guidance. The coordinated dental arches, as observed on the cephalometric tracing, reflected the successful resolution of crowding and arch form discrepancies identified during the initial diagnosis.

Functionally, the improved jaw relationship and corrected occlusion allowed for a more balanced distribution of occlusal forces, reducing the risk of future temporomandibular joint strain and occlusal trauma. The forward development of the maxilla also facilitated better lip support and balanced perioral musculature, which are critical for long-term stability and orofacial function. These changes underscore the significance of combining skeletal and dental corrections to achieve comprehensive orthodontic outcomes.

From an aesthetic perspective, the post-treatment radiograph corresponds with the observed improvements in the patient's profile. The enhanced maxillary projection and corrected incisor position contributed to improved facial harmony and soft tissue balance. These results demonstrate the effectiveness of early interceptive orthodontics in not only resolving functional and occlusal issues but also enhancing overall facial esthetics during a critical stage of craniofacial development.

Figure 7. Lateral cephalometric radiograph after orthodontic treatment showing successful correction of the anterior crossbite, improved maxillary projection, and harmonized skeletal and dental relationships.

Table 1 presents the cephalometric parameters assessed before and after treatment, illustrating changes in skeletal, dental, and soft tissue relationships. In the skeletal analysis, the pre-treatment values indicated a skeletal Class I relationship with mild retrusion of both the maxilla and mandible (SNA: 78°, SNB: 77°, ANB: 1°) and a Wits appraisal of –2 mm, consistent with a pseudo-Class III tendency. Following treatment, the ANB increased to 2°, and the Wits appraisal improved to –1 mm, reflecting a more balanced anteroposterior skeletal relationship. The FMA value increased from 25° to 30°, suggesting vertical maxillary growth in a downward and backward direction during the treatment period.

In terms of dental analysis, the maxillary incisors were initially proclined, with a U1-NA angle of 31° and a linear measurement of 5 mm. After treatment, the inclination of the maxillary incisors normalized to 23°, with a U1-NA measurement of 4 mm, indicating successful correction of anterior tooth position. The lower incisors (L1-NB) showed minimal change, maintaining alignment throughout the treatment period, with a slight increase in inclination from 20° to 23°.

Regarding the soft tissue profile, only minor changes were observed. The upper lip remained aligned with the esthetic line (0 mm). In comparison, the lower lip moved slightly inward from 2 mm to 1 mm relative to the E-line, resulting in a more balanced and harmonious soft tissue profile after treatment. Collectively, the cephalometric findings in Table 1 underscore the effectiveness of the reverse twin block appliance combined with maxillary expansion and Z-spring activation in correcting the anterior crossbite, optimizing maxillary incisor inclination, and achieving improved skeletal harmony and soft tissue balance.

Table 1. Cephalometric analysis pre and post-treatment

Parameters	Mean	Pre-treatment	Post-treatment	Difference
Skeletal analysis				
SNA°	82 ± 2 °	78 °	78 °	0 °
SNB°	80 ± 2 °	77 °	76 °	1 °
ANB°	2 ± 2 °	1 °	2 °	1 °
FMA°	25 ± 3 °	25 °	30 °	5 °
Wits appraisal	1 ± 2 mm	-2 mm	-1 mm	-1 mm
Dental analysis				
U1-NA mm	4 ± 2 mm	5 mm	4mm	1mm
U1-NA°	22 ± 6 °	31 °	23 °	8 °
L1-NB mm	4 ± 2 mm	4 mm	4mm	0 mm
L1-NB°	25 ± 7 °	20 °	23 °	3 °
Soft Tissue				
E line to upper lip	0 ± 1mm	0 mm	0 mm	0 mm
E line to lower lip	1 ± 1mm	2 mm	1 mm	1 mm

3. Discussion

The patient was diagnosed with pseudo-Class III malocclusion, characterized by an anterior crossbite, malposition of teeth 11, 12, and 22, and a maxillary arch discrepancy. Treatment was carried out using a reverse twin block (RTB) appliance combined with bilateral maxillary expansion and a Z-spring targeting teeth 21 and 22 to facilitate anterior alignment. The therapeutic outcomes demonstrated successful correction of the anterior crossbite, realignment of the malpositioned teeth, and significant expansion of the maxillary arch, leading to a more harmonious dental and skeletal relationship. The selection of RTB was based on the patient's age and active growth phase, optimizing orthopedic effects to correct the maxillomandibular relationship during a critical developmental period.

The RTB appliance is specifically designed to stimulate anterior maxillary growth, restrict excessive mandibular advancement, and promote a more physiological occlusal relationship between the upper and lower jaws. This is achieved through its reverse occlusal inclination planes, cut at a 70° angle, which apply occlusal forces to drive the maxillary teeth forward while simultaneously inhibiting mandibular displacement.[13] This biomechanical principle makes RTB particularly effective in managing pseudo-Class III malocclusion in growing patients, allowing for both skeletal and dental corrections without resorting to invasive procedures.

Previous studies have reported high success rates of RTB therapy when implemented at the appropriate stage of craniofacial development. Nishant et al. demonstrated that RTB provides stable and predictable results for pseudo-Class III correction when used during the growth phase, emphasizing the importance of treatment timing.[13] Furthermore, RTB offers several clinical advantages: it is simple, durable, versatile, and well-tolerated by patients. The appliance is removable, allowing for easier oral hygiene maintenance, reduced plaque accumulation, and better gingival health during treatment. These factors contribute to both patient compliance and long-term treatment success.

In addition to RTB, other functional appliances such as the bionator, modified Hawley appliances, and fixed orthodontic devices have been reported in the literature to correct pseudo-Class III malocclusions successfully.[3,10,14] However, in this case, the combination of functional orthopedic correction, maxillary expansion, and targeted tooth movement using RTB demonstrated highly satisfactory results. The anterior crossbite was effectively corrected, and the maxillary arch length was increased, reflecting the success of early interceptive treatment. Nonetheless, it must be emphasized that the effectiveness of pseudo-Class III management depends on accurate diagnosis, careful timing of intervention, appropriate appliance design, and the patient's adherence to wearing the appliance as prescribed.[15]

4. Conclusion

The management of pseudo-Class III malocclusion in a growing child using the reverse twin block (RTB) appliance represents an effective and minimally invasive approach to early orthodontic treatment. This case demonstrated the success of RTB in correcting the anterior crossbite, promoting maxillary development, and re-establishing a more balanced maxillomandibular relationship. The appliance not only achieved favorable dental corrections but also guided skeletal growth, thereby reducing the risk of progression to a true skeletal Class III malocclusion in the future.

These results emphasize the importance of early diagnosis and timely interceptive intervention during the active growth phase, where functional orthopedic techniques can yield significant skeletal and dental improvements. The combination of RTB with bilateral maxillary expansion and targeted anterior alignment provided comprehensive treatment outcomes, delivering both functional and esthetic benefits. This case reinforces the value of RTB as a predictable and conservative treatment option for pseudo-Class III malocclusions in growing patients, helping to minimize the need for complex orthodontic or surgical corrections later in life.

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Authors Contribution

Contribution	Rifki A	Yulina V	Ulfah K	Rambe S	Fitri M
Concepts or ideas	√				
Design	√				
Definition of intellectual content	√	√	√	√	√
Literature search	√				
Experimental studies	√	√	√	√	√
Data acquisition	√				
Data analysis	√	√	√	√	√
Statistical analysis					
Manuscript preparation	√	√	√	√	√
Manuscript editing	√				
Manuscript review	√	√	√	√	√

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