

Correction of Anterior Cross Bite in Mixed Dentition period using Quadhelix and Catalans appliance - A Case Report

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ABSTRACT

The case report addresses the challenge of correcting anterior cross bite in mixed dentition period. It emphasizes the complexity of treating skeletal Class III malocclusion, especially in young patients, and highlights the importance of choosing appropriate orthodontic appliances for effective treatment. The subject of the case report is a 9-year-old girl, MK, who presented with a prognathic profile, upper and lower incisor proclination, and bimaxillary protrusion. The treatment plan was multifaceted, incorporating oral prophylaxis, fluoride application, indirect pulp capping, and strategic extractions. Key appliances used were the Quadhelix and Catalans appliances, supplemented by a lower inclined plane, removable Jack Screw appliance with a posterior bite plane, and a Nance Palatal Arch space maintainer. The report meticulously documents the treatment progression with detailed photographs and radiographs, capturing changes at 10 days, 24 days, and 3.5 months intervals. The case report concludes that the use of Quadhelix and Catalans appliances, in conjunction with a comprehensive treatment plan, effectively corrected the anterior crossbite in this patient. The treatment led to significant dental and skeletal improvements, as evidenced by the post-treatment cephalometric analysis. This case underscores the effectiveness of these appliances in pediatric orthodontic cases with similar presentations.

Keywords

Anterior Crossbite, Catalans Appliance, Cephalometric Analysis, Class-III Malocclusion Mixed Dentition, Quadhelix Appliance.

Introduction

The correction of anterior crossbite in mixed dentition presents unique challenges in pediatric orthodontics. Anterior crossbite, often associated with skeletal Class III malocclusion, can have significant implications for facial esthetics, dental function, and overall oral health if not addressed in a timely manner (1). Mixed dentition, the transitional phase where primary and permanent teeth coexist, offers a critical window for orthodontic interventions to rectify malocclusions effectively (2).

The use of appliances like Quadhelix and Catalans has gained prominence in such treatments due to their effectiveness in correcting dental and skeletal discrepancies in young patients (3). The Quadhelix appliance, a fixed orthodontic device, is particularly beneficial for expanding the maxillary arch and correcting posterior crossbites (4). On the other hand, the Catalans appliance, with its design and functional attributes, aids in

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anterior crossbite correction by facilitating mandibular positioning and dental alignment (5). The successful management of anterior crossbite in the mixed dentition phase can significantly improve the occlusal relationship and facial profile, reducing the need for more complex orthodontic procedures in the future (6). This case report aims to demonstrate the efficacy of these appliances in the management of a pediatric patient presenting with anterior crossbite and Class III malocclusion.

Case Presentation

The patient, MK, a 9-year-old female, was brought to the dental clinic with a chief complaint of anterior crossbite. On examination, MK exhibited a Class III malocclusion characterized by an anterior crossbite, (Figure 1) a prognathic profile, and bimaxillary protrusion. The dental history revealed no significant medical or dental anomalies, and the family history was non-contributory.

Clinical Examination and Diagnosis:

The clinical examination included a thorough intraoral and extraoral evaluation. Intraorally, the patient had a mixed dentition with the presence of upper and lower permanent incisors and first molars. The anterior crossbite involved the upper incisors, which were positioned lingually relative to the lower incisors. A cephalometric analysis (Figure 2) including Down's and Steiner's analysis, was conducted, The Down's and Steiners analysis results are elaborated in Table 1 and these confirm the skeletal Class III malocclusion with upper and lower incisor proclination.

Treatment Planning:

The treatment objective was to correct the anterior crossbite, achieve a functional occlusion, and improve the patient's facialesthetics. The treatment plan was devised as follows:

Oral Hygiene Phase: The treatment began with oral prophylaxis and instructions on maintaining oral hygiene. This was followed by fluoride gel application and indirect pulp capping.

Extraction and Inclined Plane: Strategic extractions were performed to manage the bimaxillary protrusion. A lower inclined plane (Catalans appliance) was installed to correct the incisor relationship and facilitate forward movement of the upper incisors. (Figure 3)

Quadhelix Appliance: A Quadhelix appliance was fixed in the upper arch to expand the maxillary arch

and correct the posterior crossbite. The appliance was activated periodically to achieve the desired expansion. (Figure 4)

Catalans Appliance: A Catalans appliance was used to reposition the mandible and align the dentition. This appliance, known for its effectiveness in anterior crossbite correction, played a crucial role in the treatment.

Nance Palatal Arch and Jack Screw Appliance: The Nance Palatal Arch space maintainer was used to maintain the arch space post-extractions. A removable Jack Screw appliance with a posterior bite plane was also employed to facilitate vertical and anteroposterior corrections.

Treatment Progression and Monitoring:

The treatment progression was closely monitored with regular appointments. Photographs and radiographs were taken at various intervals (10 days, 24 days, 3.5 months) to document the changes. The patient responded well to the treatment, showing significant improvement in the occlusal relationship and facial profile. The anterior crossbite was effectively corrected, and the incisors were aligned properly.

Post-Treatment Evaluation:

Post-treatment evaluation revealed a harmonious occlusion with proper alignment of the incisors. (Figure 5) The post-treatment showed favorable skeletal and dental changes, aligning with the treatment objectives.

The patient's facial profile was significantly improved, with a reduction in the prognathic appearance.



Figure 1- Intra Oral Photograph (Pretreatment)



Figure 3 – Catalans appliance

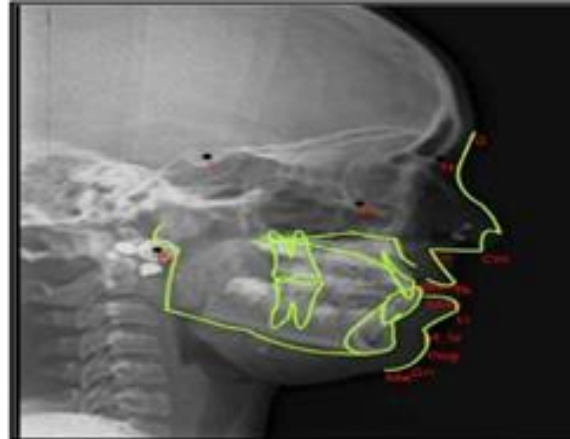


Figure 2 – Lateral Cephalogram (Pre Treatment)



Figure 4 – Quad Helix Appliance



Figure 5 - Intra Oral Photograph (Post treatment)

DISCUSSION:

The management of anterior crossbite in the mixed dentition phase is a pivotal aspect of pediatric orthodontics, especially when associated with Class III malocclusion. The case of MK highlights the successful application of Quadhelix and Catalans appliances, consistent with previous studies emphasizing their effectiveness in such scenarios (1,2).

The Quadhelix appliance, primarily used for maxillary arch expansion, has been widely recognized for its role in correcting posterior crossbites and de-rotating molars (3). In this case, its use facilitated the necessary expansion of the upper arch, addressing the constriction that often accompanies Class III malocclusion. This finding aligns with Cleall et al.'s research, which demonstrated the Quadhelix's efficacy in expanding the mid palatal suture (4).

On the other hand, the Catalans appliance played a critical role in repositioning the mandible, an essential step in managing anterior crossbite (5). Its effectiveness in this case corroborates with the findings of Cozza et al., who reported significant improvements in mandibular position and dental alignment with similar appliances (6).

The combination of these two appliances, along with the strategic use of an inclined plane and a Nance Palatal Arch, underscores a comprehensive approach to treating complex malocclusions in pediatric patients. This approach is supported by O'Brien et al., who highlighted the importance of multi-faceted orthodontic

interventions in achieving desired outcomes (7).

Table 1 - DOWNS ANALYSIS and STEINERS ANALYSIS (PRE TREATMENT)

DOWNS ANALYSIS (PRETREATMENT)				
Sr. No	Angle	Dimensions	Normal	Interpretation
1	Facial Angle	81.03°	82 to 95°	Normal
2	Angle Of convexity	-15.71°	-8.5 to 10°	Prognathic profile
3	A-B Plane angle	7.25°	-9 to 0°	Skeletal Class-3
4	Mandibular Plane angle	28°	17 to 28°	Normal
5	Y-axis	62.97°	53 to 66°	Normal
6	Cant Of Occlusal Plane	8.17°	1.5 to 14°	Normal
7	Interincisal Angle	112°	130 to 150.5°	Bimaxillary protrusion
8	Incisor Occlusal Plane Angle	66.02°	3.5 to 20°	Lower Incisor Proclination
9	Mandibular Plane angle	94.16°	-8.5 to 7°	Lower Incisor Proclination
10	Upper Incisor to A-Pog line	7.54 mm	-1 to 5 mm	Upper Incisor Proclination

STEINERS ANALYSIS (PRETREATMENT)				
Sr. No	Angle	Dimensions	Normal	Interpretation
1	SNA Angle	75°	82°	Skeletal Class III
2	SNB Angle	82°	80°	Prognathic mandible
3	ANB angle	-6.94°	2°	Skeletal Class-3
4	Mandibular Plane angle	22.96°	32°	Horizontal Grower
5	Occlusal Plane Angle	6.22°	14.5°	Horizontal Grower
6	Upper Incisor to NA Angle	38.15°	22°	Upper incisor Proclination
7	Upper Incisor to NA (liner)	12 mm	4 mm	Upper incisor Proclination
8	Lower Incisor to NB Angle	22.13°	25°	Lower Incisor Retroclination
9	Lower Incisor to NB (liner)	3.95 mm	4 mm	Normal
10	Interincisal Angle	112°	130 to 131°	Normal

CONCLUSION

In conclusion, this case reinforces the notion that early orthodontic intervention, particularly in mixed dentition, can significantly improve occlusal relationships and facial esthetics. The success achieved in this case provides valuable insights and adds to the growing body of evidence supporting the use of specific orthodontic

appliances for complex malocclusions in children.

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