Nanotechnology Perceptions
ISSN 1660-6795
www.nano-ntp.com

Comparative Evaluation of Three Treatment Modalities for Correction of Anterior Crossbite in Pediatric Patients: A Randomized Control Trial

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Aim: To evaluate and compare three treatment protocols to correct anterior dental crossbite in the mixed dentition. Materials and Methods: Thirty children, 8–10 years of age, participated in the randomized clinical trial conducted in a private college in Chennai. Individuals were divided into three groups. Group 1 consisted of 20 children treated with 2*4 Appliance; Group 2, 20 children treated using Catlans Appliance; Group 3, 20 children treated using posterior bite plane with Z-spring. The 60 participants were evaluated before treatment (T1) and after treatment was done (T2). The variables evaluated included overjet, overbite, perimeter of the maxillary arch. Cephalometric analysis and parental acceptance was also evaluated. Data analysis was done using SPSS software version 23.0. Descriptive statistics were expressed as mean, standard deviation, frequency and percentage. Inferential statistics used were one way ANOVA, paired t test and Chi square test. Results: There was a significant difference between the pre and post parameters between the groups when evaluated for overjet (p=0.001*), overbite (p=0.001*) and perimeter of the maxillary arch (p=0.001*). In cephalometric analysis there was a significant difference between the groups. The acceptance rate (p=0.001*) was highest with 2*4 appliance followed by Catlans appliance and the least was with posterior bite plane with Z-spring. The time duration (p=0.001*) was least with Catalans appliance followed by 2*4 appliance and the highest time duration was with posterior bite plane with Z-spring. Conclusion: The pre-treatment and post-treatment parameters for each group demonstrated a significant difference, indicating that each appliance successfully corrected the crossbite.

Keywords: Children; Malocclusion; Anterior crossbite; Mixed dentition; Interceptive orthodontics.

1. Introduction

Anterior crossbite is an oral health problem that can cause both aesthetic and functional problems. It occurs when the upper front teeth are positioned behind the lower front teeth.[1] Depending on the underlying etiology and expression, the condition can be classified as dental, functional, or skeletal and present in the primary teeth, mixed dentition and permanent dentitions.[2] Skeletal crossbites are caused by differences in jaw proportions or locations, dental crossbites are usually the consequence of an irregular eruption path of the teeth, and functional crossbites are caused by an improper occlusal connection that modifies jaw placement during closure.[3] It can be further specified by indicating the location in the mouth, such as anterior or posterior, and by identifying whether a single tooth or a group of teeth are involved.[4,5]

The prevalence of anterior crossbite varies significantly, with studies reporting rates ranging from 2.2% to 11.9%. No matter how common it is, anterior crossbite is a clinical problem in young children worth being concerned about since, if left untreated, it can lead to both short-term and long-term consequences.[6,7]

A noticeable change in the anterior-posterior relationship of one or more maxillary anterior teeth, with the mandibular teeth more facially oriented and the maxillary incisors positioned lingually, is diagnostic of an anterior crossbite. The possible implications of untreated crossbite, such as traumatic occlusion, periodontal issues in the mandibular incisors, increased risk of tooth wear, and the development of temporomandibular joint disorders, highlight the clinical significance of this condition. Furthermore, if left untreated, an anterior crossbite can result in dentoalveolar malocclusion, which raises aesthetic concerns and affects the child's social relationships and self-esteem.[8,9]

The establishment of self-identity and early personality among kids with primary dentition is a developmental stage that can result in malocclusion and subsequent low self-esteem. Treating developing malocclusions early on with interceptive orthodontics can be very helpful in reducing the detrimental effects of anterior crossbite.[10] These early treatments, which are usually carried out in the mixed dentition era, can encourage the jaws' and dental arches' harmonious growth and development, possibly reducing or even eliminating the need for more involved orthodontic procedures down the road. In order to stop the crossbite from continuing into the permanent dentition, the main objective of interceptive intervention is to guide the teeth into a more favourable position.[11,12]

It is recommended to treat crossbite early in the deciduous or early mixed dentition to enable spontaneous adjustment of the succedaneous teeth. There are several techniques available for correcting anterior crossbite in the mixed dentition. These consist of basic detachable appliances incorporating springs or screws to protraction mask application in the anterior region.[13] These consist of fixed options like resin-reinforced glass ionomer cement bite pads bonded on the lower first molars and detachable appliances such higher removable appliances with finger springs. Also utilized in fixed orthodontic treatment are 2*4 appliances. While fixed appliances function by altering the occlusal connections to allow natural tongue pressure to help correct the crossbite, removable appliances are made to deliver controlled forces to the teeth to guide them into the proper position.[14]

These therapy techniques are available, but there is a dearth of high-quality research

comparing their effectiveness.Recent systematic reviews have highlighted the need for carefully designed clinical trials to evaluate the effectiveness of different treatment regimens for anterior crossbite. Establishing evidence-based recommendations to help medical practitioners can assist healthcare professionals in making well-informed judgments regarding the best course of action for the patients for the people they treat.

The objective of this study is to evaluate and compare the efficacy of three frequently employed treatment methods for treating anterior crossbite in children with a mixture of primary and permanent teeth. The treatment protocols being compared are the 2*4 fixed orthodontic appliance, Catalan's Appliance, and the upper removable appliance with posterior bite plane and Z-spring. By assessing the results of these interventions, the study aims to provide insightful information about how effective each is in comparison, strengthening the body of evidence supporting clinicians' ability to make rational decisions concerning the prevention and management of cross bite in interceptive orthodontics.

2. Materials and Methods:

The study is a randomized clinical trial that follows the Institutional Human Ethical Committee. The study was carried out in a private dental college in Chennai from January 2024 till June 2024 with an ethical clearance number IHEC/SDC/PEDO-2105/24/089.

The sample comprised 60 individuals aged 6 to 10 years who exhibited anterior crossbite in the mixed dentition. The participants were divided into three groups. Group 1 comprised 20 children who received treatment with the 2*4 Appliance; Group 2 consisted of 20 children who were treated with Catlan's Appliance; Group 3 included 20 children who were treated using a posterior bite position with Z-Spring. The 60 participants were divided into the three groups in a randomized fashion as follows: A total of 60 cards, with 20 cards for each of the three treatment procedures, were enclosed in a sealed envelope. One card indicating the patient's group assignment was pulled from the envelope for each participant. A helper continued to do this until each patient was assigned to a group. One pediatric dentist supervised the care of every kid involved in the study.

The study included participants with anterior crossbite in their mixed dentition, aged between 6 and 10. Additionally, all participants had at least one maxillary permanent incisor in a crossbite with all four permanent first molars still to erupt. There is enough space within the dental arch for the teeth to be repositioned, according to Moyer's mixed dentition analysis. Any medical issues that were recorded in the child's medical records, confirmed through a physical examination, and reported by the parents, which had an effect on the child's overall health and well-being, were excluded. Examples of these conditions were cognitive disorders and craniofacial abnormalities. Those who have posterior crossbite connected to anterior crossbite or skeletal anterior crossbite were also excluded. Individuals who had previously received orthodontic treatment as well as children who had a propensity of sucking or who had stopped during the last year were not included.

Sample calculation:

The sample size was determined using G-Power software version 3.1.2, following the methodology outlined in the study conducted by Cristhina D et al[15] in 2018. The mean and

standard deviation of SNA, SNB, ANB values of Group-1 (Upper removable Appliance using finger spring) were used for deriving the sample size using the following input conditions F tests; ANOVA: Fixed effects, omnibus, one-way and A priori type of power analysis was used with a power of 95% and alpha error 0.05. Therefore the total sample size estimated was 60 participants.

Catlans Appliance:

Impressions were made of both arches using alginate and an inclined plane was made on the mandibular permanent incisors and canine to cover the long axis of the tooth. The inclined plane was securely attached to the mandibular incisors and canine teeth using Zinc oxide eugenol, ensuring a strong bond. The contact point was precisely adjusted at the incisal edge of the cross bite, ensuring proper alignment.[16] The patient was recalled every week for evaluation of the crossbite.

2*4 Appliance:

Following a discussion with the parents, we decided to proceed with a short-span wire-fixed orthodontic treatment. This treatment involved using two prefabricated bands with buccal tubes on either side of the upper first molar. The brackets were bonded to the buccal surfaces of the four maxillary permanent incisors. A round arch wire (0.014 inch) made of nickel-titanium (Ni-Ti) with a small span was cut into equal lengths on both sides of the centerline and inserted into the slots of the brackets. The wire was secured in place using elastomeric ligature ties. The patient's occlusion was adjusted by increasing the vertical dimension by 2mm using a blue bite registration material, which was then bonded to the right and left lower first molars.[17] The patient was called for a follow-up every week to monitor the tooth movement.

Posterior Bite Plane with Z-Spring:

An alginate impression was taken for both dental arches and promptly filled with dental stone. Using the cast, a Hawley appliance with a posterior bite plane was made using 21 gauge stainless steel wire and acrylic. A double cantilever spring was created using 23 gauge wire to correct the crossbite which contacted the palatal surface of the affected tooth. This device is renowned for providing a consistent and gradual application of force.[18] The detachable device was placed in the patient's oral cavity and the patient was instructed to independently insert and remove the device with parental supervision. The patient was summoned for a follow-up appointment 24 hours later to assess the proper adjustment of the appliance. Parent was summoned weekly to activate the double cantilever spring by opening each of the two helices by 2mm. Child was directed to wear it continuously, with the exception of mealtimes and while sleeping at night.

Evaluated Criterias:

Sixty participants were evaluated before treatment (T1) and after the treatment (T2) by one evaluator who was blinded to prevent bias in the study.

Overjet and Overbite:

The parameters were assessed on study castings subsequent to obtaining alginate impressions from each participant. The therapeutic efficacy of the three treatment protocols was assessed by measuring the rise in overjet and overbite in millimeters, using a metal ruler. Overjet refers

to the change in horizontal distance between the upper and lower teeth at two different time points, T1 and T2. Overbite refers to the vertical overlap of the upper front teeth over the lower front teeth that is measured between two time points, T1 and T2.

Perimeter of the Maxillary Arch:

The perimeter of the maxillary arch was determined by measuring the original and final plaster models using a brass wire. The measurement commenced at the furthest point of the permanent first molar or the deciduous second molar, and it proceeded along the arch, encompassing the incisal edges of the front teeth and the contact points of the back teeth, concluding at the furthest point of the permanent first molar or the deciduous second molar on the opposite side. The expansion in arch perimeter was calculated by subtracting the perimeter of the arch in T1 from the perimeter of the arch in T2.

Cephalometric Analysis:

The examination focused on assessing the relationship between the maxilla and mandible with the cranial base, as well as their relationship with each other, by analyzing the cephalometric angles SNA, SNB, and ANB. The following measurements were evaluated: upper incisor inclination (U1.NA), incisal tip to point A (mm), incisal tip to point A (angle), incisal tip to point B (mm), incisal tip to point B (angle), and incisor to incisal edge (angle). The difference between T1 and T2 data was used to calculate the change in cephalometric angles.

Treatment Duration:

The duration of treatment required to repair each group's crossbite was measured in weeks, starting from the first treatment session (T1) and ending with the device being removed (T2).

Patient Acceptance:

The Smiley Scale was utilized to determine patient approval of various appliances employed across groups. The scores were: 1-Excellent; 2-Good; 3-Medium; 4-Poor; 5-Very Bad (Figure-1).

Figure 1- Smiley Scale

Statistical Analysis:

The data analysis was conducted utilizing SPSS software, specifically version 23.0. The descriptive data were presented as the mean, standard deviation, frequency, and percentage. The inferential statistics employed in the analysis included one-way ANOVA, post hoc Tukey's test, paired t-test, and Chi-square test.The One-Way ANOVA test was employed to

compare the pre and after crossbite parameters across the different groups. The paired t-test was utilized to compare data among groups, whereas the chi-square test was employed to compare qualitative data.

3. Results:

The study sample comprised 20 children in each group who maintained regular appointments until the correction of their crossbite, which lasted for a duration of 3 months. Additionally, a follow-up review was conducted following the completion of the treatment. The comparison of the pre-treatment parameters between the groups are mentioned in Table-1: SNA, ANB, Incisal tip to Point A(mm), Incisal tip to point A(angle), Incisal tip to point B(mm), Incisal tip to point B(angle), Incisor to incisal edge(angle), Overjet, overbite and arch length are statistically significant.

Table-1 Comparison Of Crossbite Pre Parameters Between Group 1, Group 2 and Group 3

OUTCOME	GROUPS	MEAN	STD DEVIATION	ONE WAY ANOVA	P VALUE
SNA	I	81.62	0.31	105.77	0.001*
	II	80.06	0.22		
	III	80.75	0.45		
SNB	I	80.63	1.06	1.37	0.26
	II	80.80	0.98		
	III	81.08	0.43		
ANB	I	3.26	0.77	21.71	0.001*
	II	1.83	0.22		
	III	2.83	0.92		
Incisal tip to Point A (MM)	I	4.29	0.75	42.13	0.001*
	II	3.08	0.12		
	III	4.64	0.61		
Incisal tip to Point A Angle	I	23.30	0.65	119.27	0.001*
	II	22.65	0.40		
	III	25.44	0.70		
Incisal tip to Point B (MM)	I	4.24	0.80	29.88	0.001*
	II	3.83	0.24		
	III	5.06	0.30		
Incisal tip to Point B Angle	I	24.84	0.61	22.83	0.001*
	II	24.99	0.26		

	III	25.79	0.50		
Incisor to Incisal angle	I	131.11	0.41	24.49	0.001*
	II	131.52	0.20		
	III	131.70	0.15		
Overjet	I	2.70	0.08	30.43	0.001*
	II	2.70	0.15		
	III	2.95	0.11		
Overbite	I	2.50	0.15	79.76	0.001*
	II	2.25	0.11		
	III	2.71	0.08		
Arch length	I	75.30	0.08	26.89	0.001*
	II	75.54	0.17		
	III	75.60	0.15		

The comparison of the post-treatment parameters between the groups are mentioned in Table-2: SNA, SNB, ANB, Incisal tip to Point A(mm), Incisal tip to point A(angle), Incisal tip to point B(mm), Incisor to incisal edge(angle), Overjet, overbite and arch length are statistically significant.

Table-2 Comparison of Crossbite Post Parameters Between Group 1, Group 2 and Group 3

OUTCOME	GROUPS	MEAN	STD DEVIATION	ONE WAY ANOVA	P VALUE
SNA	I	81.99	0.14	55.32	0.001*
	II	82.82	0.32		
	III	82.53	0.26		
SNB	I	81.70	0.15	362.18	0.001*
	II	83.15	0.22		
	III	82.85	0.17		
ANB	I	2.10	0.08	46.84	0.001*
	II	2.55	0.23		
	III	2.45	0.11		
Incisal tip to Point A (MM)	I	4.14	0.11	193.17	0.001*
	II	5.07	0.16		
	III	4.65	0.17		
Incisal tip to	I	22.15	0.11	140.64	0.001*

Point A Angle	II	23.15	0.17		
	III	22.78	0.26		
Incisal tip to Point B (MM)	I	4.19	0.14	38.93	0.001*
	II	4.55	0.23		
	III	4.73	0.22		
Incisal tip to Point B Angle	I	26.16	0.32	1.51	0.23
	II	25.85	0.91		
	III	25.90	0.37		
Incisor to Incisal angle	I	130.92	0.55	110.50	0.001*
	II	131.72	0.32		
	III	132.86	0.33		
Overjet	I	2.20	0.08	24.02	0.001*
	II	2.44	0.17		
	III	2.40	0.08		
Overbite	I	2.15	0.05	43.74	0.001*
	II	2.31	0.08		
	III	2.10	0.08		
Arch length	I	75.33	0.05	77.24	0.001*
	II	75.66	0.11		
	III	75.65	0.11		

The pre-treatment records and post-treatment records for Group 1 are compared in Table-3: SNA, SNB, ANB, Incisal tip to point A(angle), Incisal tip to point B(angle), Overjet, Overbite values are statistically significant.

Table 3- Comparison of Crossbite Parameters Of Group I Between Pre And Post Parameters

OUTCOME	GROUP I	PAIRED T TEST VALUE	P VALUE
SNA	PRE	-4.03	0.001*
	POST		
SNB	PRE	-5.03	0.001*
	POST		
ANB	PRE	6.40	0.001*
	POST		
Incisal tip to Point A (MM)	PRE	0.91	0.37
	POST		

Incisal tip to Point A Angle	PRE	8.06	0.001*
	POST		
Incisal tip to Point B (MM)	PRE	0.29	0.76
	POST		
Incisal tip to Point B Angle	PRE	-7.32	0.001*
	POST		
Incisor to Incisal angle	PRE	1.22	0.23
	POST		
Over jet	PRE	17.69	0.001*
	POST		
Over Bite	PRE	9.95	0.001*
	POST		
Arch length	PRE	-1.45	0.16
	POST		

The pre-treatment records and post-treatment records for Group 2 are compared in Table-4: SNA, SNB, ANB, Incisal tip to point A(mm), Incisal tip to point A(angle),Incisal tip to point B(mm), Incisal tip to point B(angle), Overjet and arch length are statistically significant.

Table 4- Comparison Of Crossbite Parameters Of Group 2 Between Pre And Post Parameters

OUTCOME	GROUP II	PAIRED T TEST VALUE	P VALUE
SNA	PRE	-27.28	0.001*
	POST		
SNB	PRE	-10.84	0.001*
	POST		
ANB	PRE	-9.94	0.001*
	POST		
Incisal tip to Point A (MM)	PRE	-41.40	0.001*
	POST		
Incisal tip to Point A Angle	PRE	-6.04	0.001*
	POST		
Incisal tip to Point B (MM)	PRE	-10.10	0.001*
	POST		
Incisal tip to Point B Angle	PRE	-3.69	0.002*
	POST		
Incisor to Incisal angle	PRE	-2.39	0.06
	POST		
Over jet	PRE	5.63	0.001*

	POST		
Over Bite	PRE	-1.58	0.13
	POST		
Arch length	PRE	-2.50	0.02*
	POST		

The pre-treatment records and post-treatment records for Group 3 are compared in Table-5: SNA, SNB, Incisal tip to point A(angle),Incisal tip to point B(mm), Overjet and Overbite are statistically significant.

Table 5- Comparison of Crossbite Parameters of Group 3 Between Pre And Post Parameters

OUTCOME	GROUP III	PAIRED T TEST VALUE	P VALUE
SNA	PRE	-16.26	0.001*
	POST		
SNB	PRE	16.67	0.001*
	POST		
ANB	PRE	1.86	0.08
	POST		
Incisal tip to Point A (MM)	PRE	-0.09	0.92
	POST		
Incisal tip to Point A Angle	PRE	14.65	0.001*
	POST		
Incisal tip to Point B (MM)	PRE	4.39	0.001*
	POST		
Incisal tip to Point B Angle	PRE	-0.84	0.40
	POST		
Incisor to Incisal angle	PRE	14.58	0.06
	POST		
Over jet	PRE	22.35	0.001*
	POST		
Over Bite	PRE	37.98	0.001*
	POST		
Arch length	PRE	-1.07	0.29
	POST		

The patient acceptance was best in Group 1(2*4 Appliance) followed by Group 2 (Catlans Appliance) and the least was Group 3(Posterior Bite Plane with Z-Spring). There was a statistically significant difference where p=0.001* (Table 6).

Table 6- Comparison Of The Acceptance Scores According To Groups

ACCEPTANCE SCORE	GROUPS			Total
	I	II	III	
Score 1	17(85%)	1(5%)	1(5%)	19(31.6%)
Score 2	3(15%)	14(70%)	5(25%)	22(36.6%)
Score 3	0(0%)	3(15%)	1(5%)	4(6.6%)
Score 4	0(0%)	(0%)	2(10%)	2(3.3%)
Score 5	0(0%)	2(10%)	11(55%)	13(21.6%)
TOTAL	20(100%)	20(100%)	20(100%)	60(100%)
CHISQUARE TEST VALUE	63.94			
P VALUE	0.001*			

The treatment duration for the correction of crossbite for each group was calculated and the fastest was with Group 2(Catlans Appliance) followed by Group 1(2*4 Appliance) and the least was with Group 3(Posterior Bite Plane with Z-Spring) (Table 7).

Table 7-Comparison of The Treatment Duration According To Groups

TREATMENT DURATION	GROUPS		
	I	II	III
MEAN	3.3	2.4	8.1
STANDARD DEVIATION	0.1	0.05	0.31
ONE WAY ANOVA TEST VALUE	413.33		
P VALUE	0.001*		

4. Discussion:

There has been a lack of information in the orthodontic literature on early treatment methods for anterior crossbite. A recent systematic review has recommended the need for clinical studies to assess the efficacy of various treatment procedures for this specific malocclusion.[19] Considering the absence of statistically significant variations among methods, the null hypothesis could not be rejected in the current investigation. Anterior crossbite affecting one or more incisors was corrected efficiently by using the 2*4 appliance, Catalan appliance and upper removable appliance with Z-spring. Therefore, all three treatment procedures are ideal for treating anterior crossbite. Hence, this study provides pertinent information to professionals as the prompt intervention of anterior crossbite has been extensively recommended. Correcting anterior crossbite during the mixed dentition phase is crucial in order to prevent any dental and skeletal issues in the future.

The utilization of archwire mechanics, specifically the 2x4 appliance, which comprises brackets on the four maxillary incisors and bands on the first molars, facilitates precise regulation of tooth movement. [20] This appliance is preferred because it can improve occlusal interactions and align the incisors to address both functional and dental anterior crossbites. In line with our research, Maheshkumar K et al [21] found that this appliance can significantly improve overjet and overbite measurements while correcting anterior crossbite in a short amount of time, usually 3-6 months. According to a study by Thilander et al [22], the appliance can correct anterior crossbite within a few months, with significant improvements in overjet

and overbite measurements. also noted that. In this study it was noted that the fixed nature of the 2x4 appliance ensures continuous force application, leading to predictable and stable outcomes which was in accordance with the suggestions by Quinzi V et al [23]. Additionally, the fixed nature of the 2x4 appliance ensures continuous force application, leading to predictable and stable outcomes. However, the 2x4 appliance requires patient cooperation, particularly in maintaining oral hygiene, as the brackets and wires can complicate brushing and flossing.[24] The potential for root resorption due to continuous force application is another consideration that necessitates careful monitoring by the clinician.[17]

The Catalans appliance, a fixed device constructed with acrylic and embedded wires, is designed for patients with dental anterior crossbite. According to Prakash P et al[16] the appliance successfully corrected anterior crossbites in a majority of cases, with improvements observed in both dental alignment and occlusal relationships. The acrylic base of the appliance allows for customization to individual patient anatomy, enhancing comfort and effectiveness. One advantage of the Catalans appliance is its ability to maintain the corrected tooth position through the retention properties of the acrylic and wire components.[25] However, it requires precise fabrication and fitting, and any breakage or loosening of the appliance can compromise treatment effectiveness. Regular follow-up appointments are essential to ensure appliance integrity and adjust the embedded wires as needed.

By restricting the posterior teeth and allowing anterior tooth movement, the removable posterior bite plane with Z-spring corrects anterior crossbite. The maxillary incisors get a gentle, constant force from the Z-spring, which encourages labial movement. This device is very helpful when there is a deep bite in addition to an anterior crossbite since the posterior bite plane helps to expand the bite and make it easier to treat both problems at the same time. Research by Niaf et al [26] highlighted the effectiveness of this appliance in achieving significant anterior tooth movement while maintaining patient comfort. Studies conducted in 2023 by Shyagali et al [27] demonstrated how well this appliance works to shift teeth in the anterior region while keeping patients comfortable. Compared to fixed choices, the appliance's portable design makes dental hygiene upkeep simple. However, the effectiveness of this therapy technique depends on patient compliance. Any deviations from the recommended wear schedule may result in an extended course of treatment or subpar results. To guarantee continued tooth movement and maintain proper force levels, the Z-spring must also be adjusted on a regular basis.[28]

During the course of treatment, all patients in the fixed appliance group and all but one in the removable appliance group had their crossbites satisfactorily repaired (T0–T1). In comparison to the 2 by 4 appliance group (mean, 3.3 weeks; SD, 0.05) and the detachable appliance group (mean, 8.1 weeks; SD, 0.31), the catlan's appliance group's treatment period was noticeably shorter (mean, 2.4 weeks; SD 0.01). The study found that the SNA, SNB, and ANB angles did not significantly change, indicating that the 2x4 appliance is effective in quickly correcting anterior crossbite without changing the patient's growth pattern. Following treatment, the fixed appliance group experienced a considerably higher rise in overjet ($P < 0.05$).

According to a randomized clinical trial done by Magnifico M et al [29], a fixed device (Quad-helix) had a higher success rate in treating unilateral posterior crossbite than treatment with a removable appliance and an expansion screw. With the bonded device, the average treatment

time was likewise much cheaper and shorter. This result might be explained by the detachable device's low compliance. It is common knowledge that patient compliance plays a critical role in determining the effectiveness of therapy when detachable appliances are recommended. The lengthier treatment times seen with detachable appliances may be partially explained by the degree of adherence to treatment. On the other hand, perhaps things might have turned out better if the patients had cooperated. Compared to patients with posterior crossbite, those with anterior crossbite are more likely to be aware of their malocclusion since it is more visually noticeable. As a result, the participants in this study have been very motivated and eager to follow treatment guidelines.[30]

When the three appliances were evaluated in the current study, the 2*4 and Catlans appliances showed faster treatment times and acceptance rates. Due to its removable aspect, which adversely affected patient acceptability and made it the least well-received appliance, the posterior bite plane with Z-spring required the longest amount of time for treatment. A previous study that examined the effectiveness of upper removable appliances with finger springs against fixed appliances showed that an anterior crossbite in a mixed dentition may also be satisfactorily repaired with either of those two regimens. Furthermore, all three therapy modalities had comparable long-term post-treatment stability.

5. Conclusion:

Fixed or removable prostheses that have comparable stability and favorable prognosis can be a viable treatment for anterior crossbite in one or more incisors in a mixed dentition.The before and post parameters for each group showed a substantial difference, suggesting that each appliance was successful in correcting the crossbite. The removable nature of the posterior bite plane with z-spring, however, made it the least popular alternative and resulted in the longest treatment period. Conversely, the most widely accepted appliance was the 2*4 appliance.

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