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IP Indian Journal of Orthodontics and Dentofacial Research

Journal homepage: https://www.ijodr.com

Original Research Article

Evaluation of bite opening by connecticut intrusion arch with and without cinch back on the distal end of the tube of first molars and mini- implant

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Abstract

Introduction: The intrusion of maxillary incisors is required for deep bite repair in patients with convex profiles, increased visibility of maxillary incisors, and normal or increased vertical dimension. For this, miniscrews or intrusion arches are frequently utilised. The Connecticut intrusion arch (CIA), a prefabricated intrusion arch, and temporary anchoring devices (TADs) are compared in the current study for orthodontic intrusion efficacy.

Aim: To evaluate and compare bite opening by Connecticut intrusion arch with and without cinch back and mini- implant.

Materials and Methods: Thirty individuals between the ages of 15 – 30 years receiving fixed orthodontic treatment participated in the current prospective research. CIA with cinch back were positioned in Group I, CIA without cinch back in group II and TADs were positioned for incursion in Group III. Treatment changes among the groups were evaluated using ANOVA test.

Results: There was no significant difference in terms of intrusion between the CIA with and without cinch back group, but there was a significant difference in terms of intrusion between the CIA with cinch back and mini-implant. The maxillary incisor exhibits intrusion and backward movement in CIAs with cinch back groups, while the maxillary incisor exhibits intrusion and forward movement in CIAs without cinch back groups.

Conclusions: Maxillary incisors intrusion with a minimal protrusion could be achieved with the connecticut intrusion arch with cinch back and mini-implant technique. Anchorage control was good with mini-implant.

Keywords: Bite opening, Connecticut intrusion arch, Intrusion, Temporary anchorage devices, Cinch back.

Received: 16-01-2025; **Accepted:** 18-03-2025; **Available Online**: 28-06-2025

1. Introduction

Deep bite is defined as an increased vertical overlap between the upper and lower incisors. Treatment options for this common malocclusion are mostly determined by the aetiology of deep bite, which involves aberrant mandibular and maxillary growth, altered lip and tongue function, and dentoalveolar development.[1]

In essence, there are four processes involved in treating a deep bite:

(1): Molar extrusion; (2): Labial inclination of the incisors; (3) Intrusion of the lower and/or upper incisors; and (4): Levelling of the arch by premolar eruption, which is connected to a clockwise rotation of the jaw and raises the lower face height.[2] The eruption of premolars and molars, which opens the jaw, is virtually always the preferable course of therapy. Extrusion of the posterior segment, intrusion of the maxillary and/or mandibular incisors, or a combination of both may be used to address overbite, depending on the diagnostic and treatment objectives.[3]

It would not be advised to open the bite by extruding the posterior occlusion in patients who have a tendency towards vertical development. The preferred course of therapy for these individuals is genuine incisor intrusion.[4]

The centre of resistance for a section of four maxillary incisors with a typical axial inclination is located apical to a position that connects the distal side of the lateral incisor and the distal side of the canine, according to research on dry

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https://doi.org/10.18231/j.ijodr.2025.024

skulls. In proportion to the position of the incisor crowns, the centre of resistance is located differently when the incisors have a varied axial tilt. It is expected that incisors with more flare will apply force via the centre of resistance at a more distal position than those with greater retrocline. With few negative consequences, Connecticut Intrusion Arch (CIA) offered an effective anterior segment intrusion device.[5]

However, it's possible that the location of the intrusion arch in relation to the Cr is not the only factor to consider. Another factor that may be significant is whether or not a distal bend was made at the distal aspect of the maxillary first molar tube in the intrusion arch, which may have an impact on how much the maxillary incisors flare.[6]

The CIA is a prefabricated nickel-titanium arch that is V-shaped in the posterior area and has a low load/deflection ratio. Its purpose is to provide a modest intrusion force, between 40 and 60 g, on the anterior teeth.[7]

The recent popularization of temporary anchorage devices (TADs) has helped in overcoming this limitation of uncontrolled movement of posterior segment. Of the various arches used for intrusion, the CIA has the advantage of being prefabricated and precalibrated and delivers light and continuous force under large activation. On the other hand, mini screws for intrusion eliminate the negative effects on the posterior segment.[8]

Hence, the present study is to compare the efficacy of the CIA and mini-screws In Intrusion of maxillary Incisors for deep bite correction.

2. Materials and Methods

2.1. Method

Sample size & sample technique: The formula used for sample size calculation is as:

$$N = \left(\frac{Z_\alpha}{E}\right)^2 p(1-p)$$

For 95% confidence, z_α = 1.96, taking p = 0.5 and taking E=0.3

$$N = \left(\frac{1.96}{0.3}\right)^2 * 0.5 * (1-0.5) = 10.6$$

Therefore, a sample size of 10 is taken. (Overall sample size 30).

2.2. Inclusion criteria

1. 15-30 years of age with permanent dentition.
2. Patient with deep bite.
3. No history of systemic disease.

2.3. Exclusion criteria

1. Any craniofacial disorders
2. Local/systemic problems or trauma
3. Case with missing anterior teeth.

By means of easy sampling, the participants were split into three groups, each consisting of ten subjects:

Group 1: The Connecticut intrusion arch group with cinch back;

Group 2: Had a Connecticut intrusion arch without cinch back;

Group 3: The implant group had an intrusion using a mini-implant system.

Connecticut intrusion arch with cinch back (group 1) was considered as a control group. All 30 patients were bonded with 0.022 x 0.028 SS MBT brackets. Levelling and alignment were done before intrusion for crowded incisors. To keep the four maxillary incisors in their original positions, a passive 0.016 X 0.022inch rectangular segmental archwire were bent for each patient in all three groups.

Lace back ligatures were placed on the brackets of the 4 maxillary incisors. 0.016 x 0.022-in maxillary long Nickel titanium intrusion arch were inserted, and the maxillary molars were banded. For group 1, the Connecticut intrusion arch was cinched back in order to avoid incisor facial tipping. The intrusion arch was attached above lateral incisor brackets on both sides using ligature wire.

In group 2, the procedure in Group 1 was performed as it is, however the wire was not cinched back.

In Group 3, At the mucogingival junction, between the roots of the lateral incisors and canines, two self-drilling mini-implants (diameter: 1.3 mm; length: 5 mm grade V titanium mini-implant, S.K SURGICALS COMPANY) were placed into the alveolar bone. Crimpable hooks were attached between lateral incisor and canine. The Nickel titanium closed coil spring were engaged to the mini-implant on one side and to the crimpable hook other side to deliver intrusive force. Using a calibrated Dontrix gauge, CIA intrusion arch exerts a force of 35–45 gm the extent of the intrusive force was measured to be 60 grams for four anterior tooth and verified at each consultation for all three groups.

2.4. Method of data collection

Every patient extraoral and intraoral photographs were taken both before (T0) and after (T1) intrusion, an orthopantomograph, and a lateral cephalometric radiograph.

In the cranial base superimposition, the sella-nasion line was accepted as the x-axis, and a line perpendicular to the sella-nasion line at sella was defined as the y-axis. The anterior nasal spine-posterior nasal spine line was accepted as the x-axis, and a line perpendicular to that line at the posterior nasal spine were defined as the y-axis. Data were collected by assessing 13 measurements on the lateral cephalogram radiographs before and after intrusion. (**Table 6** and **Figure 2**, **Figure 3**)

3. Results

3.1. With cranial base superimposition SN plane / X axis)

Statistically significant decrease in the central incisor's inclination measured by U1 to X axis in groups 1, 2 and 3 were seen following intrusion. (**Table 1**-**3**)

Significant reductions in occlusal plane angle were seen in CIA with cinch back (group 1), CIA without cinch back (group 2) and implant (group 3) (**Table 1**-**3**)

The upper incisor to NA linear was significantly reduced in group 1 and. On the other hand, there was a noteworthy rise in the upper incisor to NA in group 2.(**Table 1**-**3**)

1. Showed that group 2 experienced higher upper incisor flaring after intrusion than groups 1 and 3. (table 4 and graph 4)
2. Groups 1 and 2 as well as group 2 and 3 showed statistically significant differences when compared between them, however group 1 group 3 values did not differ significantly. (**Table 4**)

3.2. With palatal plane superimposition (ANS PNS plane / X axis)

In groups 1, 2, and 3, the upper incisor to palatal plane angle significantly decreased. (**Table 1**-**3**)

The mean values of groups 2 and 3 differed significantly from one another when compared. (**Table 4**)

The upper incisor centre of resistance to the palatal plane linear measurement, which indicates the degree of incisor intrusion. There was significant decrease in U1(Cr) to X Axis Linear distance in Group 1,2 and 3 with mean intrusion of 0.8mm, 1.7 mm and 2.95mm. (**Table 1**-**3**)

1. There was a statistically significant difference in the amount of intrusion at the centre of resistance between group 1 and 3 andgroup 2 and 3. (**Table 4**)
2. Implant group exhibits much higher encroachment at the centre of resistance (**Table 4**).

The upper incisor tip to palatal plane linear distance was significantly reduced in group 1,2 and 3. (**Table 1**-**3**)

1. When the groups were compared, there was a significant difference in the mean amount of intrusion between the group 1 and 3 and the group 2 and 3. (**Table 4**)

In all three groups, there was a statistically significant decrease in the distance between the tip of the upper incisor and the Y axis (a perpendicular drawn at point PNS on the palatal plane) (**Table 1**-**3**)

Significant amount of backword movement of the central incisor's centre of resistance as compared to the Y axis in group 1 and 3(**Table 1**-**3**). On the other hand, group 2 and 3 showed notable differences. (**Table 4**)

There was significant increase in distance between U6 (Tip) to palatal plane Linear distance post intrusion by mean value of -1.2mm and -1.5mm in group 1 and Group 2. (**Table 1**, **Table 2**)

Substantial increase in the mean distance between U6 (tip) to Y Axis Linear in group 1 and 2. (**Table 1**, **Table 2**)

3.3. Other parameters

There was a substantial decrease in mean overjet by mean of 3.4mm and 1.5mm and 3.7mm in group 1 and 2 and 3. (**Table 1**-**3**)

There was a statistically significant difference in the mean overjet between CIA with cinch back and without cinch back (group 1 and 2) and CIA without cinch back and implant group (group 2 and 3). (**Table 5**)

The mean overbite of CIA patients with cinch back, without cinch back and those with implants decreased significantly post intrusion by mean value1.8mm, 2.8mm and 3.1mm. (**Table 1**-**3**)

A statistically significant difference in the reduction of deep bite was seen between the CIA without a cinch back and the implant group. (**Table 5**)

The mean of the group 1, 2 and 3 were significantly reduced by 2.4mm, 2mm and 3.2mm. (**Table 1**-**3**)

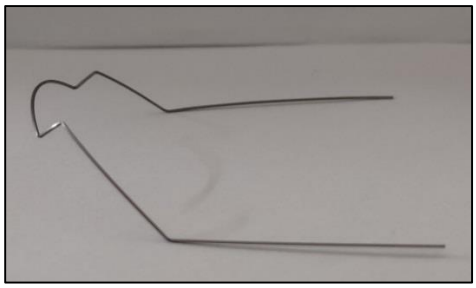

Figure 1: Preformed Niti Connecticut intrusion arch

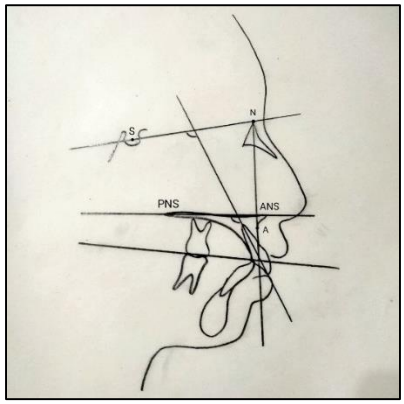

Figure 2: Parameters measured with cranial base superimposition (U1 SN plane, U1 NA linear, SN OP).

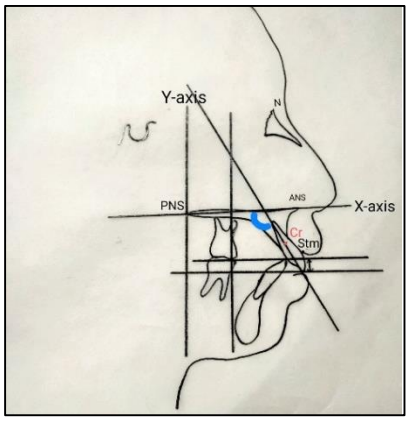

Figure 3: Parameters measesured with platal plane superimposition (U1 x axis, U1 cr axis, U1 tip Y axis, U1 Y axis, U1 cr Y axis, U6 X axis, U6 Y axis.) Other (overjet, overbite, U1 Stm).

Figure 4: Connecticut Intrusion Arch with cinch back pre intrusion and post intrusion.

Figure 5: Connecticut Intrusion Arch without cinch back Pre- intrusion and post intrusion.

Figure 6: Intrusion with mini-implant pre-intrusion and post intrusion.

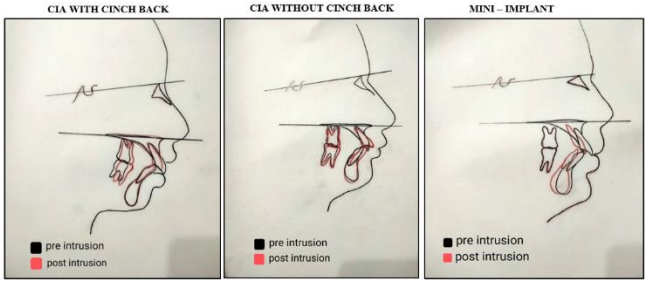

Figure 7: Pre intrusion and post intrusion superimposition of Connecticut intrusion arch with cinch back, without cinch back and mini-implant group.

Table 1: Statistical analysis of parameters in group 1 (CIA with cinch back)

Parameter	Mean Difference	Std. Deviation	S.E. Mean	t	df	P Value	Result
U1 to SN	4.6	3.75	1.19	3.88	9	0.004	Significant
U1 to NA Linear	3.4	1.43	0.45	7.52	9	0.000	Significant
SN to OP	1.5	2.8	0.89	1.69	9	0.012	Significant
U1 to X Axis(PP) Angle	4.8	3.29	1.04	4.61	9	0.001	Significant
U1(Cr) to X Axis(PP) Linear	0.8	0.92	0.29	2.75	9	0.022	Significant
U1 to X Axis(PP) Linear	2	0.47	0.15	13.42	9	0.000	Significant
U1 to Y Axis Linear	3.3	1.16	0.37	9	9	0.000	Significant
U1(Cr) to Y Axis Linear	2	0.67	0.21	9.49	9	0.000	Significant
U6(Tip) to X Axis Linear	-1.2	0.79	0.25	-4.81	9	0.001	Significant
U6(Tip) to Y Axis Linear	-1.2	0.63	0.2	-6	9	0.000	Significant
Overjet	3.4	1.43	0.45	7.52	9	0	Significant
Overbite	2.8	0.92	0.29	9.64	9	0	Significant
U1 Stm	2.4	0.7	0.22	10.85	9	0	Significant

Table 2: Statistical analysis of parameters in group 1 (CIA without cinch back)

Parameter	Mean Difference	Std. Deviation	S.E. Mean	t	df	P Value	Result
U1 to SN	2.9	1.1	0.35		9	0.000	Significant
U1 to NA Linear	-0.8	0.63	0.2	8.33	9	0.003	Significant
SN to OP	0.8	0.42	0.13	-4	9	0.000	Significant
U1 to X Axis(PP) Angle	1.6	0.84	0.27	6	9	0.000	Significant
U1(Cr) to X Axis (PP) Linear	1.7	1.06	0.33	6	9	0.001	Significant
U1 to X Axis (PP) Linear	1.5	0.97	0.31	5.07	9	0.001	Significant
U1 to Y Axis Linear	1.6	0.84	0.27	4.88	9	0.000	Significant

U1(Cr) to Y Axis Linear	0.7	1.7	0.54	6	9	0.226	Non-Significant
U6(Tip) to X Axis Linear	-1.5	0.71	0.22	1.3	9	0.000	Significant
U6(Tip) to Y Axis Linear	-1.2	0.79	0.25	-6.71	9	0.001	Significant
Overjet	1.5	0.53	0.17	-4.81	9	0.000	Significant
Overbite	1.8	0.79	0.25	9	9	0.000	Significant
U1 Stm	2	1.49	0.47	7.22	9	0.002	Significant

Table 3: Statistical analysis of parameters in group 3 (mini-implant)

Parameter	Mean Difference	Std. Deviation	S.E. Mean	t	df	P Value	Result
U1 to SN	3.2	2.44	0.77	4.15	9	0.002	Significant
U1 to NA Linear	3.45	1.57	0.5	6.94	9	0	Significant
SN to OP	3.2	2.62	0.83	3.87	9	0.004	Significant
U1 to X Axis (PP) Angle	5.8	5.37	1.7	3.42	9	0.008	Significant
U1(Cr) to X Axis (PP) Linear	2.95	0.83	0.26	11.22	9	0	Significant
U1 to X Axis (PP) Linear	3.2	1.23	0.39	8.23	9	0	Significant
U1 to Y Axis Linear	3.3	2.79	0.88	3.74	9	0.005	Significant
U1(Cr) to Y Axis Linear	3.6	2.07	0.65	5.51	9	0	Significant
U6(Tip) to X Axis Linear	0	0	0	-	9	-	Non-Significant
U6(Tip) to Y Axis Linear	0	1.56	0.49	0	9	1	Non-Significant
Overjet	3.7	1.06	0.33	11.04	9	0	Significant
Overbite	3.1	1.37	0.43	7.15	9	0	Significant
U1 Stm	3.2	1.14	0.36	8.91	9	0	Significant

Table 4: Comparision of parameters between groups

U1 to SN plane Angle		Mean Difference	Std. Error	P Value	Result
Control	Without Cinch Back	1.7	1.19	0.34	Not Significant
Control	Implant	1.4	1.19	0.477	Not Significant
Without Cinch Back	Implant	-0.3	1.19	0.966	Not Significant
U1 to NA Linear					
Control	Without Cinch Back	4.2	0.57	0	Significant
Control	Implant	-0.05	0.57	0.996	Not Significant
Without Cinch Back	Implant	-4.25	0.57	0	Significant
SN plane to OP					
Control	Without Cinch Back	0.7	1	0.764	Not Significant
Control	Implant	-1.7	1	0.221	Not Significant
Without Cinch Back	Implant	-2.4	1	0.058	Not Significant
U1 to palatal plane					
Control	Without Cinch Back	3.2	1.64	0.144	Not Significant
Control	Implant	-1	1.64	0.816	Not Significant
Without Cinch Back	Implant	-4.2	1.64	0.042	Significant
U1(CR) to palatal plane Linear					
Control	Without Cinch Back	-0.9	0.42	0.101	Not Significant
Control	Implant	-2.15	0.42	0	Significant
Without Cinch Back	Implant	-1.25	0.42	0.017	Significant
U1 to palatal plane Linear					
Control	Without Cinch Back	0.5	0.42	0.473	Not Significant
Control	Implant	-1.2	0.42	0.022	Significant
Without Cinch Back	Implant	-1.7	0.42	0.001	Significant
U1 to Y Axis (perpendicular to palatal plane) Linear					
Control	Without Cinch Back	1.7	0.81	0.109	Not Significant
Control	Implant	0	0.81	1	Not Significant
Without Cinch Back	Implant	-1.7	0.81	0.109	Not Significant
U1(CR) to Y Axis (perpendicular to palatal plane) Linear					
Control	Without Cinch Back	1.3	0.71	0.181	Not Significant
Control	Implant	-1.6	0.71	0.081	Not Significant
Without Cinch Back	Implant	-2.9	0.71	0.001	Significant

U6(Tip) to palatal plane Linear					
Control	Without Cinch Back	0.3	0.27	0.524	Not Significant
Control	Implant	-1.2	0.27	0	Significant
Without Cinch Back	Implant	-1.5	0.27	0	Significant
U6(Tip) to Y Axis (perpendicular to palatal plane) Linear					
Control	Without Cinch Back	0.2	0.44	0.891	Not Significant
Control	Implant	0	0.44	1	Not Significant
Without Cinch Back	Implant	-0.2	0.44	0.891	Not Significant

Table 5: Comparision of parameters between groups

Overjet		**Mean Difference**	**Std. Error**	**P Value**	**Result**
Control	Without Cinch Back	1.9	0.48	0.001	Significant
Control	Implant	-0.3	0.48	0.807	Not Significant
Without Cinch Back	Implant	-2.2	0.48	0	Significant
Overbite					
Control	Without Cinch Back	1	0.47	0.105	Not Significant
Control	Implant	-0.3	0.47	0.802	Not Significant
Without Cinch Back	Implant	-1.3	0.47	0.027	Significant
U1 Stm					
Control	Without Cinch Back	0.4	0.52	0.722	Not Significant
Control	Implant	-0.8	0.52	0.285	Not Significant
Without Cinch Back	Implant	-1.2	0.52	0.069	Not Significant

Table 6: Parameters measured using cranial base superimposition, palatal plane superimposition and other parameters (**Figure 3**)

U1 to SN Plane (X AXIS)	**Angle between long axis of upper incisor to SN plane**
U1 to NA Linear	Distance measured from most prominent labial surface of upper incisor to NA linear
X AXIS to OP	SN to occlusal plane
U1 to X AXIS Angle	Long axis of upper incisor to palatal plane (ANS-PNS) angle.
U1(Cr) to X AXIS Linear	Center of resistance of upper incisor to palatal plane (ANS-PNS) angle.
U1 to X AXIS Linear	Long axis of upper incisor to palatal plane (ANS-PNS) linear.
U1 to Y AXIS Linear	Long axis of upper incisor the line drawn perpendicular to palatal plane at point PNS linear.
U1 (Cr) to Y AXIS Linear	Center of resistance of upper incisor the line drawn perpendicular to palatal plane at point PNS linear.
U6 (TIP) to X AXIS Linear	Mesial cusp tip of maxillary first molar to palatal plane.
U6 (TIP) to Y AXIS Linear	Mesial cusp tip of maxillary first molar to line drawn perpendicular to palatal plane at point PNS linear.
Overjet	Horizontal distance between cusp tip of upper incisor to labial surface of lower incisor.
Overbite	Vertical distance between cusp tips of upper and lower incisor.
U1 to Stm	The linear distance between stomion superius to tip of upper incisor.

4. Discussion

The rotational moment increases with distance from the centre of resistance to the point of force application. In particular, class II div 1 is more likely than class II div 2 to experience incisor flare.[13-15]

Due to the flexibility in positioning the mini-screw with respect to the centre of resistance and the controllable and reduced unfavourable side effects, investigations indicated that the amount of intrusion resulting from the use of TAD (temporary anchorage) was more than that of conventional approaches.[16]

The utility arch group showed a substantial difference, but the implant group did not show any change in the form of flare as determined by U1-SN.[17] Similar to this, the incisor inclination in the implant group changed less in the current study than in the group 1 and 2, although there was no statistically significant difference observed between the three groups.

In study there was a decrease in angle SN-U1 a tight cinch back prevented the incisors from flaring.[18] Similar to this, the current study's Connecticut intrusion arch with cinch back and implant group exhibits significantly more incisor retraction and intrusion than the CIA without cinch back

group. Additionally, the CIA with cinch back and implant group exhibits significantly less flaring.

In research occlusal plane angle decreased in the utility arch and CIA group.[19] This led to the spontaneous change of the incisor and molar vertical alterations

However, when examining the upper incisor to NA linear distance, the CIA without cinch back group showed a significant increase in mean, while the implant group and CIA with cinch back showed a significant decrease. because the undesired effect the incisor flaring along during intrusion have been removed due to cinch back.

Probably the first to describe maxillary incisor intrusion, utilised mini-implant anchoring, which is increasingly being employed in orthodontics to maintain anchorage.[20]

In our study, the maxillary incisors with group 1,2 and 3 had intrusions of 0.8 mm, 1.7 mm, and 2.95 mm. This is the actual intrusion as determined by measuring from the maxillary central incisor's Center of resistance (Cr) to the PP. Statistics were used to determine the degree of intrusion in each group and the statistically significant difference was found between CIA with cinch back and implant and CIA without cinch back and implant group. Previous study reported 0.7- 4mm of incisor intrusion in earlier investigations.[21-23]

The maxillary incisors' centre of resistance migrated backword.[24] Thus, during intrusion, retraction of the maxillary incisors was achieved. An explanation for the retraction of the maxillary incisors might be the direction of the intrusion force, which was delivered through center of resistance by the cinching back of the Connecticut intrusion arch group and in the implant group.

In a similar vein, the CIA with cinch back and implant group in our investigation demonstrated a notable backward shift of the incisor centre of resistance in CIA with cinch back and implant group which was calculated by mean difference between center of resistance to Y axis (Y- axis is perpendicular drawn at PNS on palatal plane). However, the group 2 did not exhibit a significant backword movement of the incisor's centre of resistance. This could be because the intrusion force in group 2 passed labially to the incisor's centre of resistance, causing incisal flaring in addition to the intrusion rather than the retraction observed in the other two groups. Similar results were obtained in the previous studies.[17,24,25]

The upper teeth in CIA with and without cinch back groups were extruded by the rotating force vector of the intrusion arches, with significant mean value of -1.2mm and -1.5mm increasing the posterior facial height as a result. Our findings align with the findings of previous studies.[26-29] and contrast with the approaches who employed supplementary anchoring mechanisms to avert molar extrusion.[22,30]

To stop the maxillary incisors from tilting forward, the Connecticut intrusion arch was cinched back. The incisors move lingually when the intrusion arch is cinched back, and this force has a moment opposite the intrusion force. It also creates a moment to tilt the molar mesially and a force to propel it in that direction. The observed anchoring loss may be caused by mesial stresses induced by cinching the intrusion arches. The similar positional changes in molar were also observed in previous studies.[19,24,31]

Our research demonstrated that the mini-implant device preserved both the sagittal and vertical anchorages similar findings were seen in studies done previously.[20,32]

Reduction in overjet was significantly more in implant and CIA with cinch back group when compared with without cinch back. This is because cinch back prevent incisor to tip labially and the forces of intrusion were shifted more towards center of resistance in both CIA with cinch back and implant group. Whereas, in case of CIA without cinch back group there were more flaring and less retraction of anterior tooth so less reduction in overjet where seen. This finding was in accordance with the study which showed significant reduction in overjet in CIA with cinch back and implant group.[23]

Reduction in overbite was more than the mean amount of intrusion indicated incisor intrusion was with some amount of extrusion of molar in group 1 and 2, whereas implant group showed similar values of intrusion and reduction in overbite indicating no change in horizontal or vertical position of molar with absolute intrusion of incisor.

Since the maxillary molars maintain their position during incisor intrusion with mini-implants.[20,32] The stability of the outcomes is dependent on the incisor intrusion being successfully retained with the mini-implant system.

Upper incisor to stomion superius distance was significantly reduced in all three groups also indicating intrusion of upper incisor. Similar result was found in previous study.[23]

There were statistically significant variations in the treatment outcomes across the three maxillary intrusion methods. Consequently, the null hypothesis was disproved. These significant findings should be supported by more research, which should also look into the methods' posttreatment stability.

5. Limitations

1. Separate canine intrusion required in some case with cantilever spring for canine.
2. Implant failure is common, need to reinsert implant 1mm above the previous site of insertion.

6. Conclusion

1. There was no significant difference in terms of intrusion between the CIA with and without cinch back group, but there was a significant difference in terms of intrusion between the CIA with cinch back and mini-implant.
2. The maxillary first molars in the Connecticut Intrusion Arch group showed significant extrusive movement and significant mesial drift, while the implant group did not show any of these changes.
3. Mini-implants provide a more regulated, efficient, and less harmful approach for incisor intrusion.

7. Acknowledgement

We express our gratitude to the management of C.S.M.S.S Dental College and Hospital in Aurangabad, Maharashtra, for granting us permission to conduct this research. We also thank the Department of Orthodontics and Dentofacial Orthopedics postgraduate students for their assistance with the study.

8. Ethical Committee Approval

Ethical approval was obtained from our Institutional C.S.M.S.S Dental College and Hospital in Aurangabad. Ethical committee no CSMSS/DCH/EC/2021/ORTHO/03.

9. Source of Funding

None.

10. Conflict of Interest

None.

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Cite this article: Patil SS, Ajmera AJ, Daokar SS, Patil GH, More ND, Kokate AN, Patil OID. Evaluation of bite opening by connecticut intrusion arch with and without cinch back on the distal end of the tube of first molars and mini- implant. *IP Indian J Orthod Dentofacial Res*. 2025;11(2):