

## **Tooth Borne Versus Temporary Anchorage Device- Intrusion Systems for the Correction of Anterior Deep- Bite; Pain and Oral Hygiene Evaluation**

*Hager M. Younos<sup>1,2</sup>, Ahmed E. Salama<sup>3</sup>, Mohsena A. Abdarrazik<sup>4</sup>*

**Aim:** This aimed to evaluate the pain sensation and the oral hygiene during the treatment of anterior deep bite cases with tooth-borne versus Temporary Anchorage Devices (TADs).

**Materials and Methods:** The sample included sixteen patients with age (15 - 20) years old. They were randomly allocated into two groups, each with eight subjects. Group A a tooth born intrusion used Connecticut Intrusion Arch (CIA) for the maxillary incisor intrusion, and in Group B TADs intrusion by mini-screws were used. The Visual Analogue Scale (VAS) was used for pain evaluation. The Plaque (PI) and Gingival (GI) Indices used to evaluate oral hygiene.

**Results:** There were no statistically significant differences between the two groups regarding age, gender, overbite, ANB and PI to assure the consistency of baseline characteristics. Regarding the pain evaluation, the differences between the two groups were statistically significant ( $P=0.018$ ), in group A "CIA" recorded a mean ( $0.50\pm 0.93$ ) and the median value (0), while in group B "TADs" recorded a mean ( $3.00\pm 2.27$ ) and a median (3). Regarding GI, group B "TADs" recorded a higher mean ( $0.50\pm 0.53$ ) and median value (0.5), in comparison to Group A "CIA" which recorded a mean ( $0\pm 0$ ) and a median (0) which was statistically significant difference.

**Conclusion:** There was good oral hygiene maintenance for both systems. However, the pain scale and GI were higher in group B "TADs" causing clinical discomfort and less tolerance in comparison to group A "CIA".

**Keywords:** Deep overbite, Intrusive arch, Mini-screw, Oral health, Pain.

1. Dentist at Ministry of Health, Egypt.
2. MSc Student in the Orthodontic Department, Faculty of Dental Medicine for Girls, Al-Azhar University, Cairo, Egypt.
3. Professor of Orthodontic, Faculty of Dental Medicine for Girls, Al-Azhar University, Cairo, Egypt.
4. Lecturer of Orthodontic, Faculty of Dental Medicine for Girls, Al-Azhar University, Cairo, Egypt.  
Corresponding author: Hager M. Younos, email: hageryounes30@gmail.com

## Introduction

The deep bite is defined as an extreme case of overbite in which there is an excessive vertical measurement between the borders of the maxillary and mandibular incisors when the mandibular jaw is brought into habitual or centric occlusion.<sup>1,2</sup> However, it was also described as the incisor teeth's vertical overlap with the posterior teeth when they are in contact.<sup>3</sup>

Because the anterior dentoalveolar deep bite can have a negative impact on temporomandibular joint function, periodontal health, and aesthetics, correcting it is frequently the primary goal of orthodontic therapy.<sup>2</sup> Deep overbite was reported to be prevalent in 21% to 26% of the general population and approximately 75% of orthodontic patients.<sup>4</sup> When an overbite is corrected, the orthodontic appliance works by either incisor intrusion, molar extrusion or both in combination.<sup>2,5</sup>

The ideal deep bite treatment in non-growing patients is incisor intrusion since the vertical facial dimensions remain unchanged.<sup>6</sup> A number of appliances have been used in the intrusion of anterior deep bite, including anterior bite planes, functional appliances, J-hook HeadGear (J-HG), intrusion arches (three-piece base arch, Utility Arches [UIAs], Connecticut Intrusion Arches [CIAs], reverse curve arch-wire, inter-arch elastics, clear aligners, and mini-screws).<sup>2,7</sup>

Spring back, shape memory, and even, light load distribution are benefits of the nickel-titanium alloy used to make the Connecticut Intrusion Arches (CIA). It needs fewer adjustments sessions and possesses traits from both the traditional intrusion arch and the utility arch. The CIA is designed with bends that make it simple to install, use and lower chair side time.<sup>8</sup> TADs (Temporary Anchorage Devices) recently provided maximum anchorage in incisor intrusion by applying force near the center of resistance without causing the posterior teeth to shift in a counteractive manner. However, their use may be compromised by additional costs, patient

tolerance, and loose screws during therapy.<sup>9,10</sup>

The basic condition for carrying out successful orthodontic treatment involves patient awareness, motivation, and cooperation. Discomfort and the presence of pain impart negatively on patient compliance.<sup>11</sup>

Teeth must be intruded on safely and effectively. It is critical to ascertain any potential negative consequences such as tissue response, pain, and the anguish that the sufferer feels from the severity of their pain during different methods of intrusion. So, The degree of pain is assessed using the Visual Analogue Scale (VAS).<sup>12,13</sup>

For the purpose of minimizing orthodontic discomfort, preventing periodontal disease and plaque buildup, promoting gingival health, minimizing white spot lesions, encouraging tooth movement, and improving general oral health, maintaining good oral hygiene is crucial throughout orthodontic treatment. To preserve dental health, the ideal intrusive force, appropriate oral hygiene practices, and recommendations should be followed during incisor intrusion. Patient tolerance regarding oral hygiene during orthodontic treatment can vary widely. Some patients may be diligent about maintaining good oral hygiene practices, while others may struggle due to discomfort or difficulty maneuvering around braces or other orthodontic appliances.<sup>14</sup> Therefore, it is crucial to motivate and educate patients to maintain good dental hygiene.<sup>15</sup> Patients are more likely to follow advised protocols if they are given thorough information on oral hygiene procedures and are made aware of how important compliance is. As a result, there is a decreased chance of problems during incisor intrusion, better treatment results, and more patient satisfaction.<sup>16,17</sup>

Every consultation is an opportunity to evaluate the patient's professional oral hygiene using the Plaque Index (PI) and Gingival Index (GI). The gingival index assesses the degree of gingivitis based on

variables including bleeding and inflammation, whereas the plaque index quantifies the quantity of dental plaque on tooth surfaces. For evaluating and tracking gingival health and dental hygiene, both indices offer useful data.<sup>14</sup>

If the orthodontic treatment is solely concerned with occlusal and functional improvements, without taking the patient's comfort and oral health into consideration, it may not be successful. The patient's tolerance to the treatment steps and the associated quality of life during the orthodontic treatment course must thus be assessed in addition to the effectiveness of the recommended course of action.<sup>18</sup>

Regarding those different mechanics in the treatment of anterior dentoalveolar deep bite, choosing the proper method is somehow confusing. Therefore, this study determined which method was more tolerated, less painful, more convenient to maintain oral hygiene.

### Materials and Methods

A randomized sample of patients with anterior deep bites was collected from the Clinic of Orthodontics, Al-Azhar University, Faculty of Dental Medicine for Girls. The Ethical Committee of Al-Azhar University's Faculty of Dental Medicine for Girls approved this study, (REC-OR-24-04), and Clinical Trial registration number is (NCT06430710). After explaining the goal of the study, all of the patients and/or their parents signed a consent form. Sixteen patients with anterior deep overbite and their age ranges from 15 to 20 years participated in this study.<sup>19</sup>

### Sample Size Calculation

To Evaluate the effect of Intrusive Arch versus Mini-screw-Supported Intrusion for Deep Bite Correction, an independent t test or an equivalent non-parametric test will be used for comparison between groups. According to a previous study by El Namrawy et al (2019),<sup>20</sup> over-jet using Mini-screw was  $(-0.4 \pm 1.2 \text{ mm})$  compared to Intrusive Arch  $(1.4 \pm 1.1 \text{ mm})$ .

Using G power statistical power Analysis program (version 3.1.9.4) for sample size determination.<sup>21</sup> A total sample size ( $n=16$ ; subdivided to 8 in each group) will be sufficient to detect a large effect size ( $t$ ) = 1.56, with an actual power ( $1-\beta$  error) of 0.8 (80%) and a significance level ( $\alpha$  error) 0.05 (5%) for two-sided hypothesis test.<sup>12,20</sup>

### Inclusion criteria

1. Malocclusion in Angle Class I or Class II with minimal crowding
2. Patients with 70% to 100% overbite
3. Maxillary incisors positioned below the functional occlusal plane (maxillary incisor supra-eruption).
4. Each patient had a permanent dentition with except third molar.

### Exclusion criteria

1. patients with missing or non-erupted teeth in the anterior maxillary region
2. Any trauma or root canal therapy history of maxillary incisors
3. Previous orthodontic treatment
4. Possessing any syndromes or skeletal features deep overbite

### Randomization

Depending on the type of therapy employed, the individuals were divided into the two groups at random using RandList 1.2 (DatInf GmbH, Tübingen, Germany). The Park and Miller algorithm with a 1:1 ratio of Bays-Durham correction serves as the foundation for the random number generator.<sup>22</sup>

### Intervention

For each patient, a thorough case history was obtained. A personalized diagnostic chart and a clinical evaluation were created. Also ensuring all patients fulfilled the inclusion criteria Then, regular four extra-oral as well as five intra-oral photographs, a panoramic radiograph, a standard lateral cephalometric radiography, as well as an orthodontic study model are all included for the patient's orthodontic documentation.

In order to treat deep overbite, two segmental mechanics were compared in this randomized study TADs-supported intrusion

and intrusive arch. The appliance employed was a Roth prescription and edgewise brackets with pre-adjusted slot sizes (0.022" x 0.028"; series 2000; Ormco, Glendora, Calif.) 0.016" and then (0.016" x 0.022") nickel-titanium wires were utilized for the alignment in the upper arch, and lastly (0.016" x 0.022") St.St. A trans-palatal arch was used as a posterior anchor unit and cemented to the first maxillary molar and supported by with a wire diameter of 0.04". Stabilization arch-wire (Ormco) was used. Ligation wire was used to ligate the brackets of the four maxillary incisors after alignment, held together by figure-eight ligation ties made of 0.017 x 0.025-inch stainless steel wires, and the stainless-steel wire was cut into the maxillary anterior segment and two buccal segments.<sup>20</sup>

### In group A

Using an intrusive arch 0.017" by 0.025" CIA (Intranol, GAC, USA) wire and inserted into the maxillary bands' auxiliary slot, the upper incisors were intruded. A 0.017 x 0.025 steel wire, which was attached to the front portion of the Intrusion arch from the space between the central and lateral teeth, made the arch-wire cinch back in the posterior area. It was set to provide an 80 g intrusive force when applied using a Tweed loop plier (Pin Tech Instruments, Sialkot, Pakistan) and calibrated with a Dontrix gauge (Correx; Ortho Care, Saltaire, United Kingdom). (40 g per side)(Fig 1).<sup>20</sup>



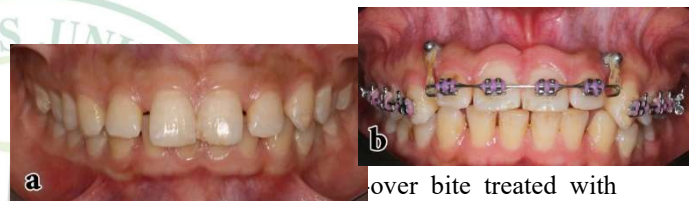
Figure 1: Group A, Deep-over bite treated with Connecticut Intrusion Arches (CIA), a; Pre-treatment, b; Post-intrusion

### In group B

Two TADs (Jeil Medical Co., Seoul, Korea) measuring 6 mm in length and 1.4 mm in diameter were employed for incisor intrusion because of the anterior segment's constrained interradicular space. The TADs were positioned distal at the mucogingival

connection to the maxillary lateral incisors.

<sup>20</sup> Immediately loading was done connecting the implant head to the sectional arch-wire using an elastic chain after the stability of mini-screws was examined,<sup>23</sup> then intrusion was started using a short elastomeric chain(3M Unitek/ESPE, St Paul, Minn).<sup>22</sup> The intrusion force of 80 g was measured using the same force gauge.<sup>20</sup> To ensure accurate force delivery, elastic power chain changed every two weeks (Fig 2).<sup>24</sup>



Temporary Anchorage Devices (TADs). a; Pre-treatment, b; Post-intrusion

### Pain Intensity

During the trial time, patients were asked not to take any analgesics. A Visual Analogue Scale (VAS) was employed to gauge the degree of discomfort. Every patient was told to mark their level of sudden pain right now and level of discomfort during the intrusion at all experimental times without receiving any stimulation on a 100 mm VAS. A VAS score of zero at the left end of the line denotes no pain, while a score of 100 at the right end denotes the highest level of pain. Three measurements were made, with the average being the distance from the left side to the pain intensity mark.<sup>12,13</sup> Score 0,10,20: no pain. Score 30,40: moderate pain. Score 50,60: depressing pain. Score 70,80: horrible pain. Score 90,100: excruciating pain.

### Oral Hygiene Evaluation

Apart from receiving guidance on maintaining good oral hygiene, which includes brushing teeth twice a day with fluoride toothpaste, using specialized orthodontic brushes to clean around braces and intrusive devices, flossing every day, and avoiding sugary and acidic foods and beverages. Until the completion of the trial, all patients rinsed their mouths twice a day with chlorhexidine mouthwash to stop

plaque formation and gingivitis. Every visit, the maxillary incisor oral hygiene of each patient was evaluated using the plaque index, which has scores ranging from 0 to 4, and the gingival index, which has scores ranging from 0 to 3.<sup>14,16</sup>

Regular dental check-ups for eight months, routine visits were set up every two weeks, and during each visit, the force level was examined and adjusted as necessary, early detection and treatment of any issues that may arise during incisors intrusion. Nothing else was done in terms of treatment during the intrusion.

### Statistical analysis

Data management and statistical analysis were performed using the Statistical Package for Social Sciences (SPSS) version 20. Numerical data were summarized using mean, median, mode, standard deviation and range. Data were explored for normality by checking the data distribution using Kolmogorov-Smirnov and Shapiro-Wilk tests. Comparisons between groups with respect to non-parametric numeric variables (GI and PI) was performed by Mann Whitney U test. Overbite and ANB data showed a normal distribution and were compared between groups using independent t test.

All p-values are two-sided. P-values  $\leq 0.05$  were considered significant.

### Results

The gender qualitative data was compared between groups using the chi-square test. A count and a percentage were used to express the gender data. A p-value always has two sides. P-values were considered significant if they were less than 0.05.

Group A "CIA" consisted of 100% females, while Group B "TADs" consisted of 87.5% females and 12.5% males. Regarding the distribution of gender across the various groups, there was no discernible difference ( $p=0.302$ ). (Table 1) Regarding the Age, it ranged from 15 to 21 years old.

The average age was ( $18.88 \pm 1.46$ ) in group A "CIA" and ( $17.5 \pm 2.07$ ) in group B "TADs". Between the two groups, there was no discernible difference in the mean age values ( $p=0.147$ ). (Table 1).

Table 1: Demographic Data analysis (Gender distribution and age) in the studied groups.

Gender n (%)	Group A "CIA"	Group B "minisc rews"	X <sup>2</sup> value	P value	
Males	0 (0%)	1(12.5%)	1.067	0.302 ns	
Females	8 (100%)	7(87.5%)			
Age(years )	Mean $\pm$ SD	18.88 $\pm$ 1.46	17.5 $\pm$ 2.07	t value (1.54)	0.147 ns
	Min-Max	17-21	15-21		

Significance level  $p \leq 0.05$ , ns= Non-Significant

The amount of anterior deep bite and ANB angle were assessed before treatment in order to ensure the normal distribution of the baseline characteristics. Moreover, the Plaque index and the Gingival index were measured too. (Table 2)

Table (2): Test of normality for the studied groups.

	Groups	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Sta.	df	Sig.	Sta.	df	Sig.
Gingival index	Group B "TADs"	0.325	8	0.013	0.665	8	0.001
Plaque index	Group A "CIA"	0.391	8	0.001	0.641	8	0.000
	Group B "TADs"	0.391	8	0.001	0.641	8	0.000
Overbite	Group A "CIA"	0.242	8	0.186	0.862	8	0.125
	Group B "TADs"	0.245	8	0.173	0.854	8	0.104
ANB	Group A "CIA"	0.293	8	0.042	0.859	8	0.117
	Group B "TADs"	0.168	8	0.200*	0.928	8	0.501

a. Lilliefors Significance Correction

\*. This is a lower bound of the true significance.

Table 3: Descriptive statistics of Gingival (GI) and plaque index (PI), overbite (%) ANB and Pain comparison between groups (Mann Whitney U test, independent t test)

	Groups	Mean ±SD	Median	Mode	Min; Max	Difference				Test value U or t	P value
						Mean	SD	C.I. lower	C.I. upper		
GI	Group A"CIA"	.00±.00	0.00	0.00	.00; .00	-0.50	0.19	-.905	-0.09	U= 16.00	.025*
	Group B"TADs"	0.50±.53	0.50	0.00	.00; 1						
PI	Group A"CIA"	0.63±.52	1	1	.00; 1	0.25	0.25	-0.31	0.805	U= 24.00	0.333 ns
	Group B"TADs"	0.38±.52	0.00	0.00	0.00; 1						
Over bite (%)	Group A"CIA"	79.79±10.57	76.80	70.00	70; 100	-6.163	5.78	-18.56	6.235	t= 1.067	.304 ns
	Group B"TADs"	85.95±12.47	83.00	100	70; 100						
ANB	Group A"CIA"	4.88±1.16	5.00	5.00	2.50; 6	0.43	.614	-0.87	1.754	t= .713	0.488 ns
	Group B"TADs"	4.44±1.29	4.50	4.00	2.50; 6						
Pain scale	Group A"CIA"	.50±.93	.00	.00	.00; 2	-2.50	.87	-4.36	-.64	11	.018*
	Group B"TADs"	3.00±2.27	3.00	.00	.00; 6						

Significance level  $p < 0.05$ , \* significant, ns= Non-Significant

SD =standard deviation, U= Mann-Whitney U, t= independent t test, C.I. 95% confidence interval

Gingival index: Group B "miniscrews" recorded a higher mean (.50±.53) and median value (0.5), in comparison to Group A"CIA" which recorded a mean (0±0) and a median (0). The difference between groups was statistically significant ( $p=0.025$ ), - GI is constant when Groups =

not statistically significant ( $p=0.333$ ), (Table 3).

Overbite (%): Group B "miniscrews" recorded a higher mean (85.95±12.47) and median value (83), in comparison to Group A"CIA" which recorded a mean (79.79±10.57) and a median (76.8). However, the difference between groups was not statistically significant ( $p=0.304$ ), (Table 3).

ANB: Group A"CIA" recorded a higher mean (4.88±1.16) and median value

Group A"CIA". It has been omitted. (Table 3).

Plaque index: Group A"CIA" recorded a higher mean (.63±.52) and median value (1), in comparison Group B "miniscrews" to which recorded a mean (.38±.52) and a median (0). However, the difference between groups was

(5), in comparison Group B "miniscrews" to which recorded a mean (4.44±1.29) and a median (4.5). However, the difference between groups was not statistically significant ( $p=0.488$ ), (Table 3)

The Visual Analogue Scale was used to measure the intensity of pain (VAS). Group A "CIA" recorded a mean (of 0.50±.93) and a median value (of 0), in comparison to group B "TADs" which recorded a mean (of 3.00±2.27) and a median value (3) The difference between

groups was statistically significant ( $p=0.018$ ), (Table 3).

**Failure of TADs:** In the mini-screw group during the first month after insertion, the failure of two TADs was observed in one case. In the second month, the failure of one TAD was observed in another case. So the failure rate of TADs was 18.75% within an average duration one month and an average number 1.5 TADs.

## Discussion

One common orthodontic aberration that may be skeletal or dental is deep bites. In Class II division 2 anomalies, supra occlusion of the upper incisors usually results in a deep bite. It is also observed in Class I and III anomalies, though.<sup>7</sup>

The importance of correcting a deep over bite from the possible harm it may bring to the temporomandibular joint, occlusion, periodontal health, and facial aesthetics. The patient's vertical dimension, incisor display, smile line, and other characteristics all influence the treatment plan that is selected. The three main techniques for correcting deep bites are incisor intrusion, posterior tooth extrusion, and a combination of these two techniques.<sup>1,2</sup> For patients who are not growing and have deep overbites, particularly those who have a gummy smile, maxillary incisor intrusion is advised. The placement of the maxillary incisors, particularly those near the upper lip, plays a crucial role in deciding the course of treatment because, in patients with inadequate incisor display, overbite repair with maxillary incisor intrusion flattens the smile arc and lessens the beauty of the smile.<sup>20</sup>

In the current study, there was no difference in age and sex selection regarding to studies of Bellamy et al. and El Namrawy et al.<sup>19,20</sup> who reported that there were no significant associations with age, sex during the incisor intrusion.

If treatment for excessive incisor intrusion is not received, the pressure from the intrusion on the gingiva may result in

discomfort, edema, and periodontal disease. Additionally, intruded incisors can generate regions that are hard to clean properly due to their hardness, which increases the risk of tooth decay and plaque accumulation. So, it is advised to employ minimal load-deflection systems, a steady intrusive force and cinch back in the posterior area of the arch-wire. In recent studies, Different force levels ranging from 40 to 100 g have been applied. Polat<sup>10</sup> used 80 g. One study evaluated the effects of 40 g and 80 g in separate investigations. In a third study, the range was 80–120 g, while in another, it was 90–100 g.<sup>20</sup>

CIA is a simple, non-invasive technique for anterior tooth intrusion. It was chosen as the method for the incisors in group A. It also requires less force for intrusion. Despite being a more intrusive surgery, group B was chosen to receive TADs. Immediate loading, numerous placement locations, and simple insertion and removal processes are among its benefits.<sup>1</sup>

Similar research study revealed there was no discernible statistical difference between the two groups' post-treatment patient tolerance to treatment. However, clinically in the current study, patients tolerated CIA better than TADs. Perhaps due to its less invasive placement and removal process compared to TADs, which are more painful during the intrusion, uncomfortable, and may cause gingival irritation and looseness following orthodontic force loading.<sup>20</sup>

As the same in the current study, it was reported that the mini-screw installation results in some mild pain and discomfort.<sup>13</sup> However, A study reported that the level of discomfort was found to be located in the "mild-to-moderate" category with the use of mini-implants and combined Nance button-TPA at the time of insertion and removal as well as three days later. The reason for this seems to be the contribution of the combined Nance button-TPA in reducing the space for the tongue and the direct contact between them during the processes of chewing, swallowing, and

speaking. On the other hand, discomfort associated with using mini-implants is due to the pain and swelling in the surrounding tissues and uncomfortable contact between the cheeks and the two protruding implants.<sup>18</sup>

As this finding, there was a higher significant difference in pain experience with TADs, this coincide with the study that demonstrated the highest pain intensity was noted after the insertion of TAD and ranged from the “moderate” and “moderate-to-severe” categories. These levels decreased after one week, reached “mild” levels, or disappeared completely after one month. In addition, the levels of discomfort of swelling reached the “moderate-to-severe” category during the first week of using TAD and then decreased or disappeared within one month. In addition, functional impairment related to skeletal anchorage devices reached the "moderate-to-severe" category; these levels decreased to a mild level after 14 days and one month of use. On the other hand, using conventional anchorage systems as CIA was most likely less problematic than TADs.<sup>18</sup>

According to a different research, individuals who reported orthodontic pain during the first week of therapy had a higher gingival index at baseline, and orthodontic discomfort was linked to greater interleukin 1 $\beta$  concentrations in gingival crevicular fluid. Nevertheless, there was no correlation seen between the degree of post-bonding OH and the occurrence, duration, or intensity of orthodontic discomfort. In patients with treated and stabilised periodontal disease, greater duration and intensity of orthodontic discomfort were explained by increased gingival inflammation.<sup>16</sup>

There are few studies comparing the results of oral hygiene between intrusive arches and TADs during incisor intrusion. To maintain oral hygiene, both approaches—as in the current study—call for strict oral hygiene routines. Though less so than TADs, intrusive arches may also need meticulous cleaning around the

brackets and wires. This is because TADs are fixed, and their elastic power chain can trap food particles and plaque, increasing the risk of decay and gum problems. In the end, the patient's compliance and the orthodontist's advice determine how beneficial oral hygiene practices are.<sup>15,16</sup> This coincide with the study that demonstrated that the level of cleaning difficulty was lower around the TPA than around the mini-implants. This can be explained by the swelling and pain around the mini-implant and the accumulation of food debris due to many factors, such as braided wire, power chains, and hooks welded to the arch-wire.<sup>18</sup>

Gingival and plaque indices offer a standardized method for classifying and evaluating oral health metrics. Plaque index: 0 – no plaque 1 - plaque only recognized by running a probe across the tooth surface 2 - visible plaque, but not covering more than one-third of the tooth surface 3 - visible plaque covering more than one-third, but less than two-thirds of the tooth surface 4 - visible plaque covering two-thirds or more of the tooth surface. Gingival index: 0 - absence of inflammation, normal gingiva 1 - mild inflammation, slight change in color, no bleeding on probing 2 - moderate inflammation, redness, swelling, bleeding on probing 3 - severe inflammation, marked redness, swelling, tendency to spontaneous bleeding.<sup>14,16</sup>

The two mechanics did not differ statistically significantly in PI, as did the current investigation, but in GI, the TADs group demonstrated a larger significant difference. Perhaps as a result of the intrusive insertion of TADs, which may irritate and inflame the gingiva, as well as the elastic power chain's ability to trap food particles that can lead to gum disease. A study showed that poor oral hygiene during orthodontic treatment can dramatically effect treatment outcomes, including longer treatment time and reduced aesthetics. All patients in each group failed to adhere to the oral hygiene measures that affected oral



hygiene. When it comes to incisor intrusion, where exact control over tooth movement is critical, keeping your mouth as clean as possible is key to getting the outcomes you want in the time you expect.<sup>15,16</sup>

Thikriat<sup>17</sup> reported that OH performance showed statistically significant worsening from T0mo (prior to appliance bonding) to T1mo (about 30 days into the bonding process), but subsequently improved to T5mo (about 150 days into the appliance bonding process), this change was statistically significant. But there wasn't a statistically significant distinction between the two groups in the current investigation in regarding the duration in the presence of good oral hygiene measures and instructions during the period of recording which was almost 8 months.

In the present study the failure of TADs occurred in the first and second month of orthodontic force loading. These were replaced immediately.<sup>22</sup> This failure rate was statistically not significant and concurred with the outcome of Chopra<sup>25</sup> who reported that the failure rate of mini-screws was statistically not significant also, the total success rate of instant loading titanium orthodontic micro-implants (OMI) was 83.33%. The only problem that was noted was inflammation around the implant. The majority of errors occurred in the study's early stages. The success rate of implants did not significantly change according to sex, kind of malocclusion, or placement side (right or left).

This study highlights the importance of understanding pain perception and oral hygiene during orthodontic treatment for anterior deep bite correction. It emphasizes the need for patient comfort and pain management in care planning, allowing for better-tailored treatments and improved patient outcomes. Further research with larger sample sizes and extended follow-up is necessary to confirm these findings and explore additional factors affecting treatment efficacy.

However there was the limitations as merely sixteen patients made up the research sample, short-term follow-up and single-center study.

### Conclusion

In summary, both tooth-borne systems using Temporary Anchorage Devices (TADs) and Connecticut Intrusion Arch (CIA) demonstrated effective oral hygiene maintenance when proper oral hygiene practices and instructions were provided during the treatment of anterior deep bite patients. On the other hand, GI and pain sensation differed more significantly, with TADs producing clinically greater discomfort and less tolerance in contrast to CIA. Age and sex selection differed equally in both methods. The effectiveness of TADs in inducing incisor intrusion was demonstrated by their 81.25% success rate.

### Conflicting interest

The authors declare no conflicts of interest.

### Funding

This research was personally funded.

### References

1. Suthar H, Trivedi K, Shah A, Mistry R, Nathwani N, Bhatt M. A Comparative study of apical root resorption during Intrusion of maxillary anterior teeth treated with intrusion arch and mini-implants – A CBCT Study. Research Square Platform LLC; 2022;1838746/v1.
2. Salim MA, Moussa ShA. Treatment of deep bite by using mini implant in comparison to conventional orthodontic methods. Ain Shams Med J. 2015;18:1-6.
3. Turpin DL. Orthodontic treatment and self-esteem. Am J Orthod Dentofac Orthop. 2007;131:571-2.
4. Huang GJ, Bates SB, Ehlert AA, Whiting DP, Chen SS-H, Bollen A-M. Stability of deep-bite correction: A systematic review. J World Fed Orthod. 2012;1:e89-96.
5. Ng J, Major PW, Heo G, Flores-Mir C. True incisor intrusion attained during orthodontic treatment: A systematic review and meta-analysis. Am J Orthod Dentofac Orthop. 2005;128:212-9.
6. Horiuchi Y, Horiuchi M, Soma K. Treatment of severe class II division 1 deep overbite malocclusion without extractions in an adult. Am J Orthod Dentofac Orthop. 2008;133:S121-9.

7. Süer Tümen D, Hamamcı O. Comparison of cephalometric changes resulting from different upper incisor intrusion methods. *Int Dent Res.* 2021;11(Suppl. 1):176-93.
8. Amasyali M, Sağdıç D, Ölmez H, Akin E, Karaçay Ş. Intrusive effects of the connecticut intrusion arch and the utility intrusion arch. *Turkish J Med Sci.* 2005;35:407-15.
9. Lobb WK. A mini-implant for orthodontic anchorage in a deep overbite case. *Yearb Dent.* 2006;2006:248-51.
10. Polat-Ozsoy O, Arman-Ozcirpici A, Veziroglu F. Miniscrews for upper incisor intrusion. *Eur J Orthod.* 2009;31:412-6.
11. Temisanren OT, Ifesanya JU, Olatunji AB. Compliance in review attendance among orthodontic patients attending a tertiary level health care centre. *Niger Dent J.* 2020;23:130-4.
12. Singh R, Jayaprakash PK, Yadav A, Dawar M, Grewal H, Mishra A. Evaluation of levels of interleukin-1b, intensity of pain and tooth movement during canine retraction using different magnitudes of continuous orthodontic force. *J Fam Med Prim care.* 2019;8:2373-7.
13. Ganzer N, Feldmann I, Bondemark L. Pain and discomfort following insertion of miniscrews and premolar extractions: A randomized controlled trial. *Angle Orthod.* 2016;86:891-9.
14. Saurav K, Shubham K, Nadira H, Ravi A, Sana S, Devleena B. A comparative assessment of the effect of professional oral hygiene measures on the periodontal health of patients undergoing fixed orthodontic appliance therapy. *Pharm Bioallied Sci.* 2021;13:S1324-6.
15. Almutairi M R, Alturaif J D, Alanzi M L. Importance of oral hygiene in orthodontic treatment. *Saudi J Oral Dent Res.* 2023;8:100-9.
16. Abozaid HM, Amer LAF. Longitudinal Evaluation of Oral Health Among Orthodontic Patients Prior Treatment, During Treatment and Post-Treatment. *Al-Azhar Assiut Med J.* 2021;4:167-78.
17. Al-Jewair TS, Suri S, Tompson BD. Predictors of adolescent compliance with oral hygiene instructions during two-arch multibracket fixed orthodontic treatment. *Angle Orthod.* 2011;81:525-31.
18. Mousa MM, Hajeer MY, Sultan K, Almahdi WH, Alhaffar JB. Evaluation of the Patient-Reported Outcome Measures (PROMs) With Temporary Skeletal Anchorage Devices in Fixed Orthodontic Treatment: A Systematic Review. *Cureus* 2023;15:e36165.
19. Bellamy LJ, Kokich VG, Weissman JA. Using orthodontic intrusion of abraded incisors to facilitate restoration: the technique's effects on alveolar bone level and root length. *J Am Dent Assoc* 2008;139:725-33.
20. El Namrawy MM, Sharaby F El, Bushnak M. Intrusive arch versus miniscrew-supported intrusion for deep bite correction. *Open access Maced J Med Sci.* 2019;3;7:1841-6.
21. Jaykaran Charan, Tamoghna Biswas. How to calculate sample size for different study designs in medical research? *Indian J Psychol Med.* 2013;35:121-6.
22. Aras I, Tuncer A V. Comparison of anterior and posterior mini-implant-assisted maxillary incisor intrusion: Root resorption and treatment efficiency. *Angle Orthod.* 2016;86:746-52.
23. Migliorati M, Drago S, Gallo F, Amorfini L, Dalessandri D, Calzolari C, et al. Immediate versus delayed loading: comparison of primary stability loss after miniscrew placement in orthodontic patients-a single-centre blinded randomized clinical trial. *Eur J Orthod.* 2016;38:652-9.
24. Al-Falahi B, Hafez AM, Fouda M. Three-dimensional assessment of external apical root resorption after maxillary posterior teeth intrusion with miniscrews in anterior open bite patients. *Dental Press J Orthod.* 2018;23:56-63.
25. Chopra SS, Chakranarayan A. Clinical evaluation of immediate loading of titanium orthodontic implants. *Med journal, Armed Forces India.* 2015;71:165-70.