Case Report

# The clinical success of infra-zygomatic crest (IZC) bone screw in non-extraction treatment of Class II malocclusion: a Case Report

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## ABSTRACT

**Introduction**: Temporary Anchorage Devices (TADs), absolute anchorage systems with minimal side effects on orthodontic mechanical movements, can be alternatives to wider non-surgical, non-extraction, and non-compliance treatments. The placement of extra-radicular mini-screws at the infra zygomatic crest (IZC) is one of the most commonly used approaches for skeletal anchorage. Maxillary arch distalization with IZC can be effectively performed in Class II malocclusion patients with large overjet using non-extraction treatment, especially due to increasing patient demands to avoid extractions. The aim of this case report is to demonstrate the effectiveness of infrazygomatic crest (IZC) extra-radicular TADs for maxillary distalization in a Class II malocclusion cases treated without extractions. **Case report**: A 16-year-old female patient came to the Orthodontic Clinic with the complaint of forward upper teeth, Class II Angle malocclusion and Class I skeletal with a convex facial profile, deep overbite, overjet 6 mm, posterior scissor bite, diastema between teeth 32-33, and deep curve of Spee. The patient was treated with non-extraction fixed orthodontics using a self-ligating system prescription, utilizing extra radicular Temporary Anchorage Devices (TADs) at the infra zygomatic crest measuring 2 x 12 mm for maxillary retraction. Following the maxillary retraction treatment, successful outcomes were achieved as the overjet decreased from 6 mm to 3 mm; Class I molar and canine relationships were established; and the distance from I to NA was reduced from 11 mm to 5 mm. **Conclusion:** The clinical use of infra-zygomatic crest (IZC) bone screw in non-extraction treatment of Class II malocclusion case was successfully conducted with non-extraction fixed orthodontic treatment.

## KEYWORDS

Class II malocclusion, infra zygomatic crest, non-extraction treatment, temporary anchorage

## INTRODUCTION

The global prevalence of malocclusion is 56%. Africa has the highest rate at 81%, followed by Europe at 72%, the Americas at 53%, and Asia at 48%.[1] Class II malocclusion ranks among the most common types, affecting 38% to 50% of orthodontic patients.[1,2] Consequently, approximately one-third of patients requiring orthodontic treatment in general dentistry practices have Class II malocclusions.[3]

Class II malocclusion is caused by factors such as ethnicity, food, lifestyle, and craniofacial growth.[3,4] Class II malocclusion presents a significant obstacle to

effective management and treatment planning.[5] Achieving the desired tooth movement with the fewest side effects is the aim of any orthodontic therapy.[6] Patients with Class II division 1 malocclusion can be treated with camouflage or surgery. Molar distalization is another method of camouflage treatment. The maxillary molar is distalized to create space and helps in solving the malocclusion. Techniques like bone screw distalization of the maxillary arch have been introduced, and they are more successful and give good results. [7–9]

Contemporary orthodontic treatment involves expanding the scope of care, improving efficiency, and reducing treatment duration.[10] TADs are effective for maxillary retraction when carefully placed to avoid interfering with distal tooth movement.[11] Their direct insertion into the alveolar bone of the posterior maxilla facilitates this process. The Infra-Zygomatic Crest (IZC) serves as a reliable site for orthodontic bone screws (OBSs), significantly broadening conservative treatment options for severe and complex malocclusions.[10] IZC bone screws have revolutionized orthodontic mechanics, emerging as a promising alternative for achieving skeletal anchorage during molar distalization.[12]

Infra-Zygomatic Crest (IZC) is the stable site at the zygomatic process of maxilla, making it the most preferred location of placing Extra Alveolar micro implants. It extends 2 cm or more to the zygomaticomaxillary suture, running laterally to the roots of the first and second maxillary molars.[13] Clinically, this ridge can be felt along the curvature between the alveolar and zygomatic processes of the maxilla. Its position varies with age; in young individuals, the cortical bone crest is found between the maxillary second premolar and first molar, while in adults, it is positioned above the maxillary first molar.[14,15]

This case demonstrates the successful management of a Class II malocclusion with a significant overjet using infra-zygomatic crest (IZC) screws as absolute anchorage, enabling non-extraction treatment while achieving favorable occlusal and facial outcomes. It highlights both the clinical and procedural uniqueness of this approach.

The uniqueness of this case lies in the use of different hook heights for retraction, which was necessary because the placement of the IZC screws on the right and left sides was not identical due to the patient's anatomical variations. In many reported cases, the use of different hook heights is not mentioned, even though the right and left anatomical structures in individuals are not always symmetrical. The aim of this case report is to demonstrate the effectiveness of infrazygomatic crest (IZC) extra-radicular TADs for maxillary distalization in a Class II malocclusion case treated without extractions.

## Case Report

A 16-year-old female patient came to the Orthodontic Clinic with a chief complaint of a large overjet between the upper and lower jaws. No significant medical or dental history of the patient was ascertained. In extra-oral examination, the patient presented a hyper leptoprosop facial type, a convex facial profile, a nasolabial angle of 105°, and a normal buccal corridor.

Intra-oral examination revealed a bilateral Class II molar relationship and end-on canine relationship on both sides (Figure 1). The overjet was 6 mm, overbite was 4 mm, with no midline deviation. A posterior scissor bite, diastema between teeth 32 and 33, and a deep curve of Spee were observed. Mild crowding was present in both the maxillary and mandibular arches. The arch length discrepancy analysis showed -1 mm in the maxillary arch and -1 mm in the mandibular arch. No temporomandibular joint pathology was detected.

The panoramic radiograph revealed that all teeth were present, but the third molars had not erupted to the occlusal plane (Figure 2). The lateral cephalogram (Figure 3) and cephalometric analysis (Table 1) showed an maxillary (SNA = 80◦), mandibular (SNB = 78◦), Class I skeletal base (ANB = 2◦ and Wits Appraisal = 1 mm), proclined interincisal angle (I to I = 112◦), protrusive upper incisors (I to NA = 11 mm), protrusive lower incisors (I to NB = 8 mm). Model analysis showed

a Bolton's ratio with an excess of mandibular anterior (1.9 mm) tooth material, respectively.

The diagnosis is angle class II malocclusion and class I skeletal. Prognosis was satisfactory. The treatment alternatives were presented. Surgical and orthodontic camouflage with premolar extraction on maxillary first premolar and mandibular second premolar. The second option of orthodontic camouflage is distalization maxillary arch with Infra-Zygomatic Crest (IZC) bone screws. This option was the most conservative approach among the treatment options with class II angle malocclusion and class I skeletal.

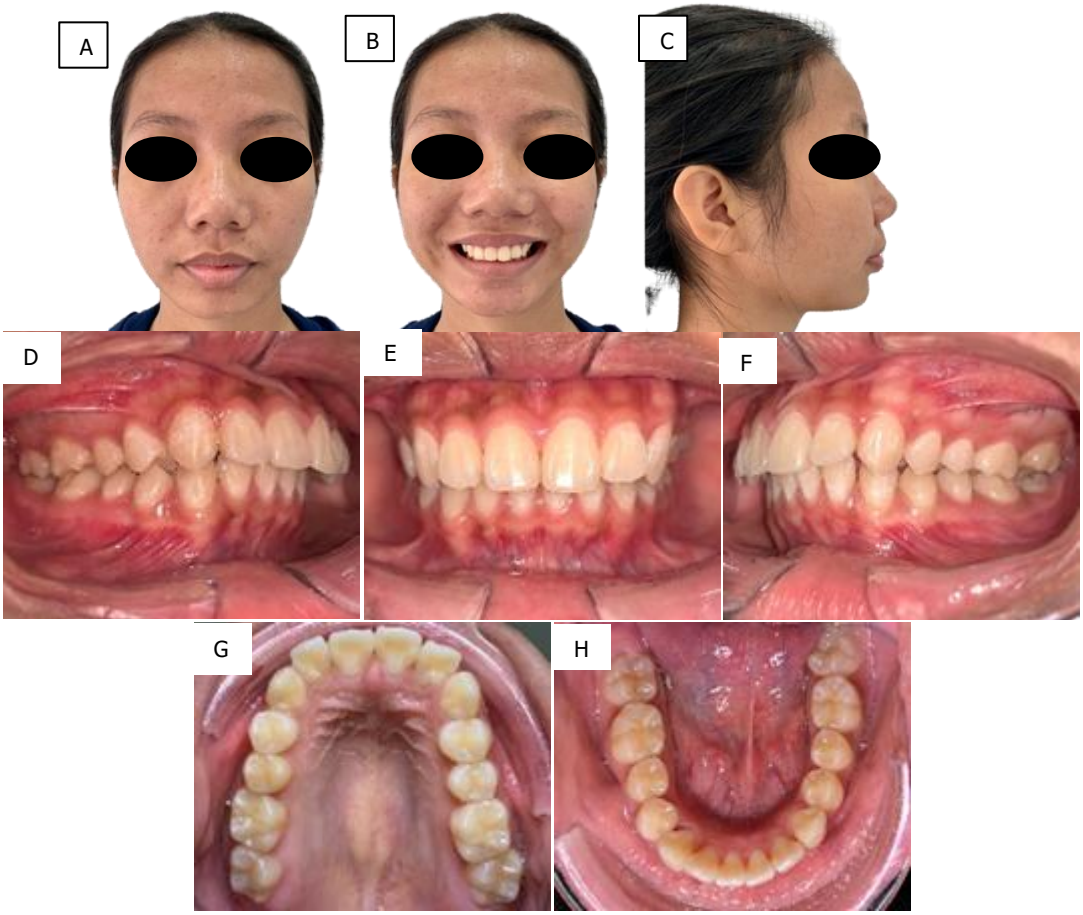


**Figure 1.** Pre-treatment records. A-C. The extra-oral photographs showed mild crowded and flared maxillary incisors. D-F. Intra-oral with lateral view showed canine and molar relation having class II angle malocclusion. G-H. Intra-oral with occlusal view showed mild crowding on both maxillary and mandibular arches.

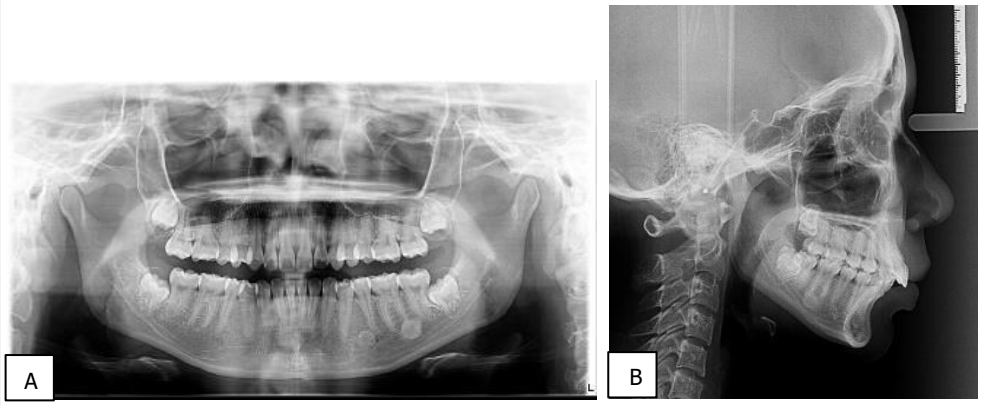


**Figure 2.** A. Pre-treatment panoramic radiograph showed unerupted maxillary third molar. B. Pre-treatment lateral cephalogram radiograph showed patient having protrusive maxillary incisor

Treatment was performed with non-extraction fixed orthodontics using a self-ligating system prescription (Damon Q Ormco, USA), utilizing extra radicular Temporary Anchorage Devices (TADs) at the infra zygomatic crest measuring 2 x 10 mm (Ormco, USA) for maxillary retraction, for overjet and interdigitation correction. Brackets were bonded according to the smile protection principle.

**Table 1**. Cephalometric Pre-Treatment and Post-Treatment Analysis

| Measurement | Normal | Pre Treatment | Post Treatment |
|---|---|---|---|
| **Skeletal Pattern** | | | |
| SNA (°) | 82±2 | 80 | 80 |
| SNB (°) | 80±2 | 78 | 78 |
| ANB (°) | 2±2 | 2 | 2 |
| Wits Appraisal (mm) | 1±2 | -2 | -2 |
| Angle of Convexity (°) | 0±8.5 | 4 | 3 |
| Y- Axis (°) | 59±6 | 70 | 66 |
| Facial angle (°) | 88±6 | 82 | 82 |
| **Dental Pattern** | | | |
| U1-NA (°) | 22±10 | 30 | 20 |
| U1-NA (mm) | 4±2 | 11 | 5 |
| U1-NB (°) | 25±10 | 36 | 36 |
| U1-NB (mm) | 4±2 | 8 | 8 |
| Interincisal angle (°) | 131±10 | 112 | 120 |
| **Soft Tissue** | | | |
| UL - E line | 2-3 mm behind E-line | 0 | 0 |
| LL - E line | 1-2 mm behind E-line | 1 | 0.5 |

The treatment started with extraction of 18 and 28 being done with initial levelling and alignment using the 0.014", 0.016", 0.014 x 0.025", 0.018 x 0.025" CuNiTi on the maxillary and mandibular arch. Following the initial phase of levelling and alignment, working archwires were placed in a maxillary arch with 0.019 x 0.025" SS and a mandibular arch with 0.016 x 0.025" SS.

Temporary Anchorage Devices (TADs) measuring 2 x 10 mm were placed in the zygomatic crestal bone in between the first and second maxillary molars on both sides (Figure 3), inclined at an angle of approximately 70 $^{o}$ and positioned 9 mm above the cemento-enamel junction. Hence, the recommended insertion angle as per the studies is between 55$^{o}$ – 70$^{o}$ (Figure 4).[16] The procedure of placing the IZC in this case was performed as follows (Figure 5).

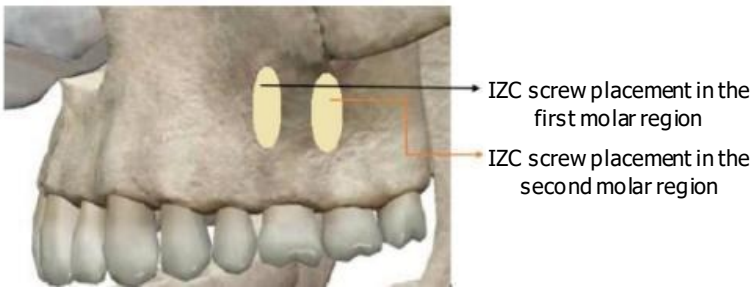


**Figure 3.** Sites for the placement of IZC screw[14]

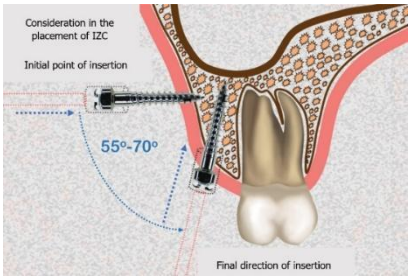


**Figure 4.** Consideration during the placement of IZC bone screws[13]


**Figure 5.** Insertion of Infra-Zygomatic Crest (IZC) bone screws measuring 2 x 12 mm. A. The self drilling screw was directed at 90° to the occlusal plane at this point. B. The bone screw driver direction was changed by 55°–70° toward the tooth, downward, which aid in bypassing the roots of the teeth and directing the screw to the infra-zygomatic area of the maxilla. C. The bone screw was screwed in till only the head of the screw was visible outside the alveolar mucosa.

A figure-of-eight steel ligature wire was used to form a unified framework connecting all maxillary teeth. The soldered hook measured 8 mm on the right side and 4 mm on the left side of the maxillary archwire, placed distally to the lateral incisor. The purpose of using different hook lengths was to generate the correct vector from the screws to the crimpable hook. In this case, the insertion height of the right and left screws were different.

After one month post TADs insertion, an elastomeric chain was attached from TADs to the hook, applying a force of 300 grams (10 oz) for distalization (Figure 6). Careful consideration of biomechanical factors ensured that the force vector's direction and height were maintained at or above the crest of the maxillary dentition. The treatment was continued for 9 months and overjet was corrected after 4 months of maxillary retraction. Class 2 elastics were used to maintain the proper relationship of the canines, molars, and interdigitation. The treatment outcomes obtained by that point are presented in the following results section.


**Figure 6**. The use of Infra-Zygomatic Crest (IZC) bone screws for maxillary retraction in both arches with 0.019 x 0.025" SS. Elastomeric chain was attached from TADs to the hook, applying a force for distalization. A and C Lateral view. B. Frontal view.

At the end of treatment an improvement was seen in dental parameters. Patient profile had no improvement with convex profile. No significant difference was observed before and after treatment, as retraction was performed exclusively on the maxillary arch, while no anterior retraction of the mandibular dentition was carried out, several studies and clinical trials have shown that these changes of soft tissue chin were mainly due to the redistribution or reshaping of the soft tissues around the chin area following the retraction of incisors.[17] Lower lip to E line decreased 0.5 mm and nasolabial angle normal decreased from $105^0$ to $102^0$.

Class I molar and canine relation was also achieved bilaterally with a good buccal inter-digitation from Class II molar and canine relation with a cusp to cusp interdigitation, with reduction in the increased overjet from 6 to 3 mm, and normal curve of Spee (Figure 7). Post treatment panoramic radiograph showed that the maxillary third molars on both sides had been extracted (Figure 8). Post treatment cephalometric radiograph, superimposed cephalometric radiograph (Figure 8 and 9) and cephalometric analysis (Table 1) readings suggested decrease in interincisal angle from $112^0$ to $120^0$, upper incisor inclination from $30^0$ to $20^0$, and the distance from I to NA reduced from 11 mm to 5 mm.

A Hawley retainer was used for the retention phase for both maxillary and mandibular arch, preserving stability following debonding. A major concern for patients was the length of the retention period. This phase, lasting 12 months, allowed for the stabilization of newly completed tooth movements during the healing process.[18] The patient reported to be very satisfied with the treatment outcome, particularly the normalization of the alignment of the upper teeth. She felt more confident when smiling.

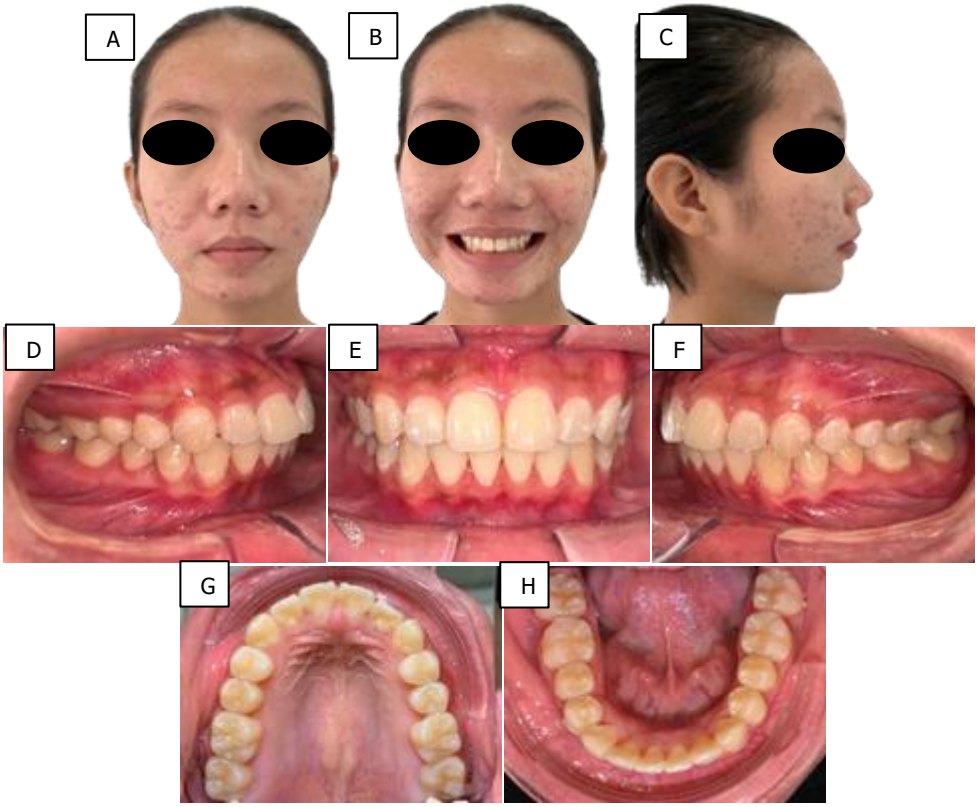


**Figure 7.** Post-treatment records. A-C The extra-oral photographs. D-F Intra-oral with lateral view showed canine and molar relation having class I angle malocclusion with good interdigitation cusp to fossa. G-H Intra-oral with occlusal view showed crowding having been corrected on both maxillary and mandibular arches.

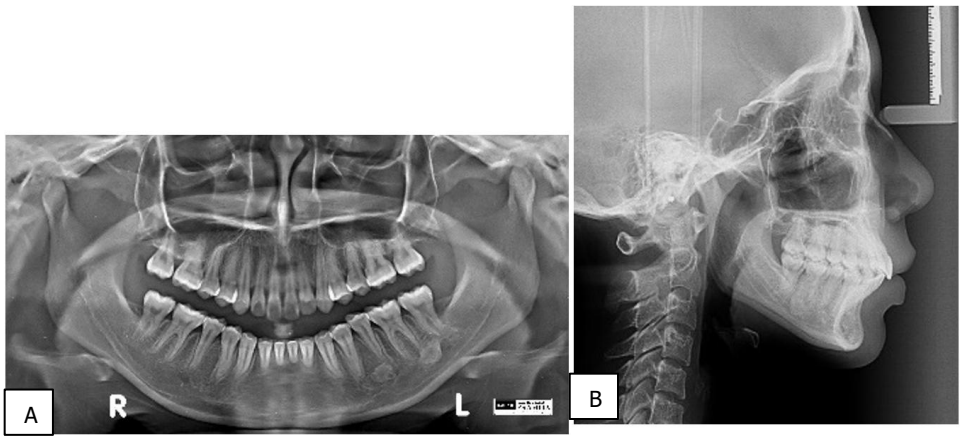


**Figure 8.** A. Post-treatment panoramic radiograph. B. Post-treatment lateral cephalogram radiograph.

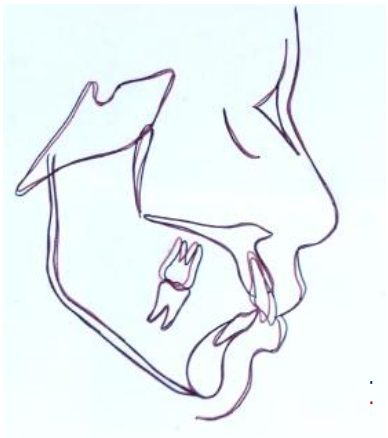


**Figure 9.** Superimpose Cephalometric Radiograph

## DISCUSSION

Facial aesthetics key concern for many patients receiving orthodontic treatment, and generally, facial appearance plays a crucial role in orthodontic diagnosis and treatment planning.[19] Aesthetic aspects refer to the alignment of the teeth and the improvement of the facial soft tissue profile.[20] Previous research has primarily explored the impact of facial features on aesthetics, focusing on factors such as the sagittal and vertical positioning of the maxilla and mandible, as well as the alignment of the anterior dentition, when the protrusion is not severe, patients are hesitant to consent to tooth extraction.[20,21] Upper molar distalization is a widely used treatment approach for correcting Class II malocclusion in non-extraction cases.

Many previous studies have examined the associated soft tissue changes, especially in the lips, after the extraction of four premolars.[22] However, most of these studies used the conventional anchorage system rather than a maximum anchorage system, such as the skeletal anchorage system. A few previous studies reported the use of maximum anchorage systems during the retraction of anterior teeth.[23] However, they mainly focused on the amount and not the type of retraction. The result showed significant differences in the hard and soft tissue changes of both treatments, especially in the region near the root apex of the upper and lower incisors. Camouflage treatment involves distalization achieved through skeletal anchorage.[22,24]

The IZC in the maxilla has shown success as an extra-alveolar site for skeletal anchorage in orthodontic procedures, such as total arch distalization in Class II correction.[22,25] The IZC is a bony ridge that follows the curvature between the alveolar and zygomatic processes of the maxilla..[26] A major limitation of intra-alveolar implant placement is the increased risk of root proximity, which can hinder the intended tooth movement and cause premature contact with the implant.[2] To address this challenge, placing implants in extra-alveolar regions, such as the IZC and Mandibular Buccal Shelf (MBS) bone screws, offers a beneficial solution.[27]

Recent studies reinforce the importance of biomechanical precision and anatomical assessment in IZC miniscrew placement. CBCT analyses show that insertion angulation and cortical bone thickness are key determinants of miniscrew stability. Steeper angulations provide greater cortical engagement, while optimal insertion zones must account for individual anatomical variability. These findings emphasize that IZC placement should be customized considering height, angle, and bone availability to minimize complications and enhance anchorage reliability.[28,29,30] A larger prospective study involving 25 patients treated with IZC miniscrews for total arch distalization reported an average distalization of approximately 4 mm, accompanied by molar intrusion, incisor retraction, and varying degrees of tipping. This differs from the present case, in which the force vector was carefully controlled by using different hook heights to minimize tipping

and promote more bodily tooth movement. Moreover, this case highlights the asymmetric placement of IZC screws and the subsequent biomechanical adjustments made to accommodate the patient's anatomical differences—an aspect not detailed in the larger-sample study. The success of en-masse maxillary retraction in this case depends on correct vector control, insertion angle, screw height, and force magnitude.[25,30] Power arms provide precise control, enabling orthodontists to apply regulated forces for optimal tooth movement.[2]

Class II correction using IZC-based full arch distalization demonstrated both dental and skeletal improvements, including reduced ANB angle and enhanced facial profile when combined with additional interventions. In contrast, the present case focused solely on dental camouflage in a skeletal Class I patient, resulting in good occlusal correction but no skeletal or facial profile improvement. The patient was highly satisfied with the treatment outcome, as the correction of her protrusive anterior teeth significantly improved her confidence. Limitation of this case is the absence of skeletal correction, which prevented any significant improvement in the patient's facial profile.

## CONCLUSION

Maxillary arch distalization use of infra zygomatic crest Temporary Anchorage Devices (TADs) as a skeletal anchorage in Class II malocclusion case was successfully conducted with non-extraction fixed orthodontic treatment. The implication of this case is that IZC screws provide effective extra-alveolar anchorage for maxillary retraction in Class II malocclusion, enabling successful non-extraction treatment with favorable clinical outcomes.

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5. Agarwal L, Singh K, Tandon R. Figure 1: Pre-treatment intra-oral and extra-oral photographs Figure 2: Pre-treatment lateral cephalogram and OPG Treatment of Class II Div 2 Malocclusion using PowerScope: A Case Report. Vol. 8, Orthodontic J of Nepal. 2018. https://doi.org/10.3126/ojn.v8i1.21352
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