

Maxillary En-Masse Distalization for Correction of Class II Malocclusion Using Infra-Zygomatic Crest (IZC) Bone Screws: A Case Report

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Abstract: **Objective:** To demonstrate the clinical effectiveness of infra-zygomatic crest (IZC) bone screws for en-masse distalization of the maxillary dentition in the correction of Class II malocclusion. **Case Description:** A 17 year old male presented with a Class II malocclusion, characterized by proclined upper incisors and increased overjet. The patient was diagnosed as having Skeletal Class II bases with maxillary excess, bilateral full cusp CI II molar relation, average growth pattern, proclined maxillary incisors, increased overjet, deep bite and protrusive upper and lower lips. The patient desired a non-extraction, esthetic treatment plan. En-masse distalization of the maxillary dentition was achieved using infra-zygomatic crest bone screws as extra-alveolar anchorage. **Treatment Progress:** Two IZC screws were placed bilaterally in the posterior maxilla. A pre-adjusted edgewise appliance (0.022" slot) was used, and distalizing force was applied with closed coil springs connected to a crimpable hook anterior to the canines. Maxillary molars and anterior teeth were moved distally as a unit. Treatment duration was 20 months. **Results:** Class I molar and canine relationships were achieved with improved incisor inclination and smile aesthetics with a balanced soft tissue profile. No significant root resorption or screw failure was observed. **Conclusion:** IZC bone screws provided effective skeletal anchorage for maxillary en-masse distalization, offering a non-extraction, compliance-independent option approach for Class II correction in adults.

Keywords: Temporary Skeletal Anchorage Devices (TSADs) Infrazygomatic Crest (IZC) bone screw, En-masse distalization Zygomatoc crest, Extra-alveolar (EA) implants, Class II Correction

1. Introduction

With an incidence rate of between 38% to 50%, Class II malocclusion is the most common skeletal malocclusion encountered clinically in modern orthodontics, negatively impacting patients' facial and dental aesthetics.¹ Traditionally, treatment modalities for Class II correction include extraoral appliances such as headgear, functional appliances in growing patients, or extraction-based mechanics in non-growing individuals. However, these methods often rely heavily on patient compliance or may involve undesirable loss of anchorage and increased treatment time.^{2,3} However the invention of Temporary Skeletal Anchorage Devices (TSADs), particularly Extra-alveolar (EA) implants like the Infrazygomatic Crest (IZC) bone screws, has led to a paradigm shift in the mechanics of orthodontic treatment by emerging as a viable alternative for achieving skeletal anchorage during the molar distalization process.⁴

Among various TAD insertion sites, the infra-zygomatic crest (IZC) region has gained popularity due to its dense cortical bone and relatively safe anatomical location for placement, allowing for effective maxillary molar

distalization and even en-masse retraction of the maxillary dentition.⁵ This has led to a high success rate of IZC implants (93.7%).⁶ Liou favours a more anterior placement, nearer the mesiobuccal root of the first molar tooth, while Lin proposes the first and second molar region for placement of IZC bone screws.⁷ Stainless steel (SS) measuring 2 x 12 mm is the preferred size and material for the IZC bone screw. To promote proper oral hygiene and prevent soft tissue irritation, a separation of five millimetres between the screw head and the supporting soft tissue is deemed appropriate.⁸ In order to achieve maximum buccal bone engagement, the IZC bone screw is inserted via a phase of cortical bone penetration with the implant tip perpendicular to the tooth's long axis. This is followed by a gradual orientation of the screw to approximately 55–70° inferior to the horizontal plane.⁶

2. Case Report

A 17 year old male patient reported with a chief complaint of forwardly placed upper teeth and unaesthetic smile. No significant medical history was ascertained while the patient had positive dental history of silver amalgam fillings in the lower molars. On extraoral examination, the patient had a

convex profile with acute nasolabial angle. The patient had normodivergent facial type and competent lips with no significant facial asymmetry.

Intraoral examination revealed bilateral full cusp Class II molar and canine relation. The maxillary and mandibular incisors were proclined. The patient had increased overjet of 8mm and deep overbite of 6mm, with coincident midlines. No temporomandibular joint pathology was detected. (Figure 1)

Pre-treatment panoramic radiograph revealed that temporomandibular joint (TMJ) of the patient was normal with bilaterally symmetrical condyles. The upper and lower third molars were erupting. The lateral cephalogram and cephalometric analysis showed an average growth pattern (Go-Me-FH = 30°), sagittal maxillary excess (SNA = 85°), orthognathic mandible (SNB = 81°), class II skeletal base (ANB = 4° and Wits Appraisal = +2 mm), proclined upper incisors (Upper Incisor to NA = 39°) and relatively proclined lower incisors (Lower Incisor to NB = 30°). Model analysis showed a Bolton's ratio with an excess of mandibular overall (5.6mm) and mandibular anterior (2.2mm) tooth material, respectively. (Figure 2)

Treatment objectives

Patient treatment objectives:

- 1) Achieve a balanced soft tissue profile and smile aesthetics
- 2) Improve incisor inclination and establish ideal overbite and overjet
- 3) Achieve Class I molar, canine and incisor relation
- 4) Distalize maxillary dentition en-masse by avoiding extractions and surgery

Treatment options

- 1) Premolar extraction: Orthodontic Camouflage treatment with extraction of maxillary first and mandibular second premolar teeth to end in Class I molar and canine relation.
- 2) Upper third molar extraction and en-masse distalization: Orthodontic Camouflage treatment with the extraction of maxillary third molars and en-masse distalization of maxillary arch with the aid of Infra-zygomatic Crest (IZC) bone screws in combination with the mandibular tooth material reduction (inter-proximal slicing or single incisor extraction).
- 3) Fixed functional appliance: Upper and lower premolar extraction followed by fixed functional appliance for Class II correction.
- 4) Premolar and single incisor extraction: Orthodontic Camouflage treatment with extraction of maxillary first premolars and lower single incisor to end in Class II molar relation with Class I canine relation.

Considering the soft tissue profile and desire for most conservative treatment, Option 2 was chosen as the treatment plan for the patient.

Treatment progress

Extraction of 18 and 28 was done, bands were placed on the upper and lower first and second molars. MBT 0.022"x0.028" slot metal bracket system from Aditek

Orthodontics™ – Vector was used. After initial leveling and alignment using sequential NiTi wires, 19x25 SS working archwires were placed in both arches. Two 2x12 mm stainless steel IZC bone screws from Bio-Ray® were placed in the zygomatic crestal bone between maxillary first and second molars under local anaesthesia. For the even distribution of applied forces, figure-of-8 steel ligature wire was used to span across all the maxillary teeth to form a single unit, Retraction force was applied using a NiTi coil spring of 9 mm length and a distalizing force of 300 grams (10 oz) was applied to the crimpable hook placed between lateral incisor and canine bilaterally to avoid gingival impingement. (Figure 3) To compensate for the mandibular tooth material excess and upright the mandibular incisors, proximal stripping was carried out. The en-masse distalization of all maxillary was completed in 8 months, with a total treatment period of 20 months.

Value	Pre-treatment	Current
SNA	85°	83°
SNB	81°	81°
ANB	4°	2°
GoGn to SN	27°	25°
FMPA	25°	25°
IMPA	99°	98°
UI to NA	39°	25°
LI to NB	30°	28°
INTERINCISAL ANGLE	108°	122°
UI TO SN	122°	108°
JARABAK RATIO	71.40%	69.80%
LAFH	54mm	56.5mm
S LINE U LIP L LIP	2mm 3mm	0mm 1mm
NASOLABIAL ANGLE	95°	106°

Treatment results

Post treatment records demonstrate that the treatment objectives have been accomplished. Extraoral photographs demonstrate an enhancement in facial aesthetics. The patient's chief complaint addressed as a consonant smile arc was attained and smile aesthetics were improved. The case was finished with a Class I incisor relationship with normal overbite and overjet. The midlines of the upper and lower teeth were coincident the end of the treatment.

Both the left and right buccal segments ended with symmetrical arch forms and a Class I molar, canine and incisor relationship. (Figure 3)

Posterior displacement of Point A and the reduction of ANB angle by 2° indicated a decrease in the sagittal skeletal disparity. Improvement in the axial inclination of upper and lower anterior teeth was achieved. Lateral cephalogram also reveals ideal inclinations of maxillary and mandibular incisors and Class I molar and canine relation with a straight balanced facial profile. (Figure 4)

3. Discussion

Facial esthetics is the paramount concern majority of the patients undergoing orthodontic treatment and usually, when the protrusion of the teeth is moderate, patients do not agree to the extraction of multiple upper and lower vital teeth. They are willing for extraction of third molars if necessary,

as they have minimal impact on aesthetics and function. This allows for distalization of the complete dentition via bone anchorage.⁹

The infrazygomatic crest region, buccal shelf area, and retromolar region all have dense cortical bone layers. Screws should be positioned away from the tooth root to avoid interfering with dental movements. The centre of resistance (Cres) of the maxillary dentition was found to be near to the centre of the premolar roots.¹⁰ Studies have shown that the IZC site can support significant orthodontic forces required for full-arch distalization.¹¹

En-masse distalization of the maxillary arch using IZC screws minimizes the treatment time compared to sequential distalization and allows for better control of the anterior-posterior and vertical dimensions. However, biomechanical considerations are critical. Force application from the IZC region results in a distal and intrusive vector, which can be favorable in cases with a gummy smile or increased overbite.¹² In the present case, this led to a simultaneous reduction in overjet and mild vertical control, improving both function and facial esthetics.

One of the main concerns with en-masse distalization is root resorption and anchorage loss. However, IZC screws have been shown to maintain stable anchorage throughout treatment with low failure rates.¹³ Additionally, patient comfort and acceptance of extra-alveolar TADs have been generally favorable, with most reporting mild discomfort

limited to the initial healing period.¹⁴

Limitations of this approach include the requirement of adequate buccal bone thickness and careful placement to avoid the maxillary sinus. CBCT imaging is recommended to evaluate anatomical structures prior to screw placement.¹⁵ In this case, pre-treatment imaging confirmed safe insertion zones, and no complications were observed.

In summary, the use of IZC bone screws for maxillary en-masse distalization presents a viable alternative to extractions or surgery in selected Class II patients. With proper case selection, biomechanics, and monitoring, this technique can achieve predictable and esthetic results.

4. Conclusion

The use of infra-zygomatic crest (IZC) bone screws for maxillary en-masse distalization offers a reliable, compliance-independent, and non-extraction approach for the correction of Class II malocclusion, particularly in adult patients. This technique provides effective anchorage control, allows for simultaneous retraction and intrusion of the maxillary dentition, and can significantly improve both occlusal function and facial esthetics. With appropriate case selection, careful biomechanical planning, and adherence to anatomical safety guidelines, IZC-based distalization represents a valuable modality in contemporary orthodontic treatment.





Figure 1: Pre-treatment extraoral and intraoral photos



Figure 2: Pre-treatment cephalogram and OPG

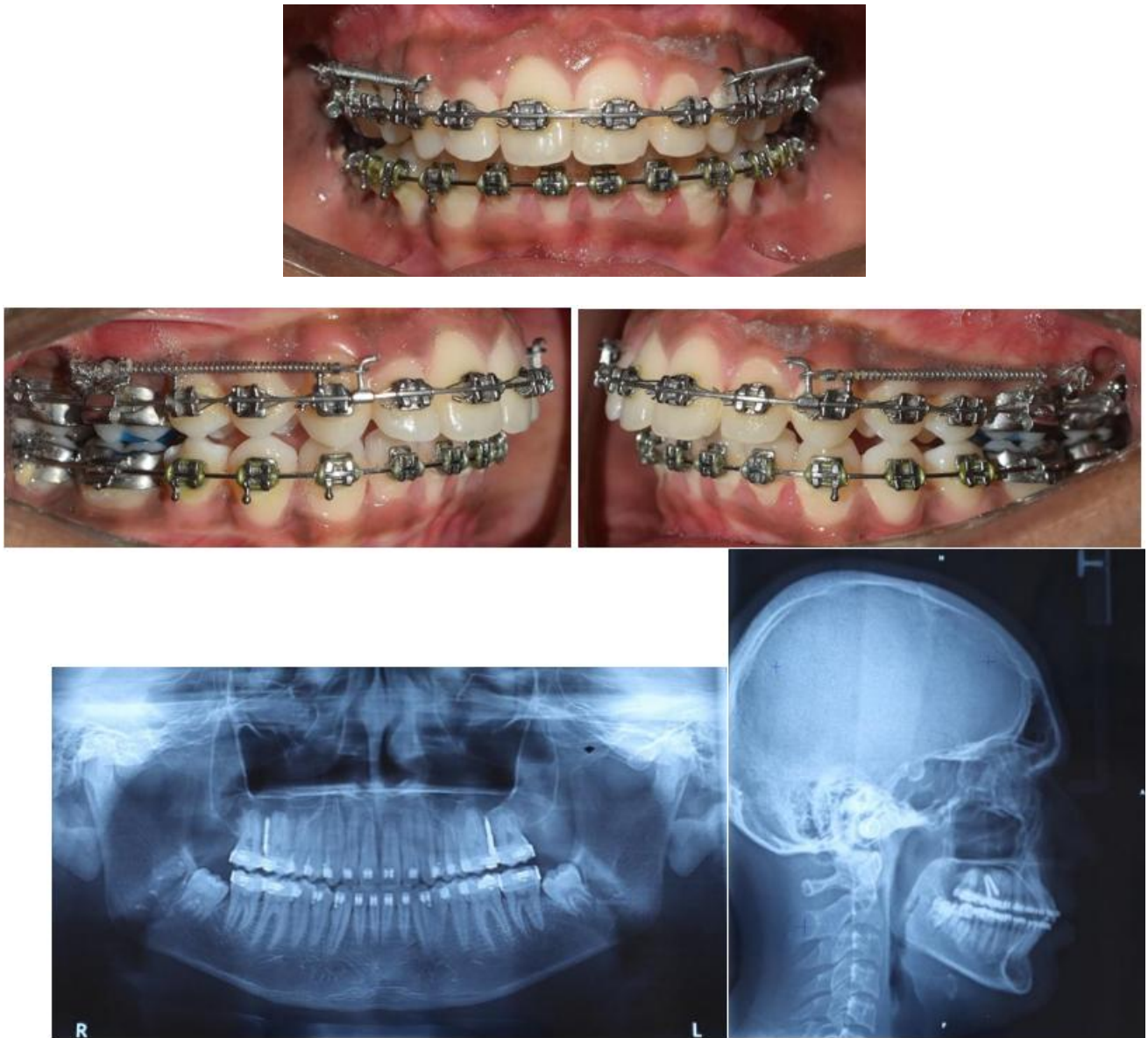


Figure 3: Mid-treatment with IZC screws and mechanics





Figure 4: Post-treatment extraoral and intraoral photos



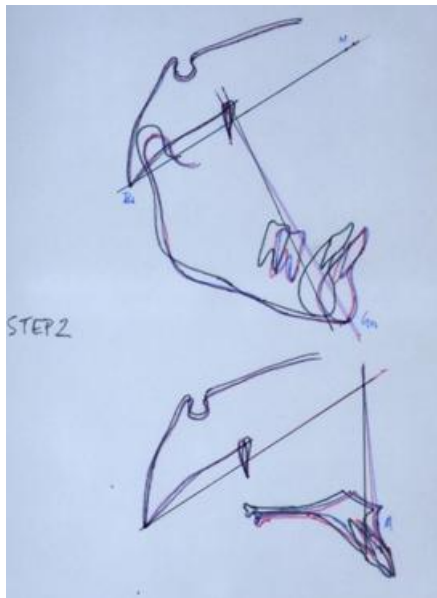


Figure 5: Post-treatment OPG, cephalogram, superimposition

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