

# Comparing the Efficiency of Infraczygomatic Crest (IZC) Implants and Conventional Method for Anterior Retraction in Class 2 Malocclusion Patients: A Prospective Analysis

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**Abstract:** *Background and Aim:* Modern procedures, such as maxillary arch distalization using mini - implants like infrazygomatic crest (IZC) implants, can yield improved outcomes. the purpose of this study was to compare the cephalometric parameters before and after treatment using IZC/buccal shelf (BS) screws and the traditional method of retraction. <sup>7</sup> Additionally, we aimed to evaluate the effectiveness of IZC screws in retracting teeth while preserving the arch length. **Material and Methods:** A split - mouth study was conducted with 20 patients at the Department of Orthodontics, NIMS dental college and hospital. The selection of cases was based on Class 2 malocclusion. Patients in the control group had class 2 malocclusion and willingly underwent extraction of their first premolar. IZC screws were utilized to facilitate distalization for the study group. Study models were created and radiographs of the individuals were taken six months after the retraction began. On the lateral cephalogram, several parameters were compared, including U6 to Ptm, upper lip to E - line, lip strain, LI - Apog, LI - NB (angular), LI - NB (linear), UI - SN, UI - NA (linear), and LI - NA (angular). To measure the length of the arch, a horizontal line was drawn connecting the mesial fossa of the first molars in the same arch. Additionally, a perpendicular line was drawn from the center of the two central incisors. **Results:** There was a significant difference in the measurements of UI - SN (degree), UI - NA, LI - Apog (in mm), and LI - NB (in mm) before and after treatment in the IZC group. There was a significant difference in the measurements of UI - SN, UI - NA (mm), LI - Apog (in mm), and LI - NB (in mm) before and after treatment in the IZC group. **Conclusion:** The effectiveness of IZC screws in en masse distalization and tooth retraction while maintaining arch length was found to be statistically significant, as shown by radiographic measures and cast measurements in the maxilla and mandible, when compared to conventional procedures.

**Keywords:** Buccal Shelf, Infraczygomatic Crest (Izc) Screws, Lateral Cephalogram, Malocclusion

## 1. Introduction

Using one or more miniscrews for absolute anchoring has become a common practice in orthodontics. Temporary anchoring devices, such as mini - implants, microscrews, and micro - implants, are commonly used in orthodontic treatment. Miniscrews are a cost - effective and user - friendly alternative to miniplates. While they may have some limitations in terms of force direction and intensity, they have gained popularity and can be easily placed by an orthodontist. <sup>1, 2</sup>

Mini - implants offer numerous benefits such as their smaller size, greater number of implant sites, easy placement without the need for full flap retraction, improved patient comfort, immediate loading without laboratory work, and simpler removal after therapy, and lower cost.

Orthodontic treatment for class 2 malocclusion typically involves camouflage treatment, which may include the use of techniques like en masse retraction and extra - or intra - oral distalization, along with the removal of the upper first premolars. Maxillary arch distalization is a popular choice for correcting class II malocclusion without the need for extraction. Headgear has long been used as a traditional approach to treat class II malocclusion by distalizing molars

or the entire maxillary dentition. Nevertheless, a significant drawback lies in the patient's adherence to the treatment. <sup>3, 4</sup>

Modern procedures, such as maxillary arch distalization using mini - implants like infrazygomatic crest (IZC) implants, can yield improved outcomes. IZC implants offer a secure and versatile option for implant placement, achieving an impressive success rate of 93.7%. With power arms, orthodontists can achieve precise tooth movement by using controlled forces for optimal results.

Therefore, it is important to assess how effective IZC implants are in retracting the maxillary and mandibular regions. <sup>5, 6</sup>

Teeth have garnered significant attention from clinicians and researchers as a result. Therefore, the purpose of this study was to compare the cephalometric parameters before and after treatment using IZC/buccal shelf (BS) screws and the traditional method of retraction. <sup>7</sup> Additionally, we aimed to evaluate the effectiveness of IZC screws in retracting teeth while preserving the arch length.

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## 2. Materials and Methods

A split - mouth study was conducted with 20 patients at the Department of Orthodontics, NIMS dental college and hospital. Prior to participating in the study, all subjects provided their informed consent for inclusion. The study was conducted in accordance with the Declaration of Helsinki and the protocol.

The selection of cases was based on Class 2 malocclusion. Patients in the control group had class 2 malocclusion and willingly underwent extraction of their first premolar. The study group included individuals who volunteered to have their third molar removed. The participants were divided into two groups based on the way they retracted. The treatment plan for the study group involved removing the third molars and using IZC screws to move the entire arch, while the control group's plan included extracting premolars and retracting the front teeth.

The study followed specific criteria for inclusion and exclusion, which are outlined below:

**Criteria for inclusion:** Individuals between the ages of 18 - 35 with class 1 malocclusion and bidentalproclination, as well as those with class 2 malocclusion who needed upper first premolar extraction for correction, were included in the study after providing consent.

**Criteria for exclusion:** Exclusion criteria for the study included individuals who were heavy smokers, had poor oral hygiene, and were diagnosed with periodontal disease.

The study was thoroughly explained to the participants, ensuring their understanding and obtaining their consent.

Various records were maintained for pre - treatment, such as imprints, lateral cephalograms, extra - and intraoral photos, and case histories. The participants were assigned to either the control or study groups based on the treatment plan. The treatment for the control group began with the removal of the premolar teeth and the attachment of orthodontic brackets to the upper and lower teeth. After aligning and leveling the teeth, the anterior teeth were retracted using a nitinol spring/E chain, which is a common approach. The study group underwent a series of treatments including leveling and aligning, extraction of third molars, IZC screw implantation, and retraction using E chain or closed coil spring.

Prior to the retraction phase of therapy, the study models were examined by collecting the participants' lateral cephalograms and imprints of the upper and lower arches. The lead investigator diligently reviewed all 20 individuals on a regular basis, ensuring their well - being and progresses were closely monitored. A standard 0.022 - inch bracket system was utilized to connect the two groups. The wires, made of NiTi and 19x25 SS, were progressively moved to

include 0.014, 0.016, 0.018, 16x22, 17x25, and 19x25 inches. The retraction phase of the SS wire started when it reached 19x25. In the control group, crimpable hooks were placed on both sides of the 19x25 SS archwire, between the lateral incisor and canine. The spring/E chains were then connected from the first molar teeth.

IZC screws were utilized to facilitate distalization for the study group. Topical anesthetic (2% lignocaine) was applied above the site of IZC screw placement. Shortly after, IZC screws measuring 2x12 mm were inserted into the infrazygomatic (IZ) region of the maxilla on both sides. In the maxillary first molar region, screws were placed in the specified area above the maxillary occlusal plane. At first, the entry was made at a 90° angle. However, after a few rotations, the angulation was adjusted to a 70° angle in order to protect the molar roots from injury, taking into consideration the maxillary occlusal plane. The crimpable rod effectively received the optimal orthodontic forces from the IZC screws.

Study models were created and radiographs of the individuals were taken six months after the retraction began. On the lateral cephalogram, several parameters were compared, including U6 to Ptm, upper lip to E - line, lip strain, L1 - Apog, L1 - NB (angular), L1 - NB (linear), U1 - SN, U1 - NA (linear), and L1 - NA (angular).

We evaluated the arch length of the research models using the following method: To measure the length of the arch, a horizontal line was drawn connecting the mesial fossa of the first molars in the same arch. Additionally, a perpendicular line was drawn from the center of the two central incisors.

## 3. Result

The cephalometric measurements and the cast measurements of both pre and post treatment of IZC and conventional groups were recorded. A comparison was made between the mean difference of the conventional and IZC groups using an independent t - test.

Table 1 presents the comparison of radiographic measurements before and after treatment with the IZC group. There was a significant difference in the measurements of U1 - SN (degree), U1 - NA, L1 - Apog (in mm), and L1 - NB (in mm) before and after treatment in the IZC group.

Table 2 presents a comparison of radiographic measurements before and after treatment in the conventional group. There was a significant difference in the measurements of U1 - SN, U1 - NA (mm), L1 - Apog (in mm), and L1 - NB (in mm) before and after treatment in the IZC group. The conventional group showed greater improvement in these measurements compared to the IZC group.

**Table 1:** Comparison of the radiographic measurements before and after treatment with the IZC group

Radiographic measurement		Mean	Standard Deviation	P value
U1 – SN	Pre	110	1.25	0.104
	Post	106	2.15	
U1 - NA	Pre	8.26	2.04	0.002
	Post	4.12	0.25	
L1 – Apog	Pre	5.87	1.05	0.004
	Post	3.65	1.06	
L1 - NB	Pre	8.25	1.25	0.002
	Post	6.32	0.14	

**Table 2:** Comparison of the radiographic measurements before and after treatment with the conventional group

Radiographic measurement		Mean	Standard Deviation	P value
U1 – SN	Pre	118.21	2.78	0.002
	Post	103.87	3.69	
U1 - NA	Pre	10.13	2.04	0.003
	Post	6.87	0.98	
L1 – Apog	Pre	8.23	3.55	1.504
	Post	4.65	0.54	
L1 – NB	Pre	12.59	4.25	0.002
	Post	8.54	3.54	

#### 4. Discussion

For many years, anchorage has been a daunting aspect of orthodontics. Anchorage is a crucial factor that greatly impacts the treatment approach and ultimate outcome. Various anchoring techniques have been suggested, including extra - oral anchorage, the utilization of opposing anchors, and the addition of more teeth in anchor units. However, these methods can have negative side effects and require patients to be diligent in following instructions. Nevertheless, the application of extra - oral anchorage poses a challenge and may lead to injury, thus making it challenging for patients to adhere to the recommended treatment.<sup>8,9</sup>

Kanomi developed MS as TADs to address patient compliance issues, particularly with anterior tooth retractions. Nevertheless, the placement of interradiolar (IR) MS between roots can lead to notable rates of failure, disrupt tooth mobility, and cause interference with nearby roots.

Several areas outside the alveolar region, such as the sublingual fossa, canine and incisive fossa, anterior external oblique ridge (AEOR), retromolar area, and premaxillary and mid - palatal region, can be used for TAD implantation. Our investigation is focused on the IZ region, which is an extra - alveolar site.<sup>10</sup>

When utilized as a site for skeletal anchoring in orthodontic procedures like maxillary canine retraction and anterior retraction, the IZC in the maxilla has shown to be effective. This study aims to assess the effectiveness of IZC screws in tooth retraction, while also preserving arch length, by comparing them to traditional retraction techniques.

In the above study, the pretreatment records showed a significant difference in the U1 - SN (degree), L1 - Apog (in mm), and L1 - NB (in mm) measurements in our investigation. However, the values for all other

measurements in the conventional and IZC groups were statistically identical. Due to the extraction of the first premolars instead of the third molars, and the process of distalization, the conventional group showed superior performance in these metrics compared to the IZC group. Furthermore, the IZC group showed significant improvements in cephalometric parameters such as U1 - SN (degree), L1 - Apog (in mm), and L1 - NB (in mm).

#### 5. Conclusion

The effectiveness of IZC screws in en masse distalization and tooth retraction while maintaining arch length as found to be statistically significant, as shown by radiographic measures and cast measurements in the maxilla and mandible, when compared to conventional procedures. Additional clinical research on IZC screws is necessary to validate our study's findings.

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