

# Management of Bimaxillary Protrusion with Mini Screw Assisted Distalization

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## ABSTRACT

Moderate and severe bimaxillary protrusion impair the passive lip sealing, facial and smile esthetics, creates negative impact on psychology and affects the overall quality of life of an individual. The extraction of premolars can be avoided by the use of skeletal anchorage to do en masse distalization of both dental arches. This approach brings many advantages such as: prevents premolars extraction; simplifies orthodontic mechanics; there is no volume reduction of a premolar when smiling; control of overbite and gingival exposure. The inter radicular mini screws are indicated for mild cases of bimaxillary protrusion, while extra-radicular mini screws may be indicated for more moderate to severe cases. This Case Report attempts to present a case of a 19 year old female patient with skeletal class III malocclusion and bimaxillary protrusion who was successfully treated with extra-radicular mini screws (IZC and Buccal shelf mini screws).

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## INTRODUCTION

Individuals who have dentoalveolar bimaxillary protrusion typically exhibit lip protrusion along with an increase in incisor inclination. This can lead to lip incompetence and muscular imbalance [1, 2]. Proper lip placement and shape is one of the prerequisites for having a beautiful facial aesthetics. In bimaxillary protrusion, retraction of the incisors reduces their inclinations and improves the soft tissues changing the profile. The degree of anterior teeth retraction and lip movement are critical indicators of how the facial profile will change following orthodontic treatment. Often, extractions of first premolars are indicated to provide space for anterior retraction and improve the inclination of incisors in their bony bases. Temporary Anchorage Devices (TADs) such as miniscrews or miniplates, can offer an excellent anchorage option for full retraction of the entire arch to correct crowding or protrusion [3-5].

Orthodontic miniscrews have made treatments more effective and predictable by allowing for the promotion of tooth movements supported on fixed points in the oral cavity while minimizing undesirable side effects. It Encourages patients to comply with treatment plans and streamlining orthodontic procedures [6, 7]. With orthodontic miniscrews, there are unique advantages for treating mild to moderate bimaxillary protrusion. For example, the entire arch can be retracted to lessen incisor inclination, which lowers the likelihood of premolar extractions. Correction of mild bimaxillary protrusion can be achieved by full retraction of the arches in a single stage, using inter radicular miniscrews, which are placed in the region between first molars and second premolars. This positioning between the roots limits the amount of retraction, due to the little space available between roots in this area. Retraction in correction of more severe bimaxillary protrusion can also be accomplished by two-stage retraction using inter radicular miniscrews. Using this tactic, the screws are replaced and positioned farther away when the second premolar root approaches the screw body. To create more room for larger retractions, different locations for miniscrew implantation have been explored, such as the area between the first and second molars or distal to the lower second molars [8]. A screw placement

technique was presented by Liou et al. in 2007 and Lin for the Infrazygomatic Crest (IZC), which is located in the buccal region of first molars and distal to first molar (Lin protocol). In order to achieve complete retraction of the maxillary arch in a single stage, these authors proposed a more inclined placement of the miniscrew with the mesiobuccal root of the upper first molar, allowing greater sagittal correction without interference from the screw body [9]. In 2008, Villela et al. used a titanium miniscrew in the region between upper first and second molars, with greater inclination in their placement, aiming at keeping the screw body away from the molar roots, which allowed greater retraction of the upper arch in a single stage [10].

Employed distalization and retraction mechanics of the entire arch in a single stage to apply extra-radicular stainless steel screws, larger in diameter and length, in denser cortex areas, both in the infrazygomatic crest region and in the mandibular buccal shelf. By compensating for bimaxillary protrusion and Class II and Class III malocclusions, this technique can lessen the indication that an extraction is necessary [11-13]

This article consists of the case report of a 19 year old female who presented skeletal class III with orthognathic maxilla and prognathic mandible, whose primary treatment plan for fulfilling the treatment objectives was fixed orthodontic therapy in conjunction with IZC and Buccal shelf miniscrews to correct bimaxillary protrusion.

**Case Description**

A 19-year-old female patient reported to our department with the chief complaint of forwardly placed upper and lower front teeth. The patient’s medical history revealed no systemic diseases that would interfere with orthodontic treatment.

**Extra-Oral Examination**

On extraoral examination, the patient presented a convex profile, straight divergence with a positive lip step, and competent lips. Also revealed sufficient display of incisors.

**Intra-Oral Examination**

Patient’s intraoral examination revealed class III molar relationship on Right and Class I molar on Left with the overjet of 1 mm with mild lower anterior crowding (Figure 1).

**Cephalometric Examination**

The cephalometric analysis confirmed the Class III malocclusion with orthognathic maxilla with SNA of 81 ° and prognathic mandible with SNB of 84 °, ANB of -3 °. Average growth pattern with mandibular plane angle of Go-Gn-SN of 28 ° and inclination angle was 82 °. The patient had proclined maxillary and mandibular incisors, U1 to SN was 123 ° and IMPA was 105 ° (Table 1) (Figure 2).

**Treatment Objectives**

1. To level and align arches
2. To correct upper and lower incisor proclination
3. To attain an ideal overbite and overjet
4. To attain class I canine and molar relation
5. To attain a pleasing profile and smile

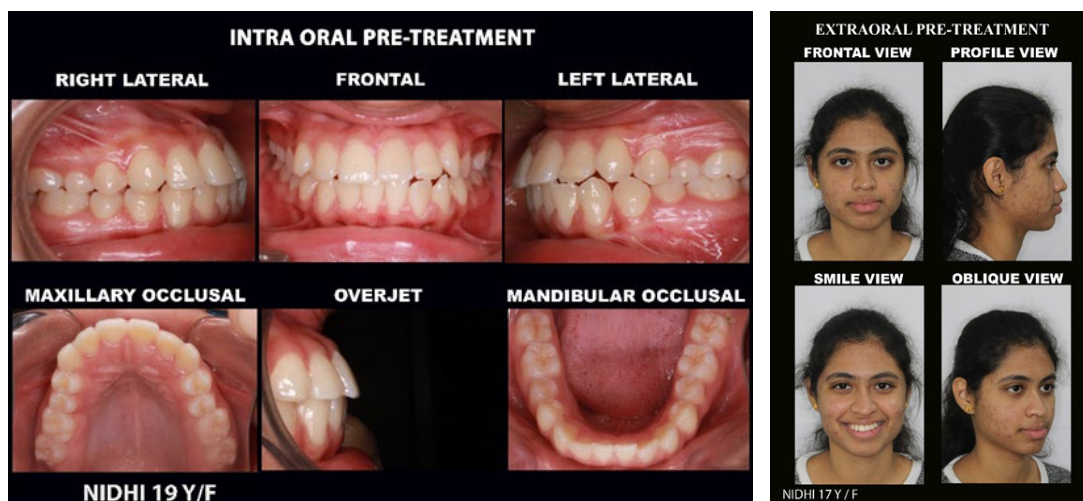


Figure 1: Pretreatment Extra oral and intra oral photographs.

Table 1: Showing pretreatment and post cephalometric values.

PARAMETER	PRE-TREATMENT	POST- TREATMENT
SNA	81 °	81 °
SNB	84 °	83 °
ANB	-3 °	-2 °
Go-Gn-SN	28 °	27 °
UI- SN	123 °	120 °
IMPA	105 °	98 °
INCLINATION ANGLE	82 °	81 °
UI-NA (Degrees/mm)	38 ° /9 mm	36 ° /8 mm
LI-NB (Degrees/mm)	37 ° /8 mm	29 ° /6 mm
Inter-incisal Angle	104 °	110 °
Upper lip- E- line	+1mm	0mm
Lower lip- E-line	+3 mm	+2 mm
Nasolabial angle	83 °	87 °

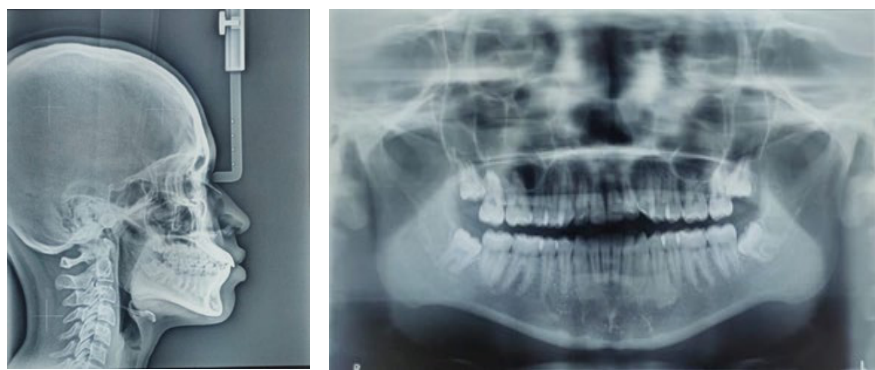


Figure 2: Showing Lateral cephalogram and OPG radiographs.

### Treatment Alternatives

Different treatment plans such as 4 bicuspid extraction, miniplate supported distalization and orthognathic surgery was proposed to the patient.

### Treatment Progress

As the patient opted for treatment with fixed appliance therapy with extra alveolar screws, treatment plan was discussed with the patient and informed consent was obtained. The treatment plan included a non-extraction treatment with initial levelling and alignment of arches followed by the application of a IZC and Buccal shelf mini screws to correct the dental sagittal discrepancies. Maxillary and mandibular arches were bonded using .022 slot pre-adjusted edgewise MBT appliance prescription. Initial levelling and alignment were done in both the arches with 0.14 NiTi wires in the upper and lower arch followed by 0.016 NiTi, 0.018 S.S, 17 × 25 NiTi and 19× 25 S.S. IZC and Buccal shelf bone screws were installed and were loaded after a week with NiTi closed coil spring delivering a force of 200g. The distalization was carried out for a period of 6 months to achieve bilateral class I molar relation with ideal overjet

and overbite. After the distalization 0.014 S.S wires were placed in upper and lower arches and settling elastics were started. Post-distalization cephalometric analysis revealed an improved ANB angle of 3° and reduced skeletal convexity. There was a dramatic improvement in the profile of the patient with the achievement of towards ideal dental relations, Class I molar relationship bilaterally at the end of the treatment. The overall treatment duration was 16 months. In retention phase, an upper essix retainer and a lower canine to a canine fixed lingual bonded retainer was given (Figure 3).

### Treatment Result

A 2 mm overjet was maintained after 16 months of active orthodontic treatment. Soft tissue and skeletal relationship were improved. Post-orthodontic cephalometric analysis showed that the ANB had decreased by 1 °. Mandibular plane angle (GoGn-SN=27 °) was slightly decreased by 1 °. The maxillary incisor inclination was decreased (U1-SN by 3° from pre-treatment values) mandibular incisor inclination was decreased (IMPA by a 7° from pre-treatment values) (Figure 4).

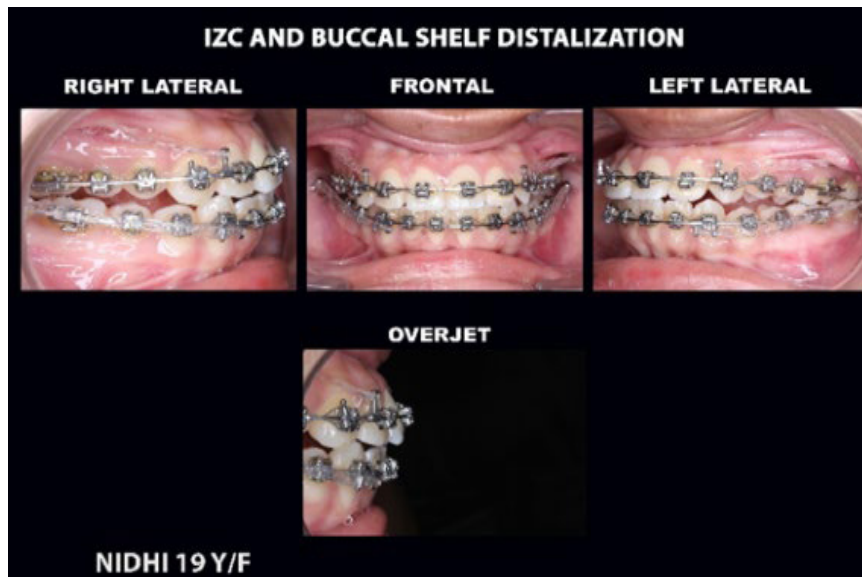


Figure 3: Showing IZC and Buccal shelf distalization.

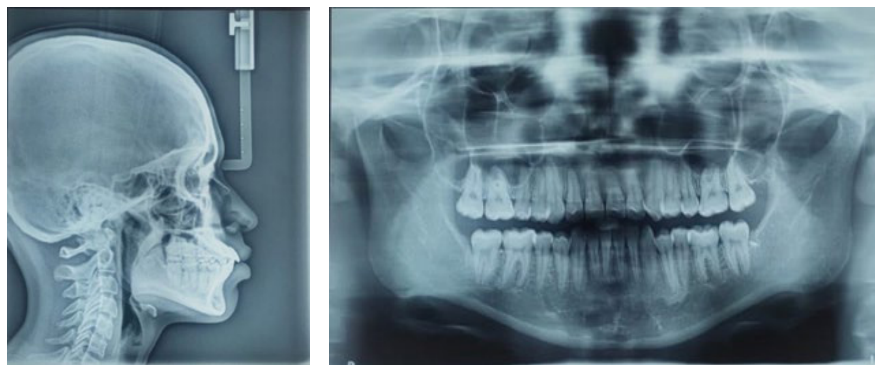


Figure 4: Post treatment lateral cephalogram and OPG.

## DISCUSSION

This case demonstrates the clinical application of IZC and Buccal shelf mini screws in the treatment of a 19-year-old female patient with bimaxillary protrusion. In the present clinical case, we decided to perform retraction of both arches, with the aid of orthodontic screws instead of extracting four premolars. This is an excellent treatment option, since it does not reduce the volume of first premolars in the arches, maintaining the transverse volume of smile and avoids disch-in appearance. Ong and Woods (2015) report that the average reduction in arch perimeter following premolar extractions was 11.3 mm [14]. Nonetheless, prior research by Bishara and Bowman has demonstrated that these extractions should be recommended when crowding is linked to dental protrusions [15, 16]. The process of distalizing the dental arch involves the use of intra-radicular and extra-radicular mini screws to efficiently accomplish

this orthodontic procedure. In cases with mild bimaxillary protrusion, inter-radicular mini-screws are especially beneficial for providing anchorage due to the limited space between the roots. By strategically adjusting the position of these screws, the degree of retraction can be enhanced, facilitating distalization of the arch and achieving greater movement in the desired direction. In orthodontics, when correcting mild to moderate bimaxillary protrusion without premolar extractions, extra-radicular mini-screws offer a crucial anchorage solution. This method negates the need to adjust screw positioning during distalization, simplifying the treatment. Extra-radicular miniscrews are highly effective in stabilizing and supporting tooth movement, particularly for protrusion correction.

In our case, the extent of retraction was determined by the duration of the mechanics' operation, as the screw body did not obstruct root movement.

It took six months to fully retract the arches and correct the bimaxillary protrusion. To maintain a proper vertical relationship with the lips during upper incisor retraction, an intrusion component was necessary. Additionally, extruding the lower incisors improved the overbite. Knowledge and proficiency in biomechanics are essential when using skeletal anchorage to achieve consistent and desired outcomes.

In our case, the degree of incisor retraction and lip thickness influenced the resulting facial aesthetics. Using skeletal anchorage for total arch retraction without extractions, we achieved up to 1 mm of upper incisor retraction and 2 mm of lower incisor retraction, which enhanced both dental and facial aesthetics. This approach demands specialized knowledge from the professional for biomechanics control and placement. Moreover, the invasiveness of using mini-screws might make patients more resistant to this treatment. While this method reduces the need for first premolar extractions, it requires space distal to the second molars for total arch retraction, often necessitating the extraction of third molars. This is usually better accepted by patients as it does not compromise aesthetics and their removal is often indicated. Therefore, the careful placement and management of mini-screws are crucial for the success of orthodontic treatment, allowing precise control over distalization and retraction. By optimizing screw positioning, orthodontists can tailor treatment plans to meet each patient's specific needs, ensuring optimal results in arch alignment and overall dental function. This innovative use of mini-screws significantly enhances the effectiveness and efficiency of orthodontic procedures aimed at correcting malocclusions and improving oral health [17].

### CONCLUSION

In this case report, a patient with bimaxillary protrusion was treated using IZC AND Buccal shelf mini screws for en masse distalization of the teeth as an alternative to the extraction of premolars and Orthognathic surgery. The treatment method was effective in reducing the proclination of anteriors and helped the patient achieve good facial esthetics at the end of the treatment.

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