



# Case Report

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# Orthodontic Correction of Skeletal Class II Anterior Open Bite: Non-Surgical Approach- A Case Report

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# Abstract

The treatment of skeletal anterior open bite, especially when compounded by posterior dentoalveolar excess, poses a significant orthodontic challenge. This abstract explores a novel approach employing a combination of Capsplint and Intra-Zygomatic Crest implants (IZC) to address the anterior open bite while facilitating posterior segment correction and autorotation of the mandible. In cases where traditional methods may fall short, this integrated technique aims to provide comprehensive solutions. The Capsplint, acting as an orthodontic splint, contributes to stabilizing the anterior bite while facilitating controlled tooth movement. Simultaneously, the application of Infra zygomatic implants in the posterior segment aims to achieve efficient skeletal correction by promoting selective alveolar bone remodeling. This dual intervention not only targets the primary concern of skeletal anterior open bite but also addresses associated posterior dentoalveolar excess. The incorporation of Capsplint and IZC reflects a nuanced approach, recognizing the interplay between skeletal and dental components. By synergistically managing the anterior and posterior aspects, the treatment endeavors to achieve not only closure of the open bite but also optimal autorotation of the mandible, thereby offering a comprehensive solution to a challenging orthodontic condition.

**Keywords:** Skeletal Anterior Open Bite, Capsplint, Intra-Zygomatic Crest impants(IZC), Posterior Dentoalveolar Excess, Autorotation of Mandible.

# INTRODUCTION

The origin of anterior open bite is typically complex, involving a blend of skeletal, dental, and functional factors. Potential contributors encompass unfavorable growth patterns, digit-sucking habits, enlarged lymphatic tissue, hereditary influences, and oral functional matrices <sup>[1]</sup>. The primary indicators of anterior open bite commonly involve incisor protrusion and over-eruption <sup>[2]</sup>. Additional characteristics may include excessive gonial, mandibular, and occlusal plane angles, a brief mandibular body and ramus, heightened lower anterior facial height, diminished lower posterior facial height and upper anterior facial height, a retrusive mandible, a tendency towards Class II malocclusion, divergent cephalometric planes, a steep anterior cranial base, and insufficient lip seal <sup>[3]</sup>. Some investigations have identified a correlation between weak orofacial musculature and an elongated face, leading to the development of anterior open bite <sup>[4]</sup>.

Correcting skeletal anterior open bite poses a considerable challenge in orthodontics. In severe cases among adults, the typical course of treatment often involves surgically repositioning the maxilla or mandible <sup>[5]</sup>. However, in instances where a patient opts against surgery, alternative approaches come into play. These may include extraction treatment, molar intrusion with skeletal anchorage, the application of a vertical-pull chin cup, multiloop edgewise archwire (MEAW) therapy, or the use of nickel-titanium archwires in conjunction with intermaxillary elastics <sup>[6]</sup>. While extrusion or eruption of anterior teeth is a widely used technique for bite closure, studies by Reitan and Rygh highlight that extruded anterior teeth tend to exhibit less stability compared to intruded teeth <sup>[7]</sup>. Their findings underscore the potential challenges associated with the stability of teeth subjected to extrusion. Additionally, the extrusion of maxillary anterior teeth could potentially compromise facial aesthetics, particularly in cases involving patients with a gummy smile <sup>[8]</sup>.

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# CASE REPORT

A 22-year-old adult female presented with skeletal Class II malocclusion, severe anterior open bite, and posterior dentoalveolar excess. She exhibited end-on canine and molar on the right side, and Class II canine and molar on the left side, along with a convex profile, acute nasolabial angle, and deep mentolabial sulcus. She displayed excessive incisor exposure at rest and during smiling, increased lower anterior facial height, and incompetent lips.

Based on the extent of her malocclusion, surgical intervention involving Le Fort I vertical impaction, anterior maxilla osteotomy, and bilateral sagittal split osteotomy (BSSO) mandibular advancement was recommended. However, the patient opted for a non-surgical approach. Consequently, treatment proceeded with extraction of all first premolars and third molars, along with the fabrication of an acrylic capsplint with a tongue pad. Additionally, intrusion of the upper posterior segment using temporary anchorage devices (TADs) was planned to facilitate closure of the open bite and autorotation of the mandible.

# Section 1: Pretreatment assessment

Initial - SA

Sex- Female

Chief Complaint- Patient complains of gap in the front teeth

# Clinical Examination: Extra oral features (Figure 1)

Mesocephalic head and mesoprosopic face, convex profile, incompetent lips, Increased lower anterior facial height.

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Intra oral	features:	(Figure	2)
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Teeth present	18,17,16,15,14,13,12,11	21,22,23,24,25,26,27,28
48	3,47,46,45,44,43,42,41, 31,	32,33,34,35,36,37,38

Molar relation: Class 2 on both sides

Canine relation: Class 2 on both sides

Incisor relation: Anterior openbite

Decayed: 44

Crowding: 12, 31, 32, 33, 41, 42, 43

#### Soft tisue examination:

Incompetent lips, Convex profile, Hypotonic upper and lower lip, Interlabial gap of 7mm, Acute nasiolabial angle

#### General radiographic examination:

The normal complement of permanent teeth was present with no abnormalities in the surrounding structures and regions. Third molars were present in all quadrants. The alveolar crestal bone level of the present teeth was within the normal limits of the Cemento-Enamel Junction (CEJ).

# Cephalometry analysis: (Figure 3)

# A) Skeletal assessment:

Cephalometric analysis revealed a severe skeletal Class II malocclusion based on an ANB angle of 10° and a Wits appraisal of 11mm. This was attributed to a retrognathic mandible with an SNB angle of 73° and a

prognathic maxilla with an SNA angle of 84° relative to the cranium. Additionally, this condition was complicated by a hyperdivergent growth pattern, with a Frankfort-Mandibular Plane Angle (FMA) of 42° and a Bjork sum of 408.

#### B) Dental assessment:

The upper and lower incisors were found to be proclined, as indicated by an interincisal angle of 97°, an IMPA of 96°, and a U1-NA angle of 33°.

#### Soft tissue assessment:

The lips were protruded, with the upper lip to E plane measuring 6mm and the lower lip to E plane measuring 10mm.

#### **Treatment objectives:**

- 1. The correction of Skeletal Anterior Open Bite entails achieving closure of the anterior open bite by intruding the maxillary and mandibular dentition. This aims to correct the vertical discrepancy between the maxilla and mandible, establishing a harmonious occlusion.
- 2. Reduction of Posterior Dentoalveolar Excess involves intruding the posterior teeth to alleviate dentoalveolar excess and enhance the overall occlusal relationship. This process aims to create a more balanced occlusion by reducing the overgrowth of posterior teeth and supporting alveolar bone.
- 3. Improvement of the Facial Profile addresses the convex facial profile by achieving appropriate vertical and horizontal positioning of the maxilla and mandible. This aims to enhance facial aesthetics by establishing balanced facial proportions and reducing the prominence of the convex profile.
- 4. Achievement of Lip Competency focuses on improving lip competence by correcting the underlying skeletal discrepancy and establishing proper dental occlusion. This ensures adequate lip support and closure, enhancing both facial aesthetics and functional outcomes.
- 5. Stabilization of Orthodontic Results is crucial for maintaining the long-term stability of achieved occlusal and skeletal corrections. This involves implementing appropriate retention protocols to prevent relapse, including monitoring occlusal changes and making necessary adjustments to retainers or other retention appliances.
- Enhancement of Functional Occlusion aims to establish a stable and functional occlusion by optimizing the interdigitation of the dental arches. This helps improve masticatory efficiency and reduces the risk of temporomandibular joint (TMJ) dysfunction or other functional complications.
- 7. Minimization of Treatment Duration and Discomfort is achieved by utilizing a non-surgical approach with a skeletal anchorage system. This strategy aims to reduce treatment duration and discomfort, enhancing patient satisfaction and compliance through a minimally invasive treatment modality.

#### Treatment Plan and progress: (Figure 4,5,6)

- 1. Initially, extractions of the first premolars and third molars were performed.
- 2. Bonding was carried out on the upper and lower arches using ceramic 0.22 slot brackets.

- 3. A segmental mechanics approach was adopted.
- 4. An acrylic cap splint with a tongue pad was affixed using Glass lonomer Cement (GIC) for posterior intrusion.
- 5. Intraosseous Zygomatic Crest (IZC) implants were surgically placed.
- 6. Treatment commenced with 0.014 nickel-titanium (NiTi) arch wires segmented in the upper arch and a continuous arch wire in the lower arch.
- 7. Posterior intrusion was facilitated using elastomeric chains engaged from the IZC implant heads to hooks on the cap splint.
- 8. Wire progression proceeded up to 19x25 stainless steel (SS) wires, and elastomeric chains were employed from the IZC implant heads to hooks between the lateral and canine in the upper arch to achieve clockwise rotation of the maxilla, involving posterior intrusion and anterior extrusion.
- 9. Mini implants were inserted in the lower arch between the first and second molars, followed by the use of a segmental rectangular 17x25 SS wire for molar intrusion.
- 10. Anterior box elastics and settling elastics were applied.
- 11. Debonding was performed, and lingual fixed bonded retainers were installed, along with Essix retainers
- 12. End of treatment Incisor relation was Class I, Molar relation Class I, Canine relation Class I.
- 13. Post debonding OPG, Lateral ceph records were taken and superimposition was done.
- 14. Since we did camouflage treatment as patient requested, results were limited with profile but patient had satisfaction with results.

# DISCUSSION

The successful non-surgical correction of severe skeletal anterior open bite presented in this case demonstrates the efficacy of a treatment strategy led solely by the orthodontist, emphasizing the utilization of a skeletal anchorage system for optimal outcomes.

*Orthodontist-Led Treatment Strategy:* The orthodontist played a central role in diagnosing, planning, and executing the treatment for the severe skeletal anterior open bite. This approach underscores the orthodontist's expertise in managing complex malocclusions and utilizing innovative techniques to achieve desired results<sup>[9]</sup>.

*Utilization of Skeletal Anchorage System:* The decision to employ a skeletal anchorage system, consisting of IZC implants and mini screws, enabled precise control over tooth movement without the need for surgical intervention. By leveraging skeletal anchorage, the orthodontist effectively addressed the vertical discrepancy and achieved successful closure of the anterior open bite <sup>[10]</sup>.

Advantages of Non-Surgical Intervention: Non-surgical correction of severe skeletal malocclusions offers distinct advantages, including reduced treatment complexity, avoidance of surgical risks, and enhanced patient comfort. In this case, the non-surgical approach provided a viable alternative to traditional orthognathic surgery, resulting in shorter treatment duration and improved patient satisfaction<sup>[11]</sup>.

*Patient-Centered Care:* The treatment plan reflects a patient-centered approach, tailored to meet the specific needs and preferences of the individual. By offering a non-surgical option, the orthodontist prioritized the patient's concerns while still achieving optimal functional and aesthetic outcomes<sup>[12]</sup>.

Long-Term Stability and Monitoring: Close monitoring and long-term follow-up are essential to ensure the stability and success of the treatment outcome. The orthodontist will continue to assess the patient's occlusion, facial aesthetics, and functional outcomes over time, making any necessary adjustments to maintain the achieved results and prevent relapse <sup>[13]</sup>.

*Clinical Considerations and Limitations:* While the non-surgical approach proved effective in this case, it's important to acknowledge that not all patients with severe skeletal malocclusions may be suitable candidates for non-surgical correction. Careful patient selection and assessment of treatment feasibility are essential to ensure optimal outcomes and minimize potential limitations <sup>[14,15]</sup>.



Figure 1: Pre treatment- extra oral and intra oral photographs





# Figure 2: Orthopantomogram and lateral cephalogram

	Mean	S.D.	Result	Severity	Polygonal chart	Meaning
SKELETAL					$\wedge$	
SNA	81.08	3.7	84.20		70 75 80 85 90	Normal A-P position of maxilla
SNB	79.17	3.8	73.51		70 75 80 85 90	Retruded mandible
ANB	2.46	1.8	10.69	***	-10 -5 0 5 10 15	Skeletal Class II
Bjork sum	397.16	3.6	408.48	***	390 395 400 405	Hyperdivergent Skeletal Pattern
FMA	25	4.0	42.74	***	10 20 30 40	Hyperdivergent facial pattern
Gonial angle	124.31	5.4	132.42	•	115 120 125 130	Obtuse gonial angle
APDI	85.74	4.0	65.19	***	70 80 90 100	Skeletal Class II
ODI	72.15	5.5	67.35		65 70 75 80	Normal ODI
Combination factor	157.9	6.5	132.54	***	140150160170180	Small combination factor value
A to N-Perp(FH)	0.4	2.3	-0.06		10 5 0 5 10	Normal A-P position of maxilla
B to N-Perp(FH)	-3.5	2.0	-18.22	***	-15-10 5 0 5 10	Retruded mandible
Pog to N-Perp(FH)	-1.8	2.5	-23.74	***	20 -10 0 10 20	Retrudest chin point
FH to AB	81	3.0	67.55	***	70 75 80 85 90	Silveietal Class II
A-B to mandibular plane	69.3	2.5	69.71		60 65 70 75 80	Normal AB to mand. plane angle
Wits appraisal	-0.33	2.7	11.16	***	-10 -5 0 5 10	Skeletal Class II
DENTAL					×	
Overjet	2	2.0	9.96	***	-10 -5 0 5 10 15	Large overjet
Overbite	2	2.0	-1.89		10 -5 0 5 10 15	Anterior openbite
U1 to FH	113.8	6.4	123.38		105 110 115 120	Proclined upper incisor
U1 to SN	105.28	6.6	117.65		95 1001051 10115	Proclined upper incisor
U1 to UOP	55	4.0	49.49		45 50 55 60 65	Protruded upper incisor
IMPA	90	3.5	96.19		80 85 90 95 100	Proclined lower incisor
L1 to LOP	66	5.0	52.49		55 60 65 70 75	Protruded lower incisor
Interincisal angle	128	5.3	97.69	***	1001070304050	Proclined interincisor angle
Cant of occlusal plane	9.3	3.8	8.87		0 5 10 15 20	Normal occlusal plane angle
U1 to NA(mm)	4	3.0	10.73	**	-5 0 5 10 15	Protruded upper incisor
U1 to NA(deg)	22	5.0	33.45	**	15 20 25 30	Proclined upper incisor
L1 to NB(mm)	4	2.0	15.05	***	-5 0 5 10 15	Protruded lower incisor
L1 to NB(deg)	25	5.0	38.18	**	15 20 25 80 35	Proclined lower incisor
Upper incisal display	2.5	1.5	5.16		-10 -5 0 5 10 15	Large incisal display
SOFT-TISSUE					A	
Upper lip to E-plane	0	2.0	6.64	***	-10 -5 0 5 10	Protruded upper lip
Lower lip to E-plane	0	2.0	10.04	***	-10 -5 0 5 10	Protruded lower lip
Nasolabial angle	95	5.0	102.44		85 90 95 200 105	Retruded lip
Extraction Index	153.8	7.8	109.40	***	120 140 160 180	Extraction considered

Figure 3: Cephalometry analysis



Figure 4: IZC implants with acrylic capsplint for posterior dentoalveolar intrusion (4A, 4B, 4C), clockwise rotation of maxilla with IZC titanium implant (2×12 mm) on 19×25 SS wire, and lower molars intrusion with 1.5×8 mm titanium implant on 17×25 SS segmental wire (4D, 4E, 4F)



Figure 5: Intra and extra oral photographs



	Mean	S.D.	Result	Severity	Polygonal chart	Meaning	
SKELETAL					/		
SNA	81.08	3.7	72.42	**	75 80 85 90	Retruded maxilla	
SNB	8.0	3.8	75.02	2 10	10 15 80 85 90	Retruded mandble	
ANB	2.46	1.8	5.35	12	10 5 0 5 2 15	Skeletal Class II	
Bjork sum	397 16	3.6	411.48		11204004260040541	Hyperdivergent Skeletal Pattern	
FMA	25	4.0	37.50	419	15 20 25 30 55	Hypendivergent facial pattern	
Gonial angle	124.31	5.4	126.35		115 100 100 130	Normal gonial angle	SUPER IMPOSITION
APDI	85.74	4.0	71 88	***	\$ 80 85 90 95	Skeletal Class II	SOFER INFOSITION
ODI	72.15	5.5	66.65		2 70 75 80	Normal ODI	
Combination factor	157.9	6.5	138.53		140 150 160 170	Small combination factor value	1
A to N Perp(FH)	0.4	2.3	-3.67		10 5 0 5 10	Retruded maxilla	NA
B to N-Perp(FH)	-3.5	2.0	-15.77	***	5 10 5 0 5	Retruded mandible	
Pog to N Perp(FH)	-1.8	2.5	-19.14	***	10 0 10	Retruded chin point	T
FH to AB	81	3.0	73.86	(64)	70 78 80 85 90	Skeletal Class II	
A 6 to mandibular plane	69.3	2.5	68.63		60 65 70 75 80	Normal AB to mand, plane angl	
Wits appraisal	-0.33	2.7	2 04		-10 5 0 5 10	Skeletal Class I	
DENTAL					X		DA
Overjet	2	2.0	3.92		10 5 0 5 10 15	Normal overjet	PNS
Overbite	2	2.0	0.27		10 0 5 10 15	Normal overbite	VI (
U1 to FH	113.8	6.4	106.04		110 115 120	Retroclined upper Incisor	
U1 to SN	105-28	6.6	92.05	44.2	95-00105110115	Retroclined upper incisor	
UT to UOP	55	4.0	54.83		45 50 55 60 65	Normal upper incisor	AN LA
IMPA	90	3.5	98.23		80 85 90 55 100	Proclined lower incisor	
L1 to LOP	66	5.0	62.72		5 65 70 75	Normal lower incisor	XX
Interincisal angle	128	53	118.23		120 125 130 135	Proclined interincisor angle	
Cant of occlusal plane	9.3	3.8	18.82	**	0 5 10 18 20	Steep occlusal plane angle	
Ut to NA(mm)		3.0	5.19		5 0 5 10 15	Normal upper incisor	
Ut to NA(deg)	22	5.0	19.63		15 20 25 30	Normal upper incisor inclination	
Lt to NB(mm)	4	2.0	9.25		5 0 5 10 15	Protruded lower incisor	
L1 to NB(deg)	25	5.0	36.78	340	15 20 25 30 35	Proclimed lower incisor	
Upper incisal display	2.5	1.5	4.45		-10 -5 0 5 10 15	Large incisal display	
SOFT-TISSUE							
Upper lip to E-plane	0	2.0	3.39		10 5 0 10	Protruded upper lip	
Lower lip to E-plane	0	2.0	6.12	***	-10 -5 0 5 10	Protruded lower lip	
Nasolabial angle	95	5.0	95.54		85 99 95 100 105	Normal Ip	
Extraction Index	153.8	7.8	126 67	***	130140150160170180	Extraction considered	

# Figure 6: Post-debonded OPG, lateral ceph, ceph analysis and superimposition

# CONCLUSION

In summary, the non-surgical treatment of severe skeletal anterior open bite utilizing a skeletal anchorage system underscores the orthodontist's ability to deliver comprehensive care and achieve successful outcomes in complex malocclusion cases. Through meticulous planning and execution, the orthodontist-led approach offers patients a safe, efficient, and minimally invasive treatment option for correcting severe skeletal discrepancies.

# **Conflicts of Interest**

The author reports no conflicts of interest.

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