

# MANUSCRIPT

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**ABSTRACT:** A 23-year-old male patient with an skeletal anterior open bite was treated with orthodontics and with orthognathic surgery. Both his functional and esthetic harmony were significantly corrected by the surgical-orthodontic treatment.

**KEY WORDS – Orthognathic surgery, Skeletal open-bite, adult open-bite**

## INTRODUCTION

The relationship of the incisor teeth at vertical plane are namely the anterior open bite (AOB) and the deepbite. Incase of anterior open bite, the maxillary and mandibular incisor teeth are apart while the posterior teeth are in occlusion.<sup>1</sup> The most common etiological factors incase of Anterior open bite (AOB) includes dental origin, skeletal, soft tissue related, respiratory or obstructive causes, neurologic, genetic, trauma and habitual in nature.<sup>2-4</sup>

The severity of anterior open bite importantly depends upon diagnosis and treatment planning with the severity and amount of involvement of face as whole. In case of non-growing adult patients associated with skeletal open bite, the possibilities are quite restricted to camouflage orthodontic therapy or surgical-orthodontic therapies.<sup>5-6</sup>

The camouflage treatment may include extraction of the first permanent molars incase of hyperdivergent patient and exhibits crowding or missing teeth.<sup>7-9</sup> The conventional techniques routinely include, use of headgear, multiloop edgewise archwires, tongue to intercept habits, posterior bite blocks, and vertical elastics for anterior extrusion.<sup>10</sup>

For skeletal Anterior Open bite, the optimum benchmark correction for a patient has to be an orthodontic treatment along with orthognathic surgery.<sup>3</sup> Orthognathic surgery such as LeFort I osteotomy, impaction of posterior segment or together with mandibular osteotomy has been most frequently used. Other techniques such as superior repositioning of the maxilla are done in order to achieve proportional facial heights and display of maxillary incisors.<sup>11</sup> The stability for approaches of orthognathic surgesies have been given by Proffit et al<sup>12</sup>.

This case report presents a skeletal anterior open bite correction with fixed orthodontic therapy combined with orthognathic surgery.

## CASE REPORT

A 23 year old male patient reported with chief complaint of inability of closing mouth and dental malposed teeth. The patient presented with a history of trauma at the age of 10 years (fall from tree) causing mandibular fracture. The fixation of fracture was done using screws. Consequently, resulted in inability of opening of mouth.

Clinically, patient was leptoprosopic, with disproportionate vertical heights indicating hyperdivergent pattern and lateral facial halves showing facial asymmetry. The patient showed convex profile, posterior divergence and lip incompetence. Functional test showed anterior tongue thrust habit with lisping of speech. Upon TMJ examination, clicking sounds were present on closing of jaw with no deviation of mandible. The maximum mouth opening was 35mm. (Fig.1)

The patient presented with an open bite, crowding in both upper-lower anterior, asymmetric arch forms and non-coincident midlines. The molar relationship was Class II bilaterally and there was missing 42. (Fig.2)

Cephalometric analysis showed a skeletal Class II pattern, skeletal open bite, increased mandibular plane angle and mandible being rotated clockwise, increased lower anterior facial height with proclined and forward positioned upper and lower anteriors. The nasolabial angle was also increased. (Table 1)

The objectives for treatment included to correct the skeletal open bite, correct the proclined upper-lower incisors, correct the crowding, midlines and achieve ideal occlusion with smile esthetics.

## TREATMENT ALTERNATIVES

1. With the presenting history by the patient and taking into consideration the age of the patient and acuteness of skeletal class II and the hyperdivergency, a combined surgical- orthodontic plan was prepared as the first choice, which included differential vertical impaction with agumentation genioplasty.
2. Orthodontic therapy with temporary skeletal anchorage devices (TADs), which will allow intrusion of the maxillary molars; which will allow mandibular autorotation and thus aiding closure of the bite.
3. Camouflage Orthodontic therapy with Extraction of all first premolars and achieve dental corrections and dental open bite correction.

The treatment plan opted by the patient was for the surgical correction.

## TREATMENT PROGRESS

The treatment involved upper first premolars and lower first premolar on third quadrant extraction only because of missing 42, to level and align the arches. Standard edgewise prescription of 0.022" Slot was bonded. The leveling and alignment lasted for 4 months initiated with 0.012"Niti, followed by increasing thickness. During the course of pre-surgical orthodontic phase, the dental corrections achieved were posterior intrusion and anterior extrusion simultaneously. This was achieved using every arch wires with curve of spee in upper arch and reverse arch of spee in lower arch. Retraction was initiated on 19x25"SS wire during these 13 months using E-chains. Group B anchorage was incorporated. (Fig.3)

Patient was prepared for surgery once dental corrections were achieved. Both upper and lower arch wires were 0.019x0.025 ss with crimpable hooks for intermaxillary fixations. A CBCT was taken for the proper planning prior to mandibular surgery. For surgical correction, isolated mandibular surgery was opted. For mandibular skeletal corrections isolated mandibular osteotomy was performed. Post surgically anterior cross elastics to correct mild dental midline and settling elastics were given to achieve good interdigitations in the buccal segments for 5 months. (Fig.4)

The case is currently ongoing in its settling stage, and shall proceed with fixed bonded retainers in both upper-lower arches from 3-3.

### TREATMENT RESULTS

The treatment improved the functional stability, smile esthetics and facial profile, with retraction of upper-lower incisors with visible improvements on hyperdivergent appearance.

An occlusion with Class I canine relationships, acceptable overjet and overbite, and coincident midlines was obtained. Cephalometric analysis confirmed the retraction, uprighting, intrusion of posteriors and extrusion of the upper-lower incisors, reduction in overjet and increase in overbite, correction of the soft tissue nasolabial angle and retrusion of the upper and lower lips. The mandibular plane angle i.e autorotation of mandible was corrected by 3°. (Fig. 5,6)

### DISCUSSION

In adults with Anterior openbite, with skeletal discrepancies, an ideal treatment option is the Orthognathic surgery. It provides positive incisor overlap, which is a relatively stable outcomes,<sup>11</sup> but the favorable outcome of orthognathic surgery are variable depending the malocclusion presented by the patient. The etiological factors are multifactorial but in our case the patient reported with a history of trauma causing mandibular fracture, which was associated with inability of opening of mouth and open bite pattern. In case of adult severe openbite tendencies with hyperdivergent growth pattern, the ideal treatment of choice are combination of orthodontic and orthognathic surgery. To surgically correct an anterior open bite of primarily of skeletal origin in a non-growing adult patient there are three gold standard approaches<sup>1</sup>

1. Impaction of the posterior maxilla(Segmental)
2. Differential posterior impaction of the Le Fort I osteotomized maxilla
3. Isolated mandibular surgery

Since the patient was an adult, an isolated mandibular osteotomy was selected. Correction of the open bite, transverse variations, canting of occlusal plane, coincident midline, and display of incisors was achieved. After mandibular counterclockwise rotation was achieved, an augmentation with genioplasty for mandibular asymmetry, and midline was performed. The autorotation of mandible in anterior-posterior direction and the chin was considered, in addition to the intra-oral dental occlusion. After the mandibular autorotation, mandibular osteotomy was performed with due consideration of soft tissue chin and the mandibular chin position. This was a secondary procedure. No mandibular surgery or bilateral sagittal split osteotomy will be needed if there are acceptable intra-oral dental relationships and mandibular antero-posterior position.<sup>13</sup>

However, there are unavoidable relapses associated with such surgical procedures, which must be taken into consideration additionally, subjective to dental and skeletal parameters. Dental relapse can present with features such as surge open bite, whereas skeletal relapse show as an increased mandibular and occlusal plane angle post-operatively.<sup>14</sup>

Extractions was required for correction of upper-lower crowding and proclination in our patient, because of the “drawbridge effect”—a pattern in treatment of open-bite because it enhances the closure of bite.<sup>15-16</sup>

Such extraction protocols can aid some autorotation of mandible in accordance with the mesial movement of teeth of posteriors, thus adjunct to open-bite correction.<sup>17</sup>

Maxillary incisors tend to relapse apically when the fixed orthodontic appliances are taken off leading to anterior open bite. To overcome such effects, its best advised to independently level and align the segments of anterior and posterior teeth and perform segmental posterior impaction of the maxilla. In our case we levelled and aligned the arches priorly and retracted the anterior followed by orthognathic surgery.

Post surgically our patient showed marked soft tissue changes, with average nasolabial angle, acceptable facial profile, reduced hyperdivergence of mandible, improved smile esthetics and balanced facial symmetry. Skeletal changes showed, reduced FMFA and LAFH. Dental relationships improved with correction of open bite, well aligned symmetric archforms with intercuspatations of all teeth with Class I canine relation bilaterally.

The settling elastics are given currently, as an active retention to maintain the bite closure and correction of midlines. The extrusion of the upper-lower anteriors was attributed to the distalisation and uprighting since no anterior elastics were used for the anterior.

The patient is currently in his settling stage. The patient has been inconsistent with his follow-ups post-surgery due to COVID-19 pandemic situation. Hence the further follow-ups for current stage was out of our reach.

### CONCLUSIONS

Orthodontic treatment along with orthognathic surgery can be practiced to achieve desired result outcomes. In this present case report, disharmony with skeletal units and malocclusion were highly corrected, and the acceptable esthetics and functional balances were acceptably improved after treatment. The patient approved the final results post surgery.

### ADDITIONAL REMARKS

There is no conflict of interest to be declared.

A prior patient consent for sharing of patient photographs for educational purposes was taken.

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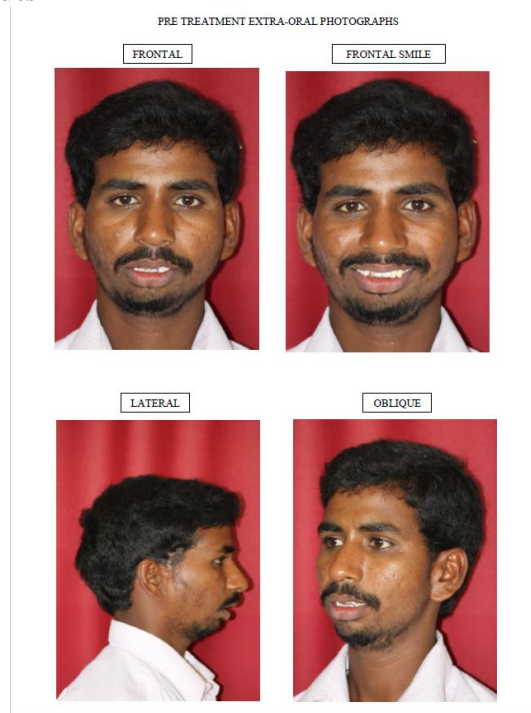
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#### FIGURE LEGENDS

1. **Figure 1- Pretreatment Extra- oral Photograph**
2. **Figure 2 – Pretreatment Intra-oral Photograph**
3. **Figure 3 – Mid-treatment intra-oral Photograph**
4. **Figure 4 – Post Surgical Extra-oral and intraoral Photograph**
5. **Figure 5 – Pretreatment Radiographs**
6. **Figure 6 – Post Surgical Radiographs**

#### Table Legends

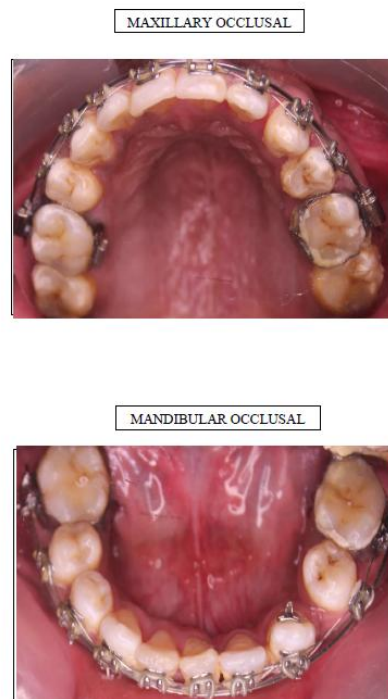
1. **Table 1 - Cephalometric Values**



(Fig 1)

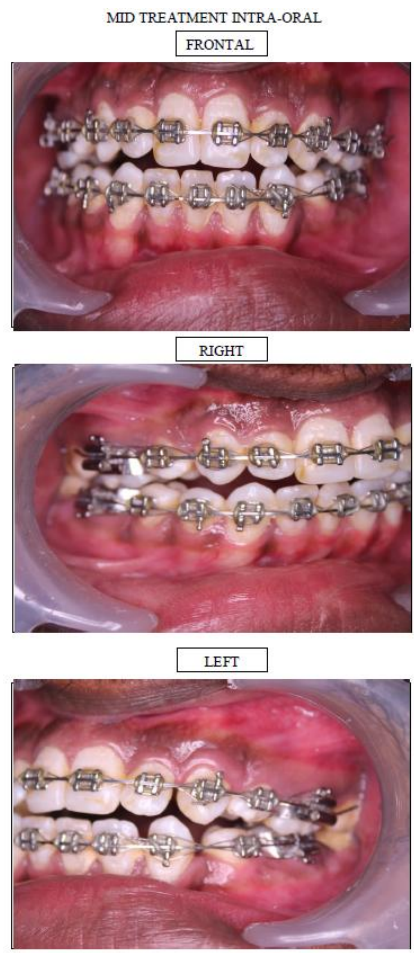


(Fig 2)



(Fig. 3)

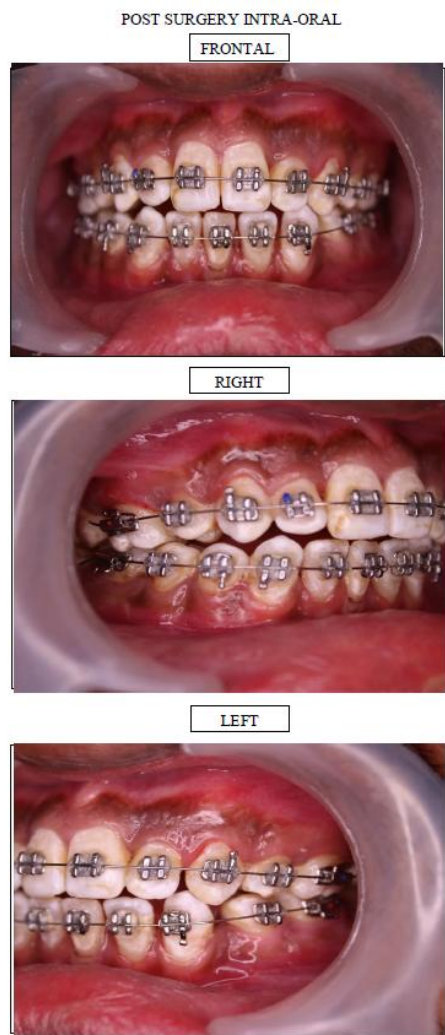




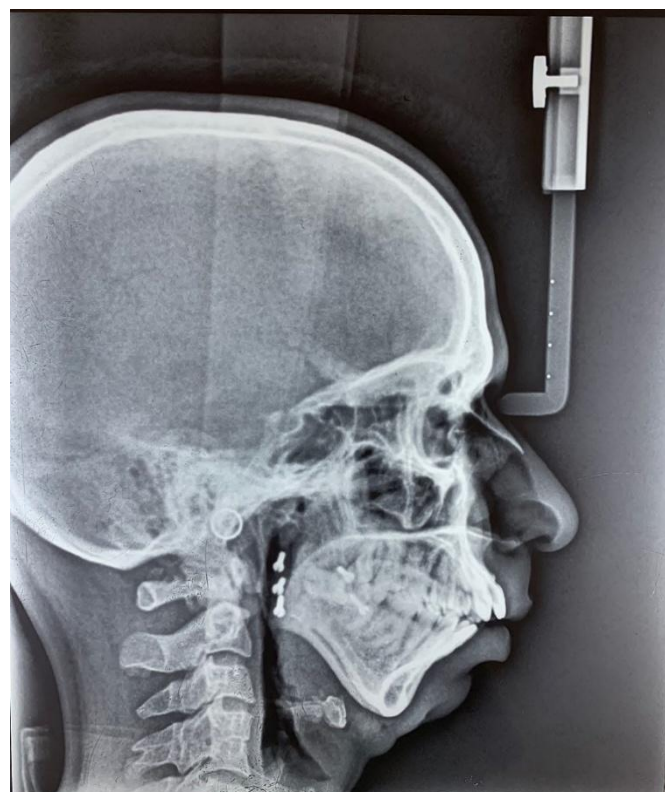
(Fig.3)



(Fig.4)

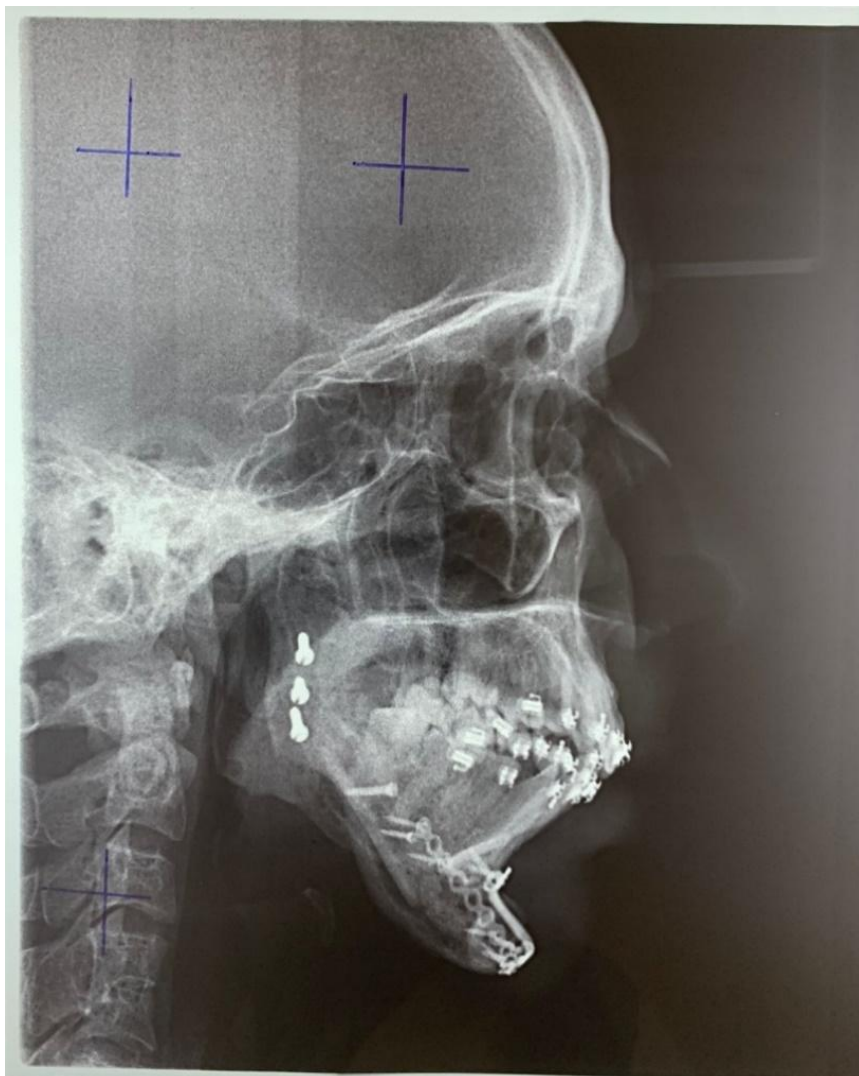


(Fig.4)

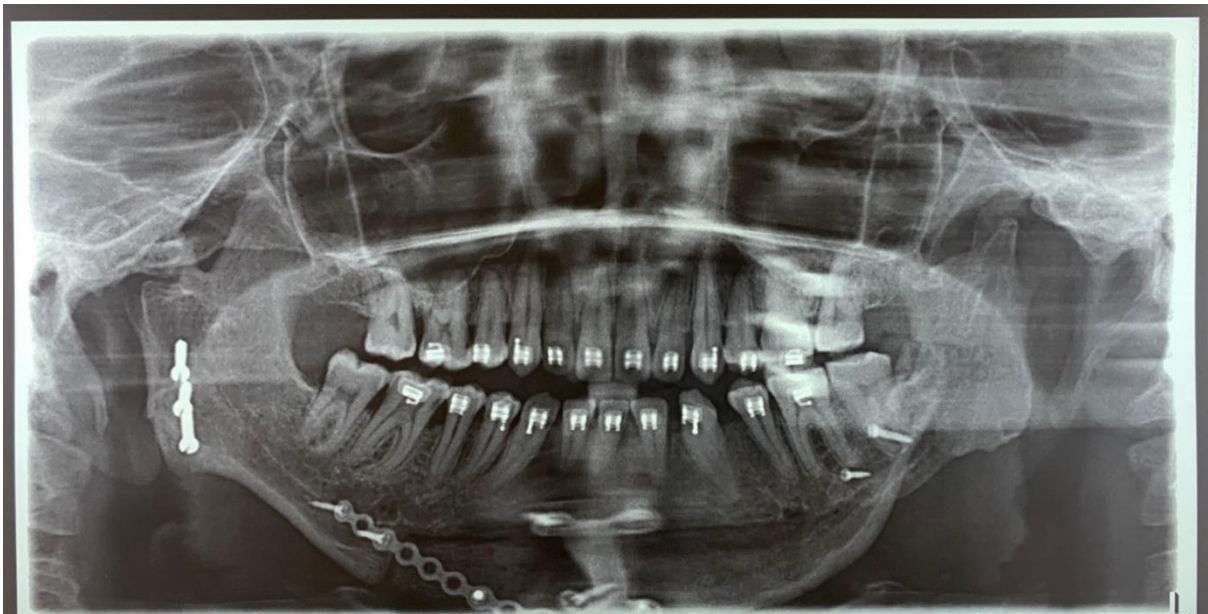




(Fig.5 Pretreatment)







(Fig.6 Post surgical)

S. NO		PRE-TREATMENT	PRE-SURGICAL	POST- SURGICAL
1.		<b>Maxilla</b>		
	SNA	80 <sup>0</sup>	80 <sup>0</sup>	78 <sup>0</sup>
	Co-A	97mm	75mm	78mm
2.		<b>Mandible</b>		
	SNB	68 <sup>0</sup>	67 <sup>0</sup>	71 <sup>0</sup>
	Co-Gn	109mm	107mm	108mm
3.		<b>Maxilla and mandible</b>		
	ANB	8 <sup>0</sup>	9 <sup>0</sup>	7 <sup>0</sup>
	WITS	5mm	4mm	3mm
4.		<b>Vertical</b>		
	FMA	48 <sup>0</sup>	45 <sup>0</sup>	43 <sup>0</sup>
	Sn-Go-Gn	48 <sup>0</sup>	45 <sup>0</sup>	37 <sup>0</sup>
	Occlusal plane	37 <sup>0</sup>	32 <sup>0</sup>	28 <sup>0</sup>
	LAFH	81mm	73mm	71mm
5.		<b>Maxillary Dentoalveolar</b>		
	U1-NA	27 <sup>0</sup>	16 <sup>0</sup>	16 <sup>0</sup>
	U1-NA (mm)	8mm	0mm	2mm
	U6-NF	18mm	19mm	19mm
6.		<b>Mandibular Dentoalveolar</b>		
	L1-NB	45 <sup>0</sup>	40 <sup>0</sup>	40 <sup>0</sup>
	L1-NB (mm)	14mm	11mm	8mm
	L1-Go-Me	97 <sup>0</sup>	94 <sup>0</sup>	92 <sup>0</sup>
	L6-MP	38mm	35mm	35mm
7.		<b>Dental Relationship</b>		
	Overjet	Anterior open bite	1mm	2mm
8.		<b>Soft tissue profile</b>		
	Nasolabial angle	112 <sup>0</sup>	104 <sup>0</sup>	100 <sup>0</sup>

(Table 1 Cephalometric analysis)