

# ETIOLOGY DIRECTED ORTHODONTICS IN TREATMENT OF OPEN BITE- A CASE REPORT

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## Abstract

**Background:** Very rarely we come across a complex combination in the form of dentoskeletal openbite with skeletal Class III and dental Class I. In this aligner world orthodontics has become more mechanical. We forgot that the very basic fundamentals of orthodontics i.e. elimination of cause prevents relapse. Proper diagnosis plays a key role in planning of these sort of cases. Proper case history becomes invariably very important to figure out probable etiological factor responsible for such malocclusion. Eliminating the etiology serves 80% of treatment goals along with surety of post treatment stability. In this case addressing the etiological factor not only guarantee post treatment stability but also played a key role in reducing the duration of orthodontic bracket wear by the patient. The impeccable result of this case is a perfect example of an ideal treatment planning.

**Result:** After total treatment time of 3 years and two months, the soft tissue profile was pleasing with ideal overjet and overbite. Coincident dental midlines were achieved at the end of treatment. Cephalometric soft tissue values were improved. The extraoral and intraoral photo graphs showed a stable occlusion and esthetic smile. A 0.5 mm space existed in first quadrant between canine and second premolar and small amount of settling was required in premolar area as patient insisted debonding.

**Conclusion:** Open bite malocclusion is difficult to treat and retain in orthodontic. Treatment modalities based on etiological factors should be taken into account while diagnosing and treatment planning for open bite cases.

## Introduction

The etiology of an anterior open bite is generally multifactorial, which involves skeletal, dental, and functional causes.<sup>1,2</sup> Potential etiological causes have been listed as abnormal tongue function and posture, tongue thrust, unfavourable growth pattern,<sup>3</sup> digit-sucking, enlarged lymphatic tissue,<sup>4</sup> heredity and oral functional matrices.<sup>5</sup>

Dentofacial morphology is influenced by the tongue posture. As tongue thrusting can affect the stomatognathic functions and become a probable etiological factor in creating of an open bite malocclusion.<sup>6, 7</sup> Tongue pressure ranges from 41g/cm<sup>2</sup> to 709g/cm<sup>2</sup> and a constant forward tongue posture can cause proclination of maxillary and mandibular anterior teeth generally accompanying with spacing and anterior open bite. The effective and stable correction depends on accurate diagnosis of anterior open bite.<sup>8</sup>

Normal tongue posture is described as the one in which the tongue tip rests on the incisal papilla and its dorsum lies along the palate, while resting within transverse dimension of the upper arch. Tongue posture can be classified as follows-High, Horizontal, Low and very Low.<sup>9</sup> All of these tongue postures are related to particular nature of anterior open bite.

However, it's a debatable topic whether tongue functions lead to malocclusion or it merely adapts to malocclusion. Although some researchers consider the morphology and debilitated function of the tongue as essential etiological factors in the development of malocclusion, others believe that tongue thrust

Swallowing should be considered a result rather than the cause of malocclusion.<sup>10</sup>

The following case report illustrate the management of anterior open bite (AOB) due to habitual forward tongue posture in a post-adolescent female patient.

## Assessment

On extra oral examination she had mesocephalic, mesoprosopic, convex facial profile, no gross asymmetry, competent lips, average clinical FMA. No incisor exposure during smile was observed. TMJ examination revealed no clicking sound.

On intraoral examination she had Class I molar and canine relation with spacing between 11, 12, 13, 21, 22, 23, 31, 32, 41, 42. Upper and lower dental mid line was aligned with the facial mid-line. The maxillary and mandibular arch was U-shaped. Incisor was severely proclined with an open bite of 10mm. Forward tongue posture was observed. There was no relevant medical history.

Bolton analysis revealed 1.2 mm of mandibular anterior tooth material excess.

On evaluating orthopantomogram, TMJ showed no unusual changes. Height of inter-dental crest was normal. Posterior occlusion was present in OPG suggestive of anterior open bite. While evaluating ceph values SNB of 92 degree and ANB of -3 degrees suggestive of skeletal class III due to mandibular prognathism. Mandible was forwardly rotated.

Parameters	Average value	Pre treatment	Post treatment
<b>SKELETAL</b>			
SNA angle	82	89	87
SNB angle	80	92	90
ANB angle	2	-3	-2
N prep to Pog mm	-4-0	4	3
Mandibular plane angle	25	24	23
Facial axis angle	90	96	95
Lower anterior face height mm	58-59	63	61
Angle of inclination(Rakosi)	85	91	89
Occlusal plane to mandibular plane	14	12	10
<b>DENTAL</b>			
UI to NA angle	22	36	23
UI to NA mm	4	7.5	3
LI to NB angle	25	35	19
LI to NB mm	4	8	3
LI to A Pog mm	1+/-2	10	3
LI to MP angle	90	118	81
Inter incisal angle	131	84	135
U1 to nasal floor	27.5(F)	24.5	28
U6 to nasal floor	32.1(F)	31.5	31
L1 to MP	23(F)	19	23
L6 to MP	32.1(F)	32	32
<b>SOFT TISSUE</b>			
'S' line mm - Upper Lower	0 0	.5	0 3
<b>E-Line(mm)</b>			
Upper lip Lower lip	-2 to-4 -1to-2		1
Mentolabial sulcus	4+/-2		

Table 1- Pre and post treatment cephalometric values.

On the basis of clinical finding and cephalometric values patient was diagnosed as skeletal Class III malocclusion with bi-maxillary protrusion, average to hypo divergent growth pattern and convex soft tissue facial profile with protruded lips (Figure 1 and table 1).



Figure 1- pre-treatment records.

1. Pregnant and lactating women were not included in the study.
2. Medical compromised patient.
3. Comminuted mandibular fracture.
4. Fractures others than specific sites.

#### Treatment objectives

- 1) To close the anterior open bite,
- 2) To maintain Class I molar and canine relationship,
- 3) To achieve ideal overjet and overbite,
- 4) To improve smile and correct tongue posture,
- 5) To achieve an esthetic soft tissue profile.

#### Treatment option and plan

First treatment option was non extraction line of treatment. Which was discarded due to limitation in achieving our treatment goals and less documented result of stability in non extraction therapy.

The second option was extraction of 14, 24, 34, and 44 followed by retraction. This treatment option was opted due to well documented result of extraction in open bite cases.

After explaining benefits and disadvantages of each treatment modality the patient opted for the second treatment alternative.

#### Treatment progress

A palatal crib was made with 0.036" stainless steel wire. Both arms were inserted in lingual sheath welded on maxillary first molar band. Crib height was extended to the lingual gingival margin of lower incisors (Figure 2)

Figure 2- Placement of fixed



Figure 2- Placement of fixed tongue crib.

After 8 months, open bite was completely corrected with retroclination of flared maxillary and mandibular incisor with edge to edge overbite (Figure 3).



Figure 3- After eight months of tongue crib insertion.

In second phase of treatment, crib was removed and preadjusted edgewise appliance with MBT prescription metal brackets (0.022" × 0.028" slot 3M Unitek™ Gemini metal, USA) was placed following extraction of 14,24,34,44. An initial 0.014" nickel-titanium (Nitinol super elastic 3M Unitek, USA) arch wire was placed for levelling and aligning of upper and lower arches. Anchorage requirement was Group B in both the arches that's why TPA is not placed in upper arch. As treatment progressed, heavier arch wire 0.019" × 0.025" stainless steel with crimpable retraction hooks were placed between lateral incisor and canine in upper and lower arches. Type I active tie back (MBT) was used for retraction (Figure 4).



Figure 4- Mid treatment photograph.

After space closure, settling of occlusion was done on 0.014" niti arch wire in upper and lower arch with short settling elastics (triangular fashion). Upper and lower fixed lingual retainers with modified Begg's retainer was delivered. Crib was inserted in upper Begg's retainer to maintain correct tongue posture.

#### Observation and Results:

After total treatment time of 3 years and two months, the soft tissue profile was pleasing with ideal overjet and overbite. Coincident dental midlines were achieved at the end of treatment. Cephalometric soft tissue values were improved (table 1). The extraoral and intraoral photographs showed a stable occlusion and esthetic smile. A 0.5 mm space existed in first quadrant between canine and second premolar and small amount of settling was required in premolar area as patient insisted debonding. Composite build up was done in 12, 22 to correct Bolton's discrepancy (Figure 5).

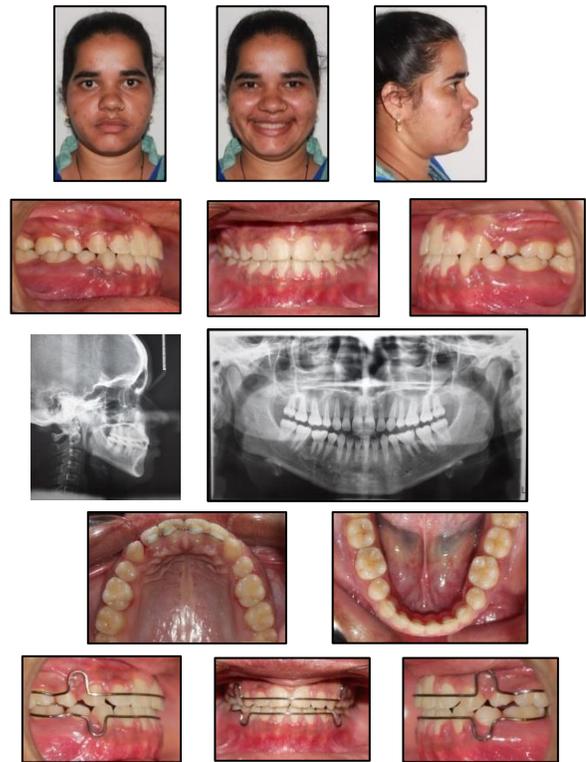


Figure 5- post treatment records with retention appliances.

#### Discussion

Tongue crib is not only an effective treatment of open bite but also acted as a retainer. This case report demonstrated the efficiency of palatal crib in discouraging forward tongue posture with significant correction of AOB within 8 months.

Justus concluded that crib is effective in growing and non-growing individuals equally. The reason for this increased stability may be due to modification of tongue posture.<sup>11</sup>

In horizontal tongue posture palatal crib is preferred but in low & very low tongue posture spurs in lower arch is used. Crib has been proved to be extremely helpful by changing the tongue posture and allowing the eruption of anterior teeth.<sup>9</sup>

Skeletal open bite is ideally treated with a combination of both orthodontics and orthognathic surgery. In a nonsurgical plan, orthodontic treatment involves camouflage of the skeletal discrepancies, so that ideal esthetics and function can be achieved to the maximum extent possible. Nonsurgical correction is more complicated and usually requires longer treatment time.<sup>12</sup> This patient had a favorable facial pattern, we were able to avoid surgery by employing camouflage.

Sarver and Weissman proposed helpful guidelines for nonsurgical treatment of open bite in adult patients, based on an approach using extraction and retraction. They emphasized that there are a limited number of patients who are convenient to non-surgical line of treatment. Patients for non-surgical approach should meet the following criteria which includes: (1) proclined maxillary

or mandibular incisors, (2) little or no gingival display on smile, (3) normal craniofacial pattern, (4) no more than 2–3 mm of upper incisor exposure at rest.<sup>13</sup>The present case encountered all above criteria. Therefore, all first premolars were extracted, followed with upper and lower anterior retraction, facilitating bite closure, overjet reduction and profile improvement.

Janson also concluded that open-bite extraction treatment has greater stability than open-bite non-extraction treatment.<sup>14</sup>

In addition patients who do not show sufficient incisor exposure should be treated with incisor extrusion not by molar intrusion, making it more conventional and more suitable option for open bite correction.<sup>14</sup>In this case, we were able to achieve moderate incisor-crown display on smiling by extrusion of the upper and lower incisors.

Anterior open bite correction is one of the most challenging rectification to be maintained after treatment completion.<sup>15</sup>The difficulty of maintaining the occlusion arises from the lack of control over the correct tongue posture.

Fixed retainers alone were not absolutely sufficient for maintaining the results of open bite treatment. Previous study on open bite correction shows that use of crib increases the post treatment stability. As explained by Beane prolonged retention with fixed and removable retainers is advised in most cases of open bite treatment.<sup>16</sup> That's why lingual bonded retainer (upper 11,12,21,22 and lower 31, 32, 33, 41, 42, 43) along with modified Begg's retainer with crib in upper arch was delivered to patient.

### Conclusion

Open bite malocclusion is difficult to treat and retain in orthodontic. Treatment modalities based on etiological factors should be taken into account while diagnosing and treatment planning for open bite cases.

An error in identifying the etiology may lead to poor end result and stability.

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