
Orthodontic Treatment of Dental Open Bite in an Adult: A Case Report

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ABSTRACT

Case report of an adult Bangladeshi male aged 26 years who complained about ineffective chewing of food and unpleasant aesthetic look. The patient was diagnosed to have a 4 mm of anterior dental open bite on skeletal Class I with normal mandibular plane and palatal plane angles. Treatment was orthodontics alone with non-extraction. The main mechanics used to close the anterior open bite, were by the conventional aligning, leveling and arch contraction by standard edgewise technique. The result showed that it was possible to correct the open bite within a short period; however, the appliance was difficult to clean. The treatment was complete after 2 years with positive overbite of 3 mm and acceptable occlusion. The patient was happy with his new appearance and function.

Key words: Orthodontic treatment/ Dental open bite/ Non-extraction/ standard edgewise technique.
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INTRODUCTION

Open bite malocclusion is considered to be one of the most difficult problems to treat.¹ The causes of open bite are multi factorial, which can develop from genetic and/or environmental factors.² Open bite is generally classified in two categories: skeletal and dental. The diagnosis is important due to the different treatment approaches. Generally, a dental open bite can be treated with orthodontics alone, while a true skeletal open bite requires a combination of orthodontics and surgery.

Characteristics of the open bite malocclusion

The dental open bite is an open bite without facial disfigurement. It is associated with some or all of the following characteristics^{1,3-7}:

- Normal craniofacial pattern.
- Proclined incisors.
- Under erupted anterior teeth.
- Normal or slightly excessive molar height.
- Mesial inclination of posterior dentition.
- Failure of eruption of teeth with no known etiology.
- Divergent upper and lower occlusal planes.
- No gummy smile.
- Thumb and finger sucking habits.
- Tongue thrusting habit.
- Without remarkable cephalometric findings.

The skeletal open bite is an open bite with a divergence of the sagittal skeletal planes. It is associated with one or more of the following characteristics^{1,3-8}:

- Steep mandibular plane angle.
- Increased gonial angle.
- Short mandibular ramus.
- Downward rotation of the posterior part of the maxilla or palatal plane tipped up anteriorly.
- Increased lower anterior facial height.

- Decreased upper anterior facial height.
- Increased anterior and decreased posterior facial heights.
- Increased flexure of the cranial base (Na-S-Ba).
- Steep anterior cranial base.
- Shorter nasion-basion distance.
- Small mandibular body and ramus.
- Retrognathic mandible.

The treatment strategy

The proper differentiation of the etiology of the open bite malocclusion in an individual patient is very important because it is used to determine the appropriate treatment method and the plan for retention.^{3,10}

The treatment strategy can be divided into 3 periods of dental development¹⁰:

1. Primary dentition

Generally, it is not recommended to treat in this period because most cases involve habits and self-correct after stopping Para functional habits. Control of the abnormal habits should be advised for the patient and the parents.

2. Mixed dentition

2.1 Habit control

The tongue crib is an appliance that has been widely used for stopping thumb sucking and other habits that produce and maintain anterior openbite.^{10,11}

2.2 Lip seal and swallowing exercises

The underlying goal is to establish normal neuro-muscular function. The patient is instructed to keep the lips together at all times.⁵ Swallowing without thrusting the tip of the tongue towards the upper or lower incisors is suggested before treatment and continues during retention.¹⁰

2.3 Growth modification to control vertical growth and posterior dentoalveolar development

The objective is to control vertical growth and retard eruption

of posterior teeth. The common treatment approaches are high pull headgear¹², Frankel IV regulator, bionator/activator, active vertical corrector (AVC), posterior bite blocks, and vertical pull chin caps.⁵

3. Permanent dentition

Treatment approaches in this period can be divided into 4 categories as follows: -

3.1 Habit control, lip seal and swallowing exercises.

3.2 Growth modification to control vertical growth and posterior dentoalveolar development (in early permanent dentition period).

3.3 Orthodontic camouflage (only orthodontics).

3.4 Orthognathic surgery (a combination of orthodontics and surgery).

As mentioned, a dental open bite can be treated with orthodontics alone while, generally, a true skeletal open bite requires a combination of orthodontics and surgery.³

Orthodontic camouflage

Several papers have suggested extraction and retraction for correcting the dental open bite in adult patients. Proclined upper and lower anterior teeth will be retracted following extractions to reduce both overjet and openbite, and elongate the anterior teeth by a "drawbridge effect".^{2,3,13} Generally, the most posterior teeth, such as, second molars, are recommended to be extracted because this allows forward rotation of the mandible. On occasions, extraction of premolars is considered in crowding and/or protruded anterior teeth. Most open bite malocclusions show some aspects of both dental and skeletal problems. The treatment principles for skeletal open bite by orthodontic camouflage are to intrude posterior teeth, maintain or create a curve of Spee, minimize conventional use of Class II and Class III elastics, and minimize using anterior vertical elastics.³ There are several methods to intrude posterior teeth:

1). high pull headgear², 2). Skeletal anchorage such as a titanium mini plate temporarily placed implant^{16,17} 3). MEAW technique⁴, 4). Posterior bite blocks^{3,18,19}, 5). Functional appliances such as the functional regulator appliance (FR4)²⁰ or an open bite bionator/activator^{3,21}, 6). Active vertical corrector²², 7). Vertical pull chin cup²³, and 8). The rapid molar intruder which is a modification of the Jasper Jumper²⁴. Recently, Aras stated that the extraction of teeth could reduce a steep mandibular plane, which improves a long-faced patient. However, extraction patterns and the age of patients must be considered. Aras found that in the deceleration period of jaw growth, extraction of the second premolars or the first molars led to a closing rotation of the mandible in skeletal anterior open bite extending to the posterior teeth.²⁵ Although, there are several orthodontic approaches that may be used to correct the skeletal open bite problem as mentioned, it has been known that the more severe the skeletal pattern, the more likely surgery will be required.^{3,5}

Orthognathic surgery

The guidelines for coordinating orthodontics and surgery for the open bite malocclusion is the same as for any other surgical-orthodontic treatment.²⁶ Surgical procedures often involve a bimaxillary approach with Lefort 1 posterior maxillary impaction. Segmental maxillary and/or mandibular osteotomies are likely to be employed. During the presurgical orthodontics, the objective should be to level within but not across the segments, to maintain or create appropriate root separation at the osteotomy sites, and to avoid cross elastics to move the teeth in the direction of the surgical correction. Post surgically, the orthodontic finishing is no different from that of any other orthognathic surgery patient.²⁶

Retention

The importance of retention is to enhance stability, especially eliminating the cause of the open bite.^{3,27} The stability is the most important criterion in deciding the treatment method for open bite malocclusion. Active extrusion of anterior teeth is generally not advisable.²⁸ However, the study of Beckmann and Segner²⁹ showed that active extrusion may be possible, but it should not exceed the vertical growth of the lower face. Elongation of the lower incisors is more preferable to upper incisor elongation because it results in better esthetics and stability.³⁰ It has been found that retrusion of the maxillary incisors during treatment leads to a more stable overbite during the retention period.²⁹ The cant of individual occlusal planes must be corrected and the teeth must be up righted in relation to the bisecting occlusal plane for ensuring stability and function.⁴ Relapse of open bite is mostly the result of elongation of the posterior teeth, particularly the upper molars, without any evidence of intrusion of incisors. Controlling eruption of the upper molars, therefore, is the key to retention in open bite malocclusion. Wearing high-pull headgear to the upper molars at night time, in conjunction with a standard removable retainer is one effective and comfortable way for the patient to control open bite relapse.³¹ Other alternative approaches are: 1). placing retainers with occlusal coverage to prevent further molar eruption³, and 2). wearing conventional maxillary and mandibular retainers at daytime, and wearing a functional appliance with bite blocks (an open bite bionator) at night time.³¹ Prolonged retention is advisable and necessary in most cases of open bite treatment; however, generally, patients do not use retainers as recommended.³

CASE REPORT

Case history: A Bangladeshi man, 26 years, was accepted in the Orthodontic Department, Dhaka Dental College and Hospital in 21st August 2007 with a chief complaint of ineffective chewing of food because of an anterior open bite, as well as unpleasant aesthetic look. He had no relevant medical history and had no previous history of orthodontic treatment. He mainly breathed through his nose. Speech was normal. He had a tongue thrust swallowing pattern. Nobody in his family had similar conditions.

Clinical examination Extra-oral assessment (Figure 1)



Figure 1: Pre-treatment extra-oral facial photographs

Shape of the head	: Mesocephalic.	Stage of dentition	: Permanent (chronological age).
Profile Analysis	: Convex profile	Teeth present	: all the teeth present except lower left 2nd molar
Facial divergence	: Straight.	Periodontal status	: average
Vertical relation	: Lower facial height high	Carious teeth	: Absent
Shape of the face	: Oval.	Extracted tooth	: lower left 2nd molar
Facial symmetry	: Symmetrical.	Retained teeth	: Absent
Lips	: Competent.	Impacted teeth	: Absent
Upper lip line	: High.	Gingival recession	: Absent
Lower lip line	: High.	Missing teeth	: Absent
Naso-labial angle	: Acute.	Maximum inter occlusal clearance	: 52 mm.
Mento-labial depression	: Shallow.	Palate	: Normal
Temporo-Mandibular joint	: Normal path of closure.	Tongue	: Normal in size, shape and exhibit adaptive forward posture + simple tongue thrust
Breathing	: Nasal.		
Deglutition	: Normal.		

Intra-oral assessment (Figure 2)



Figure 2: Pre-treatment intra-oral photographs

Model analysis

Arch Discrepancy

Upper arch
 Arch perimeter --Total tooth material
 = 101mm - 96mm
 = 5 mm

Lower arch
 Arch perimeter --Total tooth material
 =96mm - 87mm
 =9 mm

Remarks: Spacing in both the arches due to tooth tissue discrepancy. Both the arches appear to be ovoid and symmetrical.

Radiographic examination

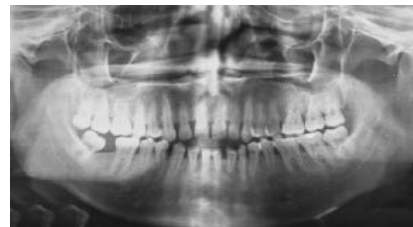


Fig 3: pre treatment OPG

OPG reveals presence of all permanent teeth except for lower right 2nd molar. There evidence of generalized mild alveolar bone loss. Anterior open bite extends from canines onwards.

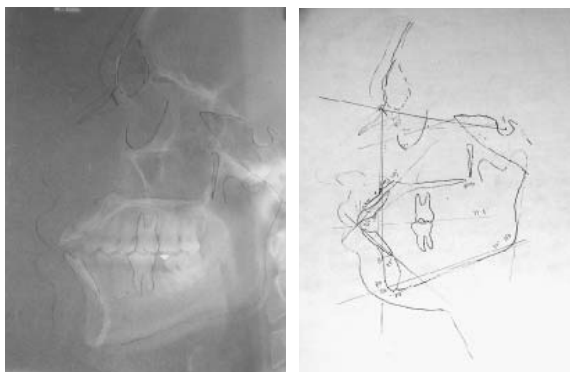


Fig 4: pretreatment lateral cephalogram and tracing

Parameter	Reference Measurement ($\pm 2^\circ$)	Patient's Measurement
SNA (angle)	82°	83°
SNB (angle)	80°	80°
ANB (angle)	2°	3°
Upper 1 to NA (mm)	4mm	13 mm
Upper 1 to NA (angle)	22°	39°
Lower 1 to NB (mm)	4mm	12 mm
Lower 1 to NB (angle)	25°	48°
Inter incisal angle	131°	95°
Go Gn to SN (angle)	32°	30°
Occlu to SN (angle)	14°	13.5°

Cephalometry reveals no antero-posterior skeletal jaw dysplasia. Upper and lower incisors are severely tipped forward relative to skeletal pattern resulting in an acute IIA. The mandibular plane angle, palatal plane angle, and functional occlusal planes were normal. The upper and lower incisors were protruded and proclined. The soft tissue profile showed normal convexity.

TREATMENT OBJECTIVES

1. To retrude and retrocline the upper and lower incisors.
2. To correct the cant of the upper incisors down-ward by extruding them.
3. To align and level the functional occlusal plane in each arch.
4. To close all spacing.
5. To obtain a normal overbite and overjet.
6. To achieve a Class I molar and canine relationships.
7. To correct the dental midline.
8. To correct cross bite of #13/43.

TREATMENT PLAN

This case had the dental open bite problem, and the profile was acceptable so that orthodontics only was decided. The treatment was decided to be non-extraction because of the spacing problem. Maximum anchorage by banding all second molars early, was suggested to close all spacing from the anterior, and to reduce proclined and protruded upper and lower incisors. The full fixed appliance 0.018x0.022 inch Standard Edgewise prescription was used. It was decided to use the multi loop edge-wise arch wire technique to correct this open bite problem by extrusion of upper and lower anterior teeth as well as contraction of the upper lower arches. The patient was taught to change the adaptive tongue thrusting swallowing to be the normal swallowing before starting the treatment. Wrap around retainers with labial and buccal acrylic straps were decided for retention in the upper and lower arches.

TREATMENT PROGRESSION

The treatment started in December, 2007 with 0.014 inch multi-loop stainless steel arch wires for aligning and leveling. At around 5 months of aligning and leveling stage (Figure 5), the patient had 2 mms anterior open bite, 1 mms overjet so 0.016 inch continuous stainless steel arch wires with offset bends for canines in the upper arch were used to correct cross bite. After 8 months, with spacing remaining in upper and lower anterior teeth. 0.016x0.022 inch stainless steel arch wires with contraction loops were used to contract both the upper lower arches. After 14 months the anterior open bite was 1 mm and overjet was 2 mms.

The last arch wires were 0.014 inch continuous stainless steel arch wires with zig-zag short Class II elastic 3/8 inch, light force both sides to get good inter-digitation. An anterior box elastic 12 inch, 3.5 oz was used to maintain the positive overbite. After 18 months, overbite was 3 mms, overjet was 2mms with Class I canine relationships and Class I molar relationships. (Figure. 6)

Upper and lower wraparound retainers were used for retention. The patient was advised to wear the retainers full time for one year, then night-time use might be sufficient; however, he was also advised to continue to wear them at night time for as long as he could. He was asked to come back for follow-up check during his vacation.



Figure 5: During treatment photographs



Figure 6: After treatment Intra Oral photographs



Figure 7: Before and after treatment lateral cephalograms



Figure 8: After treatment extra oral photographs

CONCLUSION

Treatment time was 18 months. The patient had competent lips without lip strain (Figure 8). He had a normal adult swallowing pattern. Upper incisor edges to lip line were changed from 0 mm to 2 mms. The upper lower dental midlines coincided. Overbite was 3 mms, and overjet was 2 mms with Class I canine relationships and Class I molar relationships. After three months follow-up, the occlusion was still the same (Figure 6).

SUMMARY

There are several treatment approaches to correct the open bite problem. The importance is to detect the cause and the abnormal features, so that it leads to the proper treatment. The patient's compliance is one important factor to achieve successful treatment. Finally, the long-term wearing of appropriate retainers is needed for the open bite case.

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