

Open Bite : Treatment Modalities

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Abstract

The treatment of open bite comes as a challenge with variation of modalities at every age group. This article is an attempt to club the plethora under one roof. A sound clinical and cephalometric analysis are must to identify the etiology and intercept the problem either conservatory or surgically. The transition phase of mixed dentition usually resolves without treatment, whereas complex open bite involving posterior dentition goes for surgical or skeletal management. Open Bite develops as a result of the interaction of many different etiologic factors including thumb and finger sucking, lip and tongue habits, airway obstruction, and true skeletal growth abnormalities. Growth in vertical dimension is the last to be completed; therefore, treatment may appear to be successful at one point and fail later thus some treatment may be prolonged, if begun early. Long-term clinical outcomes are needed to determine treatment effectiveness and clinicians should consider the cost-effectiveness of these early initiated and protracted plans.

Introduction

Treatment of open bite is considered a difficult treatment procedure together with the subsequent challenging retention,¹ where relapse has been reported in 25% to 38% of conventionally treated and conventionally retained open bite cases.²

Different approaches have been advocated for retention after treatment of open bite. Day time wear of removable retainers and night time wear of either high pull headgear, or functional appliance with bite blocks (an open bite bionator).³ Others suggested retainers with occlusal coverage to control molar eruption.⁴ Although many studies evaluated the effect of different treatment procedures (extraction, nonextraction, and surgical) of open bite on the stability and the relapse rate,⁵⁻⁹ there appear to be no studies that evaluated the stability of open bite cases based on different retention modalities.

Miniscrews offer an excellent anchorage method and have been used to manage open bite successfully in many studies. Therefore, they may be used as skeletal retention during the retention period to minimize the relapse of open bite cases.¹⁰⁻¹⁴

Characteristics Of The Openbite Malocclusion

Teeth and alveolar bones are exposed to antagonistic forces and pressures stemming mostly from muscle function, which may partly determine the position of the teeth. On the other hand, the intrinsic forces of the lips and tongue at rest generate the balance required to position the teeth (Fig-1). By definition, balance occurs when a body at rest is subjected to forces in

various directions but does not undergo acceleration or in the case of teeth is not displaced¹⁵.

Every time this balance is altered, changes occur, such as for example contraction of the dental arches in animals subjected to glossectomy when compared to control animals. Thus, when a tooth is extracted its antagonist continues the process of passive eruption, indicating that the mechanism of eruption remains basically unchanged throughout life and that the tooth seeks occlusal or incisal contact until balance is reached¹⁶.

Dental Open Bite

The dental open bite is an open bite without facial disfigurement. It is associated with some or all of the following characteristics:

- 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
- No vertical maxillary excess
- Thumb and finger sucking habits
- Tongue thrusting
- Without remarkable Cephalometric findings

Skeletal Open Bite

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:

- Steep mandibular plane angle

- Short mandibular ramus
- Increased gonial angle
- Increased lower anterior facial height
- Decreased upper anterior facial height
- Downward rotation of the posterior part of the maxilla or palatal plane tipped up anteriorly
- Increased anterior and decreased posterior facial heights

- Retrognathic mandible

Cephalometric Characteristics

- Steep palatal plane and increased: percentage lower facial height.
- Excess eruption of the maxillary posterior teeth.
- Downward and backward rotation of the mandible.
- Excess eruption of maxillary and mandibular incisors

Prevalence

It was verified a 12% prevalence of anterior open bite, more frequently in males, in patients with Class I and in the age group of 7 to 9, showing the significant difference if it is compared to the prevalence found in the permanent dentition¹⁷. In the mixed dentition the prevalence of the anterior open bite can reach up to 18.5%, decreasing with age¹⁸.

Diagnosis

Treatment is ultimately dependant on an appropriate diagnosis, which in turn requires an unambiguous description of the problem.

A successful treatment of open bite requires a careful analysis of the factors contributing to the problem.

A detailed clinical examination of the dentition, occlusion, jaw movements and soft

tissue pattern of face is very important. For an adolescent patient, a lateral cephalograms must be taken to study the skeletal, dental and soft tissue relationship and the growth pattern and its status. The different diagnostic aids are

1. Case history
2. Clinical examination
3. Study models
4. Cephalograms
5. Photographs

Treatment Strategy

Treatment considerations of open bite include the following

- 1) Etiologic considerations
- 2) Esthetic considerations
- 3) Functional considerations
- 4) Clinical considerations

It can be divided into 3 periods of dental development¹⁹

- Primary dentition
- Mixed dentition
- Permanent dentition

Primary Dentition

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

· The main cause of open bite in deciduous dentition is the prolonged habit of thumb sucking²⁰. Thus, the most important measure to fix it would be to break the bad habit, through techniques of behavioural change. It was observed significant changes in the cephalometric measurements, in the inter-incisal and Na angles, before and after the treatment with methods of awareness and positive reinforcement, without any use of orthodontic braces. The correction of open bite also depends on the restoration of nasal breathing.²¹

Mixed Dentition

1. Habit Control
2. Lip seal and swallowing exercises
3. Growth modification to control vertical growth and posterior dentoalveolar development

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 open bite^{22,23}.

Lip seal and swallowing exercises

The underlying goal is to establish normal neuromuscular function. The patient is instructed to keep the lips together at all times²⁴. Swallowing without thrusting the lip of the tongue towards the upper or lower incisors is suggested before treatment and continues during retention²⁵.

Growth modification to control vertical growth and posterior dento-alveolar development

The objective is to control vertical growth and retard eruption of posterior teeth. the common treatment approaches are high pull headgear²⁶.

Frankel IV regulator, bionator/activator, active vertical corrector (AVC), posterior bite blocks, vertical pull chin cups²⁷.

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Open bite in which the tongue causes or keeps the infra-occlusion of the maxillary and mandibular incisors, the use of the functional braces of Balters Bionator²⁸.

The instrument has lateral bite blocks to prevent the eruption of the posterior teeth, leaving the anterior teeth out-breaking freely. The Semi-Flexible Activator (modified Bionator) as an indication of choice in the early treatment of skeletal open bite and the hypotonic masticatory muscles²⁹.

Permanent Dentition

In adult patients with severe open bite, the treatment aims to ensure the containment and the stability over time, indicating orthognathic surgery.³⁰

The additional bilateral sagittal split osteotomy does not affect the stability, while the multi-segmental Le Fort I osteotomy, stabilized by rigid internal fixation, provides a superior transverse stability if it is compared to the intra-osseous fixation with surgical thread, and maxillo-mandibular fixation. The recurrence of the inter-premolar and inter-molar width of the upper arch are unrelated to the interposition of the tongue, loss of inter-cuspal, changes in overbite or overjet. However, there are significant correlations with the clockwise rotation of the mandible.³¹

The clockwise rotation of the palatal plane, which moves the anterior jaw structures down, is an effective way to produce a reasonably stable correction of anterior open bite. On the other hand, the repositioning of the upper maxilla which rotates the mandible toward the end should be applied with caution³². The decrease of overbite, observed after the treatment, can be result of the influence of skeletal, dental and soft tissue factors, more obvious than any other isolated factor³³. The interposition of lingual "brackets" and inter-maxillary elastics between the tongue and the incisor, correct the malocclusion by the new posture imposed to the tongue³⁴.

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

1. Habit control, lip seal and swallowing
2. Growth modification to control vertical growth and posterior dento-alveolar development (in early permanent dentition period)
3. Orthodontic camouflage (only orthodontics)

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 extraction to reduce both overjet and open bite, and elongate the anterior teeth by a "drawbridge effect"³⁵⁻³⁷.

Generally, the posterior teeth, such as, second molars, are recommended to be extracted because this allows forward rotation of the mandible. Occasionally extraction of premolars is also considered in cases with crowding and/ or protrusion of anterior teeth³⁵. Kim introduced the Multi-loop Edgewise Arch Wire (MEAW) to correct the open bite malocclusion. This technique uses a combination of multi-loops in boot shape on

0.016x0.022 inch S.S arch wires in 0.018 inch slot edge wise brackets, and short, heavy anterior 3/16 inch, 6oz elastics. The vertical loop segments serves as a break between the teeth, lowers the load/ deflection rate, and provides horizontal control. the horizontal loop further reduce as the load/ deflection rate and provides vertical control. The prepared maxillary MEAW arch should show a marked sweep curve, and the mandibular arch has a marked reverse curve of spee. Before the preparation of MEAW, the teeth must be well aligned. It has been advocated as a resource to treat cases of severe open bite without surgical intervention by retraction and extrusion of the anterior teeth combined with up-righting and intruding the posterior teeth, and altering the occlusal planes. The treatment changes with the MEAW technique minimally affect the skeletal pattern; they occur mainly in the dento alveolar region by increasing the upper and lower anterior dento alveolar heights. One of the objectives of this technique is the proper vertical positioning of the incisal edges of upper incisors relative to resting lip line at or near 4mm as measured cephalometrically, so that it is not useful for patients who have adequate or excessive dento alveolar height before treatment. The result from this technique has proven to be very stable^{36,38,39}.

Recently, so called "modified MEAW", or upper accentuated- curve and lower reverse curve NiTi arch-wires combined with inter-maxillary elastics, was introduced by Enacar et al as an alternative technique for correcting the open bite problem⁴⁰. Most open bite malocclusion shows some aspect 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 III elastics, and minimize using anterior vertical elastics³⁶.

Orthognathic Surgery (A combination of orthodontics and surgery)

The guidelines for coordination orthodontics and surgery for the open bite malocclusion is the same as for any other surgical- orthodontic treatment. Surgical procedures often involves a bimaxillary approach with Lefort I posterior maxillary impaction. Segmental maxillary and/or mandibular osteotomies are likely to be employed. During the pre surgical 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.⁴¹

Il orthodontists have been faced with the difficult task of treating patients with anterior open-bite and the subsequent challenge of retention. The orthodontic literature has numerous case reports and studies reporting good results at the end of treatment. These are helpful, but the success of open-bite therapy is ultimately measured by long-term stability.

Retention Stability of Open Bite



The high relapse rate seen in patients with anterior open bites makes treating these cases frustrating. Relapse may result in negative esthetic characteristics such as a reverse smile line, and in some instances, inter-proximal anterior spacing⁴².

Mostly relapse of openbite is 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 head gear to the upper molars at night time, in conjunction with standard removable retainer is one effective and comfortable way for the patient to control open bite relapse⁴³.

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