

Open Bite: A Challenge to Orthodontist

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ABSTRACT

Background: In this changing era and in our day to day orthodontic & paediatric dentistry practice, the severity, the modalities and the options to treat various type of malocclusion are changed and upgraded as per the expectation of the patients, because in orthodontics we deal with the correction of malocclusion as well as the esthetics of the patients. Open bite is one of the various malocclusion which is occurring in vertical dimension which lead to an unacceptable facial appearance. It can be skeletal or dental or may be seen in growing as well as adult patients. This article updates clinicians on the causes and cures of open bite based on clinical data.

Keywords: Open bite, dental open bite, skeletal open bite, pathological open bite.

INTRODUCTION

Open bite was defined by Subtelney¹ and Sakuda as open vertical dimension between the incisal edges of the maxillary and mandibular anterior teeth, although loss of vertical dental contact can occur between the anterior or the buccal segment. Because different etiologic factors are involved when the open bite occurs in the anterior (as opposed to the buccal segments) our discussion will be restricted to anterior open bite.

PREVALENCE AND PROBLEM RELATED TO OPEN BITE

The prevalence of skeletal long face malocclusion is unknown, but has been estimated to be 0.6% or 1,350,000 U.S. citizens ² The prevalence of dental open bites in U.S. children is approximately 16% in the black population and 4% in the white population³, with the prevalence of simple anterior open bites (involving mainly the incisors) decreasing until adolescence. Masticatory⁴ and speech ⁵ problems have been attributed to open bites. The inability to incise is the chief complaint

often voiced by open bite patients. Other patients indicate displeasure with their facial esthetics.⁶

ETIOLOGY AND CLINICAL FEATURE

1. DENTAL OPEN BITE

This open-bite is caused by obstruction of eruption of the anterior teeth. Classically, Many of these cases show spontaneous remissions⁷, and about 75 to 80% had marked improvement without any form of treatment.⁸ Since the vast majority of these patients are children in the transitional dental stage, it is conceivable that the rate of eruption of the anterior teeth will slow down temporarily. These subjects are often referred to as having "transitional or pseudo open-bite".



Fig 1: Dental Open Bite

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2. SKELETAL OPEN-BITE (HEREDITARY)

This group shows some craniofacial malformation which often varies with maturity⁹. Adverse functional activities such as mouth breathing may affect the facial architecture and enhance the development of open-bite.^{10,11} Masticatory muscle functions probably affect mandibular posture and progressively alter the skeletal configuration.^{12,13}



Fig 2a: Skeletal Open Bite(Clinical Features)



Fig 2b: Cephalometric Features Of Skeletal open Bite.

3. PATHOLOGICAL OPEN-BITE

Pathological conditions may also present as anterior open-bite, such as in cleft palate, acromegaly or in bilateral condylar fracture cases. Le Fort II and III fracture cases often present with gagging occlusion, hence anterior open-bite.^{14,15}



Fig 3a: Pan facial fracture showing characteristic Open Bite.



Fig 3b: Open bite can be seen in cleft patients

4. ABNORMAL TONGUE FUNCTION

The cause and effect relationship of abnormal tongue function and open-bite is not clear¹⁶. This controversy still rages on because little scientific evidence exists to establish the relationship. However, Cooke¹⁷ reported that young patients possessing anterior open-bite are frequently presented with large tongues. Evidence also suggests that in some cases, the aberrant tongue¹⁸ and tongue behaviour known as "endogenous tongue thrust"¹⁹ are the actual cause of the anterior open-bite.



Fig 4: Tongue thrusting habit is one of the major cause of open bite

5. Thumb And Finger Sucking or Pacifier Use

In younger children, the major cause of anterior open bite (excluding open bites associated with the transition from the primary to mixed dentitions) are non-nutritive sucking habits. By adolescence, environmental causes of anterior open bite are less important than skeletal factors. Prolonged thumb-sucking tends to create this malocclusion. A surprisingly large percentage (10-15%) of children continue to suck a thumb, finger, or other object well into the elementary school years.



Fig 5: Prolonged thumb sucking habit result in anterior open bite and flaring of incisors.

6. AIRWAY OBSTRUCTION OR MOUTH BREATHER

Patients with skeletally disproportionately long faces are often suspected of having an airway obstruction. These patients' facial appearances were characterized many years ago as adenoid facies: the cheeks are narrow, the nostrils are narrow and pinched, the lips are separated, and often there are exaggerated shadows beneath the eyes^{20,21}. Hultcrantz examined the incidence of open bite in children with tonsillar obstruction and found a higher proportion of open bites than in children with unobstructed airways. Harvold showed that total nasal airway obstruction caused various developmental problems, but an open bite did develop in some animals²².



Fig 6: Anterior open bite associated with mouth breathing habit

DIAGNOSIS OF OPEN BITE

Clinical examination

Open bite can be dental or skeletal, the dental open bite could be caused by infraeruption of incisors or supra eruption of molars, so the proper evaluation

of the clinical crown length of incisor and molar should be assessed on patient cast.

Habits

As explained earlier the aetiology of the malocclusion should be evaluated for proper diagnosis and treatment planning. The habit which should be evaluated are tongue thrusting, thumb sucking habits, mouth breathing habits

Relationship between temporomandibular joint dysfunction (TMD) and open bite

Williamson surveyed 304 pre-orthodontic patients (aged 6-16), and found that 72% of those with pain dysfunction symptoms had either open bite or deep bite. In subjects with TMD, 72.9% exhibited some form of malocclusion and 5.4% had open bite. Because a large number of subjects with TMD also had malocclusion, the authors recommended early treatment to prevent severe TMD²³.

Cephalometric analysis

Open-bite subjects showed a significant increase in the lower anterior facial height, mandibular plane angle, gonial angle, Y-axis, mandibular occlusal plane to SN angle, and a significant decrease in maxillary length. Both the maxilla and the mandible were in a retruded position in relation to the SN plane. In addition, the interincisal angle was significantly increased²⁴.

TREATMENT CONSIDERATION

The treatment for open bite problems ranges from observation or simple habit control procedures to complex surgical procedures. This is complicated by the fact that vertical growth is the last dimension to be completed.

HABIT THERAPY

In young children engaged in non nutritive sucking habit NNS, treatment consists of controlling the habit, which alone may be sufficient to allow the teeth to erupt to a normal position. Johnson and Larson²⁵ suggest that therapy should begin when the benefit to the patient outweighs the risks (dental, emotional, and psychologic) of habit discontinuation.

Treatment may involve habit awareness, time out, contract of reward or punishment, positive reinforcement, and sensory attenuation procedures (procedures designed to interrupt the sensory feedback from NNS such as orthodontic appliances, chemical aversion, and hand wraps). A habit device can be incorporated into the maxillary expansion appliance to correct both the transverse (maxillary constriction) and vertical problems (Fig). Because patient compliance and cooperation are essential in eliminating NNS habits, a child must want to terminate the habit before intervention begins.



Fig 7a: Hand wrap to interrupt thumb sucking habit.



Fig 7b: Maxillary expansion appliance.

TONGUE CRIB APPLIANCE

In cases with anterior open bite, the crib should be longer and can be up to 3/4th of the interincisal distance between the upper and lower central incisors. This is to avoid the tongue from thrusting over the tip of the crib. The palatal crib acts as a barrier against the thrusting tongue and works as a mechanical restrainer²⁶



Fig 8: Tongue crib appliance

MAGNETS

Magnets also have been incorporated into bite blocks to exert an intrusive force on the molars with a result of decreasing the open bite²⁷

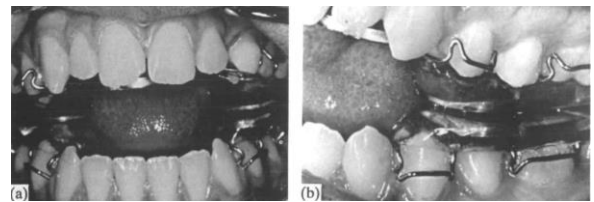


Fig 9 Repelling Magnets are placed in posterior bite block

RAPID MOLAR INTRUDER

The mechanism of the appliance is quite simple. When the patient tends to close his or her jaws, the intrusion force created by the flexion of the elastic spring modules is transferred to the maxillary and mandibular first molars²⁸.

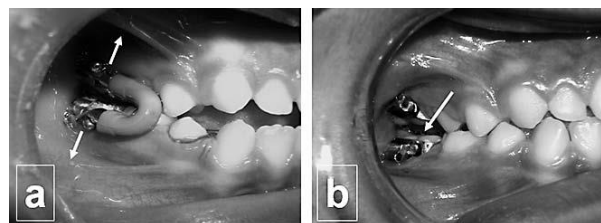


Figure 10(a): The intrusion force is directly transferred to the maxillary and mandibular first molars. (b) Significant molar intrusion soon after removal of the appliance

FUNCTIONAL APPLIANCES

In correcting skeletal open bite problems, intraoral appliances, such as activators, bionators, Frankel regulators (most with the inclusion of posterior bite blocks), have been used to control vertical maxillary growth of the mixed dentition. Weinbach and Smith²⁹ showed that a bionator can be used to treat open bite problems, especially if accompanied by a class II molar relationship.

COMBINATION THERAPY WITH EXTRAORAL ORTHOPAEDIC APPLIANCE

Ngan demonstrated that open bite complicated by a class II vertical growth pattern can be treated during the mixed dentition with favorable results by using a combination of an activator and high-pull headgear³⁰.

SURGICAL MANAGEMENT

One method of surgical correction is to extract second and/or third molars if they are the only source of centric contacts³¹.

Glossectomies have been used to correct open bite problems associated with abnormal tongue habits. Their effectiveness in closing anterior or posterior open bite problems has not been substantiated. Severe skeletal open bites in patients who are not growing are often treated by combined orthodontic surgical approach. Superior repositioning of the maxilla, via total or segmental maxillary osteotomies, is indicated in skeletal open bite patients with excess vertical maxillary growth. Maxillary impaction allows forward and upward rotation of the mandible, therefore decreasing the lower face height and eliminating anterior open bite³¹.

SKELETAL ANCHORAGE SYSTEM

Recently, as a result of advances in biocompatible medical materials, osteointegrated titanium implants have been developed and used in bone screws and miniplates for rigid fixation in orthognathic surgery. This application leads to the hypothesis that a titanium miniplate^{32,33} might also be used as a source of stationary anchorage for tooth movements.

Therefore, titanium miniplate that is temporarily implanted in the maxilla and/or mandible as an immobile intraoral anchorage, particularly for intrusion of the molars.

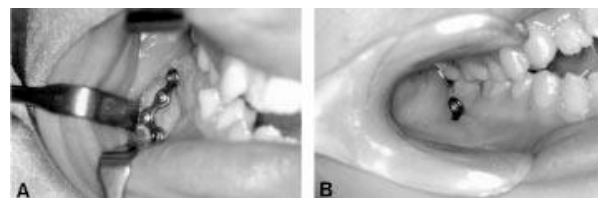


Fig 11a: Implantation of a titanium miniplate., Surgical procedure, **B** after healing of the wound.

RETENTION AND RELAPSE

Many studies have indicated that if open-bite correction is not stable, it was because the tongue continues to be postured anteriorly which causes the bite to reopen.³⁴⁻³⁷ Incomplete cessation of digit sucking habits, following treatment, often results in the relapse of anterior open-bite due to continued excessive vertical growth and eruption of posterior teeth.³⁸ Controlling the eruption of upper molar until late adolescence is the key to retention in anterior open-bite cases. High pull headgear to upper molars in addition to conventional removable retainers prevent relapse of open-bite. Long-term prognosis of anterior open-bite is somewhat unpredictable. Lopez-Gavito et al assessed 41 patients all of whom had had an anterior open-bite of at least 3mm. Ten years after treatment, only 35% of patients had an overbite of at least 3mm. No reliable predictor of post-treatment relapse was found.

CONCLUSION

Developmental or skeletal open-bites are usually much more complex in nature. Patients with open bite malocclusion can be diagnosed clinically and cephalometrically, however, diagnosis should be viewed in the context of the skeletal and dental structure. Accurate classification of this malocclusion requires experience and training. A detailed understanding of its etiology and developmental processes is, thus, essential for their management. The relapse of anterior open-bite could be minimized with appropriate retention regimen. On a long-term basis, no reliable predictors of post-treatment relapse could yet be found.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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