

Management of Open Bite Malocclusion- A Literature Review

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Abstract

Open bite is a malocclusion that occurs in the vertical plane, characterized by lack of vertical overlap between the maxillary and Mandibular dentition. Open bite malocclusion is easy to diagnose but difficult to retain. Management of this malocclusion is challenging to the orthodontics due to the presence of multiple etiological factors. Because of the multiple etiological factors, treatment of open bite often requires comprehensive, multidisciplinary approach. This article focuses on the various treatment modalities for the correction of open bite.

Keywords: Open bite, Etiology, Management of Open Bite

Introduction

Glossary of Orthodontic terms defines open bite as a developmental or acquired malocclusion whereby no vertical overlap exists between maxillary and mandibular anterior or posterior teeth. The term “open bite” was coined by Caravelli in 1842 as a distinct classification of

malocclusion^{1,2}. Open bite must be considered as a deviation in the vertical relationship of maxillary and mandibular dental arches.

Open bite was defined by Subtelney and Sakuda³ 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.

Open bites can occur in the anterior and the posterior region and are called anterior open bite and posterior open bite respectively⁴. The diagnosis, treatment, and successful retention of treated open bite malocclusion pose a challenge to the technical ability and skills of the clinicians. Etiologic factors⁵ that causes open bite include heredity factors, unfavorable growth patterns, digit-sucking habits, tongue and orofacial muscle abnormal function and their interaction with the skeletal components, imbalances between jaw posture, occlusal and eruptive forces and head position. A detailed

understanding of its etiology is important for the management of Open bite malocclusion.

Etiology⁶

It can be divided into two-

1. Hereditary
2. Non hereditary factors or Environmental factors.

Hereditary factors⁷

The open-bite anomaly is most often associated with inherited facial growth. Horizontal skeletal dysplasias appear to be inherited thus dysplasias in the vertical plane may also be inherited. Skeletal open bite malocclusion was variably expressed in Amelogenesis imperfecta affected individuals. The enamel phenotype severity did not necessarily correspond with the presence or severity of open bite malocclusion. Open bite malocclusion occurred in individuals with AI caused by mutations in the AMELX and ENAM genes even though these genes are considered to be predominantly or exclusively expressed in teeth⁸.

Savoie et al⁹ also reported that the vertical proportions are highly under genetic control. The most frequent inherited malocclusion was found to be the facial deformity and open bite malocclusion with dolichofacial pattern. The higher prevalence of anterior open bite in black population compared to the white population and the higher prevalence of deepbite in whites may reflect a different inherent facial morphology rather than environmental factors.

Grabber et al¹⁰ stated that some types of malocclusion such as long face open bite problems have an inherited component. Cases of AOB have been shown to be more common among blacks than whites or Hispanics in USA¹¹. Aberrant skeletal development is another factor that is well documented as contributing to this malocclusion. For example excess vertical growth has been blamed for the development of AOB¹². Cozza et al. observed an association between hyper divergent face and Open bite.

Non hereditary or Environmental factors

Habits: Pernicious oral habits like thumb, digit or lip sucking, mouth breathing and tongue thrust usually accompanied with macroglossia¹³.

Neuromuscular deficiencies: Categorises the skeletal component of the open bite¹⁴. Leptoprosopic patients with muscular dystrophy show supra eruption of posterior buccal segment precipitating as anterior open bite¹⁵.

Trauma: May be Skeleto-facial or dento-alveolar in nature. Pronounced anterior open bite is usually seen with condylar head trauma leading to arrested growth or ankylosis of the condyle present as an altered vertical growth of mandible. Dentoalveolar trauma specially to the incisors is seen as anterior open bite. Ankylosis of damaged teeth is seen before the patient completes growth¹⁶.

Diseases: Degenerative diseases as idiopathic condylar resorption and juvenile rheumatoid arthritis are usually present with condylar resorption.

Management of Open bite malocclusion

It's quite challenging for an orthodontist to treat open bite and maintain its results. Since the occurrence of open bite can be affected by race and age¹⁷. For treatment of growing patients orthopedic and functional appliances can be used but in adults only orthodontic intervention and Orthognathic surgery are left for curative intervention.

According to various studies both surgical and non-surgical treatment of open bite has high success rates which is expected to be greater than 75% (the mean value for patients treated with only orthodontic approach is 75% and 82% for both orthopedic and orthodontic approach)¹⁸

Functional appliances

A. Frankel appliances + lip seal exercises:- The effects of the combination therapy regarding these two appliances were noticeable dent alveolar effects without any significant results in skeletal region. There may be longer

stability of achieved results if the lips are sealed without strain.

FR IV appliance is used for open bite correction.

The effects of the FR4 appliance in cases of skeletal open-bite were evaluated cephalometrically and the following conclusions reached¹⁹:

1-The FR4 appliance did not produce any skeletal changes.

2-No significant changes in facial proportions occurred.

3-The lack of any significant increase in ramus height and an unexpected slight posterior rotation of the mandible contradict the hypothesis on which this appliance is based.

4-The amount of open-bite decreased significantly in the FR4 group. Vertical eruption of the upper and lower incisors and retraction of the upper incisors are considered responsible for the closure of open-bite.

The FR4 appliance was found to affect dental structures rather than skeletal configuration, thus failing to improve the facial pattern, and merely masking the existing vertical problem.

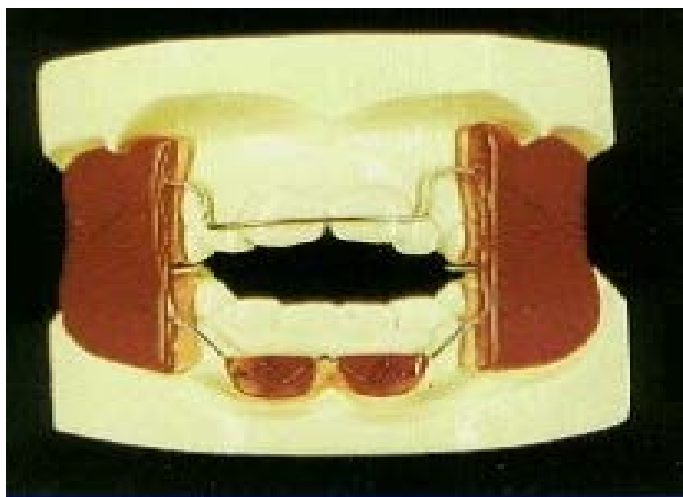


Figure 1

B. Open bite bionator (OBB):- According to one theory OBB was more effective when used in combination with other appliances than when it was used alone²⁰. Other effects of OBB are improved intermaxillary vertical correlation, facial convexity is decreased and reduces

open-bite in class II patients, reduces overjet and ANB angle²¹. Extrusion of maxillary molars is controlled.

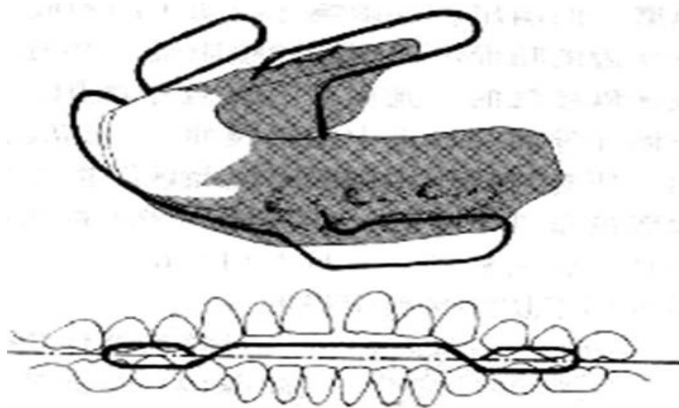


Figure 2

2. Bite Blocks

A. Spring loaded bite blocks (SLBB)²²: SLBB generates more molar intrusion and ramal inclination. The effects of SLBB are incisors extrusion, maxillary molars intrusion, control of posterior dentoalveolar height.



Figure 3

Design of Spring-Loaded Bite Blocks (SLBB)²²

The appliance has two acrylic portions: a mandibular lingual plate with occlusal coverage and maxillary bite-block overlies the mandibular plate.

The acrylic plate is extended incisally to the cingulae of the incisors to prevent their supraeruption. The maxillary bite-block is extended from lower first premolar and first primary molar area to the upper last erupted molar.

These two acrylic portion are connected together by 2 helical springs (buccal and lingual) made from 0.9- mm stainless steel wire.

The spring is located with the helices facing the first premolar or Primary 1st molar. The inferior end of the buccal spring is soldered to the Adams clasp (0.8-mm stainless steel), and the superior end is embedded in the maxillary bite block.

The lingual spring has its inferior end embedded in the mandibular plate and the superior end embedded in the maxillary bite-block. Both buccal and lingual springs are parallel to each other.

A hook made from 0.9-mm stainless steel wire is embedded in the occlusal bite-block in the molar region on the buccal side to measure the amount of delivered force which should be within 300g.

Spring loaded bite blocks combined with vertical pull chin cup could effectively improve both Soft tissue and dentoskeletal structures in patients, where greater reduction in the interlabial gap and upper lip-E line were observed in patients treated with this approach. As well as, the spring loaded therapy combined with vertical chin cup could result in greater increase of lower lip length and nasolabial angle. The soft tissue changes reflect the treatment effects on hard tissues .

B. Posterior bite blocks with modified TPA and tongue crib²³:- The effects of PBB are incisive extrusion and lingual tipping, manages posterior dentoalveolar height, mandibular autorotation, effective in treating AOB. Modified TPA will give additional intrusion effect to molars aid in dental open bite correction.



Figure 4

Posterior bite block with modified TPA and tongue crib

C. Magnetic Bite Block (MBB)²⁴:-In 1986 Dellinger was the first one to use magnets to treat anterior open bite. The affects of magnetic bite blocks are incisor extrusion, molar intrusion, decrease anterior facial height, mandibular autorotation, comparatively more effective than spring loaded bite blocks and acrylic bite blocks.



Figure 5

3. Rapid molar intruder (RMI)²⁵:- It can be utilized in early and mixed dentition period.RMI was introduced and named by Carano a decade ago. It is designed in such manners that it has coil spring along with elastic modules in it is applied to first molars through bands which are in turn attached to molars. The effects of RMI are molar intrusion, mandibular autorotation with advancement of chin which improves appearance of patient.

1. Rapid molar intruder is an effective appliance for the treatment of anterior open bite.

2. It is considered biologically favorable, as it caused minimal root resorption and maintained the health of periodontium.

3. The upper first molar showed significantly more intrusive movement (about four times) than the lower one.

4. The upper first molar had minimal detrimental effect, evidenced by less apical root resorption and more root area, than the lower molar tooth.

4. Cribs (or) Spurs²⁶

A. Removable palatal crib (RPC):- It is found to be effective in the anterior dentoalveolar region it guides the extrusion and uprighting of maxillary and mandibular incisors. Skeletal changes depend on patient's cooperation.

B. Fixed palatal crib(FPC):- According to some authors cribs are found to be effective in correcting maxillomandibular vertical relationship but others reported that it produces only dentoalveolar changes. It is more efficient than removable crib because it does not require conformity.

C. Quad helix/crib (Q-H/C):- It obstructs the suckling habit, incisor extrusion and lingual tipping, comparatively more effective than removable crib as it does not require conformity. It directs the rotation of palatal plane downwardly and improves intermaxillary vertical relationships.



Figure 6

5. Vertical chin cup (VCC)²⁷

There was noticeable increase in the overbite with VCC either when used alone or with other appliances. Some of its effects are decreased gonial angle, vertical control, molar eruption not guided skeletal changes depends on patient's obedience.

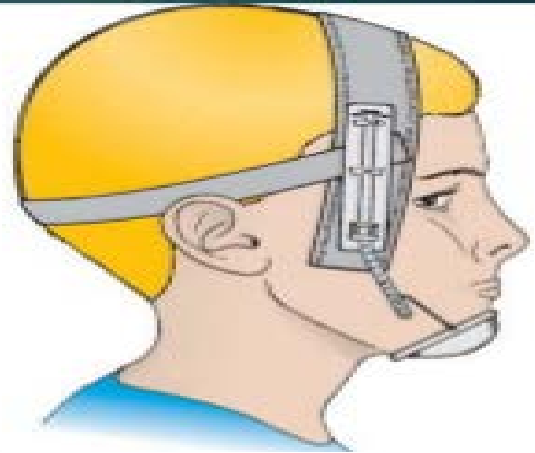


Figure 7

6. Temporary anchorage devices (TAD'S)²⁸

A. Miniscrews (or) miniplates:- The effects includes intrusion of maxillary maxillary posterior teeth, decrease in anterior facial height.

7. Maxillary intrusion splint²⁹

It obstructs the eruption of mandibular teeth and facilitates the intrusion of maxillary posterior teeth in-turn reduces the open bite. It is designed in such manner that it covers all maxillary premolars and molars but not the canines because of this in few patients there a premature occlusion in canine region and potential posterior open bite is noticed.



Figure 8

8. Orthognathic surgery³⁰: The patients who are adults and who acquired comparatively substantial open bite before the treatment were suitable for LeFort I osteotomy. It reduces the open bite, lengthening of maxillary and mandibular incisor occurs. Posterior region of the maxilla will be elevated.

Conclusion

Open bite malocclusion is a difficult to treat in orthodontic practice. Treatment modalities include functional appliances in growing children and surgeries in adults. Minor cases can be treated by fixed orthodontics along with some habit breaking appliances. Relapse rates are highest in this type of malocclusion. Functional efficiency of the stomatological system is undermined in such cases. Extra care should be taken while diagnosing and planning treatment for such these cases as any error in identifying the etiology may lead to a poor end result.

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