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# Challenging Malocclusion in Orthodontics: The Open Bite

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**Abstract**--The term open bite is referred as no contact between anterior or posterior teeth. The complexity of open bite is attributed to a combination of skeletal, dental and habitual factors. Etiology of open bite can be attributed to genetics, anatomic and environmental factors. However, the tendency toward relapse after conventional or surgical orthodontic treatment has been indicated. Therefore, open bite is considered one of the most challenging dentofacial deformities to treat. The aim of this article is to emphasize on early etiological diagnosis, dentofacial morphology and classification, which are essential for the successful outcome of the technical intervention. Failure of tongue posture adaptation subsequent to orthodontic and/or surgical treatment might be the primary reason for relapse of open bite. Prolonged retention with fixed or removable retainers is advisable and necessary in most cases of open bite treatment. The treatment of open bite remains a tough challenge to the clinician; careful diagnosis and timely intervention with proper treatment modalities and appliance selection will improve the treatment outcomes and long-term stability.

**Keywords**---open bite, tongue posture, etiology, retention.

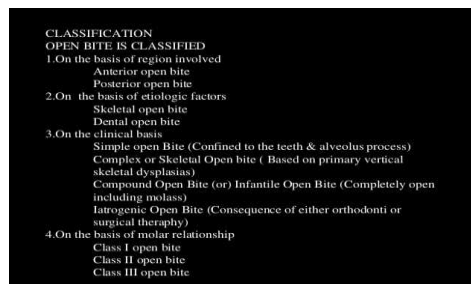
## Introduction

Traditionally open bite means opposing teeth do not meet. Vander Linder, however has indicated that the overlap criterion is arbitrary and is associated with the sagittal relation between teeth involved. The absence of an occlusal stop between the teeth with their antagonists or opposing gingival tissue is of greater significance. The same view was held by Moyers, who stated that it is important to use the term open bite for all conditions characterized by absence of an occlusal stop. Open bite must be considered as a deviation in the vertical relationship of maxillary and mandibular dental arches. In an open bite there should be a definite lack of contact, in vertical direction, between opposing segments of teeth. The loss of contact in vertical direction of segments of teeth can occur between anterior or buccal segments.

Descriptions of open-bite differ among various authors and investigators. Some orthodontists consider an open-bite to be present when there is less than an average overbite, others consider an edge-to-edge relationship to be an open-bite, while still others specify that a definite degree of openness must be present. Since definitions of open-bite vary, the reported incidence of open bite varies also. In 1842 Caravelli coined the term "open bite" as a distinct classification of malocclusion<sup>1</sup> and can be defined in different manners<sup>2</sup>. Open bite was defined by Subtelny and Sakuda<sup>3</sup>, as open vertical dimension between the incisal edges of the maxillary and mandibular anterior teeth, although deficiency in vertical dental contact can occur between the anterior or the buccal segment.

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. An abnormal dental condition in which anterior teeth in maxilla do not occlude those in mandible in any mandibular position. (Mosby's Medical Dictionary, 8th Edition). Open bite is defined as the lack of vertical overlap of the anterior teeth in centric occlusion<sup>4-5</sup>. Some authors have determined that open bite, or a tendency toward open bite, occurs when overbite is smaller than the normal. One school of thought argues that open bite is characterized by end-on incisal relationships, while the others school of thought stated that no incisal contact be present before diagnosing open bite<sup>6-10</sup>. It is one of the most complex malocclusions to manage. The interaction of skeletal, dental, and soft tissue effects can contribute to develop an open bite.

## Classification



Anterior open bite (fig. 1)



Fig.1: Anterior open bite

It is defined as a malocclusion with no contact in the anterior region of the dental arches, and the posterior teeth in occlusion. It is called combined open bite when malocclusion extends to the posterior segment<sup>11</sup>. *The open bite is one of the most prevalent and is most difficult to treat. When the etiology is multi-factorial, the pathology causes aesthetic changes, damage to the articulation of certain phonemes and unfavourable psychological conditions<sup>12-13</sup>, the open bite may have a dental, skeletal or combined etiology. The treatment of dental open bite can be easily done with fixed orthodontic therapy. However, a more comprehensive approach is required for the management of skeletal open bite which may require orthognathic surgical intervention. Dental open bite in growing patient can be treated with myofunctional appliances followed by retention period with orthodontic removable appliances<sup>14</sup>. Obstruction of the nose should be seen before and during the pubertal growth<sup>15</sup>. The hyper activity of the tongue, in the act of swallowing or even at rest, can alter the axial inclinations of the incisors which can lead to open bite<sup>16</sup>.*

### Posterior open bite



Fig.2: Posterior open bite

It can be defined as failure of contact between the posterior teeth when the teeth occlude in centric occlusion. (fig.2). According to Rakosi, Four varieties of open bite due to tongue posture may be differentiated as:

- Anterior open bite-Open bite in a deciduous dentition, caused by tongue dysfunction as a residuum of a sucking habit.
- Lateral open bite-Occlusion, in this type of open bite on both sides is supported only anteriorly and by first permanent molars.

- Complex open bite-Severe vertical malocclusion. The teeth occlude only on second molars.
- Tongue dysfunction and malocclusion-in mandibular prognathism, the downward forward displacement of tongue often causes an anterior tongue thrust habit.

**A proper cephalometric analysis enables classification of open bite malocclusions**

- Dentoalveolar open bite
- Skeletal open bite
- Positional deviation
- Dimensional deviation
- Skeletal Class II open bite
- Skeletal Class III open bite

**According to profit**

Open bite (mm)

- Extreme: Open bite more than 4mm
- Severe: Open bite in range of 3-4 mm.
- Moderate: open bite of 0-2mm.

**Open bite can be classified as**

- Incomplete overbite
- Simple open bite
- Complex open bite
- Compound open bite
- Iatrogenic open bite

**Open bite is classified as**

- Anterior open bite-Anterior open bite is defined as no contact and vertical overlap between the maxillary and mandibular incisors<sup>18-19</sup>.
- Posterior open bite-When teeth are in occlusion there is a space between posterior teeth.

**Open bite is classified by Sassouni**

as (Criterion-Angle of mandibular plane)

- Skeletal open bite
- Dentoalveolar open bite

Open bite is classified

- a) Class I open bite
- b) Class II open bite

c) Class III open bite

### **According to Moyers**

- Simple open bite:-This type of open bite is confined to the teeth and alveolar process. The main problem regarding this type of open bite is failure of some of the teeth to meet the line of occlusion.
- Complex open bite:-This type of open bite is caused by primary vertical dysplasia. Complex open bite is frequently associated with Class-I and Class-II malocclusions and occasionally associated with Class III malocclusion.

### **Classification of open bite by Worms, Meskin, and Isaacson (1971)**

- Simple open bite - From canine to canine, with 4mm or more in centric relation.
- Compound open bite - From premolar to premolar.
- Infantile open bite - From molar to molar

### **Types of open bite**

- False or Dental open bite: In this bite the teeth are proclined as there is no alteration of the osseous bases but it does not extend beyond the canine. This patient has normal facial morphology, a correct bone relation, a pseudo-bite and dento-alveolar problem<sup>21-22</sup>.
- True or Skeletal open bite: In this type of open bite the alveolar processes are involved or deformed and dolichofacial characteristics are also seen. This patient presents hyper-divergency in maxilla, with their lower facial third and vertical dimensions increased<sup>23</sup>.

### **Etiology**

According to Dawson<sup>24</sup>, the major causes of an anterior open bite are forces that result from thumb or finger sucking, pacifier use, lip and tongue habits, airway obstruction, and inadequate nasal airway

Anterior open bite like any other malocclusion is the result of certain causes either of the hereditary origin, that act prenatally or post-natally on the tissues of the orofacial region.

### **Hereditary factors**

The open-bite anomaly is most often associated with inherited facial growth. Horizontal skeletal dysplasia appear to be inherited thus dysplasia in the vertical plane may also be inherited<sup>25</sup>. Three major theories<sup>26</sup>, in the recent years have attempted to explain determinants of craniofacial growth.

- Bone, like other tissues, is the primary determinant of its own growth<sup>27</sup>.
- The determinant of skeletal growth is cartilage while bone responds secondarily and passively<sup>28</sup>.

- The primary determinant of growth is the soft tissue matrix in which skeletal elements are embedded and both bone and cartilage are secondary follower's<sup>29</sup>.

### Non-hereditary factors

Subtelny and Sakuda<sup>30</sup>, (1964) and Tulley<sup>31</sup>, (1969), have stressed the abnormal functional patterns of the tongue, pernicious oral habits, abnormal swallowing patterns and speech problems,

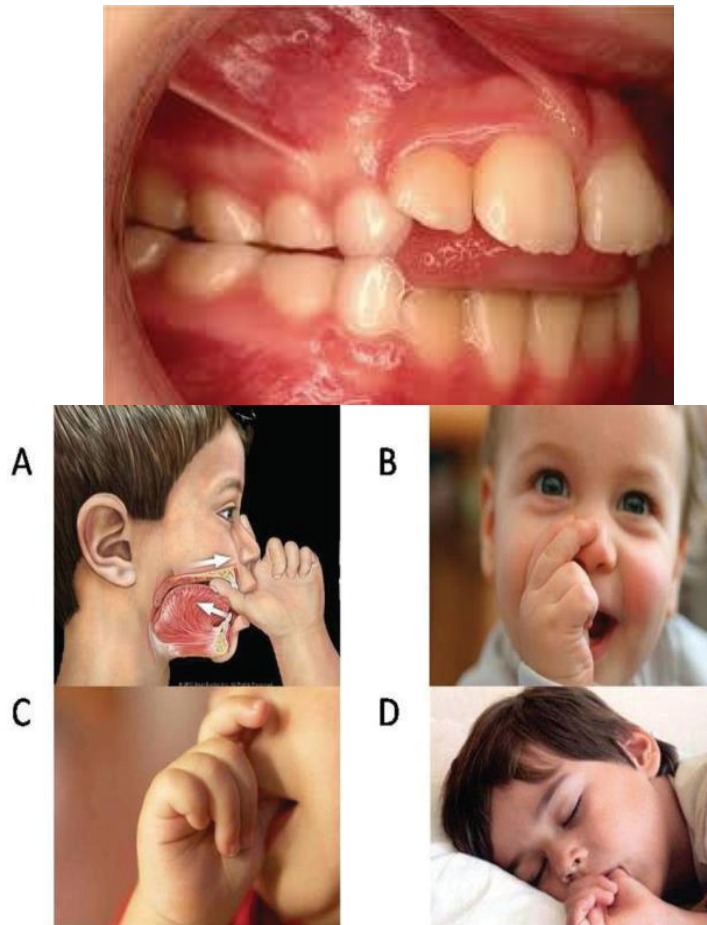


Fig.3: A) Effect of thumb sucking on palate and lower incisors,B/C) finger above nose during thumb sucking, D)thumb sucking during sleeping.

All contributing to, and being part of, the open-bite phenomenon. A malfunction of the tongue can be a contributing cause or the result of an abnormal swallowing behaviour. (fig.3). According to Gershater<sup>31</sup>, (1972), the site of the open bite deformity depends on which forces predominate, and the ability of the teeth and supporting structures to resist change. If, for example, there is an abnormal swallowing pattern and strong propelling forces of the tongue are directed forward, the chances are that there would be a tendency toward an anterior open

bite. Also the severity of the anterior open bite is greatly influenced by the presence of pernicious thumb, finger or lip sucking, mouth breathing habits, and poor labial musculature. Sucking habits: Various factors responsible for the degree of damage to the teeth and investing tissues due to the sucking habits are:

- Duration
- Frequency
- Intensity
- Location

Thumb sucking or finger sucking habit can be seen in a child up to the age of four to five years. This is considered to be a normal habit resulting in no permanent form of malocclusion. However, persistent thumb sucking continuing up to the mixed and permanent dentition age groups may well result in anterior open bite (Thompson and Popovich, 1970)<sup>32</sup>. Persistent thumb sucking can cause an upward and forward force onto the anterior aspect of the maxillary complex.

### **Abnormal tongue function**

The cause-and-effect relationship between abnormal tongue function and anterior open bite is not clear. Following four factors may be considered:

- Activity
- Posture
- Age and growth
- Adaptability (Graber-1972)

### **Prevalence of open bite**

An open bite of greater than 2 mm occurs in less than 1% of the population and has five times greater prevalence in the black population than in the white or Hispanic populations<sup>33</sup>. The incidence of anterior open bite ranges from 1.5% to 11%<sup>33</sup> and varies between races and with dental age.<sup>35</sup> In the mixed dentition the prevalence of the anterior open bite can reach up to 18.5%, and decreasing with age.

### **Factors and characteristics of open bite**

Open bite malocclusion is considered to be one of the most difficult problems to treat orthodontically. The causes of open bite are multi-factorial, which can develop from genetic and/or environmental factors. Generally open bite can be classified in two categories: skeletal and dental. Dental open bite can be treated with orthodontics therapy, but a true skeletal open bite may require surgical intervention along with orthodontic treatment. Open bite can manifest as an aesthetic, functional and psychological problems to patients. The functional problems comprise of defect in speech, mastication and deglutition resulting in impairment in child development. In mixed dentition open bite prevalence can be seen up to 17% (Worms, FW. et al)<sup>36</sup>. Recurrent adenoid infections may cause improper tongue position persistent infantile swallow accompanied with pernicious oral habits which can be seen as partial eruption of the incisors. Pernicious oral habits, such as digit or lip sucking, mouth breathing and tongue

thrusting result in dento-alveolar anterior open bite. This can be readily corrected by orthodontic treatment alone. Vertical dento-facial dysplasia has a tendency to relapse. This occurs with deep bite as well as open bite malocclusions<sup>37</sup>. Vertical dysplasia seen as anterior open bite is multifactorial<sup>38-39</sup>.

### **Environmental Factors**

- Habits
- Neuromuscular deficiencies
- Trauma
- Diseases
- Genetics

### **Why treat open bite?**

- Aesthetics. A person with an open bite may be unhappy with the appearance of their teeth because they look like they're sticking out.
- Speech. An open bite can interfere with speech and pronunciation. For example, many people with open bite develop a lisp.
- Eating. An open bite can prevent you from properly biting and chewing food.
- Tooth wear. As the back teeth are coming together more often, the wear can lead to discomfort and other dental problems including fractured teeth.

### **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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