Vertical Plane Discrepancies

(Open Bite)

Learning Objectives

1- To differentiate the etiological factors behind vertical plane discrepancy (open bite malocclusions).

2- To equip the students with the treatment modalities of managing various kinds of open bite malocclusion.

Introduction

Open bite means no overlap or a gap exists between the maxillary and mandibular teeth when the patient bites in centric occlusion. An open bite can exist in the anterior or the posterior region. It can vary from being simply dental in nature to involving the underlying skeletal structures. The classification and treatment will depend mainly on the location, etiology and the extent of the open bite. An open bite present in the anterior segment is the most unaesthetic, as the patient has to bring his tongue anteriorly between the teeth and the lips during speech and while swallowing, and this in turn proclines and may worsen the separation between the upper and lower anterior teeth. Anterior open-bite may arise by a combination of interference to normal eruption of incisors and excessive eruption of posterior teeth. Posterior open bites are relatively rare and are caused mainly because of a lateral tongue thrust (e.g. due to a large tongue) or submerged/ankylosed posterior teeth. Posterior open bites may hamper mastication and are more difficult to treat.

In the presence of an anterior open bite, the tongue will come forwards between the incisors to fill the gap and create an anterior seal during swallowing. For many years it was thought that this tongue activity or ‘tongue thrust’ was the primary etiological factor in the development of anterior open bite; but it is now recognized that in the vast majority

of cases this is an adaptive behavior since the tongue could adapt to the confines of the inter-maxillary space following some orthognathic surgical procedures. The evidence for this came from studies which reported that superior repositioning of the maxilla to close a skeletal open bite can result in autorotation of the mandible and a decrease in the inter-maxillary space with the resultant adaptation of the tongue position, yielding acceptable speech and function.

Etiologic Factors

1- Genetic Factors

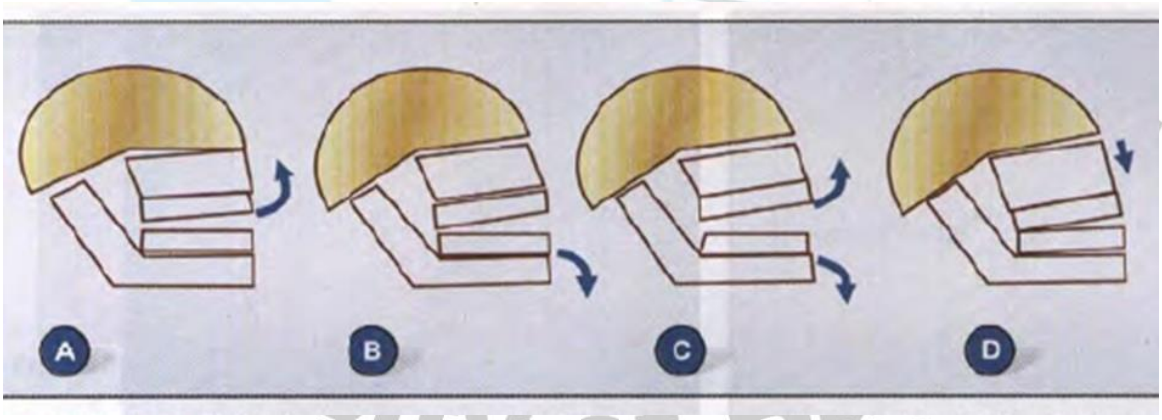
These include inherited traits such as abnormally large tongue size (main cause for posterior open bite) or abnormal skeletal growth patterns causing anterior open bite, which may be due to:

A- Upward maxillary rotation.

B- Downward, backward mandibular rotation.

C- Divergent rotation of the maxilla and mandible anteriorly.

D- Vertical maxillary excess.



2- Habits

Habits such as digit sucking, mouth breathing and tongue thrusting are also implicated in the etiology of open bites. With the majority of these habits the patient dis-occludes his/her

jaw, in other words keeps his mouth perpetually open. This over a period of time causes the posterior teeth to supra-erupt (about 1 mm supra-eruption posteriorly opens the bite about 2 mm anteriorly resulting in an open bite) in addition to flaring and infra-occlusion of the anterior teeth; this may lead to the malocclusion acquiring a skeletal component.

In case of digit sucking, the amount of tooth displacement is dependent on the duration of hours per day of digit sucking and not only on the magnitude of the pressure created. A digit routinely placed in an asymmetric position may result in the development of an asymmetric increase in overjet and open bite, whereas anterior tongue thrusting is commonly associated with symmetrical anterior open bite.

If the main etiological factor is a digit-sucking habit, as long as this ceases at an appropriate time, there can be complete and stable resolution of the anterior open bite. The main problems, which are particularly challenging to treat, arise with anterior open bites that are skeletal in origin or due to a digit habit that persists into the adult dentition and results in a permanent skeletal change.

Nasal obstruction and the resultant mouth breathing has been implicated in causing overeruption of the posterior teeth and an increase in the vertical lower face dimension caused by the open mouth posture.

3- Dental Factors

Ankylosis of posterior teeth can lead to the development of posterior open bites.

Dental Features of Open Bite

Narrow maxillary arch, excessive eruption of posterior teeth, posterior crossbite, proclination (with spacing) of maxillary and/or mandibular incisors, and anterior or posterior open bite.

Soft Tissue Features

Shallow mentolabial sulcus, lip incompetence and excessive gingival display on full smile (especially in cases associated with vertical maxillary excess).

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Ceph/Skeletal Features

Tipping of the palatal and occlusal planes downwards posteriorly, high (steep) mandibular plane angle, short ramus (decreased posterior facial height), marked antigonial notch, obtuse gonial angle, increased saddle angle and increased anterior lower facial height.

Treatment of Open Bite

In addition to the aesthetic issues, treatment is often required because the patient has trouble biting food due to the lack of an anterior or posterior occlusion. Speech may also be a concern, as an anterior open bite can be associated with lisping. Whilst treatment can improve both the occlusion and function, there is no guarantee that speech will improve, as speech patterns are established early in life, long before establishment of the permanent dentition.

There are essentially 2 ways that an open bite can be treated:

1- Vertical control or intrusion of the buccal segments. The aim is to reduce posterior dental heights, which will result in a forward autorotation of the mandible and closing down of the anterior open bite. Because the molars are closer to the condylar hinge, even a small amount of intrusion should result in a greater closure anteriorly.

In children, the use of a high-pull headgear will control posterior vertical growth of the maxilla. This will theoretically redirect mandibular growth in a more anterior than vertical direction. The headgear can be run directly either to bands on the upper first molars or to a removable appliance with posterior acrylic capping (an intrusion splint). Headgear can also be used in combination with a myo-functional appliance (e.g. Vertical Activator) to correct an increased overjet associated with a reduced overbite and a vertical growth pattern. The main problem with this approach is that vertical growth continues throughout adolescence; therefore, to be truly effective, headgear will have to be worn until adolescent growth has significantly diminished. A chin cup with a vertical-pull head cap can also be used for the correction of anterior open bites in the pre-adolescent age group.

In adults, growth will have essentially ceased; therefore, treatment of an anterior open bite will necessitate some intrusion of the buccal segments using fixed orthodontic appliances with miniscrew implants or a high-pull headgear therapy. The most predictable and stable way of correcting severe cases of long-face patterns in adults is by surgical impaction of the maxilla posteriorly.

2- Extrusion of the labial segments. An anterior open bite occurs when the labial dentition is at the limits of its eruptive potential. Therefore, any further mechanical eruption or extrusion will be inherently unstable and is not advised unless it is related to a digit-sucking habit that has prevented eruption of the incisors. Occasionally, towards the end of fixed appliance therapy, a small anterior open bite can be resolved and occlusal settling achieved by the short-term use of anterior vertical inter-maxillary elastics. When planning extrusion of the labial segments to close an anterior open bite, the amount of upper incisor display must be evaluated both at rest and on smile to avoid ending up with a gummy smile.

Retention after Open Bite Correction

Excessive vertical growth and eruption of the posterior teeth often continue until late in the teens or early twenties, so retention must also continue till then. An appliance with posterior occlusal stops (posterior bite plane), e.g. an open bite activator or bionator, can provide forces opposing eruption of posterior teeth.

Important Clinical Tips When Treating Open Bite

- If extraction is needed to treat open bite cases, second premolars (or molars) extraction is preferred as it encourages deepening of the bite.
- If the open bite was caused by a habit, controlling the habit is imperative for the success of treatment. Anterior palatal crib can be used for anterior tongue thrust and digit sucking habits. For posterior open bites, lateral tongue spikes must be used to control the lateral tongue thrust habit, then vertical inter-maxillary elastics

along with fixed orthodontic appliances can be used to close the posterior open bite.

- Posterior expansion to treat crossbite in cases with anterior open bite should be performed carefully with proper mechanics because any extrusion of the molars will worsen the anterior open bite. Similarly, it is important to avoid the use of class II and class III elastics in anterior open bite cases (due to the tendency for molars extrusion). If inter-maxillary traction is required, the extension of elastics should be short and not run to the molars.

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