# Vertical Plane Discrepancies

# (Deep Bite)

## Learning Objectives

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

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

## Vertical relationship

The face is vertically split into thirds, with these thirds being approximately equidistant. Any discrepancy in this rule of thirds will give an indication of disharmony within the facial proportions and where this lies. The upper face extends from the hairline or top of forehead (trichion) to the base of the forehead between the eyebrows (glabellar). The midface extends from the base of the forehead to the base of the nose (subnasale). The lower face extends from the base of the nose to the bottom of the chin (menton). The lower third of the face can be further subdivided into thirds, with the upper lip in the upper one-third and the lower lip in the lower two-thirds. Of particular relevance is an increase or decrease in the lower face height.



## Factors Affecting the Development of Deep Overbite

Discrepancies in the size and/or position of the jaws can adversely affect the normal vertical development, resulting in a deep bite malocclusion. Mandibular growth rotations play an important part in the etiology of some malocclusions, as well as the stability of the result. A marked forward growth rotation tends to result in reduced anterior facial proportions and an increased overbite, while marked backward rotations tend to result in an increased anterior vertical facial height and a reduced overbite (or anterior open bite).

The development of the vertical dimension is also affected by the equilibrium between the tongue, lips, cheeks, and opposing dentition on the developing dento-facial complex. This equilibrium of the biologic system is determined more by the duration than the magnitude of a force. The occlusal forces of teeth serve to maintain equilibrium in the vertical dimension of the orofacial complex, but pathologic (parafunctional) habits such as clenching, bruxism, or hyperactive muscles of mastication have the potential to influence the vertical equilibrium. This may result in the incomplete eruption of posterior teeth and a decreased vertical development of the posterior maxillary and mandibular alveolar processes producing an increased anterior overbite.

## Incisor Overbite

Normal incisor overbite refers to the maxillary incisors overlapping the mandibular incisors by 2–4 mm vertically, or one-third to one-half of their crown height, when the opposing posterior teeth are in contact in centric occlusion. Overbite is described as:

• Increased, if the maxillary incisors overlap the mandibular incisor crowns vertically by greater than one-half of the lower incisor crown height;

• Decreased, if the maxillary incisors overlap the mandibular incisors by less than one-third of the lower incisor crown height. If there is no vertical overlap between the anterior teeth, this is described as an anterior open bite and a measurement should be made of the incisor separation;

• Complete, if there is contact between opposing incisors, or the incisors and opposing mucosa;

• Incomplete, if there is no contact between opposing incisors, or the incisors and opposing mucosa;

• Reverse overbite, if the mandibular incisors overlap the maxillary incisors (e.g. class III).

If the overbite is complete to the gingival tissues, it is described as traumatic if there is evidence of damage. This is most commonly seen on the palatal aspect of the upper incisors or labial aspect of the lower incisors (e.g. inflammation, bleeding, recession).



**Traumatic overbites causing palatal (left panels) and labial (right panels) gingival trauma**

## Increased Overbite (Deep Bite)

An increased overbite can be dental or skeletal in origin. Infra-occlusion of posterior teeth/ supra-occlusion of anterior teeth, extraction of posterior teeth (causing lingual collapse of anterior teeth) are contributing factors to dental deep bite. Convergent rotation of jaw bases, mal-relationships of the size and/or position of the jaws can lead to skeletal deep bite. An increased overbite can be seen in any class of malocclusion, but it is a common feature of class II division 2 malocclusion.

## Dental Features of Deep Bite

The dental arches tend to be short, wide and mildly crowded with deep overbite. The lower labial segment is often retroclined with an increased (exaggerated) curve of Spee as a result of the lower incisors over-erupting due to the lack of occlusal contact with the maxillary incisors.

## Soft Tissue Features

Acute nasolabial angle, deep mentolabial sulcus with prominent Pogonion. The retroclination of the lower anterior teeth can result in lack of support for the lip, which relative to the chin and nose appears retrusive.

## Ceph/Skeletal Features

Palatal, occlusal, and mandibular planes, which run almost parallel, lead to a low (flat) mandibular plane angle. The mandible shows upward and forward rotation in Individuals with this condition, who tend to have a longer ramus (increased posterior facial height), a nearly right-angle or acute gonial angle, and reduced anterior lower facial height.

## Sequelae of Deep Bite

If left untreated, deep bite can impose adverse effects on facial aesthetics, TMJ problems, wear of mandibular incisors, gingival trauma and periodontal destruction.

## Treatment of an Increased Overbite

There are essentially four ways to reduce a deep overbite associated with an increased curve of Spee in the lower arch using conventional orthodontic mechanics:

• Relative incisor intrusion/ buccal segment extrusion;

• Buccal segment extrusion;

• Incisor intrusion;

• Incisor proclination (only where the lower labial segment is markedly retroclined).

In many cases, overbite reduction will be achieved using a combination of these tooth movements, but the presence of vertical skeletal growth can significantly aid the process.

Growth can be utilized in adolescent patients to help correct dental and skeletal discrepancies because growth of the mandibular condyles can help compensate for any

posterior dental extrusion that may be used to facilitate overbite reduction. In adults, however, the orthodontist must rely upon tooth movement or surgery. A deep bite in a growing individual can be corrected using a myo-functional appliance or a removable appliance with a flat anterior bite plane, which allows extrusion of the posterior dentition, levelling the curve of Spee and reducing the overbite. Facial improvement is therefore achieved via an increase in the lower face height.

In an adult, buccal segment extrusion (e.g. using inter-maxillary elastics and/or cervical-pull headgear) can result in a downward and backwards rotation of the mandible, steepening of the occlusal plane and an increase in the lower face height. This will reduce the overbite but is prone to relapse following treatment because there will be very little or no potential for compensatory growth at the condyle as the lower face height increases. For these reasons, overbite reduction can be more difficult in adult patients and the focus is often on incisor intrusion using fixed orthodontic appliances.

## Retention after Deep Bite Correction

Because vertical growth continues into the late teens, a maxillary removable retainer with an anterior bite plane often is needed for several years after fixed appliance orthodontics is completed, hence the lower incisors will encounter the baseplate of the retainer if they begin to slip vertically behind the upper incisors. Bite depth can be maintained by wearing the retainer only at night, after stability in other regards has been achieved.

## Important Clinical Tips When Treating Deep Bite

- Correction of the inter-incisal angle is important for the stability of overbite reduction, as the establishment of an occlusal stop is essential to prevent the incisors from erupting past each other and the overbite increasing again following treatment. This is especially relevant for class II division 1 cases associated with proclined upper incisors, because unless maxillary incisor inclination is corrected, an occlusal stop will not be established and the overbite will relapse. Simple retroclination by tipping of the upper incisors to reduce an increased overjet in the presence of an increased overbite is an inappropriate treatment because no occlusal stop is created. The upper incisors can retrocline and the lower incisors

over-erupt, resulting in a worsening of the overbite. Instead, bodily retraction (with or without torqueing) of the upper incisors using fixed appliances can ensure better inter-incisal relationships.

- Management of a deep overbite in cases with a low maxillary–mandibular plane angle is made easier with a non-extraction approach. If teeth are extracted, as space is closed towards the end of the treatment, overbite control becomes difficult as the incisors will tend to upright, which can lead to the overbite deepening again.
- The amount of upper incisor display at rest and on smile is a critical aesthetic parameter during treatment because one of the inevitable characteristics of aging is diminished upper incisor display at rest and on smile. As patients get older, the amount of incisor display at rest decreases with age, as does the amount of tooth display on smile. The orthodontist must be aware of this because the effect of diminishing incisor display results in hastening the aging process in terms of smile appearance. For this reason, in orthodontic treatment the choice to open a deep bite with only upper incisor intrusion may correct the occlusion at the cost of making the patient look significantly older; hence, intrusion of lower incisors/extrusion of posterior segment should also be considered. In contrast, the favorable cases for merely upper incisor intrusion are patients with a gummy smile.

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