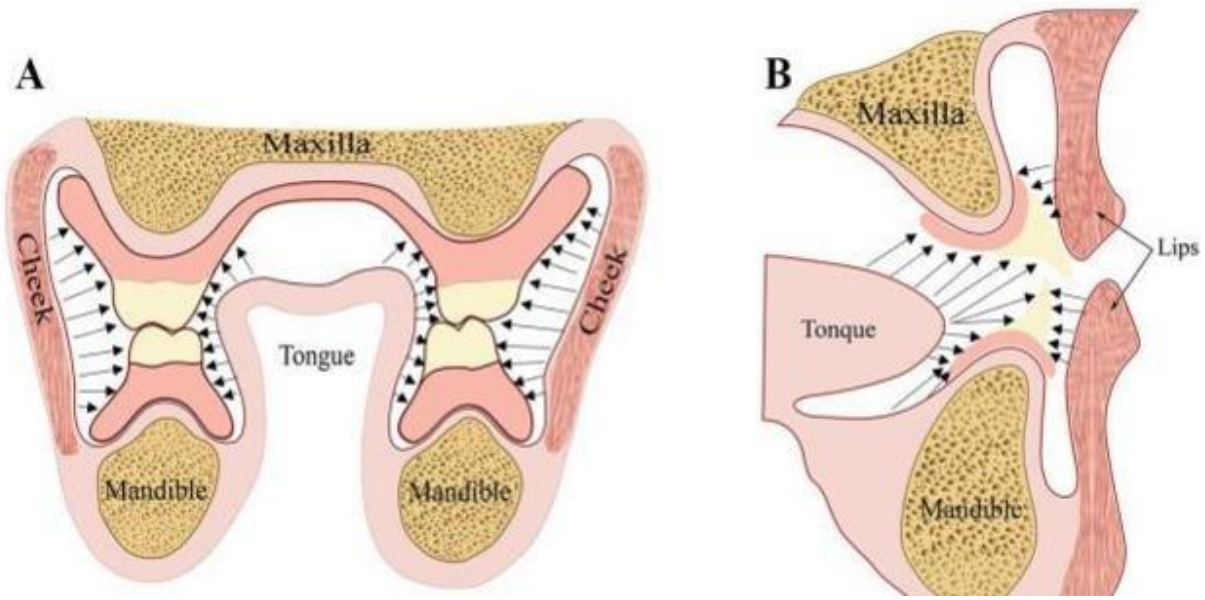
# Etiology of Malocclusion II

1. General factors
    A. Skeletal factors
    B. Soft tissue factors
        i. Lips
        ii. Tongue
    C. Dental factors
2. Local factors
    A. Anomalies of tooth number
    B. Anomalies of tooth size
    C. Anomalies of tooth shape

### 2) Tongue

The fact that the lips and cheeks function outside and the tongue within the dental arches has led to the concept of a neutral zone existing between the inner and outer perimeters of the dental arches, where the forces of lips and cheeks on one hand and of the tongue on the other are balanced and within which the teeth are positioned.

This zone should be considered not only in relation to muscle forces but also in relation to intra oral air pressures which are induced by mandibular positions and movements, occlusal contacts and the periodontal ligament. It is important to keep the teeth in the neutral zone at the end of the orthodontic treatment otherwise they will move to take up other positions.




Neutral zone. A, in transverse view. B, in sagittal view.

The tongue functioning, in conjunction with the lips and cheeks, in guiding the erupting teeth, and this affected by its **size**, its **resting posture** and its **function**.

A. **The size of the tongue**: is mainly related to the size of the lower jaw. If the lower jaw is larger than the upper jaw, the tongue is too large to fit within the upper arch, therefore tongue finds space between upper and lower arches and prevents full vertical development of the dentoalveolar structures resulting in open bite, or it procline both upper and lowerteeth resulting in generalized spacing.




Patient with a large tongue. A, Intraoral clinical exam shows indentations on the lateral borders of the tongue and coverage of the occlusal surfaces of all lower teeth. B and C, Upper and lower arches depict generalized spacing.

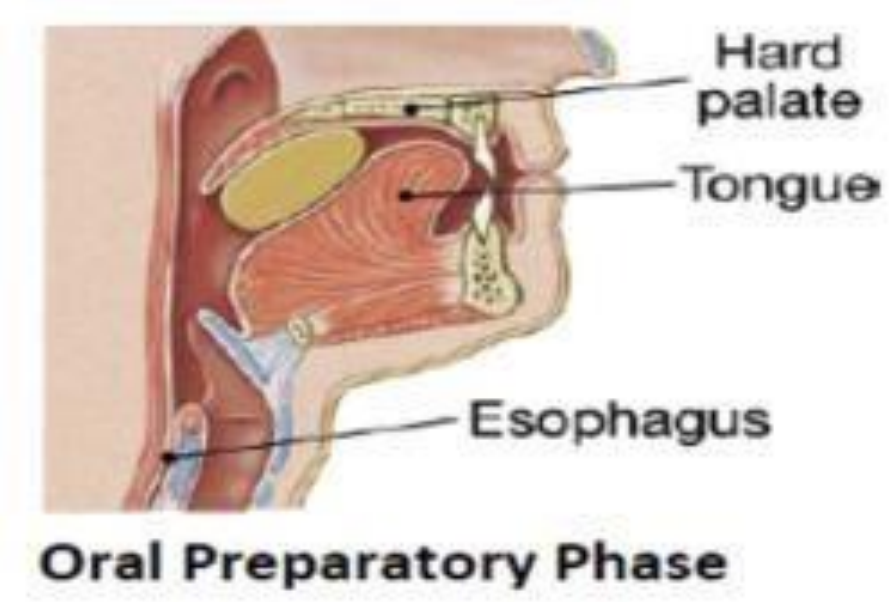



**A-E,** Intraoral views of apatient with a unilateralleft cleft lip and palate. Significant anterior openbite with spacing isobserved in the lower arch due to a large tongue. **F**, Keyhole-design glossectomy**. G–I,** Lateralborders of the tongue to be approximated aftertissue mass reduction.

B. **The resting position of the tongue**: It is ideally within the dental arches, filling the space enclosed by the teeth. Sometimes the tongue takes up an adaptive postural position, slightly protruded between teeth to touch the lower lip which will prevent the full vertical development of the incisal segment resulting in incomplete over bite. This is produced to seal the front of the mouth to allow nasal breathing (tongue lower lip anterior oral seal instead of lips oral seal) when there is difficulty to hold the lips together due to vertical or sagittal lip discrepancy.

C. **The function of the tongue:** is concerned with mastication, swallowing and speech. Its effect on the dentition is mostly related to swallowing. After the food mastication is completed, the swallowing of food and fluid take place in a sequence as: a) closure of the lips; b) teeth in light occlusal contact; c) tongue elevated to the palate, and d) momentary clenching of the teeth as food pass

into the pharynx.




Normal swallowing process of food and fluid in

Variation of normal swallowing are also seen which may be described as:

A. **Adaptive swallowing:** involves positioning of the tongue between teeth during swallowing and may be carried out with the buccal teeth apart (tongue positioned between teeth, reduce the muscle and air pressures within the upper arch lead to narrow arch and buccal cross bite also prevents the full vertical development of the anterior dento-alveolar segment result in incomplete over bite), or buccal teeth together (lead to incomplete overbite or anterior open bite due to forward position of tongue).



**Swallowing with endogenous tongue thrust:** swallowing activity is accomplished by an anterior thrust of the tongue which is a basic neuromuscular mechanism. It sometimes associated with anterior lisp during speech. It prevents the full vertical development of the anterior dento-alveolar segments resulting in an incomplete over bite or anterior open bite.

These two variations have somewhat similar effects on developing occlusion however, they respond differently to orthodontic treatment designed to reposition the teeth. The adaptive tongue will be changed if the teeth are moved but the endogenous tongue not and will reproduce the original tooth position if these are altered.




Female patient, age 18, with a tongue thrust. A-C, Extraoral views. On smile, only 50% of the incisors are displayed and an anterior tongue posture is evident. D-F, Intraoral views show a 3-mm anterior open bite with divergent occlusal planes from the first premolars.

## C. Dental factors

The third general factor affecting the occlusion of the teeth is the relationship between the size of the dentition and the size of the jaws. Ideally, there should be adequate space for the teeth to erupt into the mouth without crowding or spacing. In primary dentition the ideal situation exists when there is spacing between the anterior teeth that will give better chance for permanent incisors to erupt without overlapping.



The disproportion between teeth size and arch size can be either:

### 1) Excessive dentition size in relation to dental arch size

which can have:

- Overlapping and displacement: when the dental arch is too small for the dentition or teeth too large for the dental arch or both, the teeth will be displaced. The most affected teeth are the last teeth in each group i.e. lateral incisors, second premolars, canines and third molars.
- Impaction of the teeth: occurs when eruption of teeth is completely blocked by other teeth due to crowding, also it affects the last tooth in each segment.
- Mesial movement of the teeth: either associated with alveolar growth as part of dentoalveolar forward development also called mesial migration, or movement of individual tooth into space created by interproximal attrition or loss of the teeth, this can occur any time during or after growth period.










A, Overlapping. B, Mesial drifting. C, Impaction.

### 2) Excessive dental arch size in relation to dentition size

- ✓ it is less common, occur when there are too small teeth in relation to the size of the dental arch or too large dental arch in relation to the size of the dentition or bothwhich will result in spacing.

The size of the dental arch may not be the same as the size of the basal bone because skeletal relationship and muscular factors can produce a dental arch which is larger or smaller than the basal bone; therefore, dentition size should be considered in relation to dental arch rather than jaw size.



Normal teeth size with large arch



Small teeth size with normal arch

# 2. Local factors

| *General factors* | *Local factors* |
|---|---|
| 1. Heredity<br>2. Congenital<br>3. Environment<br>a. Prenatal (trauma, maternal diet, German measles, maternal metabolism, etc.).<br>b. Postnatal (birth injury, cerebral palsy, TMJ injury)<br>4. Predisposing metabolic climate and disease<br>a. Endocrine imbalance<br>b. Metabolic disturbances<br>c. Infectious diseases<br>5. Dietary problems (nutritional deficiency)<br>6. Abnormal pressure habits and functional aberrations:<br>a. Abnormal sucking<br>b. Thumb and finger sucking<br>c. Tongue thrust and tongue sucking<br>d. Lip and nail biting<br>e. Abnormal swallowing habits (improper deglutition)<br>f. Speech defects<br>g. Respiratory abnormalities (mouth breathing, etc.)<br>h. Tonsils and adenoids<br>i. Psychogenetics and bruxism<br>7. Posture<br>8. Trauma and accidents | 1. Anomalies of number:<br>• Supernumerary teeth<br>• Missing teeth (congenital absence or loss due to accidents, caries, etc.)<br>2. Anomalies of tooth size<br>3. Anomalies of tooth shape<br>4. Abnormal labial frenum: mucosal barriers<br>5. Premature loss<br>6. Prolonged retention<br>7. Delayed eruption of permanent teeth<br>8. Abnormal eruptive path<br>9. Ankylosis<br>10. Dental caries<br>11. Improper dental restorations |

## A. Anomalies of tooth number

Each jaw is designed to hold only a specific number of teeth at a particular age.

The anomalies in the number of teeth can be of two types:

### 1) Increased number of teeth or supernumerary teeth

Supernumerary teeth can vary remarkably in size, shape and location.

a. **Supplemental teeth:** which bear a close resemblance to a particular group of teeth and erupt close to the original sight of these teeth, i.e. incisors, premolars or molars, etc.



b. **Mesiodens:** it is the most commonly seen supernumerary tooth. It is usually conical in shape with a short root and crown, situated between the maxillary central incisors and can vary considerably in shape. It can be seen erupted or impacted, singular or in parts. It can occur in the maxilla or in mandible.



❖ Supernumerary teeth can cause the following:

a. Non-eruption of adjacent teeth.
b. Delay the eruption of adjacent teeth.
c. Deflect the erupting adjacent teeth into abnormal locations.
d. Increase the arch perimeter (increasing the over jet if in the maxillary arch or decreasing the over jet if seen in the mandibular arch.
e. Crowding in the dental arch.

### 2) Less number of teeth or missing teeth

Congenitally missing teeth are more commonly seen in comparison to supernumerary teeth. It can be either anodontia, hypodontia or oligodontia.

c. **Anadontia:** characterized by the congenital absence of **all** primary or permanent teeth. It is divided into 2 subsections, complete absence of teeth or partial absence of teeth
d. **Hypodontia:** usually missing 1 or 2 permanent teeth,
e. **Oligodontia:** is the congenital absence of 6 or more teeth.

The most commonly congenitally missing teeth are the **third molars**, followed by the **maxillary lateral incisors**.

❖ Congenitally missing teeth can lead to:

A. Gaps between teeth.
B. Aberrant swallowing patterns.
C. Abnormal tilting/axial inclination or location of adjacent teeth.
D. Multiple missing teeth can cause a multitude of problems.

## B. Anomalies of tooth size

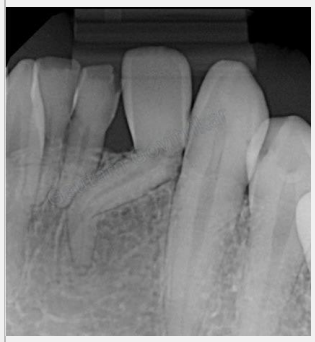
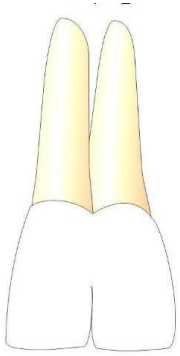
It includes macrodontia and microdontia, which can be localized orgeneralized.

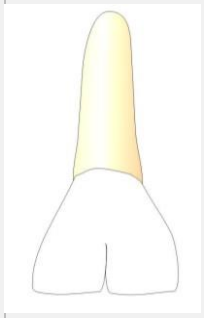
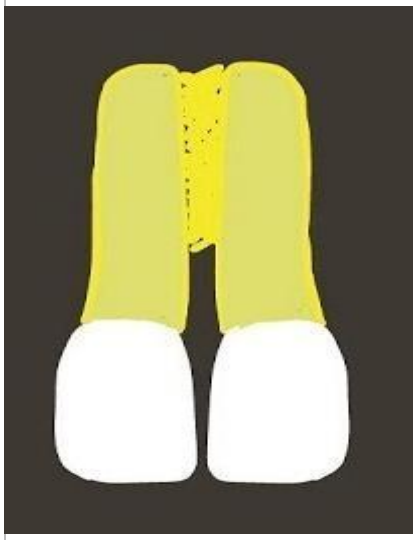
- The true generalized macrodontia, where all the teeth are larger than normal is seen in cases of pituitary gigantism.
- The true generalized form of microdontia, where all the teeth are small is rarely seen. It is usually associated with cases of pituitary dwarfism.
- The most commonly seen *localized microdontia* involves the maxillarylateral incisors. The tooth is called a 'peg lateral" and exhibits a pegshaped crown with the mesial and distal sides converging incisally. The root may be shorter and more cylindrical than normally seen.
- *Relative generalized microdontia* may also be seen, but should be considered as an illusion of the true condition.

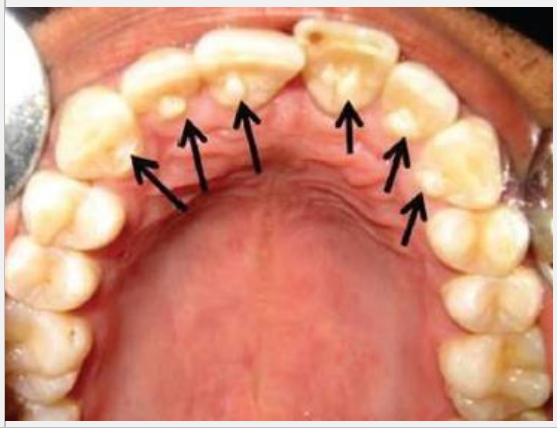


## C. Anomalies of tooth shape

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| Term | Definition | Figure | Radiograph/ graphics |
|---|---|---|---|
| Dilaceration | there is a sharp bend or curve in the root or crown. It generally does not affect orthodontic treatment planning but may complicate the extraction of the affected tooth. |  |  |
| True fusion | is seen when the tooth arises through the union of two normally separated tooth germs. It might lead to spacing or sometimes it might complicate its movement by orthodontic means. |  |  |

| | | | |
|---|---|---|---|
| Geminated | are anomalies, which arise from divisionof a single germ by an invagination, leading to the formation of twoincomplete teeth. |  |  |
| Concrescence | refers to fusion of cementum of teeth which occurs after root formation has been completed. |  |  |

| | | | |
|---|---|---|---|
| Talon cusp | is an anomalous structure projecting lingually from the cingulum area of a maxillary or mandibular permanent incisor. It might interfere in proper occlusion. It's grinding invariably leads to pulpal exposure necessitating root canal treatment. |  |  |
| Dens in Dente | is used to denote a developmental variation which radiographically may resemble a tooth within a tooth. |  |  |