

## Etiology of Malocclusion

-60% of people have malocclusion with unknown etiology  
only 5% of people have malocclusion with a known cause/ etiology  
and the other 45% have normal occlusion.

-etiology of malocclusion can be divided into:

- Genetic causes:
  - Until recently, most studies are gained from animals, family studies and twin methods, and then more epidemiological studies.
  - They found that jaw growth (arch size) and skeletal relationships, specially class 3 malocclusion has a very strong genetic influence.
  - Also teeth development, size of the teeth, presence or absence of teeth have a genetic influence.
  - Ectopic Canine growth on the palate, has also a genetic influence
  - Malocclusion generally follows polygenetic and epigenetic inheritance *-not just simple mendelian inheritance-* there's interaction between different genes and different environmental factors.
- Environmental causes:
  - They usually effect the arch size and form
  - As an example of environmental effects on malocclusion, A study was done on The aboriginals, which are the original inhabitants of Australia, they found out that these people have almost no crowding in their teeth, this was found to be due to their diet which was mostly abrasive food. This type of food, lead to wearing of their teeth, and allowed for teeth spacing which prevented any crowding later in their lives. Modern society food id refined, and doesn't cause this type of wearing of teeth. So they came out with a conclusion, that the type of food have an effect on malocclusion.
  - other examples of environmental factors include:

- \*habits (like thumb sucking)
- \*medications
- \*pathology: (like *condylar fracture* at an early age, also *juvenile Rheumatoid Arthritis* destructs the joints, may prevent the growth of the mandible)
- \*mouth breathing

### Other classification of Etiology of malocclusion:

1. Skeletal factors
2. Soft tissue
3. Habits
4. Dent alveolar and local Factors

In this lecture we are going to talk about the Skeletal Factors.

Skeletal Malocclusion can be in 3 planes: \*

- \* Anterior-Posterior plane
- \* Vertical plane
- \* Transverse plane

### ***Anterior-Posterior relationship***

- When we assess the antero-posterior relationship, we must have an idea on the soft tissue landmarks, because when we look at the patient clinically, we can't see the underlying bone, so we depend on specific soft tissue landmarks to identify the underlying skeletal factors

-Anteroposterior relationship can be assessed either clinically or radio graphically.

- Clinically:

**1.** by looking at the soft tissue **A-point** and soft tissue **B-point**.

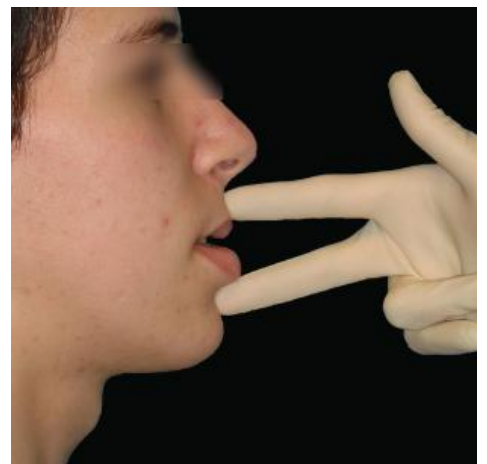
*A-point*: is the deepest concavity on the upper lip

*B-point*: is the deepest concavity on the lower lip

\* Normally, the A-point should be in front of the B-point by 2-3mm ( which represents class 1 skeletal relationship).

If it was more than 2-3mm then its a class 2 relationship.

If less than 2-3mm then its a class 3 relationship.



\* This measurement is done clinically by :

- a. looking at the patients profile (from the side)
- b. the patient must be in the Natural Head Position (NHP), which is achieved by making the patient look at his own eyes in the mirror, **or** by making the Frankfort plane to be parallel to the floor.
- c. patients head must not be kneeling on the back of the seat to get accurate results.
- d. By placing the index finger (on A-point) and the middle finger (on B-point), as shown in the picture above.

\*This method informs us if there is a skeletal malocclusion only, it doesn't inform us about the reason behind this skeletal malocclusion (whether it's the maxilla/mandible).

## 2. Facial convexity method

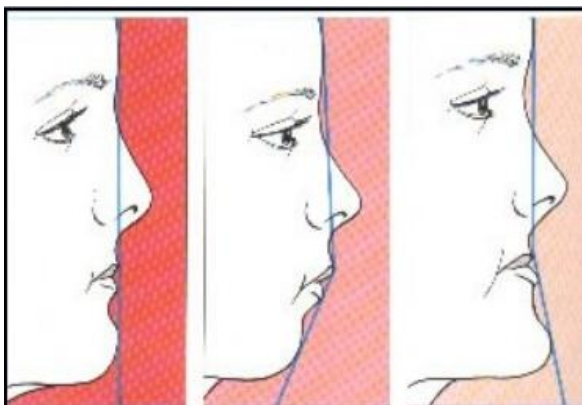
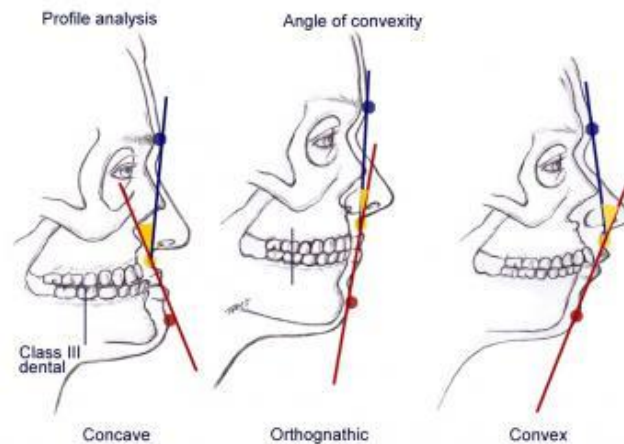
-Normally, almost a straight line passes on theses 3 points on the face:

*Glabella* most prominent part on the forehead

*Subnasale* the point where the nose meets the upper lip

*T- point (soft tissue pogonion)* most prominent point on the chin

- Its normal for females to have just a slight convexity.



- Increased convexity is a sign of class 2

- Concavity is a sign of class 3

\* Similarly, this method doesn't give us the cause behind this skeletal malocclusion.

## # Class 2 malocclusion

*When the Maxilla is more Anterior to the mandible.*

it can be caused by the teeth OR the jaw OR both together.

Can be due to:

### 1. Mandibular Deficiency (either *True* or *Relative*)

true in cases of small mandible and relative when the mandible is of normal size but its backwards.

### 2. Maxillary Excess (either *Anterio-posterior excess* or *vertical height excess*)

anterio-posterior excess when the maxilla is more forward

and vertical height excess is when the height of the maxilla is greater than normal, causing the mandible to go more backwards (posterior growth rotation)

### 3. Maxillary Anterior Teeth are more forward

### 4. Combination of these factors

-The cranial base angle influences the position of the mandible, the greater the angle the more backward the mandible is positioned. (*refer to the growth lectures*)

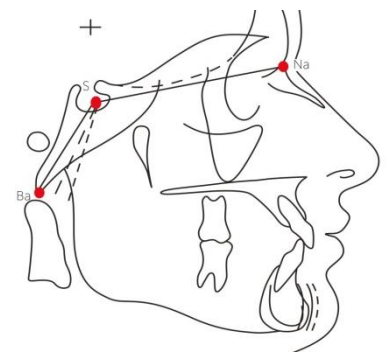
- Growth rotations (anterior Vs posterior) also effects the position of the mandible.

Posterior or clockwise growth rotations lead to development of a class 2 relation.

- 60% of class 2 are due to mandibular skeletal retrusion

10% due to maxillary protrusion

30-50% due to posterior growth rotation (*increased vertical dimension*)



## # Class 3 malocclusion

*When the Mandible is more anterior to the Maxilla.*

Can be due to:

### 1. Mandibular protrusion (*True* or *Relative*)

### 2. Maxillary retrusion

### 3. Vertical elements (anterior growth rotation)

- 20% of cases are due to mandibular skeletal protrusion
- 25% due to maxillary retrusion
- 25% due to vertical elements

### ***Vertical relationship***

As we said, skeletal malocclusions can be in 3 planes, the second plane is the vertical one.

- when we assess the vertical plane we look at the patient from his profile (side-view) by looking at the *lower facial height* and the *Frankfort Mandibular Plane Angle (FMPA)*.

#### **1. Lower facial height method**

- Generally the face is divided into 3 parts:
  - >the upper facial height (*from hair line to the Glabella- the mid eyebrows*)
  - >middle facial height (*from eyebrows to subnasale*)
  - >lower facial height (*from subnasale to lowest point on the chin - the menton*)

\*Usually these thirds are equal

\*they are measured using a ruler

\*lower facial height can be further divided into:

- >upper lip height( from the subnasale to opening the lip)
- > and lower lip height (from opening of the lip to the menton)

- upper lip height is 2 times the lower lip height.

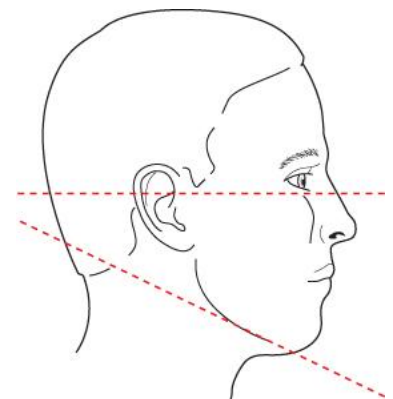
\*Lower facial height can be:

- > Normal (almost equal to middle facial height)
- > It can be increased (greater tendency to have *skeletal open bite*)
- > It can be reduced (greater tendency to have *skeletal deep bite*)

#### **2. Frankfort Mandibular Plane Angle (FMPA)**

Its the angle between:

Frakfort plane (*line extending from the upper border of the tragus to the infra-orbital margin*) AND the Mandibular plane (*a line along the lower border of mandible*)



- \* Normally, these two lines meet at the occipital area (at the back of the head) - *about 28°*
- \* on mouth opening, the intersection of the two lines occurs at a more anterior area than the occipital. Therefore, we can imagine, that as the anterior facial height increases the FMPA is increased and the intersection of the two planes is at a more anterior area
- \* Similarly, if they meet beyond or behind the occipital area, then the FMPA is smaller and the facial height is reduced.
- \* It's usually not measured clinically, just observed.
- \* FMPA can be:
  - > Normal
  - > Reduced (sometimes not always, may be more prone to *skeletal deep bite*)
  - > increased (may be more prone to *skeletal open bite*)

### # Growth Rotations

The scientist Bjork have done an unethical study, yet have benefited the dental science much. He placed metallic implants in the jaws of children, and took radiographs for them every 6-12 months until they became adults.

He found that both jaws show rotational growth with respect to the cranial base > reflecting differential growth between anterior and posterior facial heights.

\* Growth rotations divide into:

1. Anterior Growth rotation (anti-clockwise), leads to:

- > decreased Anterior Lower Facial Height (ALFH)
- > Increased Posterior Lower facial Height ( PLFH)
- > Convex lower border of the mandible
- > may have deep bite/ increased overbite
- > Lower incisor crowding (because they meet with upper anteriors and the mandible is still rotating anti-clockwise)

2. Posterior Growth Rotation (clockwise), leads to:

- > increased ALFH
- > decreased PLFH
- > concave lower border of the mandible
- > reduced overbite/ can have open bite

> lower incisor crowding ( due to lower lip resting on lower incisors instead of upper incisors in normal cases, leading to their movement backwards)

### # Anterior Open Bite

Can be due to different factors:

1. Skeletal (ex: Posterior growth rotation)
2. Habits (ex: thumb suckling)
3. Soft tissue
4. Localized failure of teeth eruption

\*Anterior open bite due to *skeletal factors* appears clinically having:

- > increased lower anterior facial height
- > also open bite appears symmetrical
- > and usually reaches molar/premolar Area



\*While Anterior open bite due to *Habits* appears clinically:

- > Normal lower anterior facial height
- > Asymmetrical
- > Not extensive (localized to Anterior area)
- > Posterior cross-bite and displacement



Severe Open Bite From Finger Habit

### ***Transverse Relationship***

*Mandible is shifted to the right or the left OR difference in vertical on left & right side.*

\*Clinically, you must look at the face from the front or above, also the intra-oral shape of the arch can give us an idea about the cause of the problem.

Radio graphically, it can also be assessed by Anterior-Posterior radiographs.

\*Normally, the face is not 100% symmetrical, there's little bit of asymmetry (not noticeable).



\*Transverse Malocclusion can be due to:

- > Skeletal factors (TMJ anomalies/ syndromes/ condylar tumors)
- > Soft tissue (ex: massetric enlargement from one side)
- > dental & functional habits

\*Intra-oral manifestations of transverse malocclusion:

- > Cross-bite OR scissor bite

( can be *localized* to one tooth Or one *segment*

can be *anterior* or *posterior*

can be *unilateral* or *bilateral*

can be *with* or *without displacement*)

### # Skeletal cross-bite

jaws are not meeting normally, so the posterior teeth try to meet together.

\*when the upper jaw is too narrow or the lower jaw is too wide, the upper posterior teeth will try to meet the lower posterior teeth, so the upper teeth go more buccally.

When the lower posterior teeth are more buccal than the upper teeth >>> *cross bite*



When the upper posterior teeth are more buccal than lower teeth >>> *scissors bite*:



**GOOD LUCK ^\_^**

( يومئذ يتذكر الإنسان وأنى له الذكرى \* يقول ياليتني قدمت لحياتي )