

## Cephalometry

*(note: For whoever didn't attend the lecture, the lecture was less than an outline and barely anything was explained in it. This sheet was written using the lecture outline and by referring to the laboratory manual and Laura Mitchell only as needed.*

*The main reference of this lecture is the manual, you can refer to it as recommended by the Doctor. Good luck, and I hope you hold a grasp of this topic =D)*

We don't take a cephalogram for each orthodontic patient; since you are exposing the patient to extra radiation. Only after clinical examination, you decide if it's indicated or not. What's more important is to be able to interpret the cephalogram if you decide to take one.

We have an Anterior-posterior Cephalogram and a Lateral Cephalogram.

### #Uses of lateral Ceph:

1) To assess the skeletal pattern A-P and vertically (the most important use)

*note: to assess the transverse skeletal pattern you need an A-P cephalogram*

2) Assess Incisal Inclination (another very important use)

3) Dental Arch length (not very effective)

4) soft tissue assessment (very poor for external soft tissue)

5) growth prediction

6) diagnosis

7) prognosis tracing/determination

8) simulation treatment

9) Assess treatment progress

10) research

cephalogram is not used to assess local dental factors, we'd rather use panoramic radiographs or CBCT.

### # Lateral Ceph Assessment

1-First thing you have to do is check that the cephalogram is taken properly and that it's taken in the standardized position and posture

*X-ray must be examined systematically and look for any disease or pathology before tracing*

## **2-lateral Ceph is traced** manually or by advanced digital techniques

To trace it manually:- the radiographic film must be secured onto a viewing box.

-the Frankfort plane must be parallel to the horizontal (to simulate the way the patient was positioned during taking the x-ray)

-and secure a tracing paper above the film

Start tracing: the soft tissue outline/ the skeletal outline/ and Teeth(incisors and molars)

## **3- Mark the basic points**

**S:** Sella turcica

**N:** Nasion (most anterior part of frontonasal suture)

**Or:** Orbitale (most inferior anterior point on margin of orbit)

**A:** A- point (position of deepest concavity on anterior profile of maxilla)

**B:** B-Point (position of deepest concavity on anterior profile of mandibular symphysis)

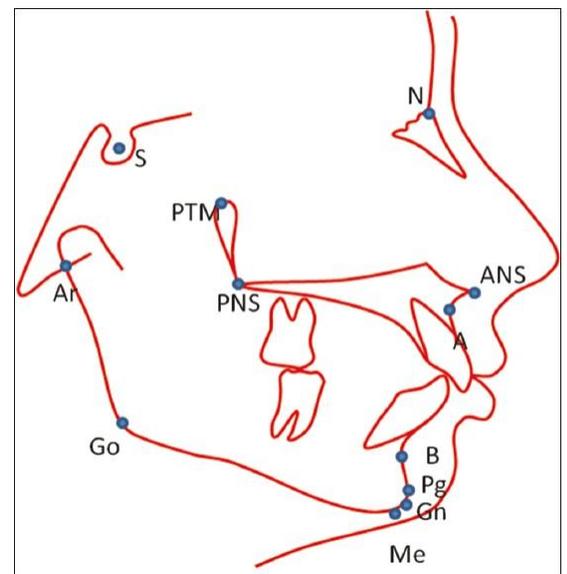
**Po:** Pogonion (most anterior part of mandibular symphysis)

**Me:** Menton (most inferior part of mandibular symphysis)

**Go:** Gonion (most posterior inferior part of Angle of mandible)

**ANS:** anterior nasal spine

**PNS:** posterior nasal spine



## **4- Mark the following lines:**

**SN:** sella-nasion line

**NA:** nasion-Apoint line

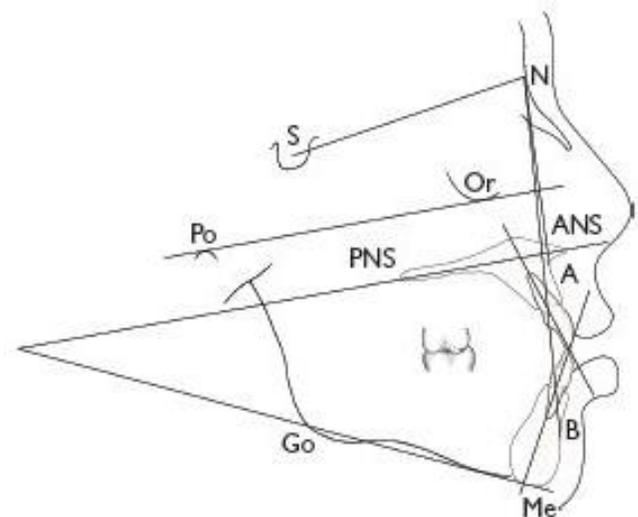
**NB:** nasion-Bpoint line

**Mx:** maxillary plane > ANS-PNS line

**Mn:** mandibular plane > Go-Me line

**UIA:** upper incisal axis

**LIA:** lower incisal axis



## **5- Measure and record the following:**

**SNA** angle

**SNB** angle

**ANB** angle

**UImxP** angle ( between upper incisal axis and maxillary plane)

**LImnP** angle (between lower incisal axis and mandibular plane)

**MMPA** (maxillary-mandibular plane angle)

**LAFH %** (lower anterior facial height percentage)

**SN-MxP** angle (between Sella Nasion line and Maxillary plane)

**IIA** (Interincisal angle> between upper incisal axis and lower incisal axis)

## 6- Assess the Anterior-Posterior Skeletal relationship

this is done by comparing ANB, SNA and SNB values to the normal values

- ANB angle is the most important angle for assessing the skeletal problem. *It relates the maxilla and the mandible to the cranium -through the nasion- which is considered a stable reference point.*

>>If the ANB was greater than the normal range, then the A point is way in front of the B-point and the patient has a class 2 relation.

>>If the ANB was less than the normal range, then the A point coincides or is behind the B-point and the patient has a class 3 relation.

Parameter	Value ( $\pm$ SD)
SNA	$81^\circ \pm 3^\circ$
SNB	$78^\circ \pm 3^\circ$
ANB	$3^\circ \pm 2^\circ$
S-N/Max	$8^\circ \pm 3^\circ$
$\bar{1}$ to maxillary PL	$109^\circ \pm 6^\circ$
$\bar{I}$ to mandibular PL	$93^\circ \pm 6^\circ$
Interincisal angle	$135^\circ \pm 10^\circ$
MMPA	$27^\circ \pm 4^\circ$
Facial proportion	$55\% \pm 2\%$

*\*we are not asked to memorize the normal values*

- After knowing the skeletal problem, we can assess the cause of this problem through the SNA and SNB angles.

*SNA shows the relative position of the maxilla in relation to the cranial base*

*SNB shows the relative position of mandible in relation to the cranial base*

FOR EXAMPLE:

> If the ANB is large then as we said this is a class 2 relation:

this can be due to:-prognathic maxilla (large SNA)

- retrognathic mandible (small SNB)

- or BOTH

- > If the ANB is small then this is a class 3 relation which can be due to:-retrognathic maxilla (small SNA)
- prognathic mandible (large SNB)
  - or BOTH

*This can be done, given that the nasion is in its correct stable position!*

*Sometimes the position of the nasion is variable, and this would affect the value of ANB and give us inaccurate results.*

*To compensate for this error we apply EASTMAN CORRECTION. YET, to be able to apply Eastman correction the angle between SN and Maxillary plane should be within normal range 5-11°*

## **7- APPLY EASTMAN CORRECTION**

*keep in mind that we are using this method to compensate for the inaccuracy in the ANB angle due to the variable position of the nasion. (so we will correct the ANB)*

> As we said we first make sure that the SN-MxP angle is within normal range (5-11°)

> IF SNA is increased: for every degree above the normal range we SUBTRACT 0.5° from the ANB angle

IF SNA is decreased: for every degree below the normal range we ADD 0.5° to the ANB angle

FOR EXAMPLE:

if the measured SNA is 89°, and the measured ANB is 8°.

When we apply Eastman correction: SNA is 8° above the normal range (normal SNA=81°)

Therefore we are going to subtract 4° from the measured ANB.

Corrected ANB= 4°

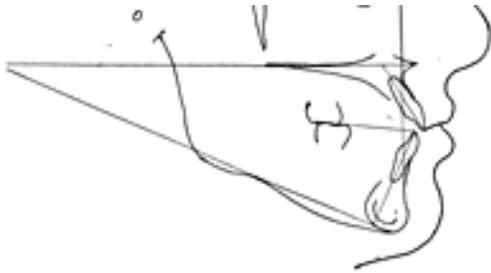
*(note that before correction, the ANB angle showed that the skeletal relation is class 2, but after correction the ANB angle is within normal range = skeletal class 1)*

## **8- Assess the Vertical skeletal relationship**

this is done by comparing the Maxillary mandibular plane angle MMPA and the Anterior Lower facial height percentage ALFH% to the normal values.

These values will enable us to assess if the lower facial height proportions are increased or decreased, also will give us an idea about anterior/posterior growth rotations

- If MMPA is increased this mostly indicates:
  - posterior growth rotation
  - increased lower facial height
  - mostly has anterior open bite



- If MMPA is decreased this mostly indicates:
  - anterior growth rotation
  - decreased lower facial height
  - mostly has deep overbite

*(if you remember, when we assess the vertical relation CLINICALLY we used the FMPPA-Frankfort mandibular plane angle, rather than the MMPA.*

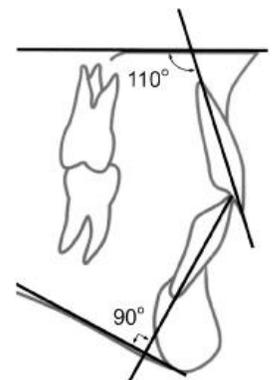
*We prefer to use the MMPA in radiographic assessment since it's easier to locate)*

## 9- Assess the Dental Relation

By assessing the relation between the **1)** Incisors and their skeletal base and **2)** between the upper and lower incisors

- Incisal inclination in relation to skeletal base is assessed through the angle between
  - >the upper incisal axis and the maxillary plane > UIMxP
  - >the lower incisal axis and the mandibular plane > LIMnP
 these angles are compared to the normal values too, and it will give you an idea about the position of the incisors (Proclined/retroclined), and whether they have a role in the etiology of the malocclusion or not.

- The relation between the two incisors is important
  - When might have a skeletal class 2 malocclusion but with normal Overjet. What does that mean? it means that *Dentoalveolar Compensation* have taken place to compensate for the skeletal malocclusion.
  - The interincisal angle I/A is used to assess the relation between the upper and the lower incisor, to have a proper stable relation between the two incisors this angle



must be in the normal range.

Its mainly a treatment target to get it in normal range, and not used in diagnosis.

## 10- Prognosis Tracing

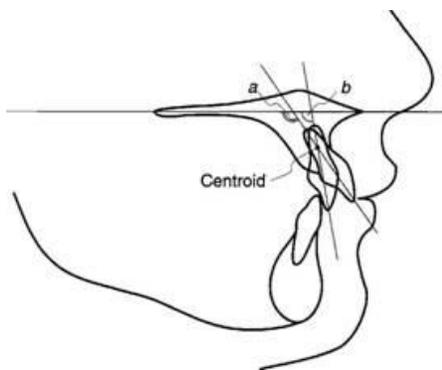
After we have diagnosed our case, we do what's so called prognosis tracing also known as Simulation treatment OR visualize treatment objectives. We have visualized treatment objectives for removable appliances and for fixed appliances.

And we supposedly did the one for removable appliances in the lab.

What we do here is try to simulate and visualize our upcoming treatment, to see if its applicable or not before actually doing it. For example, you want to move the incisors to class 1 relation, you simulate that on a tracing paper to see what type of movement is required to achieve this relation and whether it's feasible or not. This is done by comparing the incisal inclination before and after.

Prognosis tracing for *removable appliances* is only applicable in class 2 division 1 skeletal malocclusion with increased overjet; in which we are planning to change the incisal pattern to class 1 by decreasing the overjet. In this case we do prognosis tracing to see if its APPLICABLE TO USE A REMOVABLE APPLIANCE OR NOT for this case.

The laboratory steps of doing prognosis tracing are mentioned in the manual. (if you didn't already do it)



*This is just a simple illustration to give you an idea of prognosis tracing. line a is the current upper incisal inclination. After prognosis tracing we get line b which is our treatment aim*

If the resultant *Interincisal angle*, after Simulation or prognosis tracing is **>150°** (not stable) AND the resultant *Upper incisor to maxillary plane Angle* is **<95°** (incisors will appear retroclined- not esthetic)

THEN, treatment using a removable appliance is **NOT applicable**

SO, to be able to use a removable appliance, the final angles after tracing/treatment must be:

$I/A < 150^\circ$  to **provide a stable relation**

and  $UIMxP > 95^\circ$  to provide an **esthetic appearance** (not to appear retroclined)

### # Another uses of lateral Cephalogram are:

- *Research*

- *Assessment of treatment progress*

This is done by superimposition of Lateral cephalograms taken at the beginning of the treatment, middle of the treatment and upon the end of the treatment.

To superimpose the radiographs, we need to use a stable point that doesn't change with growth and time to be able to place them above each other.

You can use: 1- **De Coster's line** ( from Sella to a point on the middle part of the anterior cranial base)

2- **Sella-nasion line** (which is usually stable after a range of 6 years)

3- another stable points at maxilla or mandible

**GOOD LUCK ^\_^**