CEPHALOMETRICS - 2

Department of Orthodontics & Dentofacial Orthopaedics

Learning Objective

- TO UNDERSTAND THE APPLICATION OF VARIOUS CEPHALOMETRIC ANALYSIS
- TO APPLY VARIOUS PARAMETERS & POSITIVE FINDINGS IN THE DIAGNOSIS & TREATMENT PLANNING

Contents

- SKELETAL ANALYSIS

1. DOWNS ANALYSIS
2. STEINERS ANALYSIS
3. TWEEDS ANALYSIS
4. WITS APPRAISAL

Skeletal analysis

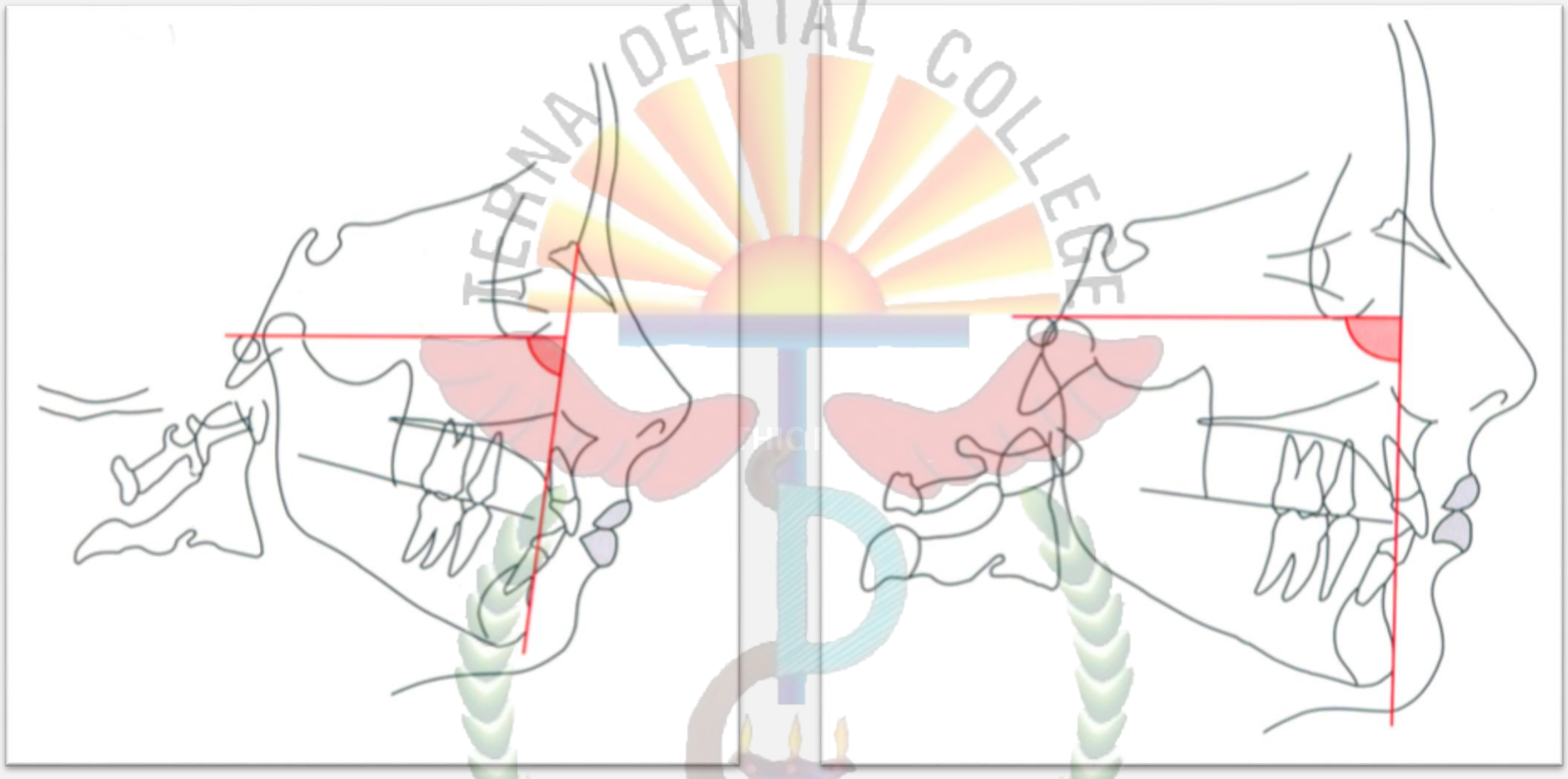
DOWNS' ANALYSIS

Given by William Benham Downs in 1948.

Downs considered 5 skeletal and 5 dental parameters to measure facial form on a cephalogram.

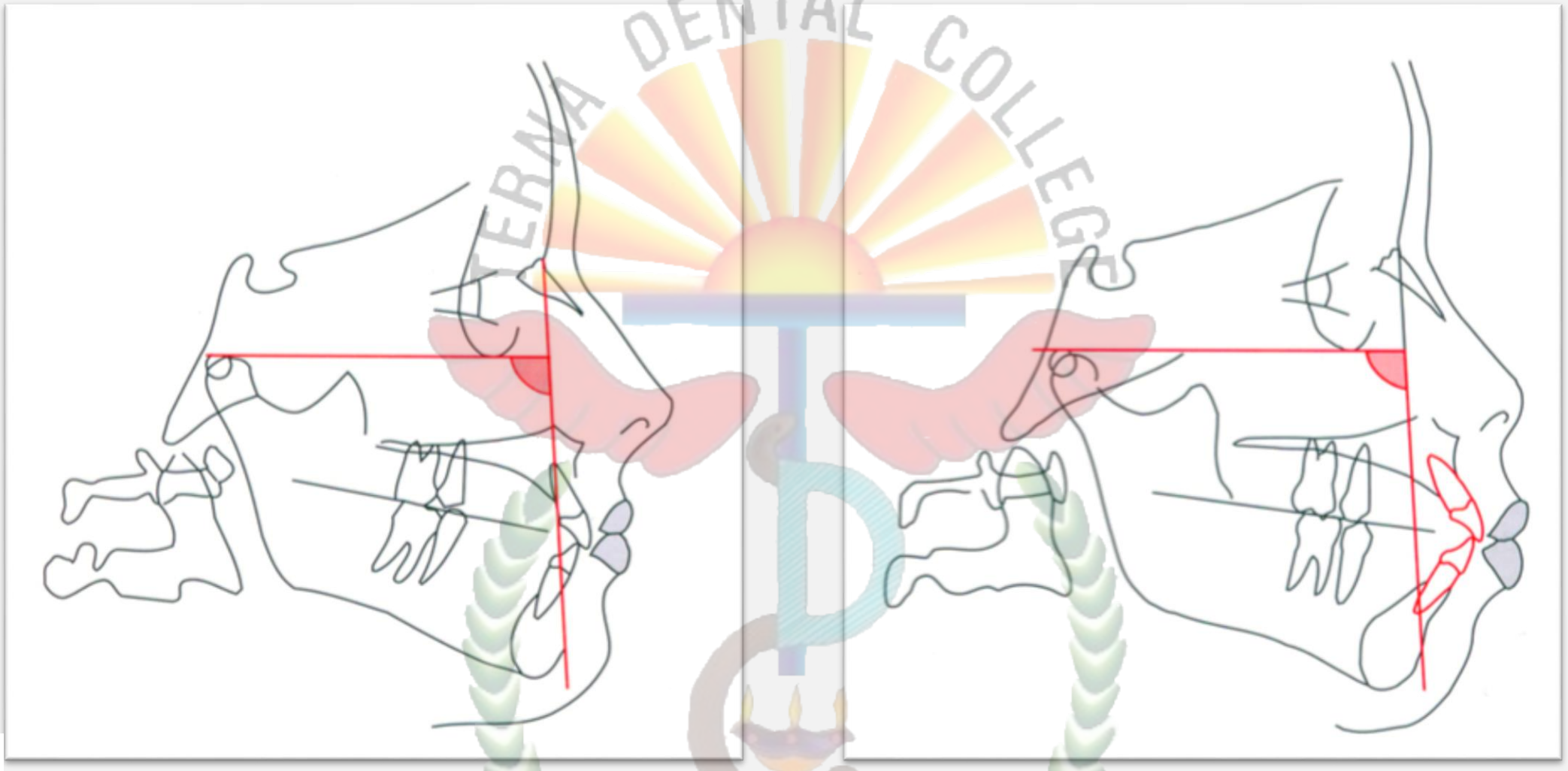
He deduced that there are four types of faces as viewed on lateral profile:

1. Retrognathic with a recessive lower jaw
2. Orthognathic with an ideal or average lower jaw
3. Prognathic with a protrusive lower jaw
4. True prognathism with a pronounced protrusion of the lower face.



RETROGNATHIC FACIAL TYPE

ORTHOGNATHIC FACIAL TY



PROGNATHIC FACIAL TYPES

TRUE PROGNATHISM

PARAMETERS OF DOWNS' ANALYSIS

SKELETAL PARAMETERS

1. Facial Angle
2. Angle of Convexity
3. A-B Plane Angle
4. Mandibular Plane Angle
5. Y (growth) - axis

DENTAL PARAMETERS

1.Cant of Occlusion Plane
2.Interincisal Angle
3.Incisor Occlusal Plane Angle
4.Incisor Mandibular Plane Angle
5.Protrusion of Maxillary Incisor

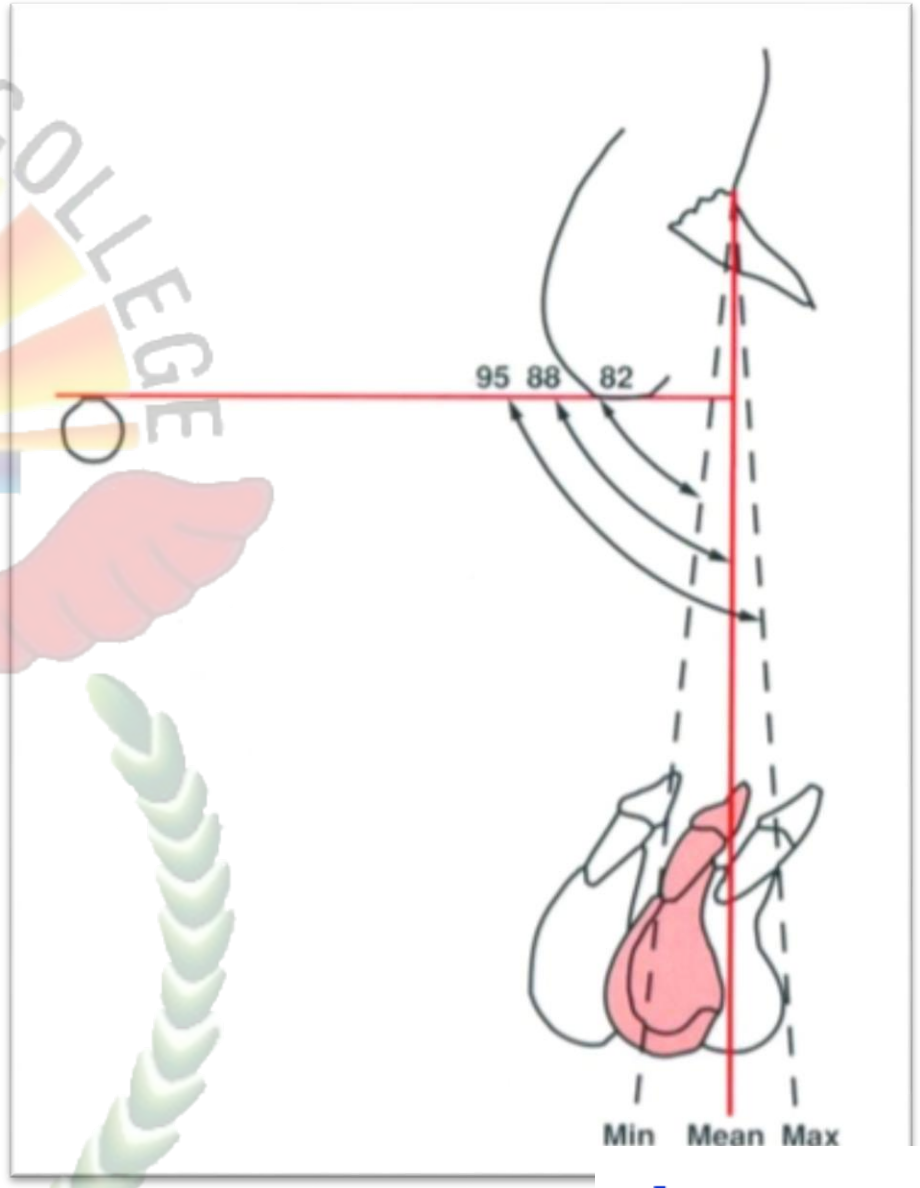
FACIAL ANGLE

Measure degree of retrusion/ protrusion of lower jaw.

MEAN READING - 87·8 degree
RANGE : 82 - 87 degree

- Angle increased in case of prominent chin.

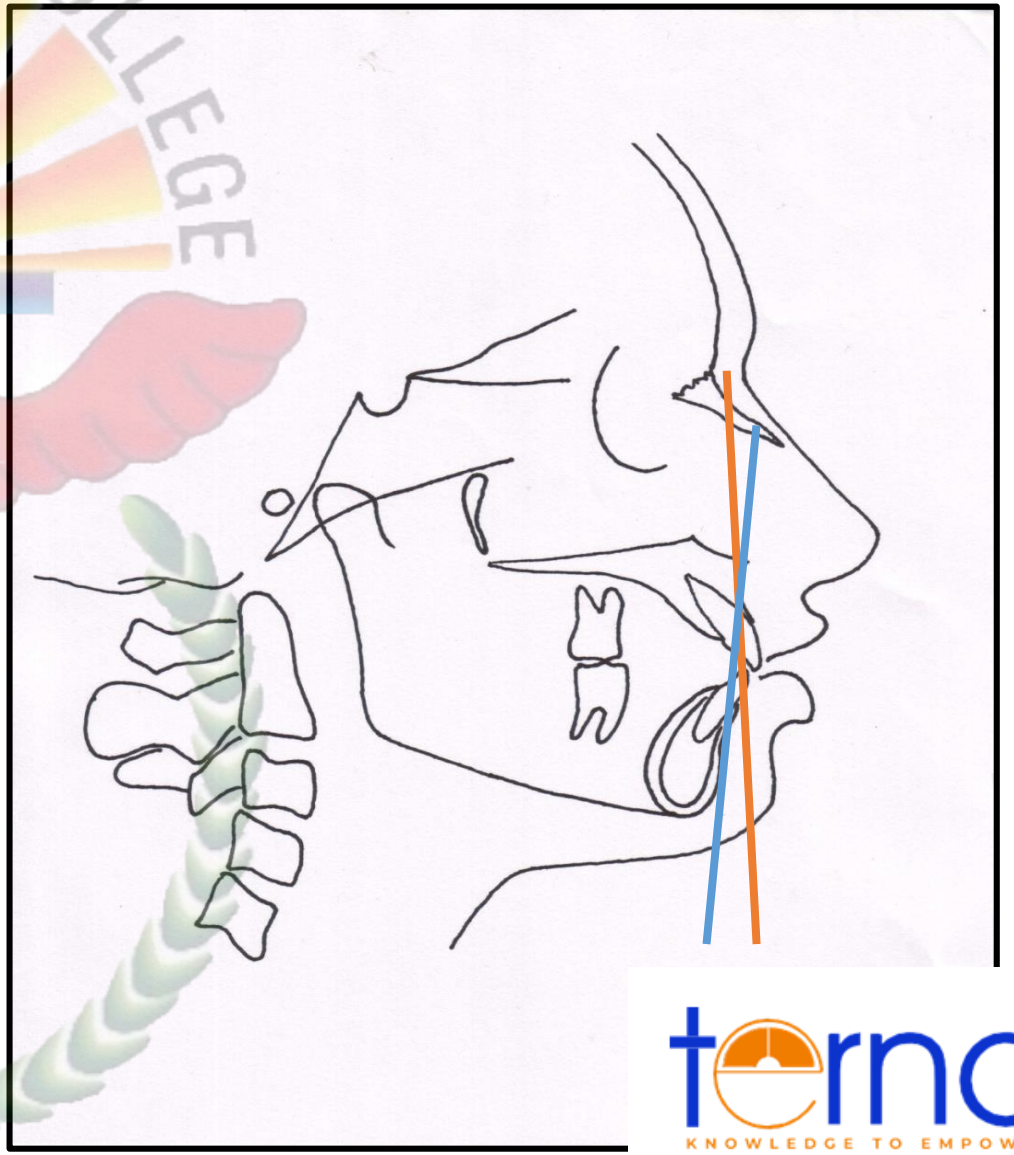
- Angle decreased in case of a retruded chin.



ANGLE OF CONVEXITY

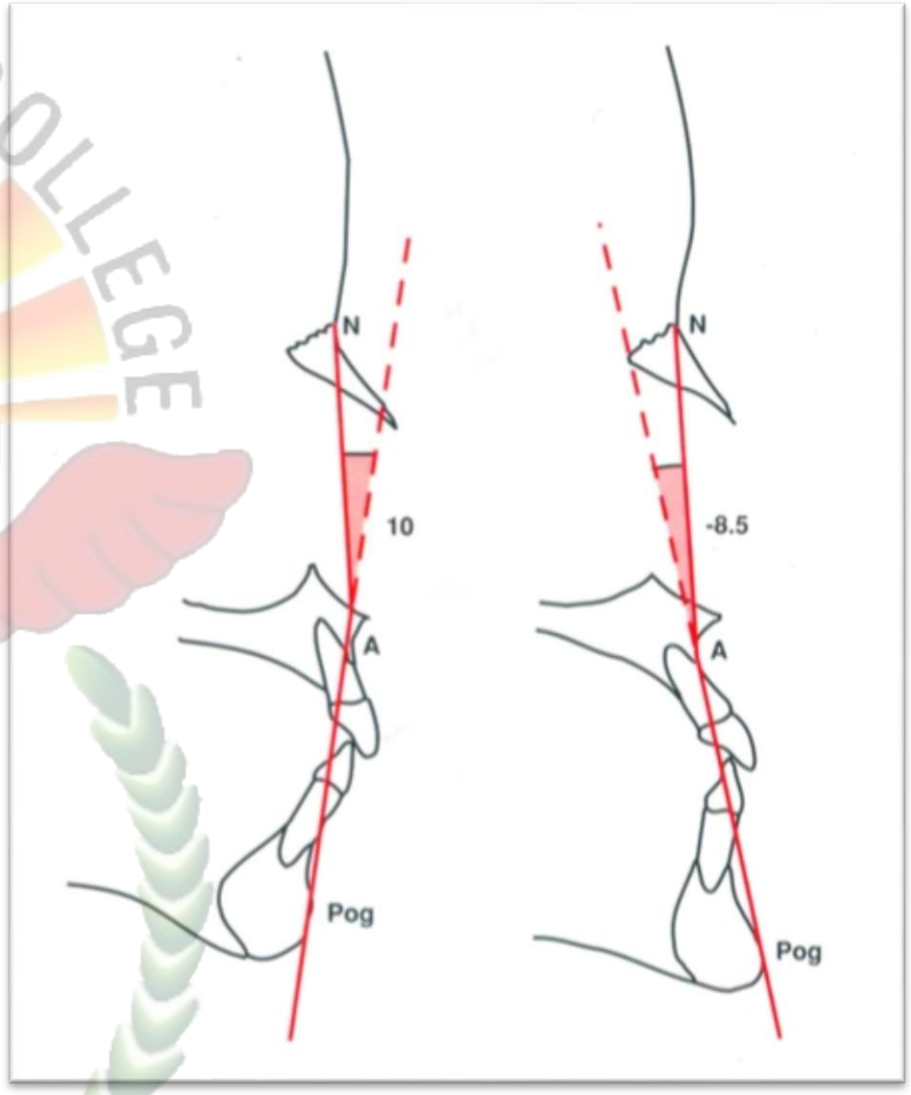
- Formed by the intersection of the line from Nasion to Point A and Point A to pogonion.

Range: -8·5° to 10°
Mean: 0°



Positive angle suggests prominence of the maxillary teeth relative to the mandible.

Negative angle is associated with a prognathic profile.



A B PLANE ANGLE

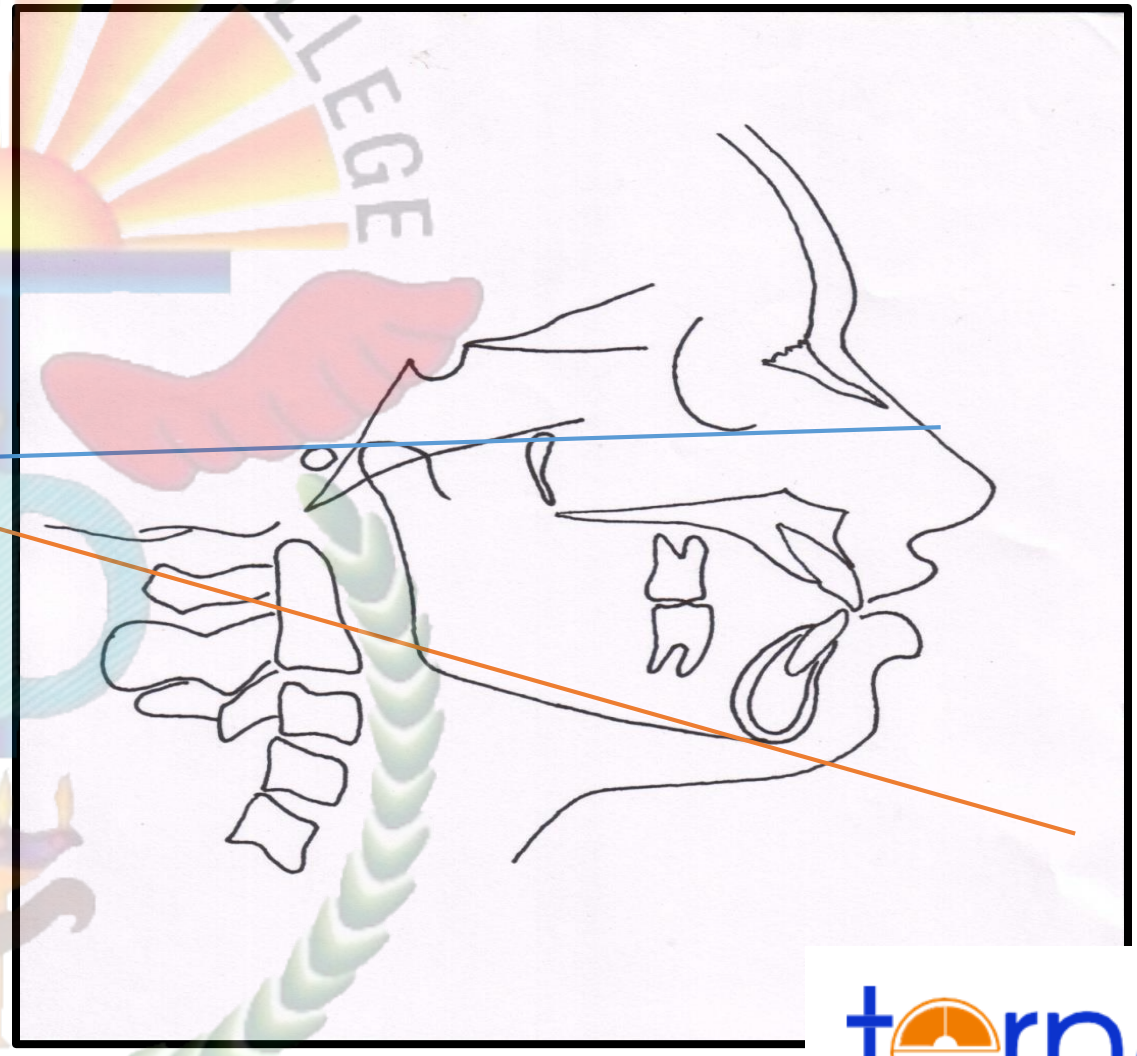
A-B plane angle is a measure of the relation of the apical bases of the maxilla and mandible to each other relative to the facial line.

RANGE : 0 TO -9 degree
MEAN : -4·6 degree

- ✓ point B is usually behind point A, this angle is usually **negative.**
- ✓ **Positive angle** is seen in case of Class III or in cases of mandibular prominence.
- ✓ A **large negative** value is indicative of a Class II pattern.

MANDIBULAR PLANE ANGLE

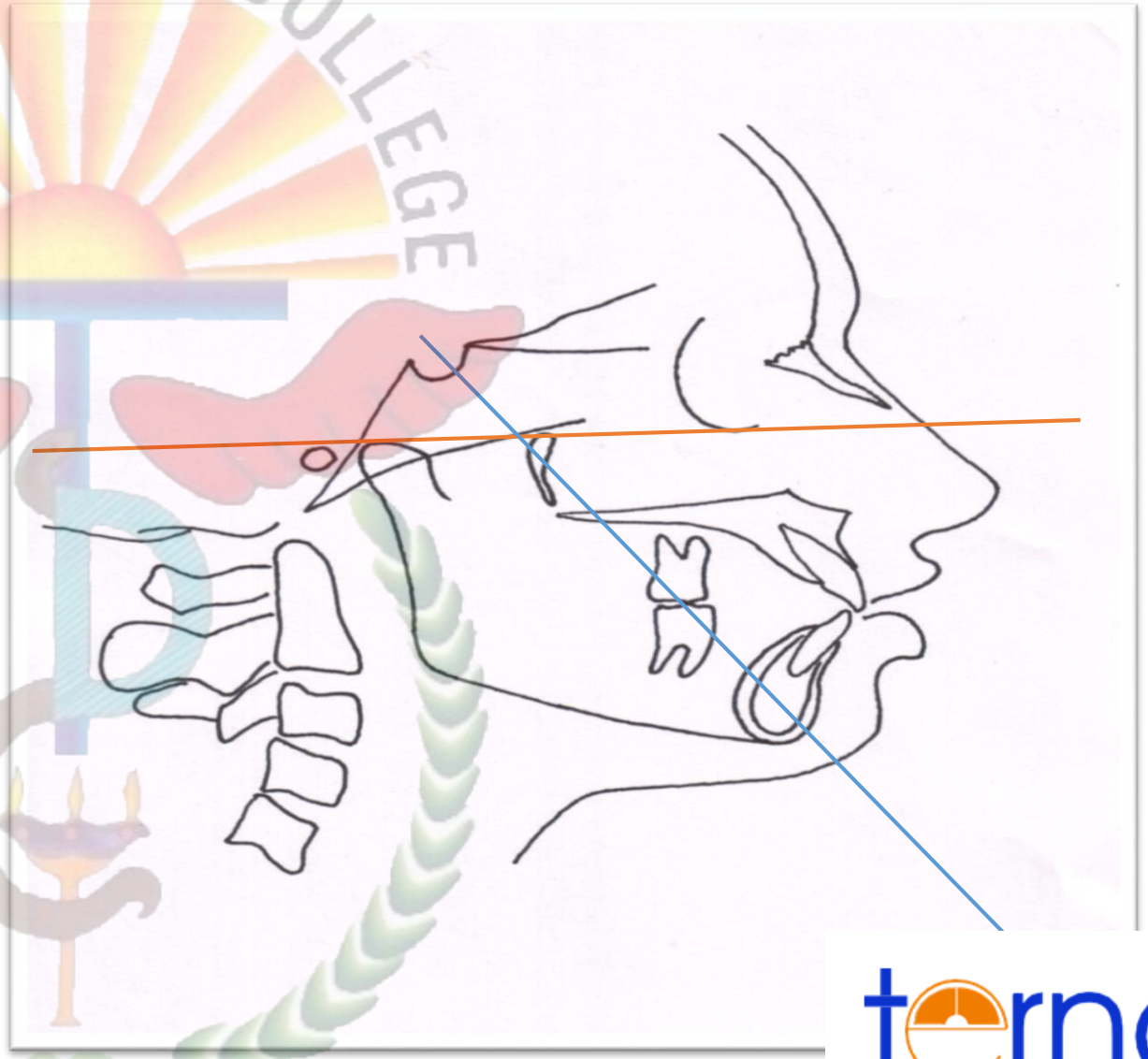
- RANGE : 17 – 28 degree
- MEAN : 21·9 degree



Y - AXIS

- Range: 53 to 66°
- Mean: 59.4°

- This angle is greater in Class II tendencies than in Class III tendencies.



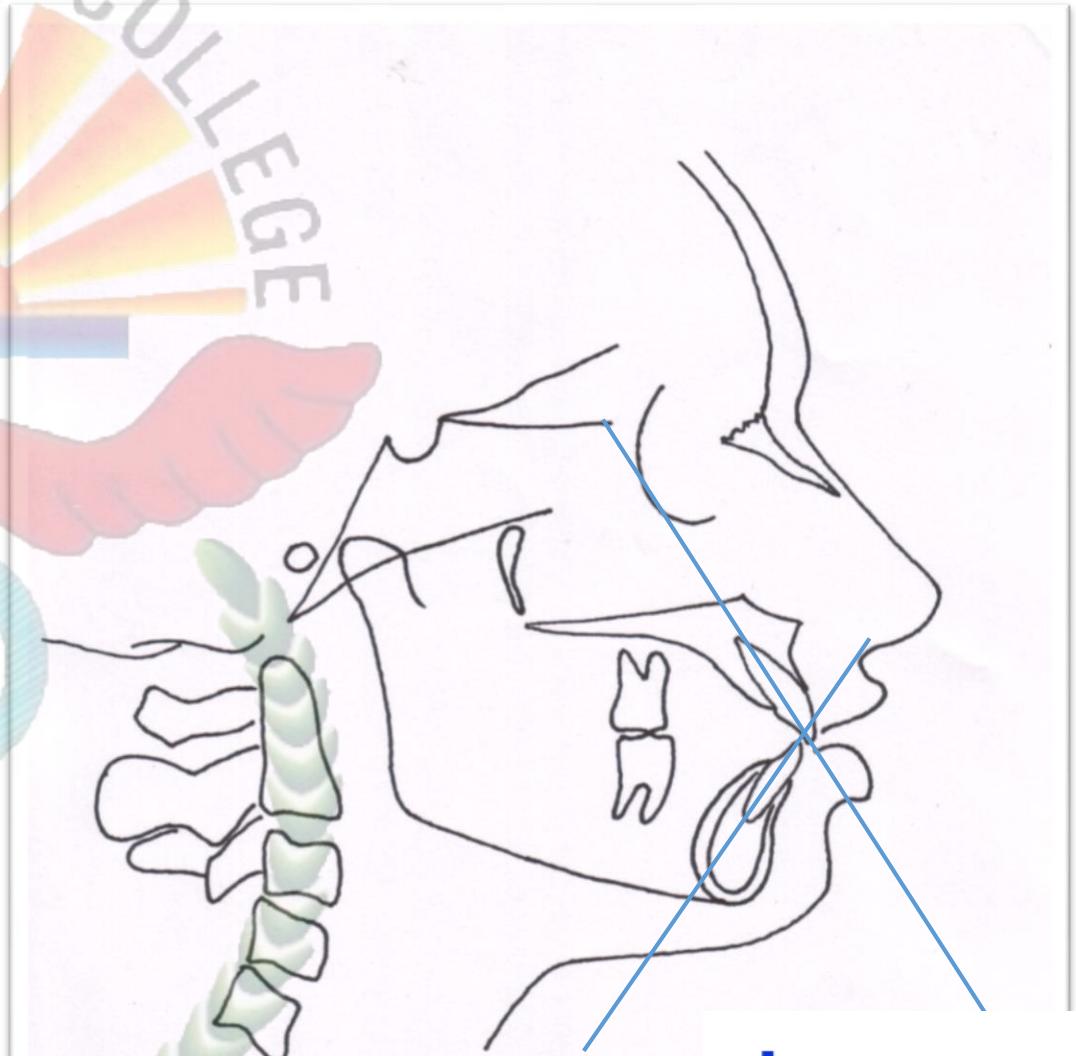
CANT OF OCCLUSAL PLANE

- The cant of occlusal plane is a measure of the slope of the occlusal plane to the Frankfort Horizontal plane.

- *Range: 1·5 to 14°*
- *Mean: 9·3°*

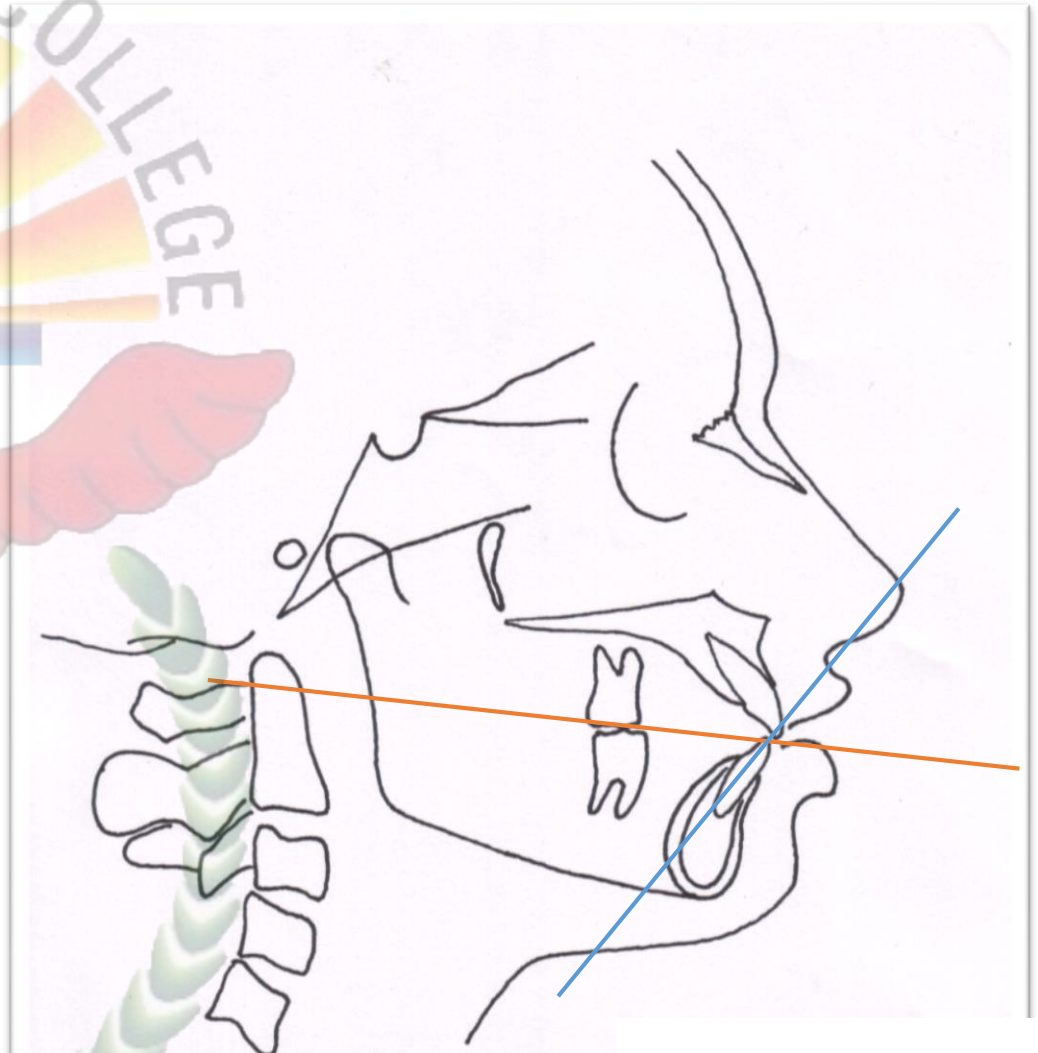
INTERINCISAL ANGLE

- Range: 130-150°
- Mean: 135·4°



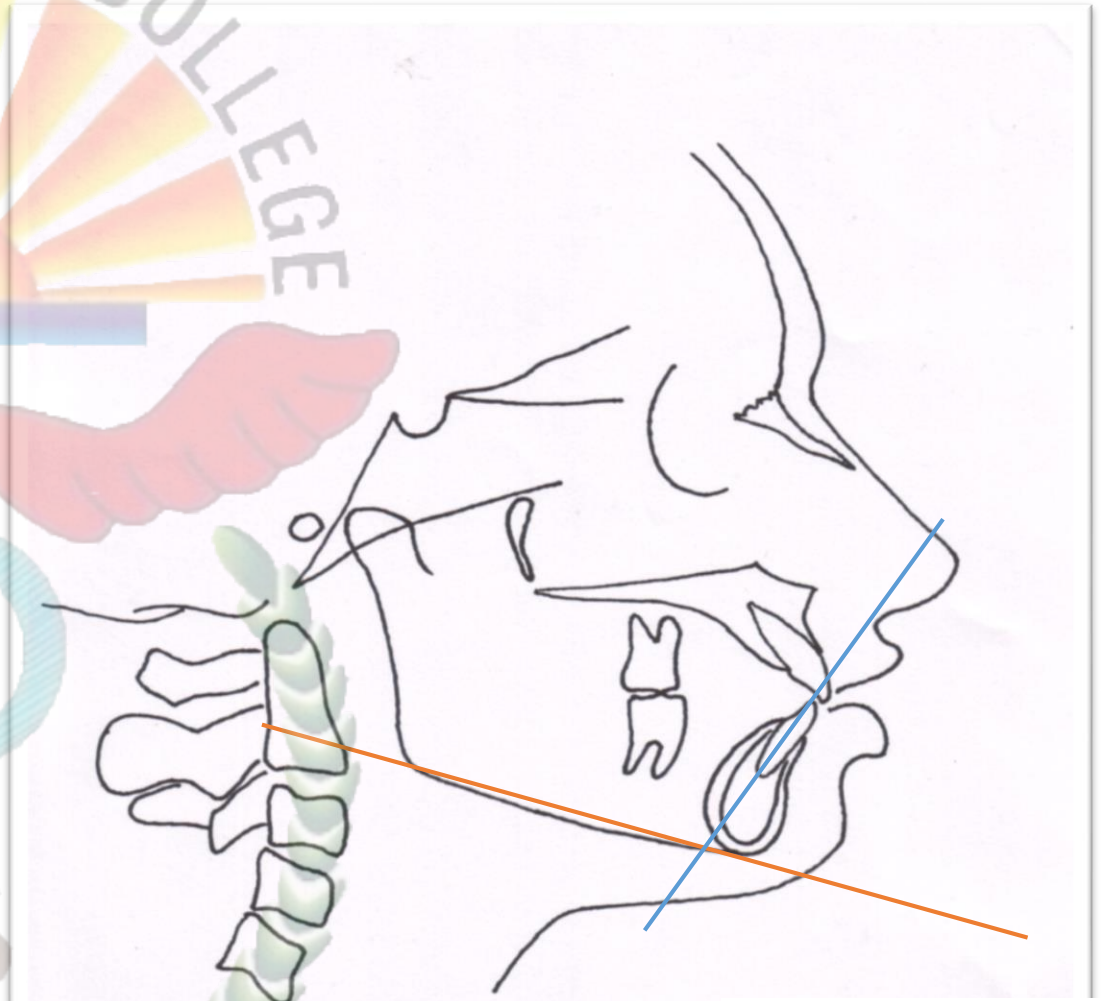
INCISOR OCCLUSION PLANE ANGLE

- Range: 3·5 to 20°
- Mean: 14·5°



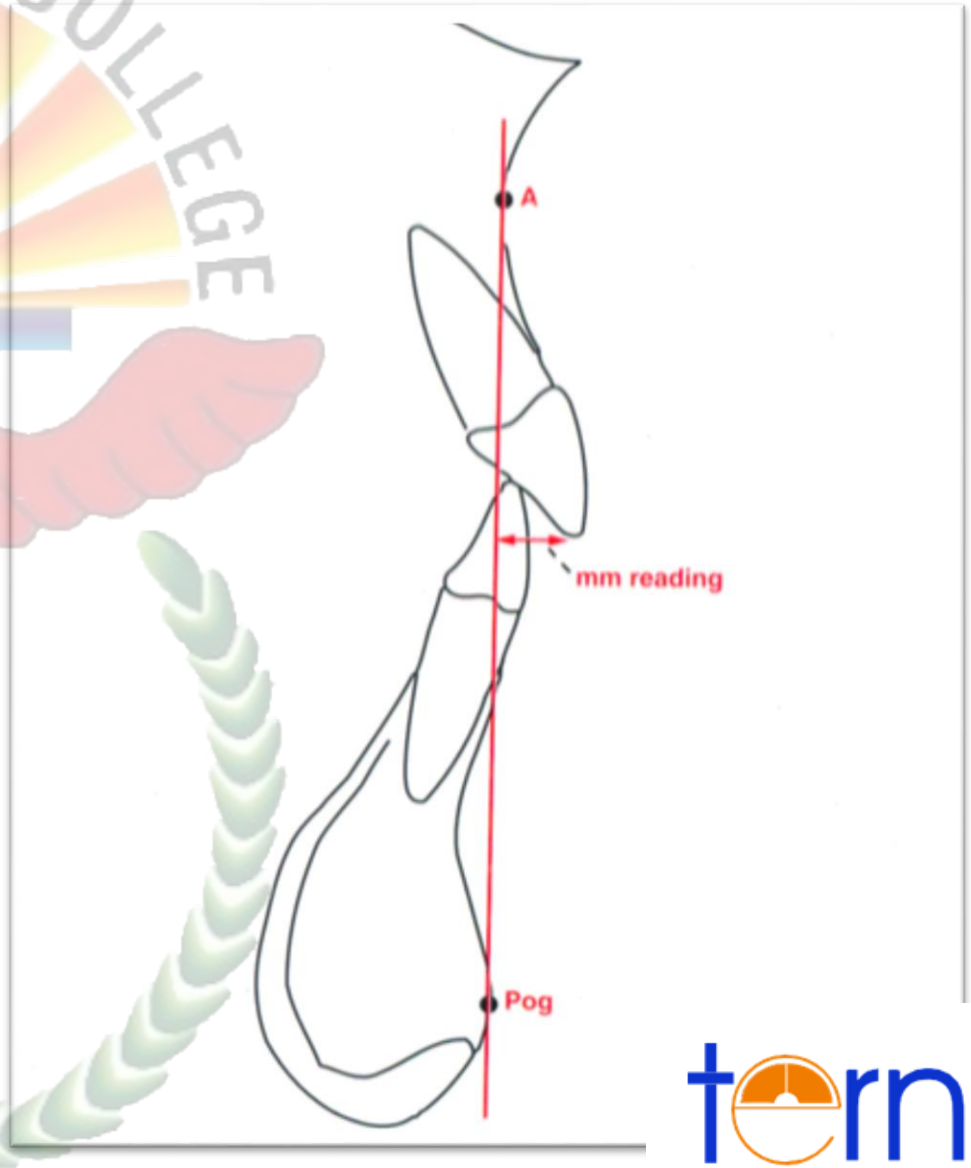
INCISOR – MANDIBULAR PLANE ANGLE

- Range: -8.5° to 7°
- Mean: 1.4°



PROTRUSION OF MAXILLARY INCISORS

- Range: -1·0mm to 5mm
- Mean: 2·7mm



STEINER ANALYSIS

Developed by Cecil C. Steiner

STEINER ANALYSIS

Cecil C. Steiner went a step ahead further when he evolved an analysis that took into account not only the relation of teeth to each other and to their respective dental bases but also recognized the importance of the soft tissue cover and included the data to analyze the same. He evolved a composite analysis, which he believed would provide the maximum information with least number of measurements. By comparing measurements of patients with malocclusions with those of normal occlusions, the degree of deviation from the normal could be determined.

Steiner divided his analysis into three parts-

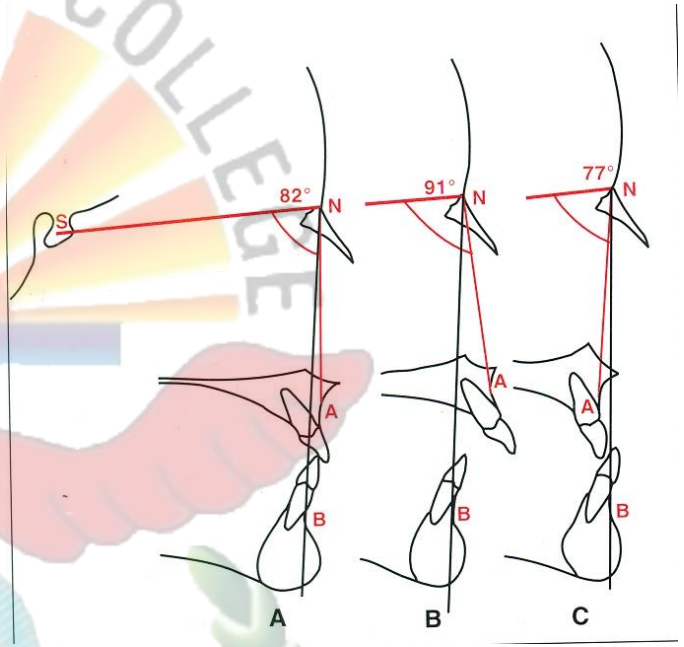
1. Skeletal
2. Dental
3. Soft tissues.

Steiner elected to use the anterior cranial base (S to N) as a line of reference his analysis.

1. RELATING THE MAXILLA TO THE SKULL

The angle SNA is formed by joining the lines S-N and N-point A.

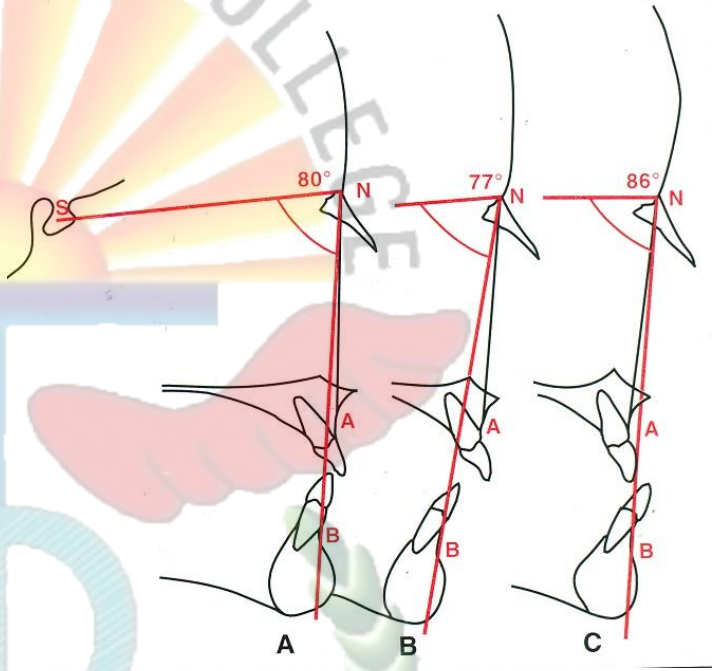
The mean reading for this angle is 82 degrees.



If the angular reading is more than 82 degrees, it would indicate protrusion of maxilla. And if the reading is less than 82 degrees, it would indicate a relative backward or retruded position of maxilla.

2. RELATING THE MANDIBLE TO THE SKULL

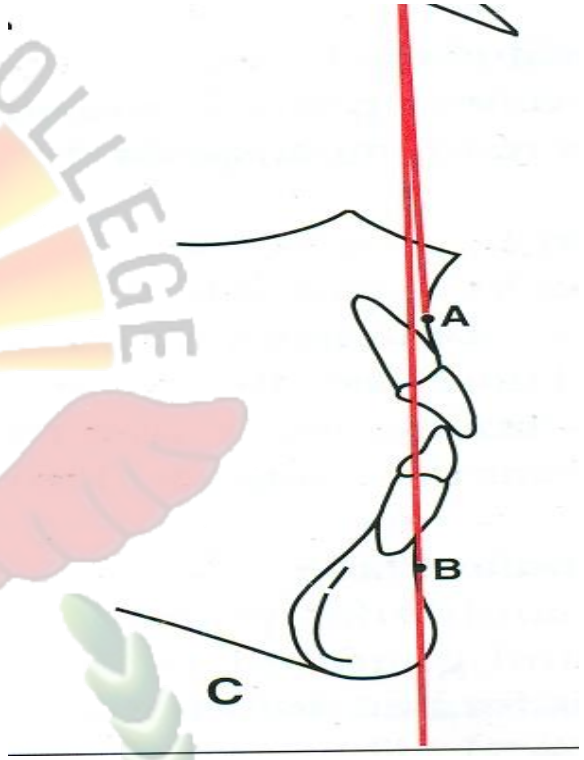
To assess whether the mandible is protruded or retruded relative to the cranial base, the SNB angle is considered. The mean for this angle is 80 degrees.



If the angle is less than 80 degrees, indicates retruded mandible. An angle greater than 80 degrees suggests a protruded mandible.

3. RELATIONSHIP OF MAXILLA TO MANDIBLE

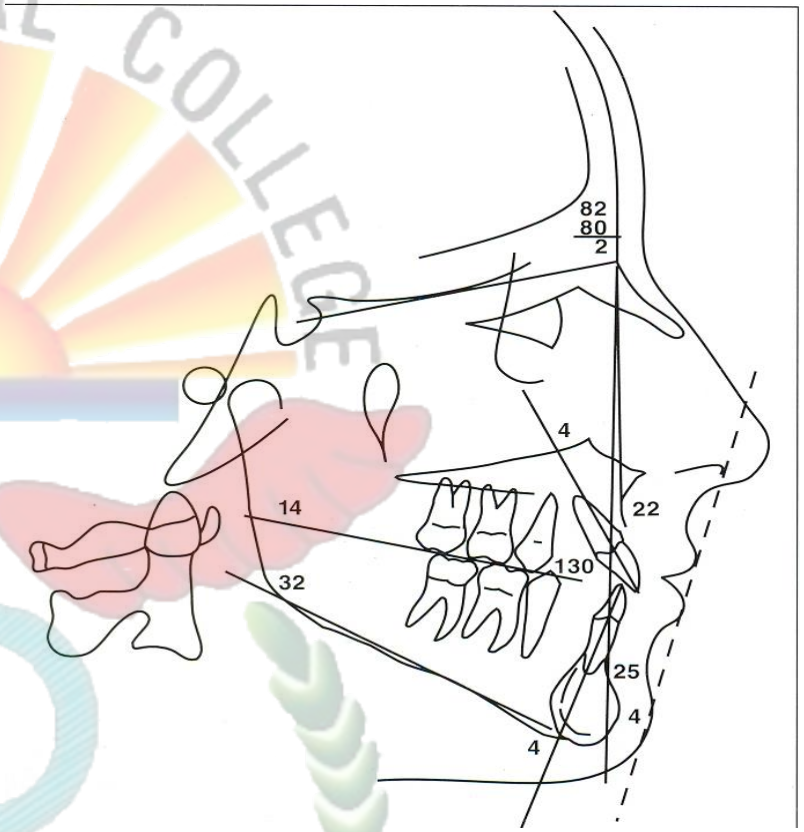
The angle ANB provides the relative positions of the jaws to each other. The ANB angle provides a general idea of the anteroposterior discrepancy of the maxillary to the mandibular apical bases.



The mean reading for this angle is 2 degrees. A reading greater than 2 degrees indicates a class II skeletal tendency. Angles less than 2 degrees indicates that mandible is located ahead of maxilla, suggesting a class III skeletal relationship.

4. OCCLUSAL PLANE ANGLE

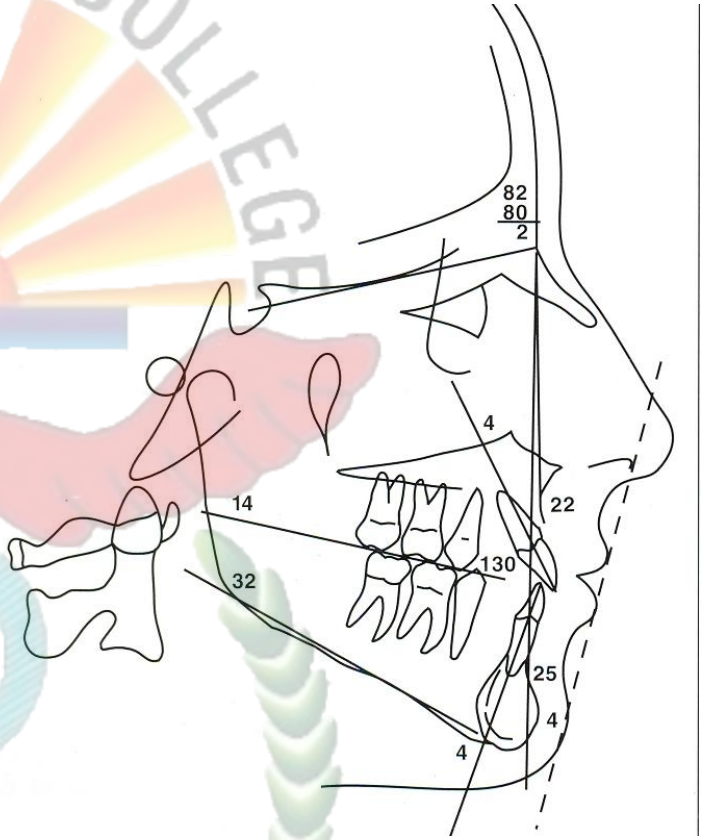
The occlusal plane is drawn through the region of the overlapping cusps of the first premolars and first molars. The angle of the occlusal plane to S-N plane is measured.



The mean reading for normal occlusions is 14 degrees. The angle is increased in long face or vertically growing individuals and also skeletal overbite cases. It may be decreased in horizontal growers or cases with skeletal deep bite.

5. MANDIBULAR PLANE ANGLE

The mandibular plane is drawn between Gonion (Go) and Gnathion (Gn). The mandibular plane angle is formed by joining the mandibular plane to the anterior cranial base. Excessively high or low mandibular plane angles suggest unfavorable growth patterns and these are likely to affect treatment results.



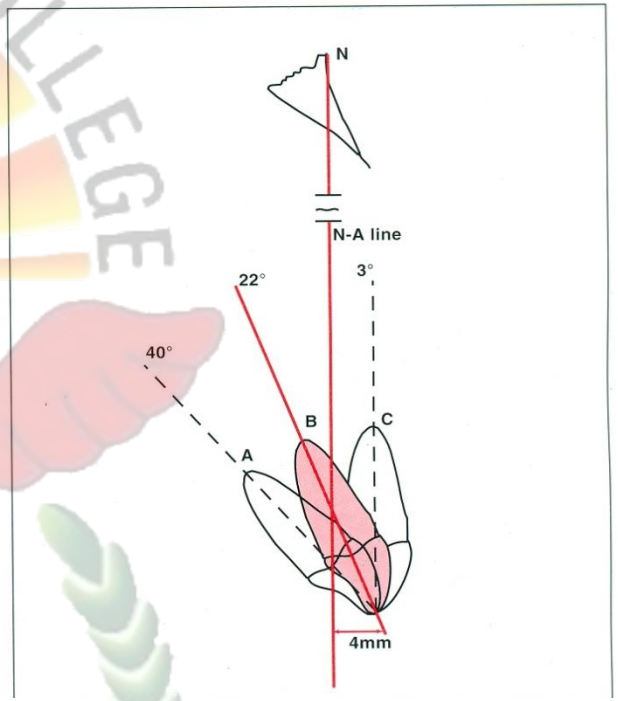
The mean reading for this angle is 32 degrees.

THE DENTAL ANALYSIS

This part of the analysis is designed to confirm the clinical observations already made and to determine the position of the dentition with respect to their respective bony bases and to each other.

1. MAXILLARY INCISOR POSITION

The maxillary incisor is related to the N-A plane both by angular as well as linear measurements. The upper incisor to N-A reading in degrees indicates the relative angular relationship of the upper incisor teeth, where as the upper central incisor to N-A reading in milimeters provides information on the relative forward or backward positioning of the incisor teeth N-A.



Upper central incisor to N-A is 4 mm (may range up to 7mm) and axial inclination bears a 22 degree angle to the line

2. Upper Incisor to NA Linear

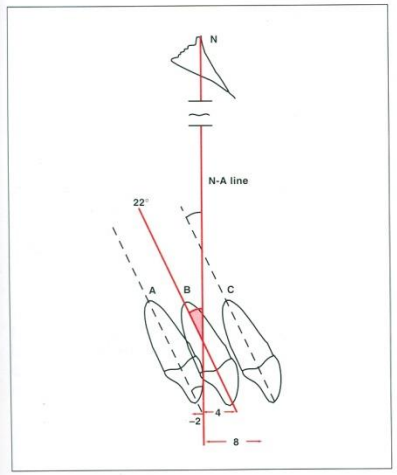


Fig 6–8 **A**, incisor angled at 22 degrees but retropositioned (–2 mm); **B**, "ideally" positioned (4 mm); and **C**, positioned too far forward (8 mm).

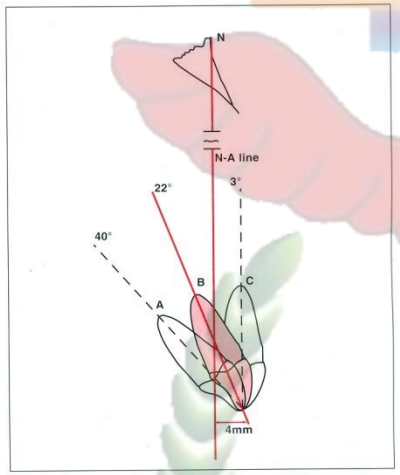
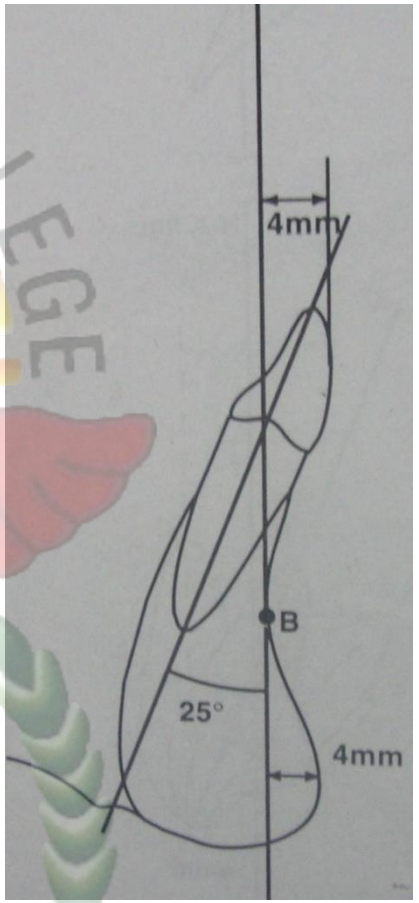


Fig 6–9 Illustration to show inadequacy of relating incisor tip to millimeter reading only. All three teeth are 4 mm from the N–A line but angled differently (ie, 40 degrees, 22 degrees, and 3 degrees).

- Linear measurement between the labial surface of upper incisor and the line joining Nasion to Pt A.
- Normal : 4mm
- Increased with increased proclination.

3. MANDIBULAR INCISOR POSITION

The relative anteroposterior linear position and angulation of the lower incisor teeth is determined by relating the most protruding incisor to the N-B line and shows forward or backward positioning of these teeth. And lower incisor to N-B in degrees indicates their axial inclination.



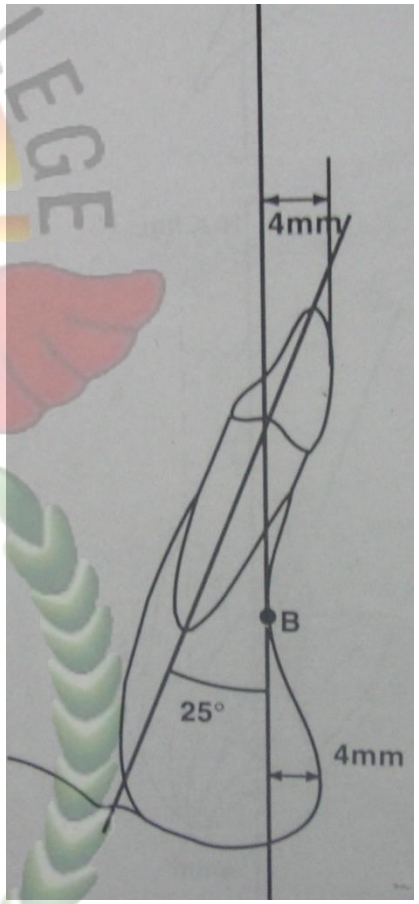
The most labial portion of the lower incisor teeth should be located 4mm ahead of N-B line, and axial inclination of this tooth to N-B line should be 25 degree.

4. INTER-INCISAL ANGLE

The inter-incisal angle relates the relative position of the upper incisor to that of the lower incisor. If angulation is more acute or less than 130 degree, then the anterior are considered to be proclined. Conversely, if the angle is greater than 130 degree or more obtuse the incisors are considered to be retroclined.

5. LOWER INCISOR TO CHIN

The chin forms the most important landmarks on the profile. According to the studies conducted by Holdway, the distance between the labial surface of the lower incisor to the N-B line and the distance from pogonion to the N-B line should be equal (4mm). A 2mm discrepancy between these measurements is acceptable. If the difference between these dimensions exceeds 4mm, however, corrective measures are generally indicated.



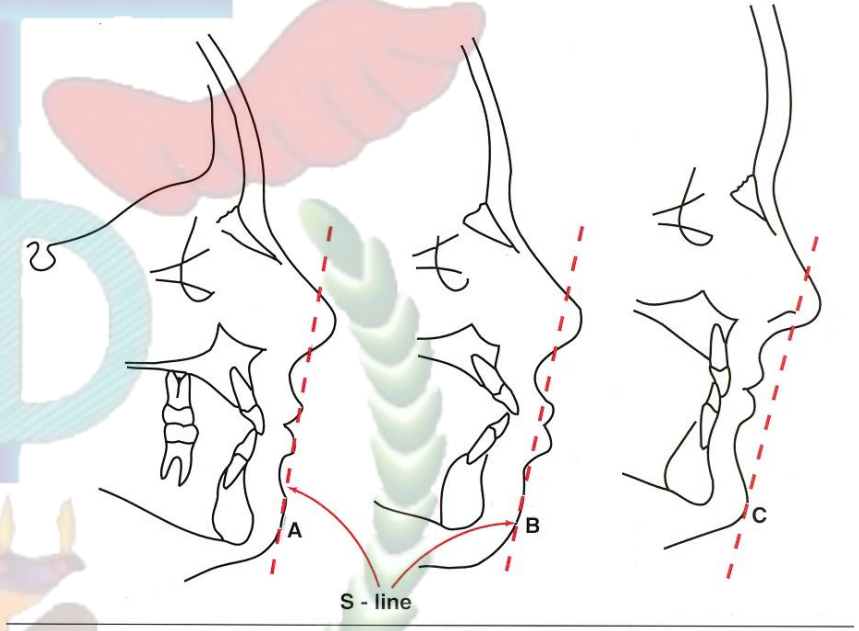
THE SOFT TISSUE ANALYSIS

The analysis laid emphasis on the soft tissue profile as well as the underlying skeletal infrastructure. The profile is mainly affected by the chin, nose and the lips. The shape and the posture of the lips is partially governed by the underlying dentition and thus can be modified orthodontically. The thickness of the tissue over the symphysis and the nasal structure also contributes to the prominence of the lower face and attention should be paid to the same when as it may camouflage the underlying malocclusion.

STEINER'S S-LINE

According to steiner, the lips in balanced faces, should touch a line extending from the soft tissue contour of the chin to the middle of an S formed by the lower border of the nose. This line is referred to as the S-line.

Lips located beyond this line tend to be protrusive. And if the lips are located behind this line are interpretated as concave profile. Orthodontic correction of teeth or jaws are required to approximate lips to the S-Line.



TWEED ANALYSIS

Tweed developed this analysis as an aid to treatment planning, anchorage preparation and determining the prognosis of orthodontic cases. At that time a great emphasis was laid on the placement of the mandibular incisors for the presevation of the orthodontically achieved results.

This analysis is based primarily on the deflection of the mandibular plane angle (FMA) and the posture of the lower incisor. The analysis is done to determine the final position, the lower incisor should occupy at the end of treatment. Once the final position of these teeth has been determined, the space requirements could be calculated and decisions regarding extractions can be made. Dr. Tweed established that prognosis could be predicted relatively accurately based on the configuration of the triangle.

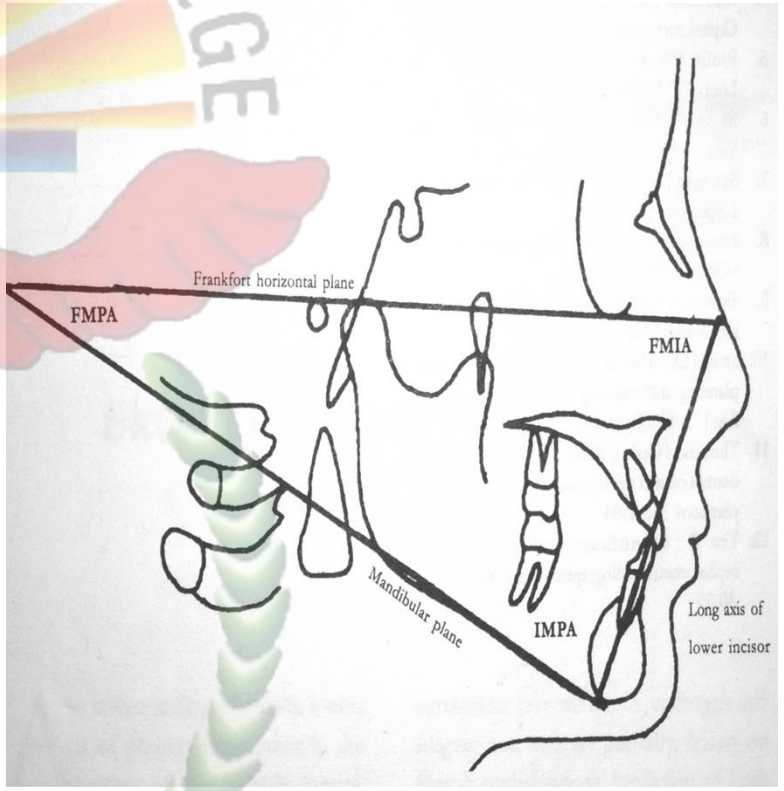
Objectives:

1. To determine the final position of lower incisors should occupy at the end of treatment so space requirement is calculated and decision regarding extraction is made.
2. As an aid in treatment planning and anchorage preparation.
3. Determining the prognosis of orthodontically treated cases.

DESCRIPTION

The analysis consist of the Tweed's triangle formed by:

1. Frankfort horizontal plane
2. The mandibular plane
3. The long axis of lower incisor



The three angles formed are:

1. Frankfort-mandibular plane (FMA).
2. Lower incisor to mandibular plane (IMPA).
3. Lower incisor to FH plane (FMIA).

The normal values:

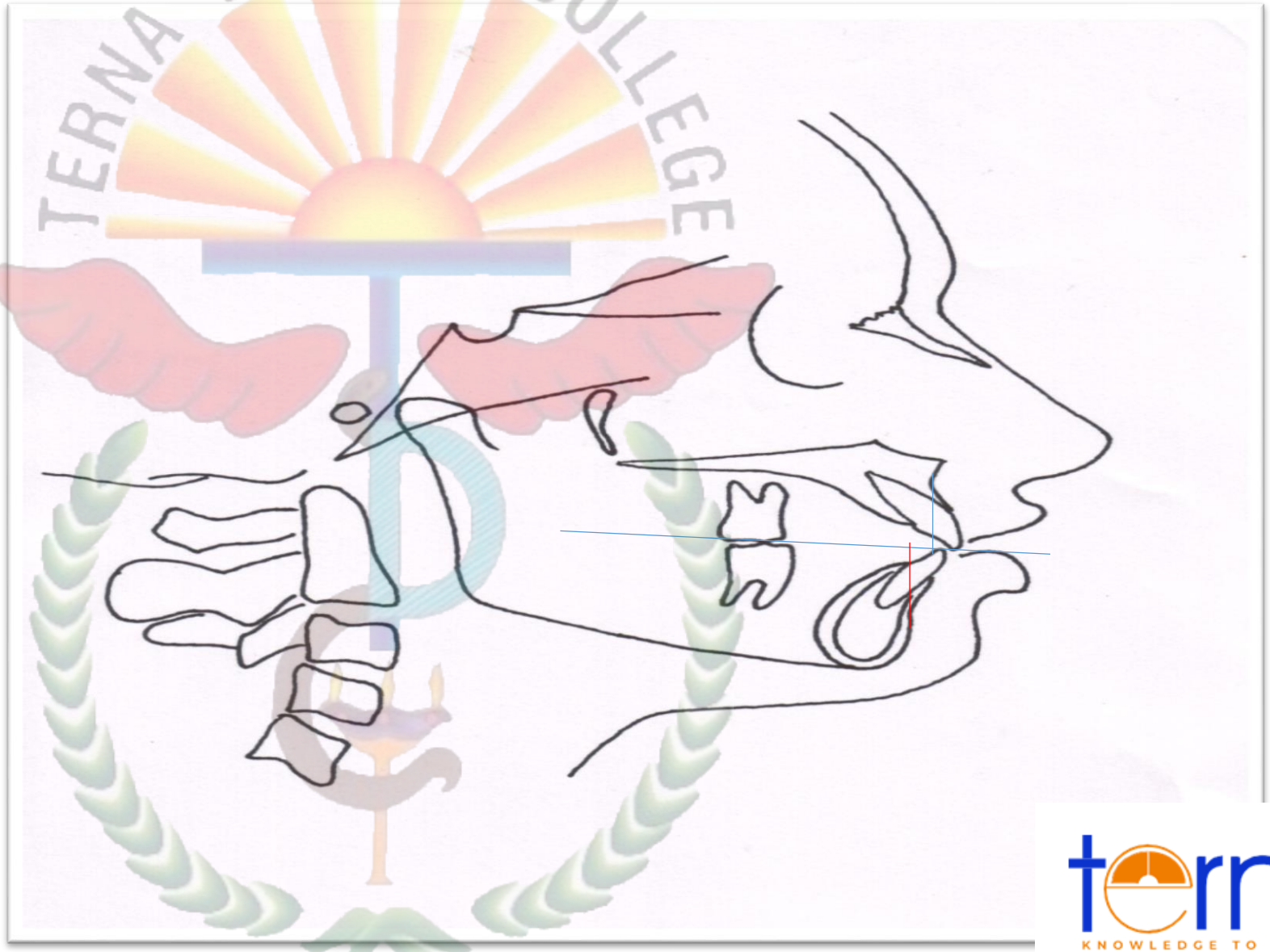
1. FMA- 25 degrees
2. IMPA- 90 degrees
3. FMIA- 65 degrees

The basis is the FMA angle, and the following can be derived from the change in its value as:

1. FMA 16 to 28: good prognosis.
   at 16, IMPA should be 95
   at 22, IMPA should be 90
   at 28, IMPA should be 85
   Approximately 60 percent of malocclusions have FMA between 16 and 28
2. FMA from 28 to 35: prognosis fair at 28, IMPA should be 85 extactions necessary
   in majority of cases at 35, IMPA should be 80 to 85.
3. FMA above 35, prognosis bad, extractions frequently complicate problems.
   Tweeds stressed the importance of the FMIA angle, recommending that it be maintained at 65 to 70.

The tweed analysis is primarily for clinical treatment planning and should not be considered a complete analysis in itself. By establishing the position lower incisor should occupy, provision are made for variations in mandibular position and the upper incisor are placed according to lower incisor. The ideal positioning of the lower incisor helps in stability of the results achieved thereby indicating the prognosis of the case.

WITS APPRAISAL



Take home message

- Cephalometrics is the backbone of Orthodontic diagnosis & Treatment Planning
- Cephalometrics includes measurements, description & appraisal of the morphological configuration & growth changes in the skull by ascertaining the dimensions of lines, angles & planes .

PROBABLE QUESTIONS

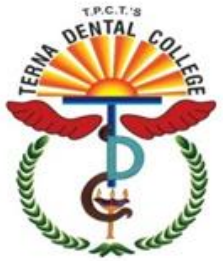
SAQ

1. Diagnostic Triangle
2. Wits Appraisal
3. Y-axis
4. Cant of occlusion
5. FMA

LAQ

1. Write about Downs analysis in detail
2. Write about Steiners analysis in detail

Thank you



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KNOWLEDGE TO EMPOWER