

# Parameters for Assessment of Antero-Posterior Skeletal Discrepancy: A Review and Compilation

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## ABSTRACT

Diagnosis and treatment planning is the most important and critical step in Orthodontics. Malocclusion is classified in all the three planes- sagittal, vertical and transverse. Various parameters for assessment of antero-posterior discrepancy have been mentioned in previous literature. However each parameter has its own characteristics, advantage and shortcomings. This review gives a compilation of the various parameters like ANB angle, WIT's appraisal, Beta angle, YEN angle, W angle which can be useful to diagnose A-P problems precisely.

**KEYWORDS:** ANB angle, Beta angle, Sagittal jaw relationship, W angle, WIT's appraisal, YEN angle.

## INTRODUCTION

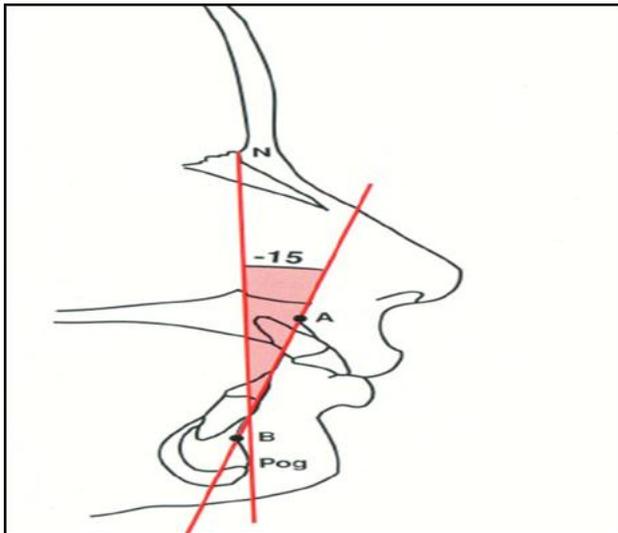
An accurate anteroposterior measurement of jaw relationships is critically important in orthodontic diagnosis & treatment planning. Numerous angular & linear measurements are used to assess the sagittal discrepancy between maxilla and mandible which is of prime importance in diagnosis & treatment planning. This article is a review and compilation of the various parameters and measurements used for assessment of anteroposterior (A-P) skeletal jaw discrepancy.

## VARIOUS METHODS

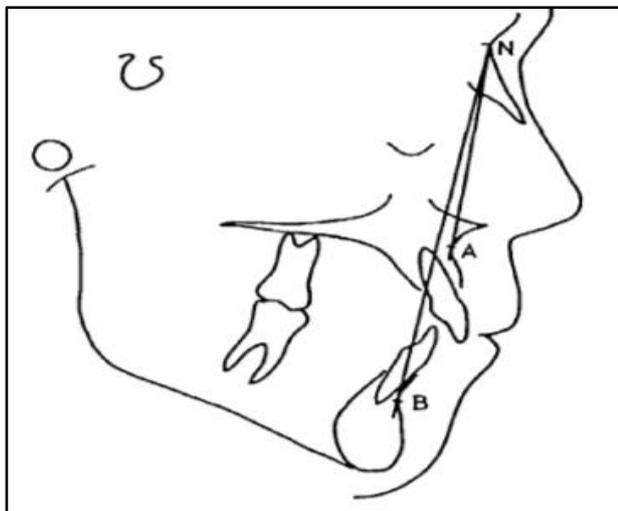
1948, Down's was first to evaluate the anterior posterior apical base relationship. Angle between A-B (point A and B) plane & N Pog (Nasion Pogonion facial angle) was used to assess the sagittal discrepancy (Figure No.1).<sup>1</sup> Riedel measured SNA (Sella Nasion subspinale) & SNB (Sella nasion supramentale) used difference ANB (subspinale nasion supramentale) in order to assess sagittal relationship (Figure No.2).<sup>2</sup>

*How to cite this article:*

Mahajan HP, Vakil K, Vakil J. Parameters for Assessment of Antero-Posterior Skeletal Discrepancy: A Review and Compilation. Int J Dent Med Res 2014;1(2):65-69.



**Figure No.1:** Down's method to evaluate sagittal discrepancy. Angle between A-B plane & Facial angle



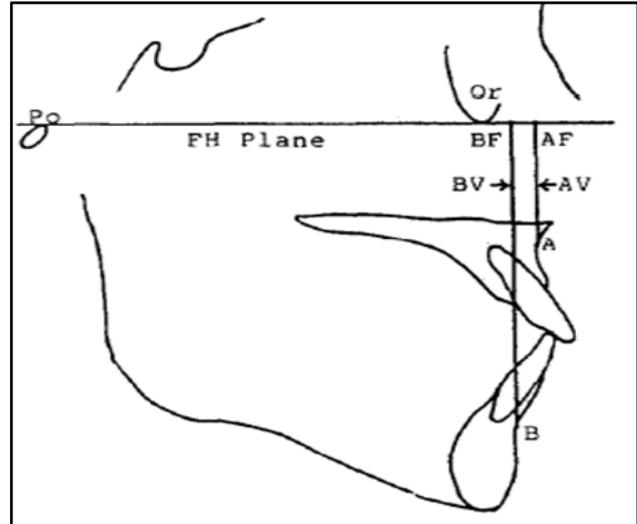
**Figure No.2:** The ANB angle

Though widely used, the following factors have been reported to affect the ANB angle:<sup>3</sup>

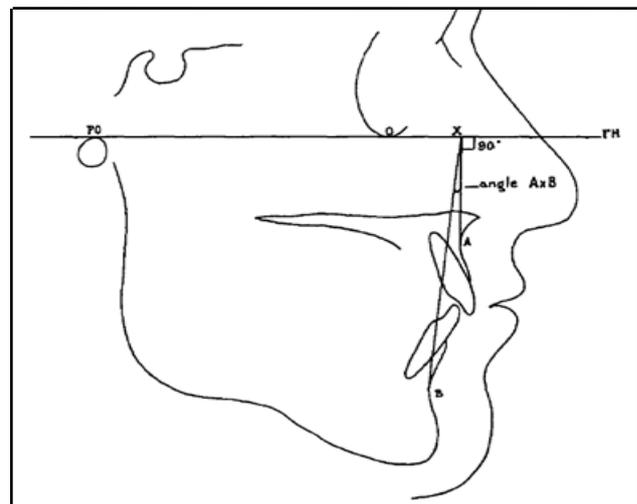
1. The patient's age. The ANB angle has a definite tendency to decrease with increasing age.
2. The change of the spatial position of the nasion either in the vertical or antero-posterior direction or both.
3. The upward or downward rotation of the Sella Nasion line
4. The upward or downward rotation of the jaws.
5. The change in the angle SN to the occlusal plane.

## 6. The degree of facial prognathism.

In order to overcome the shortcomings of ANB angle, Chang reported a linear measurement of the distance between points A and B projected onto the Frankfort horizontal plane (Figure No.3).<sup>4</sup> Freeman in 1981 gave the A-X-B method for evaluation of A-P discrepancy by eliminating the shortcomings of nasion (Figure No.4).<sup>5</sup>



**Figure No.3:** The AF-BF distance was used to assess sagittal discrepancy formed by perpendicular lines dropped from points A and B onto the Frankfort horizontal plane



**Figure No.4:** The A-X-B method of evaluating maxilla-mandibular relationships without reference to position of nasion.

Jacobson drew perpendiculars on a lateral cephalometric head film tracing from points A and B on the maxilla and mandible, respectively, to the occlusal plane to obtain a

measurement that was less affected by variations in craniofacial physiognomy (Figure No.5).<sup>6</sup> The distance between the points of contact of the perpendiculars on the occlusal plane, AO and BO, served as an indicator of skeletal sagittal jaw relationship. It has come to be known as the Wits (Witwatersland University, Johannesburg, South Africa) Appraisal.

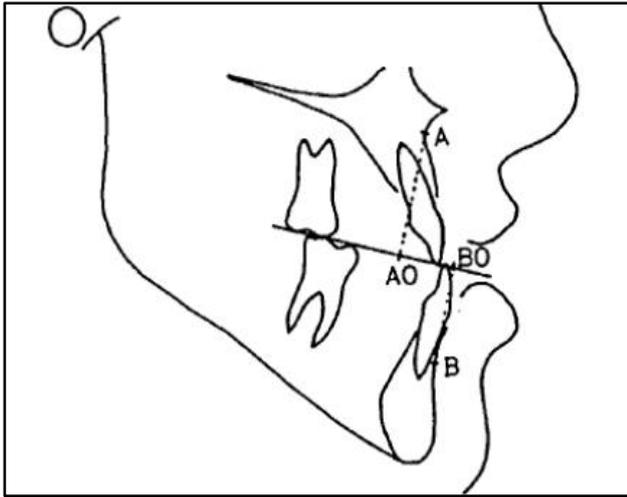


Figure No.5: The WITs Appraisal.

Kim and Vietas gave the anteroposterior dysplasia indicator (APDI), which is a resultant reading obtained from the facial angle plus or minus the A-B plane angle and again plus or minus the palatal plane angle (Figure No.6).<sup>7</sup>

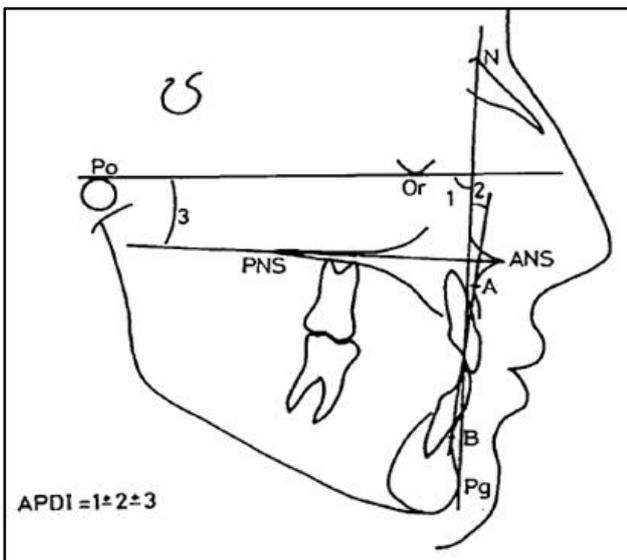


Figure No.6: The anteroposterior dysplasia indicator (APDI)

The Beta angle is a new measurement for assessing the skeletal discrepancy between the maxilla and the mandible in the sagittal plane.<sup>8</sup> It uses 3 skeletal landmarks—point A, point B, and the apparent axis of the condyle (C)—to measure an angle that indicates the severity and the type of skeletal dysplasia in the sagittal dimension. A perpendicular is drawn from point A to the line C-B and Beta angle is measured at A (Figure No.7).

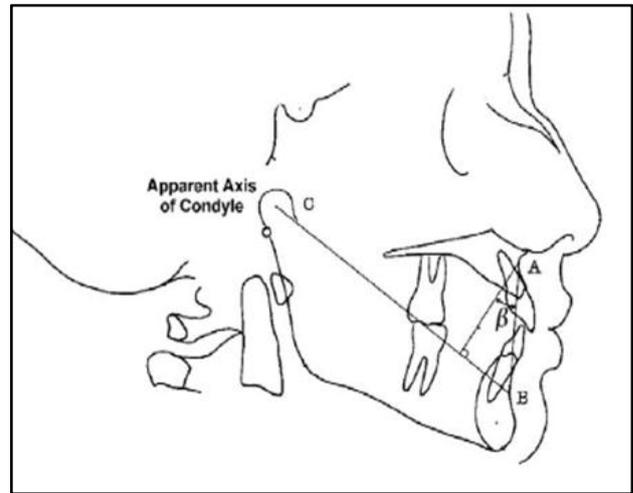


Figure No.7: The Beta angle

Shortcomings of ANB, WIT's appraisal and Beta angle are described in Table No.1

ANB	Wits Appraisal	Beta angle
Affected by patients age, growth rotation, vertical growth, & the length of ant cranial base	Occlusal plane – dental parameter used for assessing skeletal relationship.	Depends on points A & B-change their site substantially due to both growth & treatment
Point A cannot be identified in all cephalograms.	Functional occlusal plane identification is difficult in mixed dentition, open bite cases, severe cant of occlusal plane, missing teeth.	Difficulty in locating center of condyle

Table No.1

Neela et al gave a new parameter the YEN angle for assessment of A-P discrepancy.<sup>9</sup>

The following points are used:

- Centre of sellaturcica S
- Point M- Maxillary point M, representing the midpoint of the pre-maxilla in the mid-sagittal plane was located on the tracings according to the superior, anterior, and palatal outlines of the pre-maxilla, and the midpoint was identified with concentric circles.<sup>10</sup>
- G-point was established using a specially designed transparent template containing a number of circles whose diameter increased in increments of 1 mm. All the centres of the circles in the template were identified by a pinhole.<sup>11</sup> The centre of the best-fit circle tangent to the internal inferior, anterior, and posterior surfaces of the mandibular symphyseal area in each sagittal cephalogram was determined in the circle that best fit the pre-maxilla or the outline of the pre-maxilla.

The YEN angle is measured at M as shown in the Figure No.8. Bhadet al further modified this angle and gave the W angle. They constructed perpendicular from point M to line SG and then measured the angle at point M (Figure No.9)<sup>12</sup>

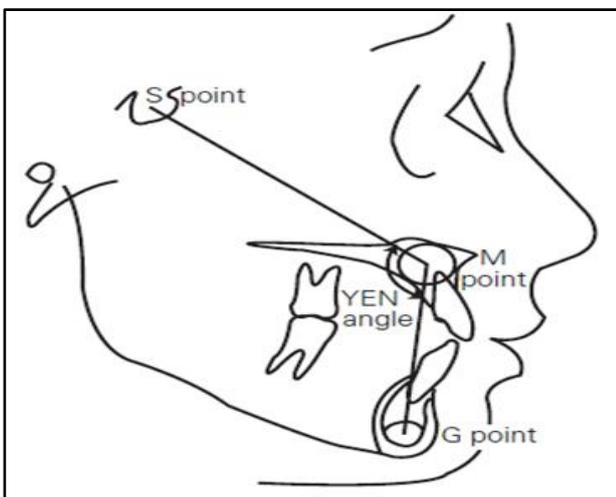


Figure No.8: The YEN angle

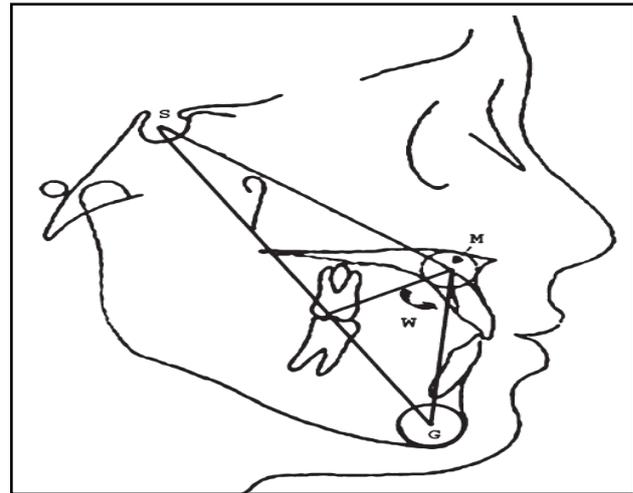


Figure No.9 W angle

The Geometry of angle W provides an added benefit that it will be relatively stable even when on the rotation or vertical growth of the jaws. Hence, measurement of W angle is of special importance as a sagittal parameter in clockwise or counter clockwise jaw rotation skeletal patterns and the transitional period of vertical facial growth.

Inadequacies of YEN angle and W angle:

- The accurate tracing and the locating the centre of the pre-maxilla requires experience.
- Determination of prognathic or retrognathic jaw is not possible.

Table No. 2: Various parameters along with their normal values.

Parameters	Normal Values.
ANB angle	Skeletal Class I - 2° Skeletal Class II > 2° Skeletal Class III < 2°
WITS Appraisal	Skeletal Class I - Coincidence of AO & BO or BO 1mm ahead of AO in males. Skeletal Class II - AO ahead of BO in females or AO coinciding with or ahead of BO in males. Skeletal Class III - BO ahead of AO in females or BO ahead of AO by more than 1 mm in males
Beta Angle	Skeletal Class I - 27° and 35° Skeletal Class II < 117 degrees Skeletal Class III > 123 degrees
YEN Angle	Skeletal Class I - 117 to 123 degrees Skeletal Class II < 117 degrees Skeletal Class III > 123 degrees
W Angle	Skeletal Class I - 51 and 56° Skeletal Class II < 51° Skeletal Class III > 56°

## CONCLUSION

Thus the various parameters discussed in this manuscript will help in accurate assessment of the A-P skeletal discrepancy. This review gives a compilation of the various parameters used for assessing the antero-posterior discrepancy. In order to overcome the shortcomings of each at least 2-3 parameters should be used.

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Source of Support: Nil

Conflict of Interest: Nil