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Cephalometric Assessment of Anterioposterior Discrepancy: A Review of Various Analyses in Chronological Order

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Abstract **Review Article**

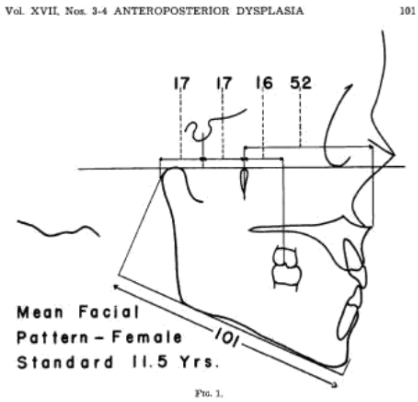
The anteroposterior discrepancy is typically of utmost concern to patients and parents and therefore has received a valuable attention in dentistry. A number of analyses are proposed over the years with varied degrees of accuracy and success in assessing sagittal jaw relationships. It is completely essential that a practitioner should be able to use one or more of the various analyses available in a particular situation. This review provide a valuable idea to use various cephalometric analysis or methods used for analysis of the anteroposterior jaw relationship in chronological order and their clinical implications in modern dental practice.
Keywords: anteroposterior discrepancy, dentistry, sagittal jaw.

Introduction

After the introduction of cephalometrics in 1931, it has been adapted as an important clinical tool for assessment of jaw relationship in all three planes-anteroposterior, transverse and vertical, and has become part of orthodontic treatment planning. The sagittal relationship is sometimes of utmost concern to the patient and desires an accurate analysis. Previously established parameters like the ANB angle[1], Wits analysis[2], AF-BF[3], APDI[4], Beta angle[5], Yen angle[6], W angle[7], Pi analysis[8] and after these, introduced SAR angle[9]' HBN angle[10] and DW plane[11] are established on which are used effectively for the analysis of anteroposterior (AP) disharmony affecting the jaws. These analysis have each merits and demerits related to their use that must be understood. And there are obvious shortcomings for each angular and linear measurements, that are comprehensively mentioned within the literature [12,13]. The purpose of this review is to discuss various angular and linear geometric parameters for assessment of sagittal jaw relationship in chronologic order and their clinical implications in contemporary orthodontics.

The anteroposterior dysplasia assessment

By Wendell L Wylie, Wylie [14] was the first to evaluate anteroposterior apical base relationship cephalometrically. In 1947, he planned an analysis where perpendiculars from glenoid fossa, sella turcica, pterygomaxillary fissure, buccal groove of maxillary1st molar and anterior nasal spine are projected to the FH plane and horizontal distances measured and entered on a formate where the normal values are mentioned. Any increase or decrease in patient values is mentioned as orthognathic and prognathic respectively. Mandibular length is assessed by projected perpendiculars from pogonion and posterior surface of condyle to a tangent drawn to lower border of mandible. Maxillary values below the norm and mandibular values above the norm are considered class III, prognathous (positive sign). The other way around to this condition is mentioned as class II, orthognathic (negative sign). A drawback here is that linear measurements are more vulnerable to errors than angular.



Assessment of AP dysplasia by Wylies method

Dimension		Standard
	Male	Female
Glenoid fossa to sella	18	17
Sella to Ptm	18	17
Maxillary length	52	52
Ptm to upper 6	15	16
Mandibular length	103	101

Down's AB plane angle and angle of convexity

The very next year in 1948, WB Downs [15] in his cephalometric analysis described the A-B plane angle, as a means to assess anteroposterior apical dysplasia. Location of this plane in relation to facial plane is the measure of the anterior limit of the denture bases to each other and to the profile. It permits estimation of the difficulty the operator can meet in gaining correct incisal relationships and satisfactory axial inclinations of those teeth. In the control group the relation of this plane to the facial plane was found to range from 0^0 to a posterior position of B which could be read as -9^0. The mean was $-4.8^{0.}$ The angle of convexity [13] also proposed by Downs (Nasion-Point A-Pogonion) was yet another measure of the protrusion of the face in profile. If point A fell posterior to the facial plane, the angle formed is read in minus degrees, and if anterior, read in pluse degrees. The normal range is $+10^0$ to -8.5^0(Fig. 1B). Being angular measurements, these were more advantageous as it eliminated differences due to absolute size. Disadvantage here is as the facial type is known to differ racially this study is limited to White race.

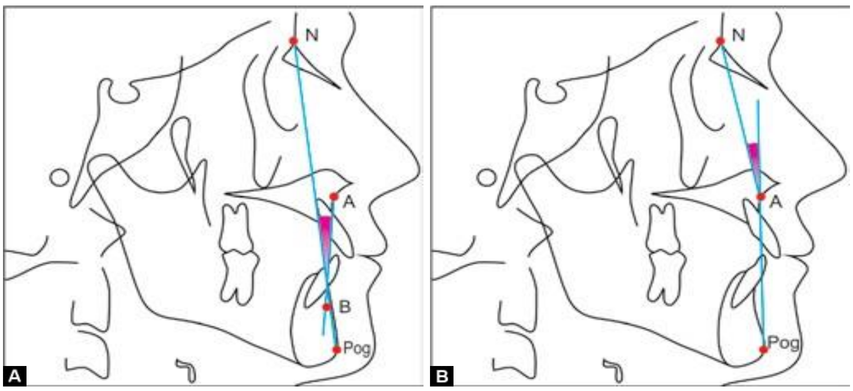


Fig-1 A and B: (A) AB Plane angle, (B) Angle of convexity

Angle "ANB" by riedel

Riedel [1] introduced the ANB angle for evaluating the anteroposterior relationship of the maxilla to the mandible. However, it was Cecil C Steiner[16] who popularized this angle (mean value of 2^0 in adults and 2.8^0 in children, range $2\text{-}4^0$) in 1953 in his classic article, 'Cephalometrics for you and me' (Fig. 2A).This has been widely accepted as the principal technique for evaluating anteroposterior jaw relationship. Though the ANB angle remains extremely popular and helpful, it's been demonstrated within the literature [17-19] that there's typically a distinction between the interpretation of this angle and also the actual discrepancy between the apical bases. Several authors [13, 17, 20, 21] have shown that the position of nasion is not fixed during growth (nasion grows 1 mm per year), and any displacement of nasion will directly affect the ANB angle [17]. Furthermore, rotation of the jaws by either growth or orthodontic treatment can also change the ANB reading [2]. The length of the cranial base, its inclination and anterior face height are the other factors affecting ANB. With advancing age, ANB decreases due to counter clockwise growth rotation of jaws. Binder [22] recognized the geometric effects at work in the ANB angle. He showed that for each five millimetre of anterior displacement of craniometric point horizontally, the ANB angle reduces by 2.5. A 5 mm upward displacement of Nasion decreases the ANB angle by 0.5^0 and 5 mm downward displacement increases ANB angle by $1^{0.}$

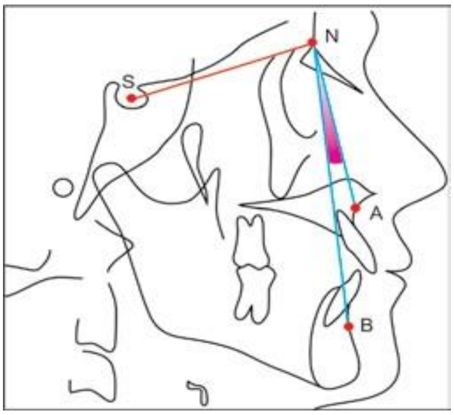


Fig-2A

Jenkin's 'A' plane- jenkins [23] in 1955 established the 'a' plane

A perpendicular dropped from point A to occlusal plane. Linear distances from 'a' plane to point B [+3 mm], Gnathion [+5 mm], and mandibular incisors [+2 mm] were computed for dysplasia identification. Advantage here is the resultants of all components of force in the masticatory area were expressed about the occlusal plane. Thus, its behavior reflects the sum of all innfluences acting on this area. Since the teeth form the occlusal plane, this was the only plane to which the teeth of each jaw are intimately related. The occlusal plane was the plane of reference of the Angle Classification I and Baume Classification.

Disadvantage is normally, it is not a plane, but a complex curve; which is very difficult to define. In any case, it cannot be reliably drawn and a tracing cannot be reliably repeated

Taylor's "AB' linear distance

Taylor [18]-Introduced new parameter, the linear distance between Point A and B'. B' was the perpendicular from point B to the sella-nasion plane (Fig. 2B). Its mean value was 13.2 mm. This study concluded that there was 1 mm of change from point A to the perpendicular B' for each degree of change in ANB.

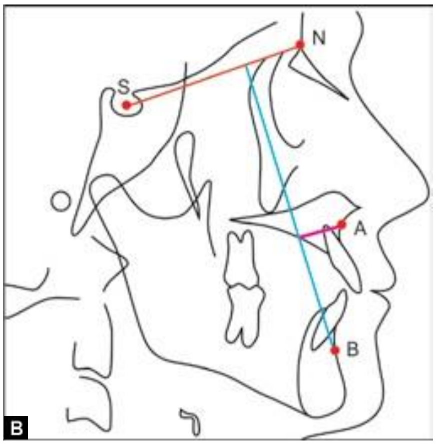


Fig-2B

AXD angle and A-D' distance

To counter the disadvantages of angle ANB, Beatty [24] introduced the AXD angle—the interior angle formed by the intersection of the lines extending from points A and D at point X (X is point of intersection of perpendicular from point A to SN plane). Instead of point B, point D is taken because it is the center of bony symphysis and not affected by changes in tooth position or chin prominence. Beatty [24] also introduced the linear measurement A-D', the distance from point A to line DD' (Perpendicular from D to sella-nasion plane) (Fig. 2C).

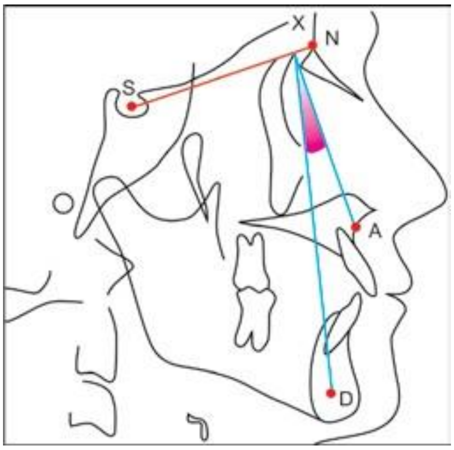


Fig-2C

Mean value for AXD angle and A-D' distance was 9.3º and 15.5 mm respectivel. Advantage here is that two variables, N and point B are eliminated and uses Point D which is not affected by the changes in incisor position and chin prominence. Disadvantage here is Point A is still used, which is affected by orthodontic tooth movement.

Wits appraisal of jaw disharmony jacobson [2]

I in order to overcome the inaccuracies of ANB angle devised 'Wits' Appraisal (Wits stands for University of the Witswatersrand, Johannesburg, South Africa) which was meant as a diagnostic aid where severityof anteroposterior jaw disharmony can be measured, independent of cranial landmarks on a lateral cephalometric film.The method of estimating the degree of the jaw discrepancy contains drawing perpendiculars on a lateral cephalometric film by tracing from points A and B on the maxilla and mandible, respectively, onto the functional occlusal plane denoted as AO and BO respectively and tabulating the distance between each other(Fig. 2D). According to Jacobson, in a skeletal Class I relationship, in females, AO and BO should coincide whereas in males, BO is ahead of AO by 1 mm. Study by Bishara[25] *et al.* showed that Wits appraisal does not change significantly with age.

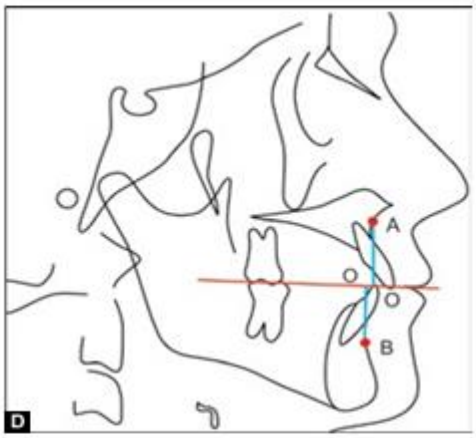


Fig-2D

Limitations of Wits Appraisal -The Wits appraisal avoids the utilization of craniometric point and reduces the motion effects of jaw growth, however it uses the occlusal plane that could be a dental parameter [2], to explain the skeletal discrepancies. Occlusal plane will be simply affected by tooth eruption and dental development likewise as by orthodontic treatment [26-28]. This could deeply influence the Wits appraisal. Furthermore, accurate identification of the occlusal plane is not always easy or accurately reproducible [29, 30]. especially in mixed dentition patients or patients with open bite, canted occlusal plane, multiple impactions, missing teeth, skeletal asymmetries, or steep curve of Spee.

Anteroposterior dysplasia indicator (APDI) kim and vieta [4]

Proposed APDI to assess sagittal dysplasia. The APDI reading is obtained by tabulating the facial angle (FH to NPog) ± the A-B plane angle (AB to NPog) ± the palatal plane angle (ANS-PNS to FH plane) (Fig. 3A). The mean value of the anteroposterior dysplasia indicator (APDI) in the normal group was 81.4º, with a standard deviation of 3.79. Lesser values indicate disto-occlusion and greater indicates mesio-occlusion.

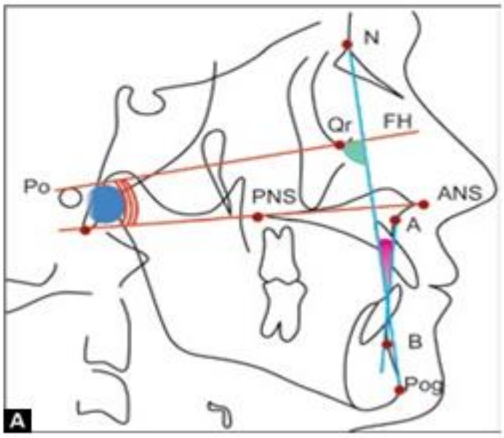


Fig-3 (A) APDI angle

Freeman's AXB angle (1981)

Freeman [17] delineates a way eliminating point N, in order that the degree of divergence of the face doesn't have an effect on the readings. A perpendicular was made from point A to Frankfort Horizontal, establishing point X. A line from points X to B forms angle A-X-B (Fig. 3B). The mean for the A-X-B measuring in traditional occlusion cases was or so 4º. A variation of this is often to draw perpendicular from point A to Frankfords horizontal plane (X-point), giving an angle of 6.5°. Freeman [17] also projected a straight forward methodology of correction of ANB angle by adjusting or modifying the measurements by simply subtracting 1º from the A-N-B measuring for each 2º that the S-N-A reading exceeds 81.5º. Conversely, add 1º to the A-N-B measuring for each 2º that the S-N-A reading is underneath 81.5°. This modification over-corrects slightly, therefore with cases 10º higher than or below, the whole adjustment should be reduced by 1º; a 1/2º adjustment could also be created for 5º distinction if desired. Disadvantage here is factors such as steepness of SN plane, variation in Point A due to root position (as in Class II Div II cases), excessively long or short faces, exceptionally large or short mandible are not mentioned.

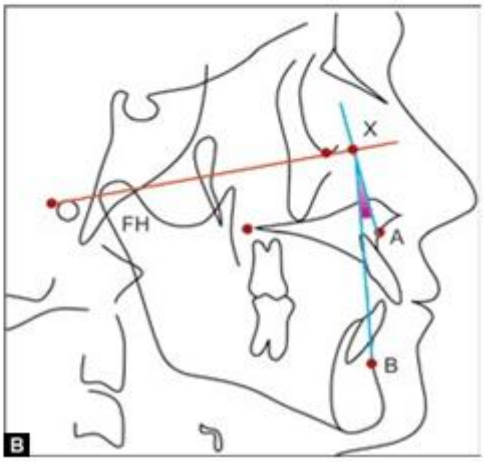


Fig-3(B) angle AXB

JYD angle (1982) - seppo jarvinen [31] projected JYD angle-

In this article anterioposterior apical base relationship, is assessed by the intersection of the lines extending from point J and D to point Y (Fig. 3C). Point J is that the center of the cross section of the anterior body of the maxilla, and Point Y is that the point of intersection of the SN plane and also the perpendicular to the SN plane from point J. Mean for this angle is 5.25 ± 1.97º. The advantage of this technique is that it eliminates use of point A. But, disadvantage is that it is affected by jaw rotation and vertical facial growth.

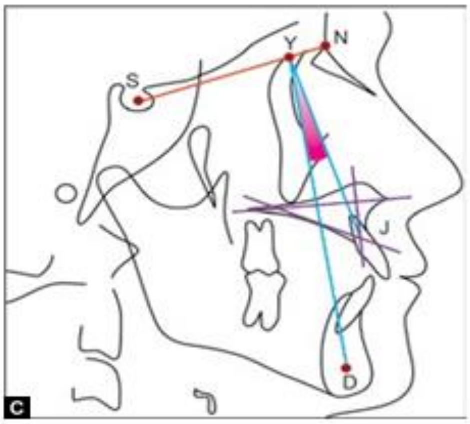


Fig-3(C) JYD angle

Quadrilateral analysis or proportional analysis

In 1983, Rocco di Paolo planned quadrilateral analysis [32] supported by a theorem in Euclidean geometry that determines the direction, extent and placement of the skeletal abnormality in millimetre which is more understandable in surgical orthodontics than angular measurements. The analysis is predicated on lower facial proportionality that states that in a very balanced facial pattern there is a 1:1 quotient that exists between the maxillary base length and mandibular base length; and also that the average of the anterior lower facial height (ALFH) and posterior lower facial height (PLFH) equals these denture base lengths (Fig. 4A).

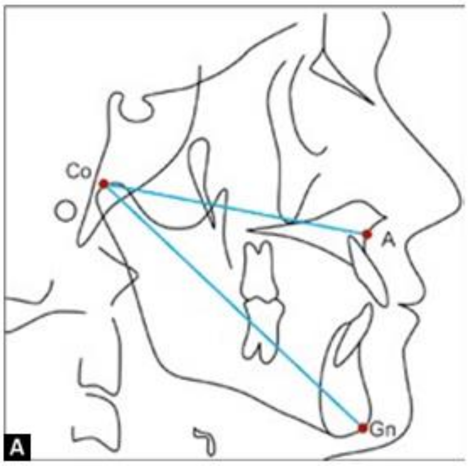


Fig-4: (A) Maxillomandibular differential

Maxillary length = mandibular length = ALFH + PLFH/2 clinically, the most important advantage of quadrilateral analysis is that it offers particular cephalometric diagnosis (not reliable on established angular or linear norms) on patients with or without skeletal dysplasias. Author claims that it's a reliable and correct methodology of assessing whether or not orthodontic treatment, surgical orthodontic treatment, or a combination of each is needed to get a satisfactory result [32].

Mcnamara's maxillomandibular differential (1984)

McNamara [33] derived a way for cephalometric analysis from the analysis of Rickett's and Harvold. This analysis was helpful with the diagnosis and treatment planning of the individual patient once the values derived from the tracing of the patient's initial head film are compared with established norms from Bolton, Burlington and Ann Arbor samples. Maxillomandibular differential was calculated by subtracting effective midfacial length from effective inframaxillary length. First the effective midfacial length, not the actual anatomic length of the maxilla, is set by measuring a line from condylion, to point A. Then, the effective mandibular length comes by constructing a line from condylion to anatomic gnathion (Fig. 4B).

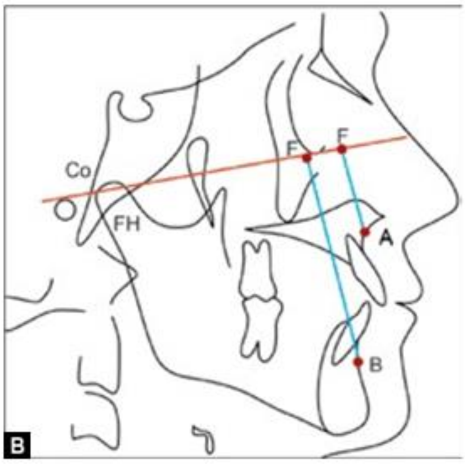


Fig-4(B): AF-BF distance

A geometrical relationship exists between the effective length of the midface and that of mandible. Any given effective midfacial length corresponds to a given effective mandibular length. Any given effective midfacial length corresponds to a given effective mandibular length [33]. Ideal maxillomandibular differentials are: small, 20 mm; medium, 25 to 27 mm and large, 30 to 33 mm.

From a clinical standpoint, this analysis is very useful in determining actual dimensional variations of midface/mandible, thus giving the orthodontist an idea as to whether a skeletal Class II or III problem is positional or dimensional.

AF-BF distance 1987

Chang [3] reported a study was conducted on 80 young Chinese and represented the AF-BF distance obtained by drawing perpendiculars from points A and B to the FH plane. (Fig. 4C), giving us one more assessment tool to measure sagittal disharmony. The mean for male was 3.43± 2.93 mm, whereas for female, it was 3.87 ± 2.63 mm. The AF-BF distance would be positive once point AF was ahead of point BF; and negative if point AF was behind point BF. An extension of this analysis is to draw perpendiculars from N to FH plane and measure the distances from points A and B to N vertical. The differance between the two values is to be adequate to the AF-BF distance. One disadvantage of this methodology is that it may be influenced by inclination of FH plane.

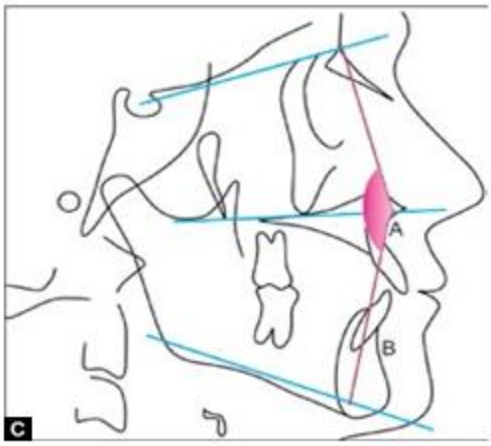


Fig-4(C): quadrilateral analysis

APP-BPP distance-

Nanda and Merrill [34] in 1994, proposed APP-BPP linear distance measurments based on palatal plane (Fig. 4D). This perpendicular projection of points A and B to palatal plane (APP-BPP) averaged 5.2 ±2.9 mm in white ladies with normal occlusions compared with 4.8 ± 3.6 mm for white men. It will increase at Class II and reduces at class III. The advantage of this analysis is that it is not dependent on variations of point N. The palatal plane is claimed to be more stable by the authors.

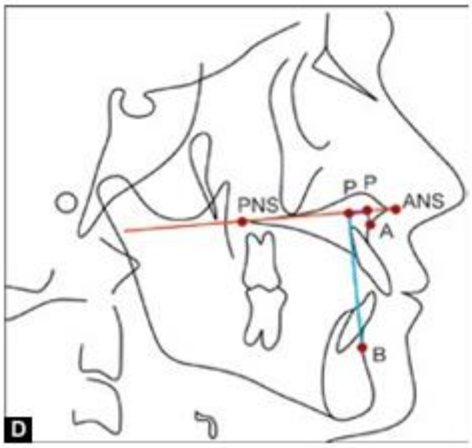


Fig-4D: (D) APP-BPP distance

FH to AB Angle (FABA)

Sang and Suhr [35] proposed FH to AB angle (Fig. 5A) to assess sagittal abnormality. This study was conducted on a 110 Korean children with normal occlusion. Mean value for this was 80.91 ± 2.53º with range of 10.5º. There was no statistically vital distinction between males and females. However, from a clinical viewpoint, once FABA was compared with Freeman's AXB angle [17] and AF-BF, it shows a lot of sensitivity to the vertical relationship between points A and B[35].

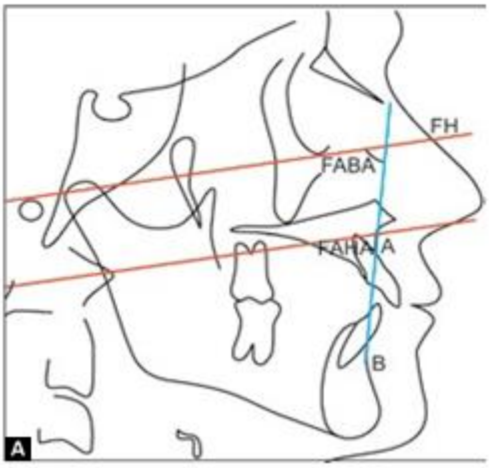


Fig-5(A): FABA angle

Beta angle (2004)-
Baik and ververidou [5] proposed the beta angle

As a new measuring tool for assessing the skeletal discrepancy between the maxilla and mandible within the sagittal plane. It uses three skeletal landmarks—points A, B, and the apparent axis of the condyl C—to measure an angle that indicates the severity and the type of skeletal abnormality within the sagittal dimension (Fig. 5B). Beta angle between 27° and 35° have a class I skeletal pattern; a Beta angle less than 27° indicates a class II skeletal pattern, and a Beta angle larger than 34° indicates a class III skeletal pattern. Authors claim that the advantage of Beta angle over ANB and Wits appraisal is that, (1) it remains comparatively stable even though the jaws are turned clockwise or counterclockwise and (2) it may be employed in consecutive comparisons throughout treatment as a result of it reflects true changes of the sagittal relationship of the jaws, which may be due to growth or orthodontic/ orthognathic intervention. Disadvantage here is it uses Point A which is affected by orthodontic treatment.

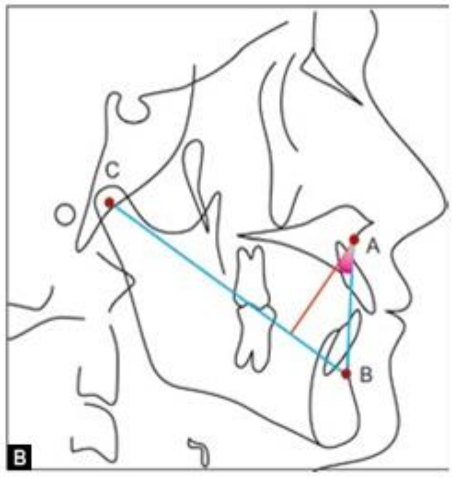


Fig-6(B): Beta angle

Overjet as predictor of mesial abnormality (2008)-

Zupancic *et al*. [36] reported a study to work out whether or not any correlation exists between overjet value, as measured on study casts, and cephalometric parameters, that assess the craniofacial complex in the sagittal plane. Authors concluded that for class I and III malocclusion, overjet is not a decent predictor of sagittal dysplasia; but, for class II division I malocclusion, overjet may be a statistically vital predictor.Overjet value permits a significant part of variability of

ANB angle, Wits appraisal, and convexity at Point A. However, there is a relatively wide interval variability, which cannot be explained by overjet alone.

Yen angle (2009)

Neela *et al*. [6] proposed yen angle

That was developed within the Department of orthodontics and Dentofacial Orthopaedics, Yenepoya Dental College, Mangalore, Karnataka, India, and therefore its name. It uses the subsequent 3 reference points: S, center of the sella turcica; M, mid- point of the premaxilla; and G, center of the largest circle that is tangent to the internal inferior, anterior, and posterior surfaces of the mandibular symphysis (Fig. 5C). Mean value of 117 to 123º are often considered as skeletal class I, less than 117º for skeletal class II, and larger than 123º as a skeletal class III. The advantage here is that it eliminates the issue in locating points A and B, or the functional occlusal plane employed in Wits and condylar axis in Beta angle analyses. Because it is not influenced by growth changes, it can be employed in mixed dentition as well. But, rotation of jaws will mask true sagittal abnormality here also.

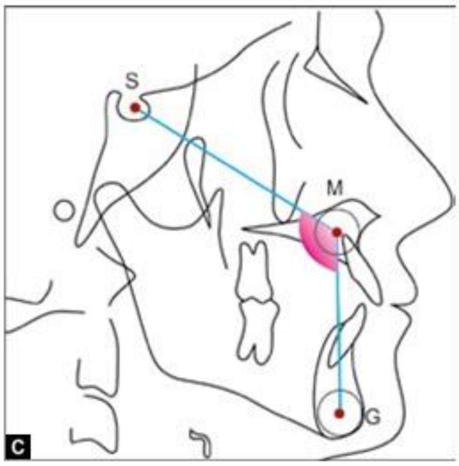


Fig-7(C): Yen angle

Dentoskel *et al*. overjet (2011)

AL-Hammadi[37] reported a study conducted on 250 Yemeni population, to develop a new linear measurment methodology and named it Dentoskeletal overjet (Fig. 6A). This relies on 2 basic principles; the primary is that the dentoalveolar compensation for underlying skeletal base relation; and the second is that the overjet that is still because of incomplete dentoalveolar compensation as a results of massive skeletal discrepancy. Mean value of –1 to +2.5 mm, classified as skeletal Class I, skeletal Class II when this measurement is more than 2.5 mm, and skeletal Class III when it is less than –1 mm. Advantage here is a linear measurement that has distinct advantages over angular ones; that there are fewer variables affecting its accuracy.Improper identification of Nasion point in the vertical direction will not affect the final assessment in this measurement. While in ANB angle, Nasion point is the head of the angle, that any deviation in its position would directly and principally affect the ANB angle. Compared to Wits appraisal, it depends on landmarks that are easy to identify. Any inclination in the functional occlusal plane will not affect the final reading.

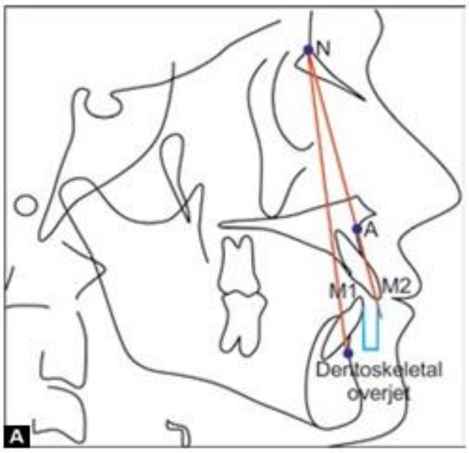


Fig-8: (A) Dentoskeletal overjet

W-Angle-(2011)

The W angle was developed by Bhad *et al.*[7] The points S, G and M employed in Yen angle was utilized here also. Angle between a perpendicular line from point M to the S-G line and therefore the M-G line is measured (Fig. 6B). Findings showed that a patient with a W angle between 51° and 56° has a Class I skeletal pattern. Patient with a W angle less than 51° has a skeletal Class II pattern and one with a W angle larger than 56° has a skeletal Class III pattern. In females with class III skeletal pattern, W angle has an average of 57.4°, whereas in males, it is 60.4° and this distinction was statistically vital. The authors claim that W angle reflects true anterioposterior abnormality not affected by growth rotations.

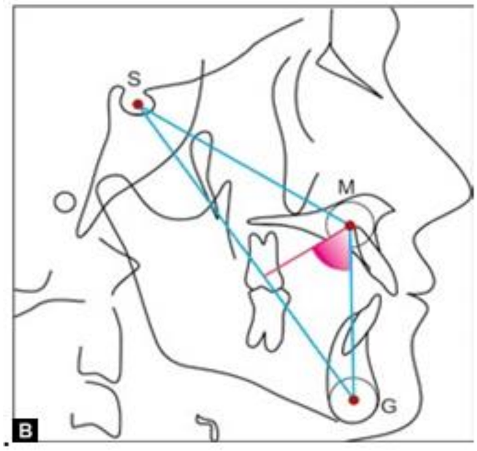


Fig-9: (B) W-angle

Pi Analysis (2012)

Kumar S *et al*. [8] introduced the Pi analysis as a new technique of assessing the AP jaw relationship. It consists of 2 variables, the Pi-angle and the Pi-linear and utilizes the skeletal landmarks G and M points to represent the mandible and maxilla, respectively. M point is that the center of the biggest circle placed at a tangent to the anterior, superior and palatal surfaces of the premaxilla. G point is that the center of the biggest circle placed at a tangent to internal anterior, inferior and posterior surfaces at the mandibular symphysis. A real horizontal line is drawn perpendicular to true vertical, through nasion. Perpendiculars are projected from each points to true horizontal giving the Pi-angle

(GG'M) and Pi-linear (G'-M')(Fig. 6C). The mean for the Pi-angle in skeletal class I, II and III are 3.40 (±2.04), 8.94 (±3.16) and 23.57 (±1.61) degrees respectively. Mean value for the Pi-linear (G'–M') is 3.40 (±2.20), 8.90 (±3.56) and 23.30± (2.30) mm, respectively for class I, II and III groups. The heighest level of correlation was obtained for Pi-angle and Pi-linear (0.96).

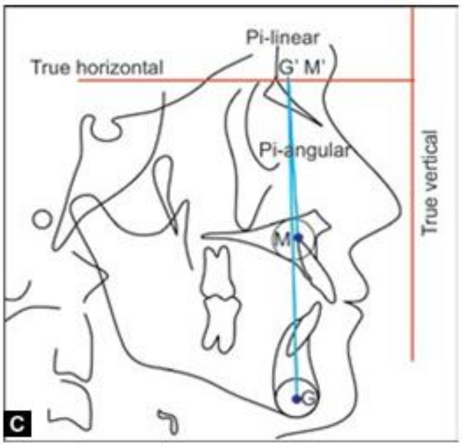


Fig-9: (C) Pi-angle and Pi-linear

SAR Angle (2014)-

Introduced by Sonahita Agrawal *et al*. [9] SAR angle is measured between the perpendicular line from point M to W-G line and the M-G line. A study conducted by including 60 North Indian individuals, of age group 13-25 years.And concluded the Mean value for Class I skeletal pattern is 55.98° (SD 2.24), Class II is 50.18° (SD 2.70) and Class III is 63.65° (SD 2.25).Advantage here is Walkers point was found to be stable after the age of five. The length of mid cranial base (W-SE) remains unchanged in all periods of pubertal growth. The SAR angle is not influenced by growth, jaw rotations, orthodontic treatment or any other factor previously associated with other angles.

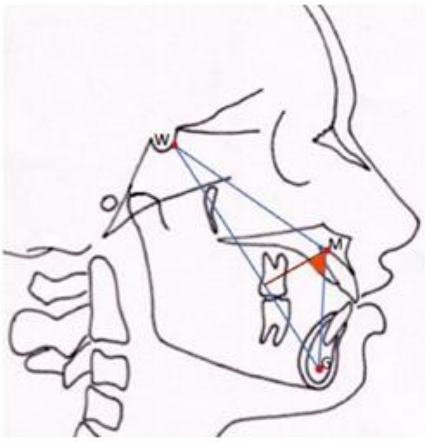


Fig-10: SAR angle

HBN angle (2015)-

Introduced by: Harsh Bhagvatiprasad Dave [10]. Previously established measurements of assessing the sagittal jaw relationship can often be inaccurate a new angle, the HBN angle was developed as it is stable even when the jaws are rotated.

It is the angle between line perpendicular from point M to CG and MG. A study conducted by including 667 Indian individuals. And concluded the Mean value for Class I skeletal pattern is 39°-46°; Class II is < 39°, Class III is > 46° .Advantage here is HBN angle does not depend on cranial landmarks or functional occlusion plane and Point A and B. Remain relatively stable even when the jaws are rotated.

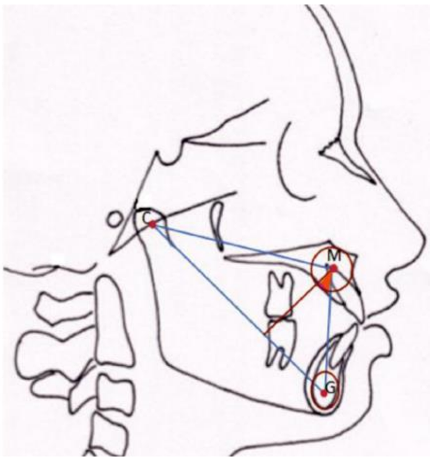


Fig-11: HBN angle

DW plane [11]

Introduced by Dr Shruti K Hatewar, in a study on 108hhattisgarh population which included 100 subjects of age group 8-27 yrs were evaluated using Walker's point. Four skeletal landmarks point A, point B, walkers point (W) and wing point (w) were used to indicate the severity and type of skeletal dysplasia. Double (W) DW was construced joining the walker's point and wing point. The difference between walkers perpendicular to A point and walker's perpendicular to B point gave the sagittal jaw discrepancy and was found to be 8.2 ± 0.9 mm. Differances of 8.2 ± 0.9 mm had class I skeletal pattern , a value less than that indicated class III skeletal pattern and value greater than that indicated class II skeletal pattern. These measurments remained relatevily constant throught life. DW plane was an effective way to accurately establish the skeletal jaw relationship. It analyses the varience between linear measurments to determine the sagittal jaw relationship, linear measurments for vertical maxillary height and angular measurments to determine rotational jaw changes.

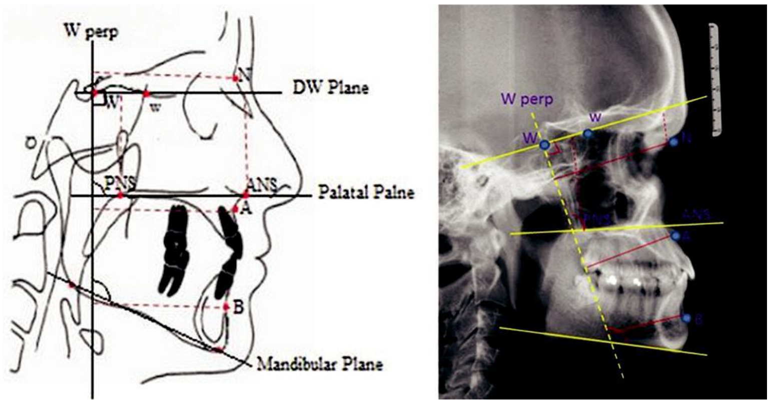


Fig-12

Discussion

Inspite of number of cephalometric anterioposterior abnormality indicators, angle ANB remains the most widely used one because of its simplicity and universal acceptableness. However, total reliablity on angle ANB can't be recomended for reasons expressed above, and corrections got to be applied in specific cases. The Wits appraisal of jaw dissharmony is also very popular. Being a linear parameter dependent on the occlusal plane again has obvious limitations. The maxillomandibular differential finds a precise place in cases wherever myofunctional therapy is considered because it helps us to know whether or not a skeletal disharmony is dimensional. The quadrilateral analysis being perticular, and not affected with established norms, and would be a superb tool in cases with underlying skeletal discrepancies. The Beta angle is claimed to replicate true changes in anteroposterior relationship of the jaws. However it will be suffering from errors in locating points A and B, and rotation of the jaws. Yen angle and W angle have eliminated the difficulties in locating points A and B, useful occlusal plane of Wits and condyle axis of Beta angle, thereby making it a useful tool in mixed dentition cases analysis. The Pi analysis defines easy application and doesn't appear to provide vital readings.The SAR angle which is not influenced by growth, jaw rotations, orthodontic treatment or any other factor previously associated with other angles. HBN angle does not depend on cranial landmarks or functional occlusion plane and Point A and B. Remain relatively stable even when the jaws are rotated. Recently the DW plane was an effective way to accurately establish the skeletal jaw relationship. It analyses the varience between linear measurments to determine the sagittal jaw relationship, linear measurments for vertical maxillary height and angular measurments to determine rotational jaw changes.The best answer would be to use a minimum of 3 analyses in every individual case. A thorough outcome of the varied analyses can facilitate the smart orthodontist in selecting the foremost applicable ones for every different case.

Conclusion

Literature is filled with many options to make an attempt to accurately assess antero-posterior discrepancy; one cannot rely on single particular cephalometric analyses for assessing the approprite discrepancy with variable degrees of success. Rotational effects of jaws, variable positions of points A and B, nasion, variations in cranial base length, tooth eruption, curve of Spee, etc. appear to have influence anterioposterior assessment resulting in the employment of extracranial reference planes also. Because of the big variability in human population, one cephalometric analysis might not offer a correct diagnosis. Moreover, cephalometrics is not a particular science or method and therefore the numerous analyses supported angular and linear parameters have obvious limitations. Hence, it is important that a clinician bear in mind the range of cephalometric analyses to be used accordingly when the need arises.

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