Sagittal Skeletal Discrepancy Evulation by Beta and a Point-Nasion-B (ANB) Angles in a Cephalometric Study Among the Pakistani People

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ABSTRACT

Objective: To compare the role of beta and A point-nasion-B (ANB) angles in evaluating the sagittal skeletal discrepancy in a cephalometric study done in the Pakistani population.

Study Design: Comparative cross-sectional study.

Place and Duration of Study: Orthodontics Department, Armed Forces Institute of Dentistry, Rawalpindi Pakistan, from Jul to Dec 2019.

Methodology: A total of 150 subjects between the age of 18 to 25 years were enrolled in the study A point-nasion-B angle was measured using the lateral cephalogram in all the subjects and was divided into classes I, II and III. Beta angle was also measured in all the patients.

Results: Out of 150 subjects, 92 (61.3%) patients were males, and 58 (38.7%) were females. The mean age of the subjects was 19.2 ± 2.138 years. 89 (59.3%) patients were classed in Class-I, 40 (26.7%) in class-II and 21 (14%) in class-III. The mean score of A point-nasion-B angles among the patients was 7.5 ± 1.112. The mean score for beta angles in the study participants was 30.5 ± 2.214. A point-nasion-B and beta angles both had a significant relationship with classes of skeletal discrepancies.

Conclusion: Sagittal skeletal discrepancies can be evaluated with accuracy by using both A point-nasion-B and beta angles. Lateral cephalograms and radiography measures emerged as reliable techniques to classify the patients in various skeletal patterns. Factors like age and gender do not influence skeletal discrepancies.

Keywords: A point-nasion-B angle, Beta angle, Cephalometry, Sagittal skeletal discrepancy.

How to Cite This Article: *Mehmood S, Jan A, Shah I T, Ashraf T, Shafique Z H, Rooma. Sagittal Skeletal Discrepancy Evulation by Beta and a Point-Nasion-b (ANB) Angles in a Cephalometric Study among the Pakistani People. Pak Armed Forces Med J 2022; 72(2): 518-521. DOI: https://doi.org/10.51253/pafmj.v72i2.4293*

INTRODUCTION

Occlusal problems have been a significant concern of orthodontics for a long.[1] Cephalometric studies play a significant role in aiding the orthodontist in picking up the cases and managing them for the problems related to malocclusion.[2] Discrepancies in the facial skeleton can be of different types according to the plane involved. They include vertical, sagittal and transverse discrepancies. Out of these three types of discrepancies, the sagittal discrepancy has been most commonly encountered in the clinical practice of orthodontics in all parts of the world.[3,5]

ANB angle has been used to assess the relationship of the posterior part of the maxilla with the mandible for a long time.[6] Sagittal dysplasias can be picked up with accuracy with this method. Beta angle is a relatively new method to assess the sagittal discrepancies.[7] Beta angle between 27° and 35° can be considered class-I more acute angle indicates class-II, and a more obtuse angle is classed as class-III.[8] Various other methods can also be used for this purpose, including ANB plane angle, AB linear distance, AXD angle and AD distance, AXB angle and JYD angle.[9] A recent study comparing the different methods concluded that ANB and beta angles have a strong relationship in predicting the sagittal discrepancy.[10] This study was conducted to compare the role of beta and A point-nasion-B (ANB) angles in evaluating the sagittal skeletal discrepancy in a cephalometric study done in the Pakistani population.

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Received: 11 May 2020; revision received: 20 Apr 2021; accepted: 28 Apr 2021

METHODOLOGY

This comparative cross-sectional study was conducted at the Orthodontics Department of Armed forces Institute of Dentistry (AFID) Rawalpindi from June to December 2019. The sample size was calculated by WHO sample size calculator using the population proportion of ANB angle as 8.5%.[11] Systematic Random sampling technique was used to gather the sample, and every 10th person entering the department and giving consent was enrolled for the study. After ethical approval from the Ethical Review Board Committee, data collection was started.

Inclusion Criteria: All the subjects between the age of 18-25 years who presented in the Orthodontics

Department were enrolled in the study and underwent cephalometry.

Exclusion Criteria: The patients with any congenital facial malformations, including cleft lip, cleft palate or any abnormality involving the facial region were excluded. Patients with facial asymmetry or those who had undergone any recent maxillofacial surgery, pregnant women or those diagnosed with any endo-crine or medical problems affecting the bones or skeleton were also not included in the study.

After written informed consent, subjects were evaluated in detail by the consultant orthodontist and enrolled in the study. A lateral cephalometric radiograph for each participant was taken in centric occlusion with lips in rest position. A single observer (S.M) did the cephalometric tracing onto acetate tracing paper using a 0.3 mm pencil.[12]

ANB angle was the angle between the deepest midline point in the curved bony outline from the base to the alveolar process of the maxilla, the most anterior point of the frontonasal suture in the median plane and the most posterior point in the outer contour of the mandibular alveolar process, in the median plane.[13] Beta angle was the angle between the perpendicular line from the deepest midline point in the curved bony outline from the base to the alveolar process of the maxilla to the head of the condyle and the line between the most posterior points in the outer contour of the mandibular alveolar process, in the median plane.[14,15]

Study subjects were classed in different skeletal patterns and categories as; Class-I; incisor relationship, straight or slight convex but esthetically pleasing profile, ANB angle between 2 and 4 Wits appraisal -3 to +3 mm, Beta angle 27 to 35, Yen angle 117 to 123, W angle 51 to 56. Class-II; incisor relationship, convex profile, ANB >4, Wits appraisal >+3mm, Beta angle < 27, Yen angle <117, W angle <51. Class-III; incisor relationship, concave profile, ANB <2, Wits appraisal < −3mm, Beta angle >35, Yen angle >123, W angle >56.

Patients who matched at least five criteria out of 7 were classified accordingly.[15,16,17] Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Frequency and percentages were calculated for gender and classes of skeletal discrepancy. Mean and standard deviation were calculated for age, ANB and beta angle scores for all the subjects.

The chi-square test was used to look at the relationship of ANB angle scores, beta angle scores, age and gender with different classes of skeletal discrepancies. *p*-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 155 patients were initially approa-ched to get them included in the analysis. Two partici-pants refused the participation, one patient had facial asymmetry and two were known cases of cleft lip and cleft palate under treatment of a plastic surgeon. 92 (61.3%) patients were males, and 58 (38.7%) were females. The mean age of the patients was 19.2 ± 2.138 years. 89 (59.3%) patients were classed in class-I, 40 (26.7%) in class-II and 21 (14%) in class-III. Characteristics of study participants were summarized in Table-I.

Table-I: Characteristics of study participants with skeletal discrepancies.

Factors	n (%)
Age (years)	
Mean ± SD	19.2 ± 2.138 Years
Range (Min-Max)	12-24 Years
Gender	
Male	92 (61.3%)
Female	58 (38.7%)
Class of Skeletal Discrepancy	
Class I	89 (59.3%)
Class II	40 (26.7%)
Class III	21 (14%)
Mean ANB Angle Score	7.5 ± 1.112
Mean Beta Angle Score	30.5 ± 2.214

The mean score of ANB angles among the patients was 7.5 ± 1.112. The mean score for beta angles in the study participants was 30.5 ± 2.214. ANB and beta angles emerged as equally effective methods to evaluate the sagittal skeletal discrepancies when chi-square was applied. At the same time, age and gender had no significant relationship with the class of skeletal discrepancy among the subjects studied in our analysis (Table-II).

Table-II: Factors linked with different classes of skeletal discrepancies.

Factors Total N=150	Class I n(%) 89 (59.3)	Class II n(%) 40 (26.6)	Class III n (%) 21 (14)	*p*-value
Age				
<18 years	42 (47.2%)	18 (55%)	08 (38.1%)	0.750
18-25 years	47 (52.8%)	22 (55%)	13 (61.9%)	
Gender				
Male	49 (55.1%)	27 (67.5%)	16 (76.2%)	0.122
Female	40 (44.9%)	13 (32.5%)	05 (23.8%)	
ANB angle scores				
1-4	80 (89.8%)	23 (57.5%)	08 (38.1%)	<0.001
<1 or >4	09 (10.2%)	17 (42.5%)	13 (61.9%)	
Beta angle scores				
27-35	74 (83.1%)	23 (57.5%)	06 (28.6%)	<0.001
<27 or >35	15 (16.9%)	17 (42.5%)	15 (71.4%)	

DISCUSSION

This study was planned to compare the role of beta and A point-nasion-B (ANB) angles in evaluating the sagittal skeletal discrepancy in a cephalometric study done in the Pakistani population.

Cephalometry and the involvement of radiological aid have revolutionized the field of orthodontics, and various landmarks have been used in the previous studies to classify the subjects based on skeletal patterns.[2,10,18] In our study, both the methods used to evaluate the sagittal skeletal discrepancy merged as accurate methods and significantly found differences in various classes of skeletal discrepancies. Similar results have been produced in the studies done in the past in various populations of the world.[9,10] This highlights that accurate screening and timely diagnosis of the sagittal skeletal discrepancy is essential, but the method used has not much significance, and beta angle or ANB angle, both measurements can be used for this purpose.

Most of the patients in our analysis belonged to class I followed by classes II and III. These findings differ slightly from the studies done in the past involving patients with orthodontic problems, especially the study done by Aparna *et al,* in 2015.[11] Most of our study participants were normal people not diagnosed with any dental or medical problem, so they fell in class I of skeletal discrepancies.

Many differences exist between males and females regarding the skeleton. Jaw and related structures could also be affected by the gender of the individual, but our analysis and gender did not reveal these findings seemed to have no role in predicting the skeletal discrepancy among the target population. These findings were produced in the past by Jajoo *et al,* in 2018 and Aparna *et al,* in 2015.[10,11] Though hormones linked with gender and lifestyle have a certain role in skeleton related changes, our area under evaluation may have such minor changes in angles that would be the least affected by gender-related changes.

Racial differences play a role in determining the skeletal pattern of the jaw and predicting the possibility of malocclusion among the common population.[13] Therefore studies done in the West cannot be generalized to our population. Some work has been done in this regard in Pakistan as well. Qamaruddin *et al,* in 2017, did a study in Karachi that revealed that there was no significant gender difference among the subjects with skeletal discre-pancies and all the methods used to evaluate this phenomenon were equally effective.[14]

Strengths of this study include the strict inclusion criteria, especially regarding the co-morbids and other types of asymmetries. Therefore, the results reflect the effect of the understudy measurements and their true accuracy in classifying the discrepancies in various classes. Age criteria were also very strict, not letting the age-related factors affect the results.

STUDY LIMITATIONS

The effect of nutritional status and family history were not considered before classifying the subjects in different skeletal patterns. There are various other methods of classifying sagittal skeletal discrepancies which were not studied in this analysis. The sampling technique was neither reflective of patients nor the normal population. Further studies with a better design and sample from the public and private sectors may generate more generalizable results.

CONCLUSION

Sagittal skeletal discrepancies can be evaluated accurately using both ANB and beta angles. Lateral cephalograms and radiography measures emerged as reliable techniques to classify the patients in various skeletal patterns. Factors like age and gender do not influence ske-letal discrepancies.

Conflict of Interest: None.

Author's Contribution

SM: Direct contribution, AJ:, TIS:, TA:, HZS:, R: Intellectual.

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