ORIGINAL RESEARCH

# Let's Find Out the Best Assessment of Sagittal Skeletal Relationships

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## ABSTRACT

Several cephalometric assessments of angular and linear jaw relationships have been developed to describe and quantify the anteroposterior relationship of the maxilla and mandible. The present study was conducted on pretreatment lateral head cephalograms of 50 patients. The sample was divided into two groups. Group I was control group comprising 25 subjects with normal occlusion and the other groups comprised 25 subjects with Angle's Class II div.1 malocclusion. In the present study, various angular and linear methods were used for the assessment of sagittal dentoskeletal relationships such as SNA, SNB, ANB, AFB, AXD, JYD, APDI, AF-BF, and App-Bpp. It was found that APDI and App-Bpp were the best angular and linear methods for assessing sagittal skeletal relationship.


**Keywords:** APDI, App-Bpp, Cephalometrics, Sagittal.

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## INTRODUCTION

Since the introduction of cephalometrics into orthodontics diagnosis and treatment planning, great importance has been attached to the evaluation of the sagittal jaw relationship. Sagittal dentoskeletal relationships are different to evaluate because many distorting factors may influence the validity of this relationship such as the rotation of the jaws during growth, vertical relationship between the jaws and the reference planes, and a lack of reliability of various methods proposed for their evaluation. However, both skeletal and angular and linear methods have been used in the present study to assess the sagittal jaw relationship.[1] The present study has been envisaged to evaluate various methods for the assessment of sagittal dentoskeletal relationship for both normal and Class II div. 1 malocclusion groups and recommend a clinically effective and reliable method for assessing the severity of Class II div.1 malocclusion from the normal occlusion groups.

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## MATERIALS AND METHODS

The present study was conducted on pretreatment lateral head cephalograms of 50 patients obtained from the Department of Orthodontics and Dentofacial Orthodontics, King George's University of Dental Sciences, Lucknow, Uttar Pradesh. The sample was divided into two groups. Group I was control group comprising 25 subjects with normal occlusion and the other groups comprised 25 subjects with Angle's Class II div.1 malocclusion. The age group considered was 13–19 years with a mean age of 16.5 years. However, the sample was not divided according to sex because of the narrow sample size.

## RESULTS

Skeletal angular and linear variables in different group (values in mean ± standard deviation) are shown in Table 1. Intergroup comparison of mean values of the skeletal angular variables between Group I (normal occlusion) and Group II (Angle's Class II div.1 malocclusion) is shown in Table 2. The comparisons revealed very highly significant differences ($P < 0.001$) in the mean values of ANB, angle of convexity, AB plane angle, AFB, JYD, APDI, SN-AB and JYD, where as the mean values of ANB, angle of convexity, AFB, AXD and JYD were found to be higher in Group II while the mean values of SNA, SNB, APDI, SN-AB, and FH-AB were found to be higher in Group I. Significant difference ($P < 0.05$) was seen for SNA and highly significant difference could be seen for variables SNB and NSAr. Table 1 also shows intergroup comparison of skeletal linear variables AF-BF and App-Bpp between Group I (normal occlusion) and Group II (Class II div.1 malocclusion). The findings of $P < 0.05$ in skeletal linear variables of two groups showed that the mean values for Group II were higher than those for Group I.

**Table 1:** Skeletal angular and linear variables in different groups (values in mean±SD)

| Parameters | *n*=25 Mean±SD | |
|---|---|---|
| | Group I (normal occlusion) | Group I (Class III malocclusion) |
| SNA | 82.24±4.25 | 78.72±5.37 |
| SNB | 79.84±4.29 | 82.00±5.34 |
| ANB | 2.4±1.71 | −3.28±2.27 |
| A. of convexity | 4.36±4.07 | −8.00±5.43 |
| AB plane Angle | −5.72±2.11 | 4.94±2.88 |
| NSAr | 124.88±5.59 | 122.17±6.40 |
| AFB | 4.48±3.04 | −1.28±2.61 |
| AXD | 8.88±2.82 | 6.06±2.53 |
| JYD | 7.44±2.74 | 4.22±2.56 |
| APDI | 84.08±5.74 | 96.67±4.77 |
| SN-AB | 75.72±6.69 | 86.44±7.13 |
| FH-AB | 82.52±5.24 | 91.56±5.48 |
| AF-BF | 5.24±3.73 | −1.94±3.02 |
| App-Bpp | 4.64±3.87 | −3.33±2.28 |

SD: Standard deviation

**Table 2:** Intergroup comparison of skeletal angular and linear variables between Group I (normal occlusion) and Group II (Class II div. 1 malocclusion) (values in mean±SD)

| Parameters | *n*=25 Mean±SD | | "*t*" | "*P*" | Sig. |
|---|---|---|---|---|---|
| | Group I | Group II | | | |
| Skeletal angular variables | | | | | |
| SNA | 82.24±4.25 | 81.08±4.18 | 0.972 | 0.336 | NS |
| SNB | 79.84±4.29 | 74.72±3.42 | 4.660 | <0.001 | *** |
| ANB | 2.4±1.71 | 6.36±2.39 | −6.730 | <0.001 | *** |
| A. of con | 4.36±4.07 | 11.44±6.23 | −4.752 | <0.001 | *** |
| AB plane angle | −5.72±2.11 | −9.68±3.27 | 5.081 | <0.001 | *** |
| NSAr | 124.88±5.59 | 126.56±6.42 | −0.987 | 0.329 | NS |
| AFB | 4.48±3.04 | 9.64±3.46 | −5.597 | <0.001 | *** |
| AXD | 8.88±2.82 | 13.24±2.11 | −6.195 | <0.001 | *** |
| JYD | 7.44±2.74 | 11.84±2.07 | −6.401 | <0.001 | *** |
| APDI | 84.08±5.74 | 72.04±6.02 | 7.237 | <0.001 | *** |
| SN-AB | 75.72±6.69 | 65.72±5.23 | 5.886 | <0.001 | *** |
| FH-AB | 82.52±5.24 | 73.92±6.21 | 5. 293 | <0.001 | *** |
| Skeletal linear variables | | | | | |
| AF-BF | 5.24±3.73 | 10.92±3.67 | −5.422 | <0.001 | *** |
| App-Bpp | 4.64±3.87 | 12.32±3.01 | −7.830 | <0.001 | *** |

NS=$P$>0.05; **$P$<0.01; ***$P$<0.001. SD: Standard deviation

## DISCUSSION

In the present study, various skeletal angular and linear parameters were assessed. Considering the skeletal angular variables, SNA value gives us the anteroposterior position of maxilla in relationship to the cranium when the intergroup comparison was made for the skeletal angular variables between Groups I and II. The mean value of SNA does not allow any statistically significant difference. Similar findings were reported by Riedel (1952)[2] and Steiner (1953),[3] who used to SNA to determine the anteroposterior position of the maxilla in relation to the cranium. SNB angle was first used by Riedel, in 1952, and by Steiner, in 1953, so as to determine the anteroposterior relation of the mandible to cranial base. Riedel's method is, however, very reliable because of the error pattern of points A, N, and B is mainly in the vertical plane as stated by Baumrind and Frantz (1971a).[4-7]

When the intergroup comparison was made between the mean values of SNB between Groups I and II, a very significant difference at $P < 0.001$ was found which shows that the position of mandible in Group II is posterior as compared to that in Group I.

Statistically very highly significant differences ($P < 0.001$) were found when the mean values of ANB were compared between the Groups I and II. Thus, it was found that ANB angle is a reliable parameter to differentiate between normal occlusion and Class II div. 1 malocclusion.

Similarly, Oktay (1991) and Gazilerli (1981) also found less variations in ANB as compared to other methods such as WITS, Af-Bf, and APDI and thus found ANB to be a better method to compare anteroposterior jaw relations as compared to WITS appraisal.[8-22]

Similarly, AB plane angle and angle of convexity showed very highly significant difference at $P < 0.001$ between both the groups, which shows retruded mandible and increased facial convexity in Group II.

Freeman (1981)[23] constructed the angle AFB, which eliminates the use of point nasion (N). In the present study, AFB values were found to increase in Group II significantly. Similarly, AXD and JYD angle values showed a very highly significant difference between Groups I and II, thus eliminating the use of points B and nasion and thus clearly point to the posterior position of mandible in Group II.

APDI shows the value to decrease in Group II and the present study found the mean values to be very near to those given by Kim and Vietas (1978).[19]

AF-BF, first used by Chang (1987),[12] eliminates point nasion and is not affected by the vertical displacement of point A and B. As in the present study, AF-BF values slow a highly significant difference; it gives a true measurement of anteroposterior relationship of maxilla to mandible along the Frankfort horizontal plane.

App-Bpp - using palatal plane eliminates the occlusal plane, which changes its inclination during growth. Moreover, rotation of jeans and group changes at point nasion do not influence the result. In the present study, significant difference in mean values was found where the intergroup comparisons were made between Group I and II. Moreover, proposed App-Bpp is considered to be the most reliable indicator of the sagittal jaw relationship, as suggested by Nanda and Merill (1994).[7,14]

## CONCLUSION

After analyzing and comparing various variables available to assess the sagittal dentoskeletal relationship, correlations were found among the various skeletal and dental angular and linear variables that were used. After this, a regression analysis was done separately for those skeletal angular and skeletal linear variables, which showed a very highly significant difference in mean values from the normal occlusion group. After carrying out the regression analysis, it was found that among all the variables studied, APDI was found to be the skeletal angular variable, which can be relied on as the best indicator of the anteroposterior jaw relationship, whereas App-Bpp was found to be the best among the skeletal linear variables.

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