Evaluation of the accuracy of beta angle in determining of antero-posterior relationship of jaws

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Abstract

Aim: Some cephalometric angles change during growth and in accordance with facial height and other facial landmarks which make it less reliable for orthodontic diagnosis.The purpose of this study was to find out relationship between Beta Angle and the anterior-posterior position of jaws.

Materials and Method: Sixty lateral cephalograms of 16 boys and 44 girls with class I, II or III malocclusions were evaluated in our study. we traced all of the cephalograms to measure Beta angle and compare these values between different types of malocclusions.Data were annalized by means of T-student statistical test.

Results: Beta angle was 28.5° - 37.5° for class I, less than 28.5° for class II and more than 37.5° for class III. There was no correlation between β angle and facial height.

Conclusion: Beta angle is independent from facial height. Beta Angle has an acceptable specificity and sensitivity for determining the anterior posterior position of Jaws (IJO 2006; 1: 184-7).

Key words: Cephalometry, Beta angle, Facial Height.

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Diagnosis plays the most important role in orthodontic treatments and is based on gathering data from different sources clinically and paraclinically. Cephalometric analysis can be assumed as a valuable data source for orthodontic diagnosis and treatment planning if a precise measurement done and a well planed analysis used.[1-3]

Evaluation of antroposterior relationship of lower and upper jaws may have a significant effect on orthodontic diagnosis and treatment. The ANB angle is a commonly used criterion for this purpose.

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But it has been demonstrated that it may have a lot of shortfalls: antro-posterior position of Nasion may alter due to racial differences or growth, posterior or anteriorly divergence of jaws, and vertical changes of maxilla and mandible can affect it.[5-10]

AB plane angle in Downs analysis[11] somehow may have other shortcomings like inaccurate drawing, and changes appeared following rotation of jaws.

Reference line in Wits appraisal_is the occlusal plane which is very hard to draw and have a high method error.[12-19]

Introduction of natural head position was a brilliant point in cephalometric analyses, made orthodontists use it worldwide. However; placing the head in NHP needs a trained operator.

Beta angle introduced recently by Baik and Vervoridou [20] seems to be a precise tool to determine antero-posterior discrepancies of jaws.

In this study we were to find validity and sensitivity of beta angle in different malocclusions.

MATERIALS AND METHODS

Sixty cephalograms of orthodontic patients admitted to Mashad dental school with final distinct diagnosis of skeletal cl I, cl II and cl III for each 20 cases was used in this retrospective study. Subjects were 16 males and 44 females. Cephalometric analysis was done by conventional methods and also by using beta angle. Following measurements done as a routine cephalometric values: FMA, Go_Gn-SN, AB/PP, ANB, SNA, SNB, Wits, PFH/AFH. And Beta[20] angle was derived from inter section of A-B plane and a normal line from A point to C-B (center of condyle to B point) as can be seen in figure1.

By means of one way ANOVA and Newman-Keuls post HOC tests, statistical data were analyzed and sensitivity and specificity of the angle were calculated.

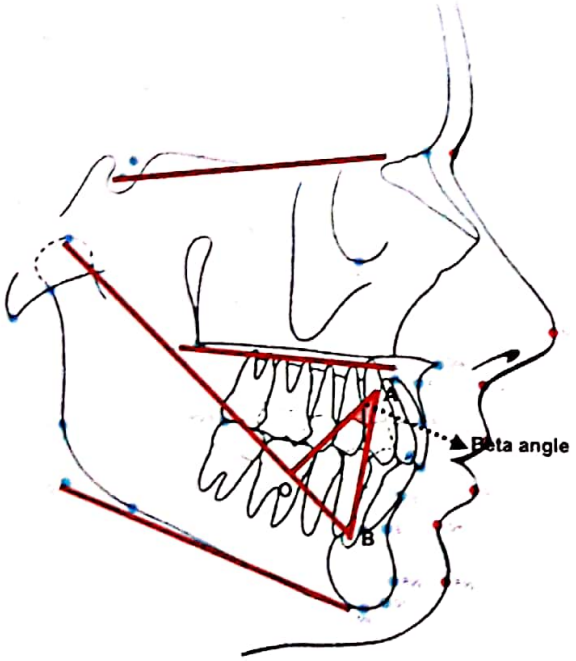

Fig 1: Landmarks and plans

RESULTS

Mean age of subjects were 13.1 years (9-19 years) with no significant difference between 16 males and 44 females, and also among different occlusions.

Mean values of Beta angle was 30.9, 27.5 and 40.5 for cl I , cl II and cl III cases respectively. Tucky test showed significant difference between different classes of skeletal malocclusions (Table 1).

Beta angle had a good correlation with some antero posterior markers but not with vertical ones (Table 2).

Sensitivity of Beta angle between cl I and cl II case was 55% and between cl I and cl III 75%. Specificity of this angle was 73.6% and 93.3% between cl I and cl II, and cl I and cl III respectively .

Table 1: Comparison of mean values and standard deviations of Beta angle in various malocclusions

Malocclusion	Mean	S.D	Min	Max
Cl I	30.9	3.8	24	39
Cl II	27.5	4.4	19	36
Cl III	40.5	4.5	32	49

Table 2: Mean values of Beta angle based on gender

Sex	Numbers	Mean	S.D
Male	16	32.6	7.39
Female	44	33.1	6.91
Total	60	33.0	6.98

Total 3: Correlation of Beta angle and cephalometric measurements in various malocclusions

	Cl I	Cl II	Cl III	Total
FMA	r=0.01 P=0.94	r=0.27 P=0.24	r=0.05 P=0.82	r=0.26 P =0.04
GoGn-SN	r=0.07 P=0.75	r=0.34 P=0.13	r=-0.09 P=0.68	r=0.10 P=0.41
AB/PP	r=0.55 P=0.01	r=0.73 P<0.001	r=0.87 P<0.001	r=0.82 |P<0.001
ANB	r=-0.57 P=0.007	r=-0.66 P=0.001	r=-0.76 P<0.001	r=-0.83 P<0.001
SNA	r=0.15 P=0.52	r=0.06 P=0.80	r=-0.05 P=0.81	r=-0.02 P=0.82
SNB	r=0.44 P=0.04	r=0.23 P=0.32	r=0.47 P=0.03	r=0.55 P<0.001
Wits	r=-0.21 P=0.36	r=-0.65 P=0.002	r=-0.70 P=0.001	r=-0.74 P<0.001
PFH/AFH	r=-0.09 P=0.69	r=-0.27 P=0.24	r=0.18 P=0.42	r=0.007 P=0.95

DISCUSSION

This retrospective study was done on the cephalograms of 60 untreated orthodontic patients aged 9-19 years:

We know some important shortcomings of ANB angle[4-10] and Wits appraisal[12-19] and other values interpreting antero-posterior jaw discrepancies. Beta angle[20] seemed to be a good substitute for them.

In our study mean value of Beta angle was 30.9° for cl I , 27.5° for cl II and 40.5 for cl III patients which was very similar to values found by Baik and Ververidou (31.1° , 24.5° , 40.0°).

A good specificity and validity of the values made them well indicators for skeletal discrepancies. We can put patients with Beta angle less than 28.5° in cl II group, and more than 37.5° in cl III group. Patients with Beta angle value between 28.5 and_37.5 can assumed to be skeletal cl I subjects. We found a very weak correlation between Beta angle and vertical marker like FMA angle Go-Gn-SN angle, posterior facial height to anterior facial height. These weak correlations make the Beta angle a good indicator of antero-posterior jaw relationship in vertically imbalanced patients.

CONCLUSION

In this retrospective study following points were important to notice:

- Beta angle had a good specificity and validity for the diagnosis of antero-posterior relationship of jaws.
- Beta angle had no significant correlation with facial height markers.

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