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A comparison of angular cephalometric measurements for assessing sagittal jaw relationship

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Abstract

Three planes of discrepancies are commonly described in orthodontics namely, transverse, sagittal and vertical. Of these, the sagittal discrepancies are most commonly encountered in day to day practice. Assessing these sagittal relationship is a challenging issue in orthodontics. A total of 100 lateral cephalograms were used for the study out of which 59 cephalograms belonged to male patients and 41 cephalograms belonged to female patients. All cephalograms were taken with patients in standing position with teeth in centric occlusion and lips relaxed. The results showed that there was statistically significant and highly correlated relationship between parameters used in the study for assessment of sagittal jaw relationship. There was a statistically significant and high correlation between FAB, AXB, and YEN, and parameters used for assessment of sagittal jaw relationship. Angular methods used for assessing sagittal jaw relationship such as FAB, AXB, YEN, W and Beta could demonstrate superiority for assessing anteroposterior jaw relationship over other methods such as AB plane, and ANB which showed more variability.

Keywords: Parental attitude, participation, sports, girls

Introduction

Sagittal relationship between the upper and lower jaw represent the basic characteristic of human profile. Three planes of discrepancies are commonly described in orthodontics namely, transverse, sagittal and vertical. Of these, the sagittal discrepancies are most commonly encountered in day to day practice. Assessing these sagittal relationship is a challenging issue in orthodontics [1]. There are obvious shortcomings for both angular and linear measurements [2]. Cranial reference planes such as Frankfort Horizontal and Sella-Nasion line have been used in the determination of jaw dysplasia. Extracranial measurements independent of the cranial reference planes or dental occlusion reflecting the true sagittal relationship have also been used. Conjunctive use of different parameters has been recommended for the assessment of the anteroposterior jaw discrepancy in individual patients [4]. With Broadbent's introduction of the cephalometer in 1931 [5], a new era of cephalometrics began in orthodontics with numerous cephalometric measurements been devised. Any cephalometric analysis based on either angular or linear measurements has obvious shortcomings, which have been discussed in detail by Moyers *et al.* [6] The aim of this study was to evaluate which of the cephalometric criteria is more reliable for clinicians and to determine the level of agreement between them.

Methodology

The study was carried out on the patients visiting the out-patient section of the Department of Orthodontics and Dentofacial Orthopaedics, Government Dental College & Hospital Shreen Bagh, Srinagar. A total of 100 lateral cephalograms were used for the study out of which 59 cephalograms belonged to male patients and 41 cephalograms belonged to female patients. All cephalograms were taken with patients in standing position with teeth in centric occlusion and lips relaxed. All the cephalograms were taken using the same x-ray machine and a standard technique. The machine used was Newtom Giana NNT. All the films were exposed with 64 KVP, 8 mA and an exposure time of 9 seconds. All the cephalograms were traced on a standard acetate paper of 8"x10" size and 0.003" thickness by a standard

technique. The linear measurements were recorded with a measuring scale up to 0.5mm correction.

Table 1: Mean age and number of patients in the three groups used in the study

Groups	No of patients (n)	Mean Age (Years)	S.D
Class I	35	19.57	4.00
Class II	35	20.48	3.58
Class III	30	20.11	4.49

Table 2: Parameters used in the study

S.N.	Parameter	Average Value
1.	A-B Plane Angle	0 to -9 degrees
2.	Anb Angle	0 to 4 degrees
3.	Axb Angle	0 to 8 degrees
4.	Faba Angle	80.91 ± 2.53degrees
5.	Beta Angle	27 to 35 degrees
6.	Yen Angle	117 to 123 degrees
10.	W-Angle	51 to 56 degrees

Results

The present study was undertaken to critically evaluate various cephalometric classification methods for sagittal jaw relationship.

Statistical Analysis: The data was collected, tabulated and statistically analyzed using the SPSS 20.0 software.

Statistical methods employed in the present investigations were:

1. Minimum and maximum value, range, mean and standard deviation were calculated for each subject (Table 4).
2. Differences in distribution of cases in each skeletal class as shown in table 3. Coefficients of Variability of all parameters were calculated (Table 4).
3. Correlation coefficients between the various parameters were calculated using Pearson’s correlation to determine which combination would produce a higher value (Table 5).

The results showed that there was statistically significant and highly correlated relationship between parameters used in the study for assessment of sagittal jaw relationship as shown in table 5.

Table 3: Comparison of Assessments of Sagittal Jaw Relationship by Seven Method of Analysis

Method of Analysis	No. of cases in each skeletal category		
	Class I	Class II	Class III
A-B Plane Angle	46	28	26
Anb Angle	45	32	23
Axb Angle	55	27	18
Faba Angle	28	27	45
Beta Angle	45	20	35
Yen Angle	41	24	35
W-Angle	38	17	45

Table 4: Descriptive Statistics of Pooled Group

	Minimum	Maximum	Mean	SD	CV (%)
A-B Plane Angle	-16	6	-4.16	6.03	-145.0
Anb Angle	-7	11	2.06	4.18	202.7
Axb Angle	-5	14	4.19	4.77	113.8
Faba Angle	65	102	83.18	4.28	5.1
Beta Angle	19	52	33.19	7.67	23.1
Yen Angle	105	135	121.80	6.72	5.5
W-Angle	40	70	56.28	4.73	8.4

Table 5: Correlation Matrix For A-B Plane, Anb, Axb, Faba, Beta, Yen And W-Angles (r- correlation coefficient; p- value).

		AB Plane	ANB	AXB	FABA	BETA	YEN	W
AB Plane	r							
	P-value							
ANB	r	0.873						
	P-value	***						
AXB	r	0.857	0.886					
	P-value	***	***					
FABA	r	0.876	0.893	0.924				
	P-value	***	***	***				
BETA	r	0.829	0.826	0.833	0.833			
	P-value	***	***	***	***			
YEN	r	0.842	0.848	0.846	0.825	0.766		
	P-value	***	***	***	***	***		
W	r	0.803	0.726	0.754	0.740	0.746	0.874	
	P-value	***	***	***	***	***	***	

***Statistically Significant Correlation(P-value<0.05)

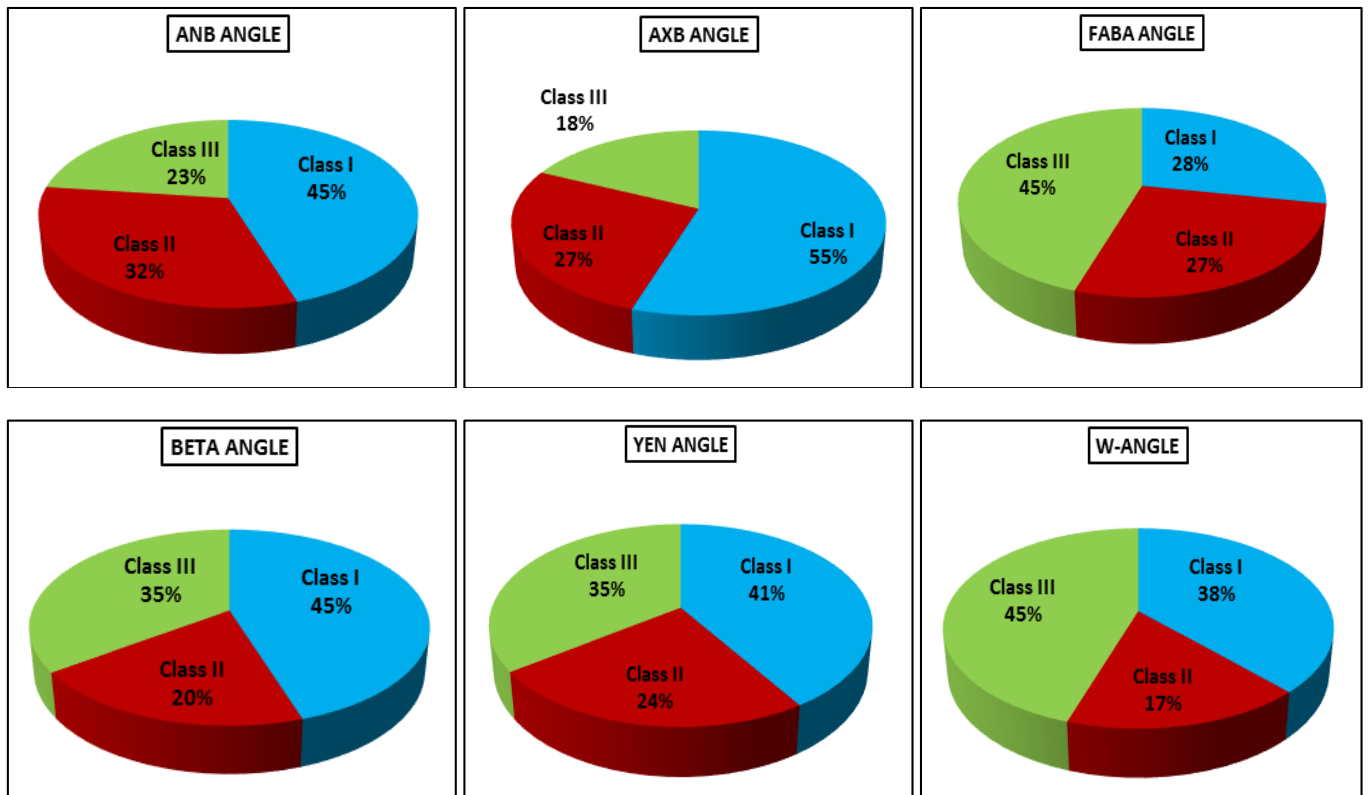


Fig 1: Showing Graphs for various angles

Discussion

The high correlation coefficients among seven sagittal parameters denote that these parameters are closely related to each other and may be used interchangeably. In the present study, FAB A had highest correlation with AXB ($r=0.924$). Similar findings have been reported by other authors [7, 8]. FAB A is more accurate in assessing sagittal jaw relationship when compared with other angular and linear measurements. In the present study, angular methods used for assessing jaw relationship such as FAB A, AXB, YEN, Beta and W-angle could demonstrate superiority for assessing antero-posterior jaw relationship over other methods such as AB plane, and ANB which showed more variability. Almost similar findings have been reported by other studies [9]. Similarly, Bhardwaj P [10] *et al.*, compared and correlated Beta angle with other angular and linear measurements for assessment of sagittal skeletal discrepancy. They also found that correlation between Beta angle and ANB, AFB, demonstrate that with the increase of Beta angle antero-posteriorly skeletal dysplasia decreases significantly. In the present study FAB A was found to be least variable indicating that it was the most homogeneously distributed parameter ($CV=5.1$). FAB A is more accurate in assessing sagittal jaw relationship when compared with other angular and linear measurements. Study by Sang SD2 and others 11 has also shown that FAB A has most homogenous distribution and there is high correlation between FAB A and AFB ($r=0.98$) which is in agreement with our study. In contrast, some studies 12 have shown that YEN angle is highly reliable ($CV=1.81$)

Conclusion

- There was a statistically significant and high correlation between FAB A, AXB, and YEN, and parameters used for assessment of sagittal jaw relationship.

- Angular methods used for assessing sagittal jaw relationship such as FAB A, AXB, YEN, W and Beta could demonstrate superiority for assessing anteroposterior jaw relationship over other methods such as AB plane, and ANB which showed more variability.
- The FAB A and YEN angle are a diagnostic tool to evaluate the AP jaw relationship more consistently.
- FAB A was found to be least variable indicating that it was the most homogeneously distributed parameter ($CV=5.1$) and is more accurate in assessing sagittal jaw relationship when compared with other angular and linear measurements.

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