

ANB + AOBO Zone Difficulty Index: A Cephalometric Study

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ABSTRACT

Aim: Horizontal jaw discrepancies can be evaluated by various cephalometric parameters, the most common being ANB angle and Wits appraisal. Both of these values got own limitations so in order to overcome these issues Polk et al. proposed ANB+AOBO zone difficulty index (ZI). The aim of present cross sectional study was to apply ZI in Pakistani population to assess its reliability.

Methods: Lateral Cephalograms of 50 patients were traced and analyzed to find out values of ANB angle and wits. Combined ANB value & wits value was then calculated. Subjects were then placed in the different zones.

Results: Results showed that 11% subjects were in Zone 0, 4% in Zone -1, 4% in Zone -2 while 9% in Zone <-2. It was also found that 29% in Zone 1, 21% in Zone 2, 16% in Zone 3, 2% in Zone 4 while remaining 4% in Zone > 4.

Conclusion: It was concluded that maximum number of patients were in least difficult zones of -1, 0 & 1 as per ZI. Thus ZI is effective method to assess horizontal jaw discrepancies.

Keywords: Wits; AN; Cephalometric.

INTRODUCTION

Cephalometry is known as method of measuring dimensions of the head, was initially introduced as a measure of calculating dimensions of skull, later it was developed by Broadbent to introduce in orthodontic profession and has since remained relatively unchanged. Since its development, cephalograms have been under usage in area of craniofacial research for the investigation of various aspects of craniofacial growth, development, and treatment¹.

Horizontal jaw issues can be quantify by various cephalometric parameters²⁻⁸. According to the Steiner's analysis: ANB indicates whether the saggital relationship between the upper and lower jaw is a normal skeletal class one (0-4), a skeletal Class two (>4⁰), or skeletal class three (0 or negative) relationship⁹⁻¹¹. Wits appraisal was introduced by Jacobson et al¹². In wits appraisal perpendicular lines are drawn from points A and B to the functional occlusion plane and measurement of distance between these points of intersection AO & BO is calculated to interpret the upper and lower jaw relationships¹³. The norms are 1 mm for boys and 0mm for girls. The following factors have been

accounted to influence the ANB angle and Wits appraisal.

1. Influence of age factor
2. The alternation of the position of the nasion point
3. The up or down rotation of the SN plane
4. The up or down rotation of maxilla and mandible
5. Alternation of occlusal plane inclination
6. The amount of maxilla and mandible prognathism

In order to overcome shortcomings of above mentioned ANB and Wits value, Polk et al.¹⁴ proposed ANB+AOBO zone difficulty index (ZI) by combining AOBO and ANB values, plotted on a scattergram, and divided into equal zones to create a new index of horizontal skeletal discrepancies and treatment predictability. This cross sectional study was design to apply ZI in Pakistani population to assess its reliability among the patients visiting department of Orthodontics, de'Montmorency College of dentistry, Lahore, Pakistan.

METHODOLOGY

This cross sectional study was conducted at the Department of Orthodontics, de, Montmorency College of Dentistry, Lahore in which orthodontic records of 50 untreated patients, between the chronological ages of 14 and 20 years, irrespective of gender (20 males, 30 females) were included. Duration of this study was May 2015 to May 2016.

Inclusion Criteria:

All teeth present except third molars
Orthodontic patients with Chronological ages of 14 and 20 years

Good quality Pre-treatment Cephalograms

Exclusion Criteria

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ANB <-3° or >9° & Wits appraisal <-7mm or >8mm
 Previous orthodontic / orthognathic treatment
 Craniofacial syndromes
 Patients with TMJ issue
 Pts with facial asymmetry and/or functional shifts.

Data collection procedure: Lateral Cephalograms of 50 patients were taken in natural head position and traced and analyzed to find out values of ANB angle and wits. Combined ANB value & wits value was then calculated. Subjects were then placed in the different zones as per Polk et al¹⁴

Zone	ANB AOBO zone range values
4	16 to 20
3	12 to 16
2	8 to 12
1	4 to 8
0	0 to 4
-1	0 to -4
-2	8 to -4

The data was analyzed in SPSS 19. The mean age and gender distribution among the selected sample was calculated. For Intraexaminer reliability, 10 cephalograms were randomly selected from the main sample and were reassessed 10 days after the initial assessment. Subjects were then placed in the different zones as per Polk et al¹⁴ by combining calculated ANB and wits values.

RESULTS

The mean age of the patients was 17.18 years. The sex distribution was 20 males and 30 females. The mean age of male patients was 17.11 years and mean age of female patients was 17.13 years (Table 1).

Table 1: Age and gender distribution (n=50)

Parameter	Results
Mean Age	17.18 Years
Males	20(40%)
Females	30(60%)

Based on the evaluation of ANB angle 40% of the subjects showed Skeletal Class I, 9% showed Skeletal Class III while remaining 51 % showed Skeletal Class II (Table 2).

Based on the evaluation of Wit's appraisal 25% of the subjects showed Skeletal Class I, 60% showed Skeletal Class II while remaining 15% showed Class III. (Table 2)

Table 2: Skeletal class as per ANB & AOBO (n=50)

Parameter	ANB	AOBO
Skeletal class 1	40%	25%
Skeletal class 2	51%	15%
Skeletal class 3	9%	60%

ZI results showed that 11% subjects were in Zone 0, 4% in Zone -1, 4% in Zone -2 while 9% in Zone <-2. It was also found that 29% in Zone 1, 21% in Zone 2, 16% in Zone 3, 2% in Zone 4 while remaining 4% in Zone > 4 (Table 3).

Table 3: ZI Distribution (n=50)

Zone	Distribution %age
Zone <-2	9
Zone -2	4
Zone -1	4
Zone 0	11
Zone 1	29
Zone 2	21
Zone 3	16
Zone 4	2
Zone >4	4

DISCUSSION

There are various shortcomings of ANB angle resulting in inaccurate interpretation of actual upper and lower jaw relationship. Varied saggital discrepancy of A and B could give the same ANB values as change in in the vertical distance from point N could compensate for other variation¹⁵⁻¹⁹.

Shortcomings of Wits appraisal is mainly due to the fact that it relates point A & B to the occlusion plane; which results in two issues.²⁰ 1) Truetracing of the occlusal plane is not always accurate, especially in mixed dentition patients or patients with anterior open bite, asymmetry of the planes, 2) Alternation of inclination of occlusion plane by normal development and orthodontic treatment, can greatly effects the results of Wits appraisal^{21,22}.

Polk et al organized the relationships in 7 zones predictive of treatment time & difficulty¹⁴. Cases in pretreatment Zones of 0 are easier to treat while increase or decrease in Zones makes the treatment difficult¹⁴. The logic in their approach was that if ANB angle is affected by protruded jaws or clockwise rotation then addition of wits will compensate the sum and more accurately suggests the lower zone. They showed that the AOBO measurement can predict variation in treatment time at each value of the ANB angle, and that the ANB and AOBO measurements together predict treatment time better than either one alone¹⁴.

Results based on ANB angle & Wits value showed that there is great variation in the distribution of patients in different categories; indicating that there is insignificant correlation between ANB and wits value, this is in agreement with results of previous international²³⁻²⁶ and local studies^{20,27,28} but in contrast with findings of Zamora et al²⁹, who found correlation between ANB and Wits. Furthermore results showed that 11% subjects were in Zone 0, 4%

in Zone -1, 4% in Zone -2 while 9% in Zone <-2. It was also found that 29% in Zone 1, 21% in Zone 2, 16% in Zone 3, 2% in Zone 4 while remaining 4% in Zone > 4. Thus maximum number patients were in Zone -1, 0 & 1, this is also in agreement with results of previous local study by Firdous²⁷ who also found maximum number patients were in Zone -1, 0 & 1.

Nowadays there is a paradigm shift to assess the patient photographically, in natural head position and 3 dimensionally, especially for functional appliances and Orthognathic surgical cases. The diagnostic information should be easily communicated to lay persons, such as patients and parents, and to general dentists who may not understand the intricacies of cephalometrics.

The limitation of this study is small sample size; further large scale studies are suggested, this would help to assess whether ZI zones accurately reflects the orthodontic therapy time and the difficulty of cases or not.

CONCLUSION

It was concluded that maximum number of patients were in least difficult zones of -1, 0 & 1 as per ANB+AOBO zone difficulty index. Thus it is effective method to assess horizontal jaw discrepancies.

Financial Disclosure: We have no relevant financial interests in this manuscript.

Conflict of Interest: We have no conflict of interest

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