

RELATIONSHIP OF THE SKELETAL MALOCCLUSION WITH DENTAL MALOCCLUSION IN THE SAGITTAL PLANE

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ABSTRACT

Objective: The aim of this study was to investigate the correlation of the skeletal malocclusion with dental malocclusion in the sagittal plane, which includes molar relation in orthodontic patients.

Material and Methods: The cephalograms and casts of 100 of vertically normal patients were included in this retrospective cross-sectional study. ANB and Wits were calculated for skeletal classification and angle classification for dental malocclusion classification. All statistical analyses were performed using SPSS 16 software (SPSS Inc., Chicago, Ill, USA). Descriptive statistics were performed for the calculation of the mean, standard deviation, minimum, maximum, and range. The Spearman's correlation coefficient (r) was also calculated between the measurement skeletal and dental relationship in sagittal relationship in female and males. Statistical significance was predetermined at the 95% level at ($P < 0.05$).

Results: Of total 100 patients 58(58%) were females and 48(48%) were males. The mean age was 21 ± 3.6 years. The mean value for ANB angle in this sample was 2.5, 4.7 and -1.5 for skeletal class I,II, and III respectively. Class I malocclusion showed the highest variation in ANB; the standard deviation was largest.. There was a definite and statistical significant correlation between ANB and Wits value. The highest correlation was for skeletal class III patients. The correlation between dental (angle classes of molar) and skeletal ANB and Wits was weak and statistically nonsignificant. Only skeletal class II carried a positive correlation.

Conclusions: There is a weak correlation between skeletal and dental malocclusion.

Key words: Skeletal malocclusion , Dental malocclusion, Sagittal plane.

INTRODUCTION

Diagnosis of malocclusion is an important criterion for the success of any orthodontic treatment and, therefore, it is essential for the orthodontist to have adequate knowledge of dental occlusion and the underlying skeletal relationship of the patient to reach the proper diagnosis and treatment plan of the malocclusion¹. Different diagnostic records are obtained to determine the optimal treatment plan. The diagnostic database includes patient's history, clinical examination, study cast analysis, cephalometric analysis, and facial photographs².

A good method of recording or measuring

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malocclusion is essential for documentation of the prevalence and severity of malocclusion in different populations and also will help in education and classifying the various types of malocclusion¹. Epidemiological studies allows to evaluate the distribution and severity of morbid conditions that occur in a population. It also allows checking the interference of etiological factors on the occurrence of diseases, providing data for planning preventive and curative actions. Currently malocclusions are third in the ranking of priorities among the problems of dental public health worldwide, surpassed only by dental cavity and periodontal diseases³. However, with the reduction of caries in children and adolescents in recent decades, this condition has received more attention⁴. In fact, malocclusions represent one of the studied problems, over time, using different classifications in different populations, often to learn about its prevalence, causes and establishing treatment protocols. Nevertheless, occlusal problems remain in direct relationship with

the other two most prevalent in dentistry, i.e. dental cavities and the appearance of gingival inflammation with possible painful symptoms³.

The publication of the Angle classification in 1899 was a milestone in the development of orthodontics not only to classify the malocclusions, but also to include the first simple and clear definition of normal occlusion of the natural dentition. This method has probably been the most used instrument to record malocclusions until now⁵. However, it has a drawback that it is representing only the dental relationship in the sagittal plane and not the skeletal relationship⁶.

Skeletal relationships in the sagittal plane do not always correspond with dental relationships. The most frequent disagreement has been found in Class I dental relationships⁷. Radiographic analysis not only assists in the diagnosis of malocclusions but can also influence the treatment plan. It has been shown that especially when extractions are involved, cephalometric data significantly influence the course of treatment⁸. Several cephalometric parameters are used to assess sagittal jaw relationships. The position of the jaws is usually defined relative to the cranial base, although this does not always offer accurate data for the anteroposterior relationships of the jaws⁹.

Indeed, previous studies revealed that the dental arch relationship is largely affected by the facial skeleton configuration upon which the teeth are invested. Thus, studies have investigated the relationship between the anteroposterior dental arch and jaw-base relationships⁷⁻¹⁰.

The aim of this study was to investigate the correlation of the skeletal malocclusion with dental malocclusion in the sagittal plane, which includes molar relation in orthodontic patients.

METHODS AND MATERIALS

This descriptive cross-sectional study was carried at the Department of Orthodontics, Khyber College of Dentistry, Peshawar. A total of hundred cephalograms and casts from the records were included in this study by convenient sampling technique. Those Patient having full complement of normal shaped permanent teeth (excluding third molars), any molar (class I, II, III) relationships, any skeletal(class I, II, III) relationship, normal vertical relationships and all

lateral cephalometric radiographs recorded in natural head position were included in this study.

Teeth with heavy fillings, congenital missing teeth, Retained deciduous, and Supernumerary teeth, previous orthodontic, orthopedic, facial surgical treatments and history of bad oral habits such as thumb sucking or mouth breathing were excluded from the study.

Study models of the patients were taken and assessed for the existing molar relationship. Patients were classified into Angle's malocclusion classes such as Angle's Class I, Class II, Class III based on the sagittal occlusal relationship of maxillary and mandibular first permanent molar as seen on the study models. The lateral cephalograms taken in natural head position for each individual was traced accurately on to the acetate tracing paper using 0.3mm pencil. The overall tracings were carefully checked for any errors. The lateral cephalograms of each subject was then taken and assessed for both linear (WITS- Linear distance between perpendicular lines from points A and B on the occlusal plane) and angular (ANB angle- angle formed by nasion, point A and point B) Anteroposterior relationship.

All statistical analyses were performed using SPSS 16 software (SPSS Inc., Chicago, Ill, USA). Descriptive statistics were performed for the calculation of the mean, standard deviation, minimum, maximum, and range. The Spearman's correlation coefficient (r) was also calculated between the measurement skeletal and dental relationship in sagittal relationship in female and males. Statistical significance was predetermined at the 95% level at ($P < 0.05$).

RESULTS

Of total 100 patients 58(58%) were females and 48(48%) were males. The mean age was 21 ± 3.6 years. The mean value for ANB angle in this sample was 2.5, 4.7 and -1.5 for skeletal class I,II, and III respectively. Class I malocclusion showed the highest variation in ANB; the standard deviation was largest. Details is given in Table-1.

There was a definite and statistical significant correlation between ANB and Wits value. The highest correlation was for skeletal class III patients. Details is

Table-1: Descriptive statistics of different skeletal classes

Skeletal class	ANB(o)	Witts(mm)
Class I	2.5±2.8	-2.8±3.3
Class II	4.7±1.9	1.2±3.2
Class III	-1.5±2.6	-9.2±3.0

Table-2: Correlation between ANB and Wits appraisal

Molar classification	ANB Angle Vs Wits	
	Person correlation	P value
Angle class I	0.533	<0.001*
Angle class II	0.596	<0.001*
Angle class III	0.711	<0.001*

Table-3: Correlation between skeletal and dental classification (Angle's)

Molar relation	ANB	Wits	P value
Class I	-0.31	-0.13	0.71*
Class II	0.04	0.05	0.65*
Class III	-0.11	-0.02	0.79*

* significant level $P < 0.05$

given in Table-2.

The correlation between dental (angle classes of molar) and skeletal ANB and Wits was weak and statistically nonsignificant. Only skeletal class II carried a positive correlation. Details is given in Table-3.

DISCUSSION

Angle's classification of malocclusion is based on the mesiodistal relationship between the upper and lower dental arches. Subsequent studies revealed that the dental arch relationship is largely affected by the facial skeleton upon which the teeth are invested. An area of extensive debate within orthodontics is whether the anteroposterior dental arch correlates with the jaw-base relationship, and thus whether both need to be assessed in orthodontic diagnosis and treatment planning⁶.

Both angular and linear measurements have been proposed in the assessment of anteroposterior jaw-base relationship. However, each of the methods described exhibits its own inherent weakness, based on the variability of factors other than the jaw relationship itself. The ANB angle, which is one of the angles used in this study, has also been recognized as a skeletal sagittal discrepancy indicator and has become the most commonly used measurement till date¹¹. More recently it has been claimed that the ANB angle is af-

ected by various factors and thus diagnosis based on this angle may give false results. In order to overcome this, Jacobson introduced the Wits appraisal¹².

In the current a significant positive correlation were found between ANB and Wits measurement in each angle class. Zhou L et al¹³ conducted a study in Chinese population to determine the association between the anteroposterior relationship of the dental arch and the anteroposterior relationship of the jaw-base. Orthodontic casts and lateral cephalograms were used of a sample of 405. Angle's classification was used to assess the dental arch relationship from orthodontic casts. The jaw-base relationship was assessed from the lateral cephalograms using angular (ANB angle) and linear (Wits analysis) measurements. The correlation between the anteroposterior dental arch and jaw-base relationships was assessed. They reported that anteroposterior dental arch did coincide with the jaw-base relationships, as expressed by the ANB angle in 61%, the Wits analysis in 67%, and with both in 53%. The jaw-base relationship assessed with the Wits analysis was more significantly associated with the dental arch relationship (P .001) than that assessed with the ANB angle (P .01). The correlation coefficient between the ANB angle and the Wits appraisal was 0.65 for the combined sample, and 0.60, 0.64, and 0.67 for Class I, II, and III dental arch relationships. These results supported the present results. (Table 2) the significant correlation showed that Wits appraisal is more realistic in diagnosis of the skeletal malocclusion in the sagittal plane. This was confirmed with the findings of Ucheonye et al¹⁴. They stated that the difference in diagnostic accuracy between the ANB angle and the Wits appraisal shows the WITS appraisal as being more reliable than the ANB in assessment of sagittal dental base discrepancy and based on this, it is wise to use the Wits appraisal as a moderator of the ANB angle in the management of orthodontic patients.

In the present nonsignificant negative correlations between molar relation and ANB or WITS were observed in angle class I with $r = -0.13$, and angle class III with $r = -0.11$ and -0.02 respectively. On the contrary, a nonsignificant positive correlation was found between molar relation and ANB or WITS at Incisor class with $r = 0.04$ and 0.05 respectively Al-Hamlan et al¹ conducted on Saudi population to determine Whether or not the dental relationship correlates with skeletal relationship in the sagittal plane using orthodontic dental casts and cephalometric radiographs

of 124 patients. Their results showed that the incisal relation had a very high significant association with WITS appraisal ($p = 0.0045$), whereas with ANB, the association was marginally significant ($p = 0.0528$). No significant associations were found with molar relation neither at ANB ($p = 0.2075$) nor at the WITS ($p = 0.4794$) appraisal. Significant positive correlations between ANB and WITS appraisal were found at the three incisal classification classes (class I, $r = 0.73$; class II, $r = 0.64$; class III, $r = 0.75$) and no significant correlation was observed in all classes with the Angle's (molar) classification. Although incisor relation was not evaluated in the current study, these supports the present results as far as molar relation is concerned.

The result of the present investigation is in disagreement with the findings of Shrikant et al⁶ who reported a significant positive correlation of the ANB angle and Wits appraisal when applied to the Angle's three groups of malocclusions class I, II, and III.

Lack of consistency between ANB and Wits assessments was found in high occlusal plane angle patients. Earlier study has suggested that in extreme or controversial cephalometric interpretations of the ANB angle and Wits appraisal, a visual inspection provides an essential aid in diagnosis and skeletal classification¹⁵. In this study we included only normo-divergent patients.

CONCLUSIONS

There is a weak relationship between skeletal and dental malocclusion.

REFERENCES

1. Al-Hamlan N, Al-Eissa B, Al-Hiyasat AS, Albalawi FS, Ahmed AE. Correlation of Dental and Skeletal Malocclusions in Sagittal Plane among Saudi Orthodontic Patients. *J Contemp Dent Pract*. 2015; 16(5):353-9.
2. Sanja ZM, Farčnik PF, Ovsenik M. Overjet as a predictor of sagittal skeletal relationships. *Eur J Orthod* 2008; 30(3):269-73.
3. Dias PF, Gleiser R. The need for treatment index Orthodontic as an evaluation method public health. *Rev Dental Press Ortod Ortop Facial* 2008;13(1):74-81
4. Garbin A, Ísper J, Perin PCP, Garbin CAS, Lolli LF. Malocclusion prevalence and comparison between the Angle classification and the Dental Aesthetic Index in scholars in the interior of São Paulo state-Brazil. *Dental Press J Orthod* 2010;15(4): 94-102.
5. Angle EH. Classification of malocclusion. *Dental Cosmos* 1899;4:248-64.
6. Shrikant S, Ganapathy KK, Reddy RPR, Thomas M. Correlation of the anteroposterior relationships of the dental arch and jaw-base in subjects with class I, class II and class III malocclusions. *Int J Contemp Dent* 2011;2:68-73.
7. Milacic M, Markovic M. A comparative occlusal and cephalometric study of dental and skeletal anteroposterior relationships. *Br J Orthod* 1983; 10 : 53 -54.
8. Pae EK, McKenna GA, Sheehan J, Garcia R, Kuhlberg A, Nanda R. Role of lateral cephalograms in assessing severity and difficulty of orthodontic cases. *American Journal of Orthodontic and Dentofacial Orthopedics* 2001;120 : 254 – 62.
9. Tanaka JLO, Ono E, Filho EM, de Moraes LC, de Melo JC, de Moraes MEL. Influence of the facial pattern on ANB, AF-BF, and Wits appraisal. *World J Orthod* 2006; 7: 369 –75.
10. Kim YH, Vietas JJ. Anteroposterior dysplasia indicator: an adjunct to cephalometric differential diagnosis. *Am J Orthod* 1978;73:619-33.
11. Wu JYC, Hägg U, Pancherz H, Wong RWK, McGrath C. Sagittal and vertical occlusal cephalometric analyses of Pancherz: Norms for Chinese children. *Am J Orthod Dentofacial Orthoped* 2010; 137(6), 816-24.
12. Jacobson A: The Wits appraisal of jaw disharmony. *Am J Orthod* 1975; 67 (2): 125 – 38.
13. Zhou L, Chung-Wai Mok, Urban Hagg, Colman McGrath, Margareta Bendeus, John Wu. Anteroposterior Dental Arch and Jaw-Base Relationships in a Population Sample. *Angle Orthod* 2008; 78:1023– 1029.
14. Ucheonye IJ, Tokunbo AA, Donald OO. The WITS appraisal among a Nigerian sub-population: an assessment of dental base geometric factors. *Braz J Oral Sci* 2013;12: 275-79.
15. Del Santo M Jr. Influence of occlusal plane inclination on ANB and WITS assessment of anteroposterior jaw relationships. *Am J Orthod Dentofacial Orthop* 2006;129: 641-48.