

THE ROLE OF SAGITTAL PARAMETERS IN THE DEVELOPEMENT OF LOWER INCISOR CROWDING AMONGST PATIENTS

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ABSTRACT

Objectives: To assess whether sagittal parameters such as SNA, SNB and ANB play a significant role in the development of lower incisor crowding amongst patients reporting to Department of Orthodontics, Khyber College of Dentistry, Peshawar.

Materials and Methods: This comparative cross sectional study was conducted at the Department of Orthodontics, Khyber College of Dentistry, Peshawar. Lateral cephalograms and study casts of 213 patients, were used to determine sagittal parameters such as SNA, SNB, ANB and Lower incisor crowding respectively. The data was collected using a structured proforma and was analyzed using SPSS version 17. The Pearson Chi square test with a critical p-value set at < 0.05 was used for determining if a significant relationship existed between Lower Incisor Crowding and ANB.

Results: Amongst the 213 patients, 120 patients were Class II (56.3%) and 87 (40.8%) patients were Class I as per the ANB classification. Lower incisor crowding and spacing was found to be more prevalent in Class II patients (45.1% and 8.5%) as compared to class I (33.8% and 5.6%). The Pearson chi square test revealed a significant statistical co-relation between the ANB classification and lower incisor crowding (p-value = 0.03).

Conclusion: Sagittal parameters such as SNA, SNB and ANB play a significant role in the development of lower incisor crowding, which must be kept in mind while formulating treatment strategies for patients with such complaints

Key Words: Lower Incisor Crowding, Sagittal classification, Treatment planning.

INTRODUCTION

The start of the 21st century and the information revolution has pushed the human population towards maximizing aesthetics, which has become the main concern for seeking orthodontic treatment.¹ That is why dental crowding is the most frequent chief complaint that an orthodontist comes across, through out his entire professional career.² Crowding may affect the whole arch, but more often, it has been reported to be localized to the anterior segment of the lower arch and hence, is more commonly seen than

the crowding of posterior arch segment of either jaws.³

Numerous factors are deemed responsible for the crowding of the lower anterior arch segment. The role of soft tissue pressure⁴, morphology⁵ and direction of mandibular growth, early loss of deciduous molars⁶, and the size, morphology and inclination of mandibular incisors⁷ are regarded as some of the causative factors of mandibular crowding. Late eruption of mandibular 3rd molars, though controversial, has also been shown to be a major contributory factor.^{8,9}

Dental crowding has spun a profound interest in the orthodontic community. As a result, over the years, various aspects related to crowding have been debated in the literature. Correlations between crowding and over jet, overbite, skeletal growth pattern, dif-

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ferent skeletal parameters and treatment modalities for crowding have been discussed in studies conducted internationally. However, no local data has been obtained and documented which relates the skeletal growth pattern and dental crowding in an Asian population. The role of vertical parameters has been discussed in part I of this paper. The objective of part II of this paper is to assess whether or not, sagittal parameters i.e. SNA, SNB and ANB play a significant role in the development of lower incisor crowding amongst the patients, reporting to the Department of Orthodontics, Khyber College of Dentistry, Peshawar.

MATERIALS AND METHODS:

This comparative cross sectional study was conducted at the Department of Orthodontics at Khyber College of Dentistry, Peshawar Khyber Pukhtunkhwa from January 2011 to June 2011, after approval from the Institutional ethical committee . Patients with a full complement of healthy dentition were included in the study. The exclusion criteria barred those patients with a history of trauma, surgery, previous orthodontic treatment and those with congenital anomalies.

Informed consent was taken from the patients and pertinent information was collected on a structured proforma. To ensure uniformity of the radiographs, all lateral cephalograms were taken on the same machine (Kodak 9000 Extra-oral imaging system, Made in France) taken by a single operator. The cephalometric measurements such as SNA, SNB and ANB as well as calculations and lower incisor crowding measurements were taken by a single researcher.

This data was entered and analyzed using SPSS Version 17. Frequencies were calculated for all variables. The Pearson Chi square test was used to determine if there was a significant relationship between Lower incisor crowding and sagittal parameters such as SNA, SNB and ANB, with a critical p-value set at <0.05.

RESULTS:

A total of 213 patients comprised the sample of this study, of which 81 (38%) patients were male and 132 (62%) patients were female with a male to female ratio of 1:1.63.

The age of the sample ranged from 11-37 years with a mean age of 16.96±5.79 years. Out of 213 patients 73.2% belonged to the age group of 11-20 years and constituted the predominant age group in this study. The 31-40 year age group comprised only 1.4% patients and hence was the least represented age group. The details of the age distribution of the sample are given in Table-I. On ANB Classification, class II patients comprised 56.3% of the sample, whereas Class III patients constituted 2.8% of the sample population. The details of ANB classification of the sample are given in Table-II.

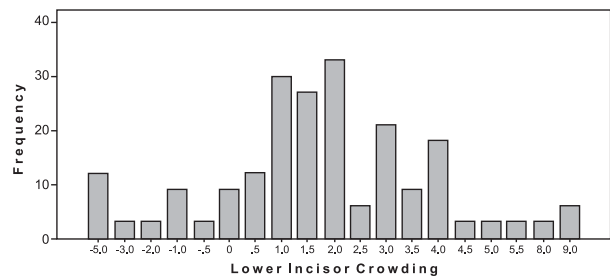
Table-I: Distribution of Age groups of the sample

Age Group in years	n	%
11-20	156	73.2
21-30	54	25.4
31-40	3	1.4
Total	213	100

Table II - Distribution of the sample's sagittal classification.

ANB Classification	n	%
Class II	120	56.3
Class I	87	40.9
Class III	3	2.8
Total	213	100

Figure-1 Distribution of crowding observed in the study sample



The sample showed Lower Incisor Crowding (LIC) in 174 patients (81.7%) and spacing amongst 30 patients (14.1%). 9 patients (4.2%) showed neither Lower Incisor crowding nor spacing. LIC was divided into 3 categories, Positive (crowding), Negative (spacing) and Normal (LIC = 0 mm). This was cross tabulated against the sagittal classification of patients. Class II patients showed the greatest amount of crowding (45.1%) and spacing (8.5%) followed by Class I patients (33.8% and 5.6% respectively). The details of this cross-tabulation are given in Table-III.

LIC of upto 2mm and 1mm was commonly observed amongst patient with crowding (18.4% and 17.2% respectively). Spacing of 5mm (40%) followed by spacing of 1mm (30%) were seen frequently amongst patients with spacing. The details of the crowding observed in this study are given in Figure I.

The Pearson Chi-Square test was applied and it revealed that a significant relationship existed between the ANB classification and Lower incisor crowding (p-value = 0.03) amongst patients reporting to Department of Orthodontics at Khyber College of Dentistry, Peshawar.

DISCUSSION

This study revealed a significant relationship between SNA, SNB and ANB on the development of lower incisor crowding. Part I of this study showed a significant co-relation between vertical facial heights and lower incisor crowding.

This study utilized only SNA, SNB and ANB to determine whether they played a contributory role in the development of crowding. Other studies have used a variety of other variables such as posterior cranial base length, mesiodistal size of the maxillary primary canine, the maxillary and mandibular dental arch lengths which had also been found to be related to lower incisor crowding.^{10, 11, 12} Attempts to find indicators of lower incisor crowding in the permanent dentition from tooth-arch size discrepancies in the primary dentition period have been met with limited success.¹³

The concept of sagittal parameters such as short mandibular bodies playing a role in the development of lower incisor crowding was reported as early as in the 1970's.¹⁴ One of the earliest studies on the subjects was carried out by Lundstorm¹⁵ in 1975 and Ronnerman and Thilander¹⁶ in 1978. Both of them found that crowding was observed far more fre-

quently in patients who did not had mandibular prognathism.

Berg¹⁷ in his study divided his sample population into patients with and without crowding. He used SNB and Ar-Po to check for any significant differences between the two. He demonstrated that the incidence of crowding was higher in patients exhibiting features of Class I and Class II as compared to Class III patients. Our findings were in conformity with this study despite the use of different indicators for measuring sagittal parameters.

Türkkahraman and Sayin¹⁸ conducted a study in 2003 amongst 60 children in the mixed dentition period with Class I skeletal patterns. The aim of their study was to determine if the dentofacial configuration of patients with and without crowding differ significantly, to determine the dentofacial factors that might be associated with mandibular anterior crowding, and to determine the possible indicators of crowding from cephalograms in the early mixed dentition. They utilized Co-Gn and SNB to measure mandibular dimensions and reported that Class II skeletal patterns were more likely to be associated with lower incisor crowding. Further investigation of this finding was done by performing Wits analysis, which showed higher values in the group with lower incisor crowding, indicating a predilection towards Class II skeletal patterns. These findings were backed by studies conducted by Leighton⁵ and Sakuda¹⁹.

According to Shaikh and Alvi²⁰, cephalometric values of the Pakistani population showed a larger SNA and a comparatively shorter SNB angle as compared to the Caucasian cephalometric norms and found this different to be statistically significant (p < 0.001), thus rendering them unsuitable for use on the local population. A regional study done in India by Agrawal²¹ agrees with the above findings by indicating that cephalometric norms of the South East Asian

Table III - Cross-tabulation of the sagittal classification against lower incisor crowding

		Lower Incisor Crowding							
		Negative		Normal		Positive		Total	
		n	%	n	%	n	%	n	%
Sagittal Classification	Class I	12	5.6	3	1.4	72	33.8	87	40.8
	Class II	18	8.5	6	2.8	96	45.1	120	56.3
	Class III	0	0	0	0	6	2.8	6	2.8
Total		30	14.1	9	4.2	174	81.7	213	100

populations tend to border on and above the upper limits of Caucasian norms. However this difference was not deemed to be statistically significant. Given such findings, testing the relationship of sagittal parameters and lower incisor crowding on the local population becomes imperative while formulating treatment plans for such patients.

CONCLUSION

This study concludes that a positive correlation exists between ANB in the development of lower arch crowding amongst a segment of the population of Khyber Pakhtunkhwa. This trait must be diagnosed in patients so that appropriate treatment planning can be instituted for its management.

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