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Correlation of intercanine width with sagittal skeletal pattern in untreated orthodontic patients

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Abstract

Introduction: Arch width is an essential component of dentition and occlusion but it receives little attention during treatment planning. The objective of this study was to evaluate a relationship between intercanine width and sagittal skeletal pattern in orthodontic patients.

Material and Methods: This cross-sectional study was conducted at Orthodontics department, Khyber College of Dentistry, Peshawar, from January to June 2018. After the proposed,study was approved by institutional review board, a total of 150 subjects for the sample were recruited based on convenient sampling technique. Dental casts and lateral cephalograms of patients (75 males and 75 females) between 18 and 23 years of age were evaluated. Intercanine widths including upper intercanine widths (UICW) and lower intercanine widths (LICW) were measured by a digital caliper. Sagittal parameters including SNA and SNB angle were obtained from lateral cephalograms.

Results: The correlation of intercanine width with SNA and SNB angles was evaluated applying Pearson correlation coefficients. According to statistical analysis a significant weak negative correlation of UICW with SNA(-0.254) and SNB angles(-0.209) was present. LICW had significant weak positive correlation with SNA (0.260) and SNB angles(0.293).

Conclusions: It was concluded from this study that there is a statistically significant relationship between intercanine width and sagittal skeletal pattern.

Keywords: Arch width; sagittal skeletal pattern; intercanine width

Introduction

Dental arch width have had significant implications in orthodontic diagnosis and treatment planning.[1,2] There is a close association between dental arch form and normal occlusion.[3] The skeletal pattern plays essential role in occlusal development and also limits the anteroposterior movement of incisors during treatment.[4]

Dental arches are dynamic and changes during the period of growth and development but lessen at adulthood.[1] Dental arches vary among people according to tooth size, tooth position, pattern of craniofacial growth and by many genetic and environmental factors.[5,6] The relationships between craniofacial morphology and malocclusion have long been of interest to orthodontists.[7] Despite individual differences, when ethnical variations are taken into consideration, the application of an ideal arch form could affect the postal functional, esthetic and stable arch form results.[8] Hence, it is important to know about certain cephalometric and dental arch parameters and their relationships for a given population.[9]

Long-term changes in dental arch widths have been seen following orthodontic treatment.[10] Increase in maxillary arch dimensions during orthodontic alignment in non-extraction cases range from 0.55 to 2.13 mm in the inter-canine region, while expansion in intermolar width ranging from 1.53 mm to 2.96 mm has been reported. It is believed that rectangular stainless steel arch wires produce expansion by promoting

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buccal movement of posterior teeth.[11] The importance of understanding each patient's arch form and preserving it during orthodontic treatment has been recommended.[3] It is now clear that changes in intercanine width can significantly increase the risk of post retention relapse and preservation of arch form is a necessary factor for stability of treatment.[3,12] A complete knowledge of the factors affecting the dental arch is beneficial to achieve satisfactory results with regard to esthetics, function and stability.[13,14]

The majority of dental arch width studies are on the relationship between arch dimension and dental malocclusion that may not be representative of the real skeletal malocclusion. Therefore the aim of this study was to evaluate the relationship between dental arch width and sagittal skeletal pattern in pretreatment records of orthodontic patients.

Material and Methods

This cross-sectional study was conducted at Orthodontics department, Khyber College of Dentistry, Peshawar, from January to June 2018. After the proposed,study was approved by institutional review board, a total of 150 subjects for the sample were recruited based on convenient sampling technique. Pretreatment study casts and cephalograms were obtained from the records of patients. The inclusion criterion was a full dentition except third molars, patients of either gender, any skeletal class, good quality casts and lateral cephalogram of high clarity. While the exclusion criteria was previous orthodontic treatment, crowding, history of bad oral habits, supernumerary teeth, deformed arch, ectopic canine, previous maxillofacial or orthognathic surgery and history of trauma. The lateral cephalograms were traced individually and Sella Nasion PointA (SNA), Sella Nasion PointB (SNB), PointA Nasion PointB (ANB) were measured. The inter-canine width (cusp tip) was measured on the dental cast using a digital caliper accurate to 0.001 mm.

Data was analyzed using SPSS version 23.0. Mean and standard deviation were calculated for numerical variables like SNA, SNB and intercanine width. Pearson's correlation coefficient was used to determine the correlation coefficients between the SNA, SNB angles and intercanine width.

Results

One hundred and fifty dental casts and cephalograms were evaluated. The minimum age was 18 years and the maximum age was 23 years with a mean age of 19.76±1.66 years. The sample consisted of equal number of males and females.

The mean, maximum, minimum and standard deviation of intercanine width including upper intercanine width (UICW) and lower intercanine width (LICW) are demonstrated in Table I. The skeletal sagittal parameters including SNA and SNB angles are also reported in Table I. The minimum value of UICW was 31.20mm and the maximum value was 36.90mm with the mean value 34.36±1.68mm. The minimum value of LICW was 24.60mm and the maximum value was 30.50mm with the mean value 26.76±1.43mm. The minimum SNA value was 77 degrees and maximum value was 90 degrees with the mean value of 84.63±3.37 degrees. The minimum SNB value was 73 degrees and the maximum value was 86 degrees with the mean value of 79.50 ±3.17 degrees.

According to Pearson correlation coefficients, there was a significant correlation of intercanine width with SNA and SNB. The correlation between intercanine width and sagittal skeletal parameters is demonstrated in Table II. There was a significant weak negative correlation ($p=0.002$) between UICW and SNA with a Pearson's correlation coefficient $\rho=-0.254$ as seen in scatter plot (Graph 1). There was a significant weak negative correlation ($p=0.010$) between UICW

and SNB with a Pearson's correlation coefficient ρ=-0.209.LICW showed a weak positive correlation with SNA (p=0.001) and SNB (p=0.000) with a Pearson's correlation coefficient ρ=0.260 and ρ=0.293 respectively.

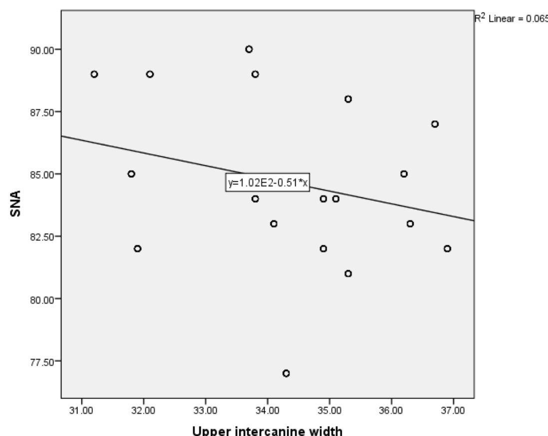
Table I: Intercanine Width and Skeletal Sagittal Parameters

	N	Minimum	Maximum	Mean	Std. Deviation
UICW	150	31.20	36.90	34.3640	1.68405
LICW	150	24.60	30.50	26.7653	1.43527
SNA	150	77.00	90.00	84.6333	3.37662
SNB	150	73.00	86.00	79.5000	3.17446
N	150				

Table II: correlation between intercanine Width and sagittal skeletal morphology

		SNA	SNB
UICW	Correlation(r)	-0.254**	-0.209*
	P-Value	0.002	0.010
LICW	Correlation(r)	0.260**	0.293**
	P-Value	0.001	0.000

*. Correlation is significant at the 0.05 level (2-tailed).



Graph1: correlation between intercanine Width and sagittal skeletal morphology(uicw and sna)

Discussion

It is important to have knowledge of the characteristics of different types of malocclusions and their dental and skeletal structures in order to carryout treatment with suitable treatment mechanics and a stable outcome.[15] The current study was carried out to find correlation of intercanine width with sagittal skeletal parameters. This study did not compare the difference of arch widths on basis of gender. A weak negative correlation of UICW with SNA and SNB angles was present. LICW had weak positive correlation with SNA and SNB angles.

The maxillary and mandibular intercanine widths were close to those noted by Rehan Q et al.[16] The results of this study showed a decrease in maxillary intercanine width as the SNA and SNB angles increased. In contrast, the mandibular intercanine width increased as the SNA and SNB angles increased. These results were in contrary to study carried out by Saffarshahroudi et al who stated that patients with a higher SNA angle had a wider dental arch in the canine area while there was no significant correlation between mandibular intercanine width and sagittal skeletal parameters. This may be due to the variation of dental arch width and sagittal skeletal morphology with race and ethnicity.[13] Another study by Traldi A et al conducted on primary and mixed dentition also concluded that dental arch widths are correlated to sagittal relationship.[17] Several studies have showed the relationship of dental arch width with other dentoskeletal features.[13] According to Enlow and Hans, class II patients have long, narrow palates and maxillary dental arch.[8] It is also believed that long-face individuals have a narrower transverse dimension and a short-face individual have a wider transverse dimension.[3] However, the studies on sagittal dimension shows more variant results.

The arch dimensions across the canines should not be changed in order to achieve a stable occlusion and individualized arch forms should be used in patients with different sagittal skeletal morphology.[18] With preadjusted brackets, the selection of a preformed archwire is an important step in

clinical orthodontic practice. Orthodontists do not agree on a single arch-form shape.[19] Therefore, it is crucial how practitioners make the correct design for the arch or how they select the appropriate form from arch wire blanks.[20]

Conclusions

From this study we concluded that a higher SNA and SNB angle was associated with a narrower maxillary dental arch in canine area. In mandible, a higher SNA and SNB angle was associated with a wider dental arch in canine area.

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