EVALUATION OF ARCH WIDTH VARIATIONS AMONG SKELETAL VERTICAL PATTERNS

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ABSTRACT

The relationship between vertical patterns and arch widths has always been a measure of interest. Present study was done to evaluate arch width variations among different skeletal vertical patterns. A cross sectional study was conducted at department of Orthodontics, Karachi Medical and Dental College, Karachi, Pakistan for six months after approval of synopsis with sample of 110 patients calculated by using WHO calculator. Arch width was calculated and SNMP angle was used for vertical plane analysis. One way ANOVA was used to evaluate differences between arch widths of patients with low, normal and high skeletal vertical patterns using SPSS 23.0. In terms of gender males were likely to have greater inter molar arch widths (i.e. 45.26±0.66) compared to that of females (i.e.42.97±0.31) though the measurements of <SNMP were found to be approximately equal for males(i.e.33.07±1.42) and females(i.e.33.10±0.78). Results indicated insignificant differences in Intermolar arch widths between high, normal and low SNMP angle groups (F2,107)=0.224, p=0.399) with p>0.05. An insignificant weak inverse relationship was witnessed between inter molar arch widths and SNMP(r=-0.96) with p >0.05.The findings of the study sum ups that the measurement of arch width does not vary in accordance to various skeletal vertical patterns. Greater arch widths were witnessed in patients belonging to normal angle category whereas patients having low & high angle SNMP were observed to have minimum arch widths.

Keywords: *arch widths, SNMP angle, vertical, variation, maxillary*

INTRODUCTION

Genuine diagnosis are essential in orthodontics.[1] Arch dimensions are one of the majors of interest for orthodontists for treatment planning of patients; it varies with time due to development and orthodontic treatments[2] which are necessary for functional and structural look of face and dentition.[3-4] The success and strength of orthodontic treatment relies on dental arch width and facial form of an individual.[5] Vertical face patterns acts as key factor for planning an orthodontic treatment.[6] The most important factor which enables to determine esthetics and harmony of a face includes vertical patterns.[7] It is a necessitation for orthodontist to understand the relationship between craniofacial structures and arch dimensions.[8] Facial morphology has long been accepted to be the result of each person's genotype and its phenotypic expression. It is also commonly believed that there is interaction between the functional capacity and the size of masticatory muscles and craniofacial form.[9] Three basic types of facial morphology exist: Short, average, and long. Those with long face have excessive vertical facial growth which is usually associated with an anterior open bite, increased sella-nasion–mandibular plane (SN-MP) angle, increased gonial angle, and increased maxillary/mandibular plane angle. Correct identification of a patients' arch form is an important aspect of achieving a stable, functional and aesthetic orthodontic treatment result; failure to preserve the arch form might increase the probability of relapse[10]. Improper arch wire changes can result in periodontal breakdown, recurrence of crowding of buccal segments, or increased crowding of labial segments particularly when inter-canine width and inter-molar width have been expanded. A research was carried out at Karachi Medical and Dental College in order to evaluate the arch width variations among different skeletal vertical patterns in patients reporting to KMDC. The major objective of study was to examine arch width variations among different skeletal vertical SNMP angle classes and to determine relationship between inter molar arch widths and SNMP.

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MATERIAL AND METHODS

A descriptive cross sectional study was conducted for six months after approval of synopsis at the department of orthodontics, Karachi Medical and Dental College, Karachi, Pakistan. A non-probability consecutive sampling technique was used to collect sample of patients. A Sample size of 110 patients was calculated by means of WHO calculator, taking the statistics of inter molar width in low angle cases as 46.18mm ± 1.6mm in margin of error 0.3 on confidence level 95%.[11]

Patients' with age 12-35 years, having fully erupted permanent teeth up to first molar as assessed clinically and belonging to any of angle classes I , II , III determined as per operational definition were included in the sample of study whereas patients who had any previous history of orthodontic treatment, presence of any fractured restorations or crowns with tooth anomalies such as number, size, form and position as confirmed on clinical examination & craniofacial anomalies/syndromes were excluded on the basis of medical record and history.

A verbal informed consent was taken from the patients before there examination was put in process.

Lateral cephalogram and upper and lower impressions were taken of each patient. Measurements were performed on pre-treatment dental casts. Intermolar arch width was calculated as distance from the central fossa of permanent maxillary first molar to its antimere using Vernier caliper. The lateral cephalogram were traced individually and SNA, SNB, ANB, and <SN-MP were measured.

All measurements were recorded on a predesigned Porforma. Arch width was measured as distance between the central fossa of first permanent molar of right side to the central fossa of first permanent molar of left side in the maxillary arch. SNMP angles of patients were divided into three categories high, normal and low. Patients having SNMP greater than 35 degrees were included in high angle group; patients having <SNMP ranging 35 ± 4 degrees were include in normal angle group whereas patients having SNMP less than 26 degrees were included in low angle group. Data was analyzed using SPSS 23.0. Mean and standard deviation was calculated for age & arch. Frequency and percentage was calculated for gender and age. One way analysis of variance was used in order to determine if any significant differences exist between groups of arch widths of patients having different SNMP angles. Pearson correlation analysis was run in order to determine relationship between measurements of inter molar arch widths and SNMP. P-value <0.05 was taken as significant.

RESULTS

The sample patients of the study included 25% of males (n=28) and 75% of females (n=82) with mean age of 17.88±4.38. The minimum & maximum age of patients of the study was found to be 12years & 35years respectively.

The mean measurement of arch width of patients was found to be 43.85±3.15.

The patients were divided into three crowding categories mild, moderate & severe. The higher frequency (n=40) of patients with severe crowding were examined in the study whereas patients with mild and moderate crowding were 25 & 31 respectively.

The <SNMP measurements were divided into three categories low, normal and high angle. 54.5% of patients were observed to lie in normal angle category (n=60), 26.4% of patients were found to lie in high angle category (n=29) & 19.1% of patients were in low angle category (n=21).

Greater inter molar arch widths were witnessed in patients belonging to normal angle category whereas patients having low & high angle SNMP were observed to have minimum arch widths.

In terms of gender males were likely to have greater inter molar arch widths (i.e. 45.26±0.66) compared to that of females (i.e.42.97±0.31) though the measurements of <SNMP were found to be approximately equal for males(i.e.33.07±1.42) and females(i.e.33.10±0.78)

Insignificant differences were observed in arch widths between high, normal and low SNMP angle groups $(F_{2,107})=0.224$, p=0.399) with p>0.05.

An insignificant weak inverse relationship was witnessed between inter molar arch widths and SN-MP(r=-0.96) with p >0.05. (See table 3)

DISCUSSION

Facial forms and arch widths are prime factors for orthodontic treatment. Various [5-9] studies have worked over vertical facial patterns.

Agarwal et.al.[12] reported cases with smaller arch widths have greater SN-MP angle. Afzal et.al.[13] found significant weak correlations between inter and lower canine widths with SNA and SNB. Sharma et.al.[14] found significant inverse correlation between arch widths and vertical facial pattern. However distinct studies[15-18] have reported insignificant association between dental arch forms and facial forms

As per the findings of this study, an insignificant weak inverse correlation was obtained between arch widths and <SN-MP in light of which it can be reported that as inter molar arch widths increases, the <SN-MP

TABLE 1: DESCRIPTIVE STATISTICS OF INTERMOLAR ARCH WIDTHS WITH RESPECT TO <SN-MP ANGLE

	N	Mean	Std. Deviation	Minimum	Maximum
Low angle	21	43.9600	3.40740	35.20	49.84
Normal angle	60	43.4853	3.32088	34.23	54.54
High angle	29	43.3900	2.65563	36.23	49.03

TABLE 2: OUTPUT OF ANOVA OF INTER MOLAR ARCH WIDTHS AND SN-MP ANGLE CLASSES

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.523	2	2.262	.224	.800
Within Groups	1080.338	107	10.097		
Total	1084.862	109			

TABLE 3: PEARSON CORRELATION BETWEEN ARCH WIDTHS AND SN-MP MEASUREMENTS

Variables	Pearson Correlation(r)	p-value
Inter molar arch width*SN-MP measurements	-0.96	0.318

angle decreases and vice versa. However, they do not significantly affect each other; though in studies by Forster CM et.al[11] and Amber et.al[19] the relationship between arch widths and SN-MP angles was found to be significant.

Amit et.al[6] found out that as vertical height increases, the arch width decreases. Similarly in this study, an inverse weak relation was observed between arch widths and <SNMP. Mandava Prasad et.al[20] and Amit et.al[6] observed in their studies that males have greater arch widths compared to females. The same results were attained in this study.

In another study by Amber et.al[19], significant differences were observed between inter canine widths in low, normal and high angle classes with $p<0.05$ and in study by Raghdal[21] significant differences were observed between arch widths and skeletal classes but in this study differences between inter molar arch widths were determined with respect to high, normal and low SNMP angle classes which were found to be insignificant with $p>0.05$.

CONCLUSION

Most patients are observed to lie in normal SBMP angle category. Males have greater arch widths compared to females. The measurement of arch width does not vary in accordance to various skeletal low, normal and high vertical patterns. As well as weak correlation exist between arch widths and SNMP measurements.

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1 Warda Arif Khan: Wrote article
2 Syed Shah Faisal & Syed Sheraz Hussain: Supervised the study