

Correlation of inter-premolar and inter-molar width with vertical facial morphology in patients seeking orthodontic treatment

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Abstract

Introduction: Many correlations exist between the vertical skeletal dimensions and the arch widths and forms. It is of importance to know of any correlation between the two and hence the rationale of present study was to see if there is any relation between the arch width and vertical facial pattern in untreated individuals. This may help us in determining the kind of arch wires to be used and whether the arches need to be expanded during treatment or not.

Material and Methods: 100 lateral cephalometric radiographs and dental casts were obtained, traced and measured for SN-MP angle, inter-premolar and inter-molar width. The data was analyzed using SPSS version 10. Descriptive statistics were calculated, mean and SD were ascertained for age, Inter first pre-molar width, Inter molar width and SNMP angle. Frequency and percentage were presented for gender. Pearson's correlation coefficient was used to elucidate the correlation of Inter first premolar width, Inter molar width and SNMP angle. r value was between -1.0 and +1.0.

Results: The p -value for all the results was $> .05$ when comparison was made between Inter First premolar width, Inter molar width in maxilla and mandible with SNMP angle.

Conclusions: There was a statistically insignificant relationship between dental arch width (inter first premolar and inter molar width) and vertical facial morphology.

Keywords: Arch width; vertical facial morphology; arch form

Introduction

In diagnosis and treatment planning, orthodontists recognize the characteristics of malocclusion and facial deformity, define the nature including the cause of problems and design a treatment plan based on the needs and desires of the patients.¹ Facial symmetry is of important value to dentists and especially to orthodontists, not only because many important organs are concentrated in this area

but also because of the social value of the face. During treatment in a patient we not only treat malocclusion but also the profile as well so different diagnostic aids are used. The conventional cephalometric analyses of Down's, Steiner, Tweed, Ricketts, Johnston, Jacobson, Wylie, Sassouni, McNamara & Jarabak are still widely used in diagnosis & treatment planning of patients for orthodontics / orthopedics & orthognathic surgeries.^{2,3} Lateral cephalometric radiographs were used by orthodontists to find out the norms for different dental, skeletal and soft tissue variables. Later on it was also used to find out different facial proportions of the human face. These proportions are in three planes of spaces namely horizontal, vertical and in sagittal planes. Vertical facial pattern of a face can be determined by a number of factors. Angular

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measurements SN-MP angle is one of the most important.^{4,5}

In the Steiner analysis, the SN-MP angle is used to establish the vertical position of the mandible.⁶ Other studies have also used SN-MP angle as one of the parameters to show vertical facial pattern.⁷ According to the studies done on vertical proportions of the face, there are three basic types of vertical facial pattern namely long face, average face and short face.⁸ Long face has excessive vertical facial growth. It is usually associated with anterior open bite and an increased SN-MP angle.⁹

Dental arch width can be found out by measuring the, inter-premolar and inter-molar width in both maxilla and mandible.¹⁰ The changes in the dental arch dimensions that occur as a result of growth and treatment are of interest to the orthodontist and require careful consideration during treatment planning. A greater understanding of these changes could influence the patient's expectations from treatment as well as the formulation of the treatment and retention plans by the clinician.^{11,12}

The purpose of the present study was to investigate if dental arch widths (inter first pre-molar and inter-molar width) are correlated with vertical facial types (MP - SN angle). One of the orthodontic treatment goals is to achieve balance and harmony in vertical facial proportions. So emphasis should be made during treatment planning to bring the facial proportion within the normal range so that facial esthetics can be improved.

Material and Methods

Data was collected from patients who reported to KRL hospital Islamabad from January 2010 to June 2010. 100 subjects fulfilling inclusion criteria were selected. Male/female patients seeking orthodontic treatment, having complete permanent dentition up to first permanent molars, without supernumerary tooth, tooth extraction before the study (excluding 3rd

molar) and no skeletal asymmetry were included in the study. Patients who had received orthodontic treatment, with unilateral or bilateral posterior cross bites were excluded from the study. 100 lateral cephalometric radiographs and dental casts were obtained, traced and measured for SN-MP angle, inter-premolar and inter-molar width. The data was analyzed using SPSS version 10. Descriptive statistics were used to calculate mean and SD for age, Inter first pre-molar width, Inter molar width and SNMP angle. Frequency and percentages was presented for gender. Pearson's correlation coefficient was performed to find out the correlation between inter first pre-molar width, inter-molar width and SNMP angle. *r* value was determined between -1.0 and +1.0.

Results

The minimum age was 10 years and maximum age of the sample patients was 38 years with mean age of 15.31 ± 4.761 years. There were 66% females and 34% males in the sample. The mean SN-MP angle was 33.80 ± 6.072 with a minimum angle of 21 degrees and a maximum of 50 degrees. The mean inter first pre-molar width of maxilla was 34.155 ± 2.8584 mm with minimum measurement of 25 mm and a maximum value of 41 mm was. Similarly, inter first premolar width of mandible had a minimum value of 15 mm and a maximum value of 38 mm. The mean value of inter first premolar width of mandible was 29.44 mm with a standard deviation of 3.0578 mm. The distribution of inter molar width of maxilla showed that the minimum measurement of inter molar width of maxilla was 23 mm and maximum being 53 mm. The mean value of inter-molar width of maxilla was 45.30 with a standard deviation of 3.6383 mm. Similarly the mean inter-molar width of mandible was 40.735 ± 2.9237 mm with a minimum value of 33 mm and a maximum value of 48 mm. The results of analysis showed that the correlation

of SN-MP angle with inter-first pre-molar width of maxilla was slightly significant with negative relationship showing $r = -0.192$ and p-value 0.056 (Table I). But the correlation of SN-MP angle with inter first pre-molar width of mandible was not statistically significant although it had a minor correlation of $r = -0.034$ with p-value > 0.05 (Table II). There was also a minor correlation between SN-MP angle and inter molar width of maxilla but was also insignificant ($r = 0.031$ and p-value > 0.05 , Table III). Similarly, the correlation of SN-MP angle with inter molar width of mandible was also insignificant with $r = 0.045$ and p-value > 0.05 (Table IV).

Table I: Correlation of SN-MP angle with Inter first premolar width (Maxilla)

	Correlations	Inter first premolar width (Maxilla)
SN-MP angle	Pearson Correlation	-.192
	Sig. (2-tailed)	.056**
	N	100

** Correlation is slightly significant at 5% level of significance

Table II: Correlation of SN-MP angle with Inter first premolar width (Mandible)

	Correlations	Inter first premolar width (Mandible)
SN-MP angle	Pearson Correlation	-.034
	Sig. (2-tailed)	.734*
	N	100

* Correlation is Insignificant at 5% level of significance

Table III: Correlation of SN-MP angle with Inter molar width (Maxilla)

	Correlations	Inter molar width (Maxilla)
SN-MP angle	Pearson Correlation	.031
	Sig. (2-tailed)	.757*
	N	100

* Correlation is Insignificant at 5% level of significance

Table IV: Correlation of SN-MP angle with Inter molar width (Mandible)

	Correlations	Inter molar width (Mandible)
SN-MP angle	Pearson Correlation	.045
	Sig. (2-tailed)	.656*
	N	100

* Correlation is Insignificant at 5% level of significance

Discussion

Correction of vertical dysplasia is very important in achieving balanced profile after orthodontic treatment. In this study, a sample of 100 patients was selected fitting in the inclusion criteria. Three groups were made on the basis of SN-MP angle into normal, low and high angle cases. Patients in which SN-MP was 32 to 34 were put in normal angle group, patients having SN-MP less than 32 were grouped in decreased angle cases and patients having SN-MP angle more than 34 were grouped as increased angle cases. In this study, more female subjects were present as the sample was not collected on the basis of gender.

As far as distribution of sample according to SN-MP angle was concerned, patients with normal angle were more as compared to the patients in other groups. Correlation of SN-MP angle with Inter first pre-molar width in maxilla and mandible and Inter molar width in maxilla and mandible respectively was significant at 0.01 Level (2-tailed). P value was significant at 0.05 level taking Post Hoc Turkey's test in comparison to SN-MP angle with Inter first premolar width and Inter molar width in maxilla and mandible in low, normal and high SN-MP angle categories.

This finding should be considered during treatment planning, biomechanics decision and appliance selection so that extrusive or intrusive mechanics can be done in different arch widths

The correlation of SN-MP angle with inter first premolar width in maxilla was significant with negative relationship showing $r = -0.617$ and p -value 0.000. The negative sign shows that the correlation between SN-MP angle and inter first premolar width (maxilla) is inversely proportional such that as the angle increases, the width decreases.

The correlation of SN-MP angle with inter first premolar width of mandible was also statistically significant and negatively correlated with correlation coefficient $r = -0.573$ and with a p -value 0.000. There was also a strong and negative correlation between SN-MP angle and inter molar width of maxilla ($r = -0.543$ and p -value 0.000).

Conclusions

On the basis of results, it was concluded that:

1. In both males and females, as SN-MP angle increased; arch width tended to decrease at inter pre-molar and inter-molar areas.
2. P value was significant at 0.05 level in comparison of SN-MP angle with inter first pre-molar width and Inter-molar width in

maxilla and mandible in low, normal and high SN-MP angle categories.

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