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Correlation of Inter Canine Width with Basal Plane Angle in Patients Seeking Orthodontic Treatment

Research Article

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Abstract

Introduction: It is generally accepted that an important relationship exists between the arch width and basal plane angle. The size and form of the dental arches can have considerable implications on orthodontic diagnosis and treatment planning. The changes that occur in the dental arch dimensions and treatment are of interest to the orthodontist, and require careful consideration during treatment planning. A better understanding of these changes could influence the formulating an efficient treatment and retention plans by the clinician. The objective of this study was to determine relationship between inter canine width and basal plane angle in a sample of patients seeking orthodontic treatment.
Materials and Methods: 50 subjects were included in the study. 50 lateral cephalometric radiographs and dental casts were obtained, and traced. On lateral cephalograph, palatal plane (PP)- mandibular plane (MP) angle was measured using digital method. On dental casts inter-canine widths were measured.
Results: When comparison was made between inter-canine width with basal plane angle, the p-value for all the results was significant with a p value <0.05. It was concluded from this study that there is a statistically significant relationship between inter canine widths and basal plane angle.
Conclusion: Growth patter influences inter-canine widths of an individual and this must be considered while destining treatment plan for the patient.

Keywords: Arch Width; Basal Plane Angle; Inter-Canine Width; Lateral Cephalometry; Canine Width.

Introduction

Lateral cephalometry has been widely used in clinical orthodontics to assess the skeletal, dental, and soft tissue relationships of craniofacial complex [1]. Proper knowledge of facial structures is very important to achieve ideal facial profile and pleasing esthetic harmony [2]. In this new era, facial harmony is of paramount value especially to orthodontists [3]. Before treating an orthodontic patient, every aspect of treatment should be planned in a way that not only to correct the malocclusion but also to improve facial esthetics and profile. That is why during treatment planning, orthodontists have to have certain diagnostic aids to assess various diagnostic parameters [4]. Various cephalometric analyses have been done to study the relationship of teeth with each other and with skeletal bases in the sagittal and vertical planes. Basal plane angle of face can be determined by a number of factors, among which PP-MP angle is one of the most important [5]. Facial types are determined by different parameters, such as ratio between the lower and upper anterior facial height, the angle formed between the mandibular plane and the base of the skull, and the gonial angle [6].

Usually patients with high PP-MP angle tends to have a long, narrow face, and one with low PP-MP angle often has a short, broad face [7, 8]. A study was done to assess the relationship between dental arch width and vertical facial morphology [9]. Ricketts et al. (1982), Enlow and Hans (1996) and Wagner and Chung (2005) reported that a long-faced individuals usually have narrow transverse dimension and a short-faced individuals have wider transverse dimension [9]. Howes (1957) found that steep MP individu-

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als generally had larger teeth and narrower and shorter arches than flat mandibular plane individuals when measured from the buccal cusp tips of the maxillary first premolars.

Clinically, preformed arch wires are routinely used by many orthodontists regardless of the facial type and gender of the patients. The purpose of the present study was to investigate the correlation of dental arch width with basal plane angle. This will help us to determine which arch wires to be used in individual facial types.

Material and Methods

A cross sectional study was conducted in the Department of Orthodontics and Dentofacial Orthopaedics, Saveetha Dental College and Hospitals, Chennai, India. 50 patients seeking orthodontic treatment were selected for the study. The subjects were selected based on following inclusion and exclusion criteria:

Inclusion criteria

• Male and female patients having permanent dentition up to first permanent molar
• No supernumerary tooth
• No permanent tooth extraction before the study (excluding 3rd molar)
• No skeletal asymmetry

Exclusion criteria

• Patients who had received previous orthodontic treatment
• unilateral or bilateral posterior cross bites

Patients history was taken and clinical examination was done to confirm the inclusion criteria. Alginate impressions of patients were taken and casts were poured out of them. A digital Vernier calliper was used to record the measurements on dental cast. The inter-canine width of maxilla and mandible was recorded.The inter canine width was measured from cusp tip of canine to the cusp tip of the other canine.(Figure 1)

Lateral cephalograms was taken and each radiographic film was traced on Facad® Software. For each individual PP-MP angle was measured.The collected data was co-related,each patients inter-canine width was co-related to the basal plane angle.

Result

A total of 50 untreated adults were selected in this cross-sectional study to find out the correlation between inter-canine width and basal plane angle in patients seeking orthodontic treatment. The minimum age was above 16 years whereas the maximum age of patients was 32 years with a mean age of 16.62 ± 4.974 years.

The distribution of PP-MP angle showed that the mean PP-MP angle was 24.98 ± 7.61 with a minimum angle of 15.23 degrees and maximum of 40.34degrees. There were 18 (36%) persons who had low PP-MP angle (< 22), 14(28%) had normal PP-MP angle (23-27) and 18 (36%) participants of the study had high PP-MP angle(>27).(Table-1)

To find out the correlation of PP-MP angle with inter-canine width of maxilla and inter-canine width of mandible, Pearson correlation analysis was applied. Which showed that there was statistically significant and strong correlation of -0.919 between PP-MP angle and inter-canine width of maxilla, but a weak co-relation of -0.419 between the basal plane angle inter-canine width of mandible in this study (Table -2).

Figure 1. Inter-canine width as measure on dental cast using vernier calliper.

Table 1. Basal Plane Angle amongst three growth patterns.

Divergence	N	Mean	Standard Deviation
Normodivergent	14	24.55	3.89
Hyperdivergent	18	35.33	3.38
Hypodivergent	18	17.78	2.44

Table 2. Co-relation between inter-canine width of maxilla and mandible to bass-plane angle.

Inter-canine width	Co-relation	Significance
Maxilla	-0.919	0.001**
Mandible	-0.419	0.05**
**=Statistically significant		

Discussion

Correction of vertical dysplasia is very important in achieving a balanced profile after orthodontic treatment. As per the results of this study mean inter-canine width decrease as the basal plane angle increases, hence individualised arch forms should be used in patients with variable vertical pattern. This confers to the basic law of stability according to which arch dimensions should not be changed especially across the canines. Use of arch expansion mechanics in patients with increased PP-MP angle should be at all avoided or used with maximum caution. In comparison with a study performed by Forster et al for the maxillary arch, there was a statistically significant inverse relationship between the mandibular plane angle and dental arch widths. However, statistical analysis showed that the r value was small, which suggests that the correlation was not very strong [15]. Similarly in this study, results showed that there was statistically significant and strong correlation between PP-MP angle and inter-canine width of maxilla. Our study did not compare the difference of arch widths on basis of gender, like the previous studies by Howes, 1957; Isaacson et al, 1971; Nasby et al, 1972; Schulhof et al, 1978 but another study investigated untreated adult males and females separately which showed a significant differences in maxillary and mandibular arch widths in males and females [17, 18].

Musculature has a possible link in this close relationship between the transverse dimension and vertical facial morphology. There are a number of studies have illustrated the influence [19] of masticatory muscles on craniofacial growth. The general agreement is that individuals with strong or thick mandibular elevator muscles tend to exhibit wider transverse head dimensions (Ringqvist, 1973; Ingervall and Helkimo, 1978; Weijs and Hillen, 1984; Kiliaridis and Kalebo, 1991; Van Spronsen et al., 1991; Bakke et al. , 1992; Kiliaridis, 1995) [20, 21]. Strong masticatory musculature is often associated with a brachyfacial pattern (short face). This muscular hyperfunction causes an increased mechanical loading of the jaws. This, in turn, may cause an induction of sutural growth and bone apposition which then results in increased transverse growth of the jaws and bone bases for the dental arches.

In terms of the difference in arch width between males and females, Wei (1970) evaluated PA cephalograms of Chinese adults and noted gender differences in maxillary and mandibular intercanine widths [22]. Eroz et al. (2000) reported that in children, males had significantly larger intermolar widths than females [23]. Ideally, this type of study should have been conducted on patients with ideal dentitions without any crowding or spacing [23]. However, due to difficulties in finding ideal untreated subjects and subsequent limitations in sample size, the degree of crowding and spacing was not included in the accepted criteria.

Conclusion

The following conclusion can be made from this study: Since dental arch width is associated with facial vertical morphology, using individualised arch wires according to each patient's pre-treatment arch form and inter canine widths is suggested during orthodontic treatment.

References

[1]. Felicita AS, Chandrasekar S, Shanthasundari KK. Determination of craniofacial relation among the subethnic Indian population: a modified approach (vertical evaluation). Indian J Dent Res. 2013 Jul-Aug;24(4):456-63. Pubmed PMID: 24047838.

[2]. Gayathri M, Arun AV. Relationship between nasolabial angle and maxillary incisor proclination in South Indian population. Drug Invention Today. 2018 Sep 2;10.

[3]. Farooq A, Mahmood A, Jabbar A. Correlation of inter canine width with vertical facial morphology in patients seeking orthodontic treatment. Pakistan Oral & Dental Journal. 2015 Jun 1;35(2).

[4]. Christie TE. Cephalometric patterns of adults with normal occlusion. Angle Orthod. 1977 Apr;47(2):128-35. Pubmed PMID: 266384.

[5]. Jena AK, Duggal R. Hyoid bone position in subjects with different vertical jaw dysplasias. The Angle Orthodontist. 2011 Jan;81(1):81-5.

[6]. McNamara JA, Bruden WL. The cephalometric evaluation of the orthodontic patient. McNamara JA, Burdon WL. Orthodontic and Orthopedic treatment in the mixed dentition. Michigan: Needham Press Inc. 1993:13-4.

[7]. Forster CM, Sunga E, Chung CH. Relationship between dental arch width and vertical facial morphology in untreated adults. Eur J Orthod. 2008 Jun;30(3):288-94. Pubmed PMID: 18263889.

[8]. Kikuchi M, Higurashi N, Miyazaki S, Itasaka Y, Chiba S, Nezu H. Facial pattern categories of sleep breathing-disordered children using Ricketts analysis. Psychiatry and clinical neurosciences. 2002 Jun;56(3):329-30.

[9]. Adams GL, Gansky SA, Miller AJ, Harrell WE Jr, Hatcher DC. Comparison between traditional 2-dimensional cephalometry and a 3-dimensional approach on human dry skulls. Am J Orthod Dentofacial Orthop. 2004 Oct;126(4):397-409. Pubmed PMID: 15470343.

[10]. Isaacson JR, Isaacson RJ, Speidel TM, Worms FW. Extreme variation in vertical facial growth and associated variation in skeletal and dental relations. Angle Orthod. 1971 Jul;41(3):219-29. Pubmed PMID: 5283670.

[11]. Howes AE. Arch width in the premolar region—still the major problem in orthodontics. American Journal of Orthodontics. 1957 Jan 1;43(1):5-31.

[12]. Bishara SE, Jakobsen JR, Treder J, Nowak A. Arch width changes from 6 weeks to 45 years of age. Am J Orthod Dentofacial Orthop. 1997 Apr;111(4):401-9. Pubmed PMID: 9109585.

[13]. Ward DE, Workman J, Brown R, Richmond S. Changes in arch width. A 20-year longitudinal study of orthodontic treatment. Angle Orthod. 2006 Jan;76(1):6-13. Pubmed PMID: 16448262.

[14]. Forster CM, Sunga E, Chung CH. Relationship between dental arch width and vertical facial morphology in untreated adults. Eur J Orthod. 2008 Jun;30(3):288-94. Pubmed PMID: 18263889.

[15]. Schudy FF. Vertical growth versus anteroposterior growth as related to function and treatment. The Angle Orthodontist. 1964 Apr;34(2):75-93.

[16]. Chung CH, Wong WW. Craniofacial growth in untreated skeletal Class II subjects: a longitudinal study. American journal of orthodontics and dentofacial orthopedics. 2002 Dec 1;122(6):619-26.

[17]. NASBY JA, ISAACSON RJ, WORMS FW, SPEIDEL TM. Orthodontic extractions and the facial skeletal pattern. The Angle Orthodontist. 1972 Apr;42(2):116-22.

[18]. Schulhof RJ, Lestrel PE, Walters R, Schuler R. The mandibular dental arch: part III. Buccal expansion. Angle Orthod. 1978 Oct;48(4):303-10. Pubmed PMID: 281887.

[19]. Weijs WA, Hillen B. Relationships between masticatory muscle cross-section and skull shape. J Dent Res. 1984 Sep;63(9):1154-7. Pubmed PMID: 6589280.

[20]. Ringqvist M. Isometric bite force and its relation to dimensions of the facial skeleton. Acta Odontol Scand. 1973;31(1):35-42. Pubmed PMID: 4513594.

[21]. Kiliaridis S. Masticatory muscle influence on craniofacial growth. Acta Odontologica Scandinavica. 1995 Jan 1;53(3):196-202.

[22]. Wei SH. Craniofacial width dimensions. Angle Orthod. 1970 Apr;40(2):141-7. Pubmed PMID: 5266015.

[23]. Eröz UB, Ceylan I, Aydemir S. An investigation of mandibular morphology in subjects with different vertical facial growth patterns. Aust Orthod J. 2000 Mar;16(1):16-22. Pubmed PMID: 11201956.