ORIGINAL ARTICLE

INTERCANINE AND INTERMOLAR WIDTHS IN ANGLE CLASS I, II AND III MALOCCLUSIONS

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ABSTRACT

Malrelation along the transverse plane is one of the most common causes of malocclusion and can be assessed by considering the intercanine and intermolar widths. An endeavour was undertaken to find the intercanine and intermolar widths on 76 dental casts of the individuals having Class I,Class II division 1,Class II division 2,Class III and Class II subdivision malocclusions, visiting orthodontic department of Sardar Begum dental college and hospital, Peshawar. Results were obtained using SPSS version 20 which showed the mean maxillary intermolar widths of 34.6mm,34.5mm,30.9mm,34.7 mm and 34.18mm for Class I, Class II division 1,Class II division 2,Class III and Class II subdivision groups respectively. Mean maxillary intercanine widths were found to be 24.16mm, 24.5mm, 24.6mm, 23.9mm and 23.05mm for Class I, Class II division 1,Class II division 2,Class III and Class II subdivision groups respectively. Similarly mean mandibular intermolar widths were 32.8mm, 33.02mm, 30.3mm, 33.1mm and 32.8mm for Class I, Class II division 1, Class II division 2, Class III and Class II subdivision groups respectively. While mean mandibular intercanine widths were found to be 19.2mm,19.06mm,20.34mm,19.54mm and 18.75mm for the Class I, Class II division 1,Class II division 2,Class III and Class II subdivision groups respectively. ANOVA analysis showed no statistical significant differences in the intermolar and intercanine widths among the five malocclusion groups.*

Key Words: *Intermolar width, intercanine width, maxillary arch, mandibular arch, dental arch.*

INTRODUCTION

Assessment of arch width and arch depth is one of the most important diagnostic criteria for a malocclusion. A relationship between crowding, archform[1,2], intercanine and intermolar widths and the types of malocclusions has been described in many studies.[3,4] Transverse dimensions of the maxillary and the mandibular arches play a key role in the esthetics of a pleasing smile.[5] Also, in narrow transverse skeletal problems the upper molars are compensated naturally in a buccal direction and their lingual cusps hang down below the curve of Wilson ,though there may not be a cross bite situation but this may lead to an occlusal interference from the palatal cusps of upper molars.[6] Bishara and colleagues[7] reported that intermolar width increases 7 to 8 millimeter between the deciduous dentition (5 years of age) and the early mixed dentition (8 years of age) and an additional 1 to 2 millimeter between the early mixed and early permanent dentition (12.5 years of age). Moyers and colleagues[8] showed greater increase for males than females for both maxillary and mandibular intermolar widths. Staley et al[9] showed that intermolar and intercanine widths of the maxillary and mandibular arches were narrower in the Class II division 1 patients than the normal occlusion individuals in both the sexes. Many analyses had been carried out to predict the intercanine and intermolar widths of the individuals, among these are the Pont's index[10], Schwarz analysis[11] and McNamara and Brudon's prediction method.[12] Though nimkarn[13] claimed that all these methods of predicting the arch widths are inaccurate. Chen et al[14] showed the difference between the maxillary and mandibular skeletal base and the intermolar widths between the skeletal Class III and the Class I subjects. They concluded that the maxillary skeletal bases and the intermolar widths of the Class III subjects were significantly smaller than the Class I individuals, though there were no significant differences.

Since consideration of arch width for treating a particular malocclusion is of utmost importance, in view of the above mentioned studies maxillary and mandibular intermolar and intercanine widths of the Angle Class I, II and III individuals of our sample has been carried out.

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METHODOLOGY

It was a cross sectional descriptive study carried out with the objective to determine the intercanine and intermolar widths of the patients having either Angle Class I, II division 1, II division 2, III and II subdivision malocclusions (Fig. 1) coming to the Orthodontic department of Sardar Begum Dental College for orthodontic treatment during the period from April 2009 till December 2011. A supplemental comparison among the different groups of malocclusion for the said variables was also obtained. This study was carried out on 76 dental casts of the selected individuals. A non probability purposive sampling technique was used. Inclusion criteria for this study was dental casts with mild (1-4mm) crowded maxillary and mandibular dental arches with all permanent teeth present from right first molar to left first molar which were fully erupted. Those individuals with caries, trauma, attrition of the occlusal surfaces of the teeth, asymmetric mandibular arch forms, missing teeth, prosthetic replacements, severely crowded/spaced lower arches and periodontally compromised dentition were excluded from the sample. All dental casts were available in white orthodontic stone (Diestone Dentamerica^{R}).

Intermolar and intercanine widths were measured on the dental casts with the help of digital calliper (Guo gen^{R}- made in China) with pointed measuring tips accurate to 0.1mm at the midpoint of cervical region of each molar and canine on its lingual surface to a corresponding point on its antimere. The data was then analyzed on SPSS version 20. A comparison for the intermolar and intercanine widths amongst the five malocclusion groups was carried out using one way ANOVA analysis.

RESULTS

Table 1 and 2 show the mean intermolar widths of the maxillary and the mandibular arches of Class I, Class II division 1, Class II division 2, Class III and Class II subdivision malocclusions along with their standard deviations and ranges. Table 3 and 4 depict the mean intercanine widths of maxillary and mandibular arches respectively along with their standard deviations and ranges of the said malocclusion groups. Table 5 depicts the significance of difference of the intermolar and intercanine widths among the five malocclusion groups.

DISCUSSION

In this study the same method for determining the intermolar and intercanine widths was applied as in Howe's[3] study since that procedure nullified the buccolingual size variations of molars and canines that could affect the measurements of original transverse widths of maxilla.

The mean intermolar width of maxilla of the sample as shown by table 1 for all the malocclusions is 34.48mm. This value is in agreement with the Howe's[3] study in which he found the mean maxillary intermolar width of 37.4mm for the male group and 36.2mm for the female

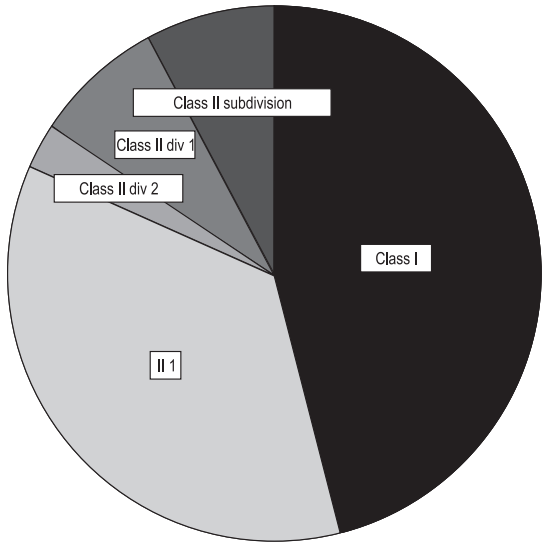

Fig. 1: Malocclusion groups of the sample

group with a range between 35-39mm in the Class I individuals. He also suggested palatal expansion for an intermolar width of less than 31mm.

The mean maxillary intermolar widths of the Class I and Class II division 1 individuals are 34.66mm and 34.53mm respectively. This finding is contrary to what Staley et al[9] found in their study which showed a considerable difference for the mean intermolar widths between the Class I and Class II individuals. He concluded that the prognathic maxillary arch compensated by lingual tilting of the maxillary molars for better interdigitation and buccal overjet thus reducing the intermolar width. However there is a notable difference of 3.68mm in the mean maxillary intermolar width between the Class I and Class II div 2 individuals of our sample (Table 1). As far as the difference between Class I and Class III individuals for the intermolar width is concerned it is negligible i.e 0.1mm, though Chen et al[14] showed a significant difference in their study.

Mean mandibular intermolar widths of Class I, Class II division 1, Class II division 2, Class III and Class II subdivision individuals are 32.82mm, 33mm, 30.3, 33.16mm and 32.8mm respectively (Table 2). Mean mandibular intermolar width in Class I individuals was found to be 34.1mm by Howe's[3] whereas Staley[9] showed that Class I individuals had the mean mandibular intermolar widths larger than the Class II division 1 and 2 groups which holds true for Class II division 2 but contrary to our findings for Class II division 1 individuals.

The mean maxillary intercanine width (Table 3) is 24.16mm in the Class I individuals of our sample, while in the Howe's[3] sample it was 26.4mm. Staley et al[9] showed that Class I individuals of his sample had larger maxillary intermolar and intercanine widths than the other malocclusion groups. From Table 3 and 4 one can figure out that both the mean intercanine widths of maxilla and mandible in Class II division 2 individuals are not much different from the rest of the malocclusion groups, which suggest that these indi-

TABLE 1: INTERMOLAR WIDTH OF MAXILLA

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Class I	35	34.6683	2.75990	.46651	33.7202	35.6163	29.55	41.60
Class II div 1	27	34.5348	2.40585	.46301	33.5831	35.4865	29.00	39.49
Class II Div 2	2	30.9850	.67175	.47500	24.9496	37.0204	30.51	31.46
Class III	6	34.7067	3.43810	1.40360	31.0986	38.3147	30.33	40.81
Class II Sub	6	34.1800	1.67908	.68548	32.4179	35.9421	32.14	36.34
Total	76	34.4884	2.60695	.29904	33.8927	35.0841	29.00	41.60

TABLE 2: INTERMOLAR WIDTH OF MANDIBLE

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Class I	25	32.8244	2.81313	.56263	31.6632	33.9856	27.60	38.60
Class II div 1	21	33.0286	3.76778	.82220	31.3135	34.7436	22.60	39.00
Class II Div 2	2	30.3000	.70711	.50000	23.9469	36.6531	29.80	30.80
Class III	5	33.1600	2.68477	1.20067	29.8264	36.4936	30.80	37.20
Class II Sub	5	32.8000	1.76068	.78740	30.6138	34.9862	30.80	35.20
Total	58	32.8381	3.04861	.40030	32.0365	33.6397	22.60	39.00

TABLE 3: INTERCANINE WIDTH OF MAXILLA

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Class I	35	24.1686	2.93152	.49552	23.1616	25.1756	19.79	32.26
Class II div 1	27	24.5189	3.18554	.61306	23.2587	25.7790	18.86	32.74
Class II Div 2	2	24.6600	5.33159	3.77000	-23.2424	72.5624	20.89	28.43
Class III	6	23.9650	2.41791	.98711	21.4276	26.5024	20.10	26.91
Class II Sub	6	23.0583	2.28968	.93476	20.6555	25.4612	20.16	26.22
Total	76	24.2022	2.94676	.33802	23.5289	24.8756	18.86	32.74

viduals do not have wide arches, though, are squarish which is the unique feature of this malocclusion.[1,2]

The difference among the five malocclusion groups is nonsignificant for both the maxillary and mandibular intermolar and intercanine widths (Table 5).

The nonsignificant results for the intermolar and intercanine widths among the five malocclusion groups could be due to the greater compensatory effects of the dentoalveolar apparatus to the interarch discrepancies. Though in this study the compensatory effects would have less impact on the results, since these are less expressed at the lingual gingival margin level from where the measurements were taken.

TABLE 4: INTERCANINE WIDTH OF MANDIBLE

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Class I	35	19.2040	2.12464	.35913	18.4742	19.9338	15.37	23.82
Class II div 1	27	19.0607	2.44417	.47038	18.0939	20.0276	13.75	25.72
Class II Div 2	2	20.3400	.76368	.54000	13.4786	27.2014	19.80	20.88
Class III	6	19.5450	1.71937	.70193	17.7406	21.3494	16.65	21.50
Class II Sub	6	18.7517	1.06976	.43673	17.6290	19.8743	17.27	20.13
Total	76	19.1742	2.11308	.24239	18.6914	19.6571	13.75	25.72

TABLE 5:ANOVA ANALYSIS TO SHOW THE COMPARISON OF INTERMOLAR AND INTERCANINE WIDTHS AMONG THE GROUPS OF MALOCCLUSION

		Sum of Squares	df	Mean Square	F	Sig.
intermolar width of max	Between Groups	26.595	4	6.649	.977	.426
	Within Groups	483.121	71	6.805		
	Total	509.716	75			
intermolar width of mandible	Between Groups	14.176	4	3.544	.364	.833
	Within Groups	515.584	53	9.728		
	Total	529.760	57			
intercanine width of maxilla	Between Groups	11.355	4	2.839	.315	.867
	Within Groups	639.900	71	9.013		
	Total	651.254	75			
intercanine width of mandible	Between Groups	4.993	4	1.248	.269	.897
	Within Groups	329.889	71	4.646		
	Total	334.882	75			

CONCLUSION

The values for the mean intercanine and intermolar widths of our sample closely match among the five malocclusion groups, unlike the previous studies which reported significant differences for the said variables among the Class I, Class II and Class III malocclusions.

No statistical significant differences were found for the intercanine and intermolar widths among the three malocclusion groups.

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