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The Assessment of Intercanine and Intermolar Widths in Angle Class I, II and III Malocclusion in Patients Reporting Orthodontics Department SPH Quetta

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Abstract:

Background: *Malocclusion due to misalignment on the transverse plane is frequently caused by malrelation, which can be evaluated by examining the intercanine and intermolar widths. A study was conducted to measure the intercanine and intermolar widths on 76 dental casts of patients with various types of malocclusions, including Class I, Class II division 1, Class II division 2, Class III, and Class II subdivision,*

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 coming to the Orthodontic department who were treated at the orthodontic department of Bolan Medical College / Sandeman Provincial hospital Quetta.*

Result: *The mean maxillary intermolar widths for different groups were obtained using SPSS version 20. The measurements were as follows: 34.6mm*, 34.5mm, 30.9mm, 34.7mm, and 34.18mm for Class I, Class II division 1, Class II division 2, Class III, and Class II subdivision groups respectively. Similarly, the mean maxillary intercanine widths were found to be 24.16mm, 24.5mm, 24.6mm, 23.9mm, and 23.05mm for the same groups respectively. Additionally, the mean mandibular intermolar widths were 32.8mm, 33.02mm, 30.3mm, 33.1mm, and 32.8mm for the respective groups. Lastly, the mean mandibular intercanine widths were 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.*

Keywords: Intercanine and Intermolar Widths, Malocclusion

INTRODUCTION:

The assessment of arch width and arch depth is a crucial diagnostic criterion for identifying malocclusions. Numerous studies have highlighted the relationship between crowding, arch form[1,2] intercanine and intermolar widths, and the various types of malocclusions. The transverse dimensions of the maxillary and mandibular arches significantly impact the aesthetics of a pleasing smile.[3,4] Additionally, in cases of

narrow transverse skeletal problems,[5] the upper molars naturally compensate by shifting in a buccal direction, causing their lingual cusps to hang below the curve of Wilson. Although this may not result in a cross bite situation, it can lead to occlusal interference from the palatal cusps of the upper molars.[6] Bishara and colleagues found that intermolar width increases by 7 to 8 millimeters between the deciduous dentition (5 years of age) and the early mixed dentition (8 years of age), and an additional 1 to 2 millimeters between the early mixed and early permanent dentition (12.5 years of age).

Moyers and colleagues[8] observed a greater increase in maxillary and mandibular intermolar widths for males compared to females. Staley et al [9] found that individuals with Class II division 1 malocclusion had narrower intermolar and intercanine widths in both the maxillary and mandibular arches, compared to individuals with normal occlusion. Several methods, such as Pont's index[10], Schwarz analysis[11], and McNamara and Brudon's prediction method12, have been used to predict intercanine and intermolar widths. However, nimkarn[13] argued that these methods are inaccurate. Chen et al [14] demonstrated differences in maxillary and mandibular skeletal base and intermolar widths between individuals with skeletal Class III and Class I malocclusion.

They concluded that the maxillary skeletal bases and intermolar widths of Class III individuals were significantly smaller than those of Class I individuals, although there were no significant differences. Considering the importance of arch width in treating malocclusion, we conducted a study on the maxillary and mandibular intermolar and intercanine widths of individuals with Angle Class I, II, and III malocclusion in our sample, based on the aforementioned studies.

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 coming to the Orthodontic department who were treated at the orthodontic department of Bolan Medical College / Sandeman Provincial hospital Quetta.

An additional comparison was conducted among the various malocclusion groups for the specified variables. The research involved examining 76 dental casts from the chosen participants. A non-probability purposive sampling method was utilized. The inclusion criteria for this research encompassed dental casts displaying mild (1-4mm) crowding in both the upper and lower dental arches, with all permanent teeth present from the right first molar to the left first molar, and fully erupted. Individuals with caries, trauma, occlusal surface attrition, asymmetric mandibular arch forms, missing teeth, prosthetic replacements, severely crowded or spaced lower arches, and compromised periodontal health were excluded from the study. All dental casts were made from white orthodontic stone (Diestone DentamericaR). Intermolar and intercanine widths were measured on the dental casts using a digital caliper (Guo genR - manufactured in China) with precise measuring tips accurate to 0.1mm at the midpoint of the cervical region of each molar and canine on its lingual surface to a corresponding point on its opposite side. The data was then analyzed using SPSS version 20. A comparison of intermolar and intercanine widths among the five malocclusion groups was conducted through one-way ANOVA analysis.

RESULT:

The average widths between the molars in the upper and lower arches for different types of malocclusions, including Class I, Class II division 1, Class II division 2, Class III, and Class II subdivision, were measured table 1 and 2. The standard deviations and ranges for each malocclusion group were also recorded. In Table 3 and 4, you can find the average widths between the canines in the upper and lower arches, along with their standard deviations and ranges for the same malocclusion groups. Table 5 provides information on the significance of the differences in widths between the molars and canines among the five malocclusion groups.

DISCUSSION

In this research, the identical approach for determining the intermolar and intercanine widths was utilized as in Howe's3 research, as this method eliminated the buccolingual size discrepancies of molars and canines that could impact the measurements of original transverse widths of the maxilla. The average intermolar width of the maxilla for all malocclusions in the sample, as indicated in table 1, is 34.48mm. This result aligns with Howe's3 findings, where he reported a mean maxillary intermolar width of 37.4mm for males and 36.2mm for females, with a range of 35-39mm in Class I individuals. Howe also recommended palatal expansion for intermolar widths less than 31mm. The mean maxillary intermolar widths of Class I and Class II division 1 individuals are 34.66mm and 34.53mm, respectively. This contrasts with the results of Staley et al9, who observed a significant difference in mean intermolar widths between Class I and Class II individuals.

Staley concluded that the prognathic maxillary arch compensated by lingual tilting of the maxillary molars for improved interdigitation and buccal overjet, thereby reducing the intermolar width. However, there is a notable difference of 3.68mm in the mean maxillary intermolar width between Class I and Class II div 2 individuals in our sample (Table 1). The difference in intermolar width between Class I and Class III individuals is minimal, at 0.1mm, although Chen et al[14] reported a significant difference in their study.

The 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, 30.3mm, 33.16mm, and 32.8mm, respectively (Table 2). Howe's[3] found the mean mandibular intermolar width in Class I individuals to be 34.1mm, while Staley[9] demonstrated that Class I individuals had larger mean mandibular intermolar widths than the Class II division 1 and 2 groups, which is consistent with Class II division 2 but contradictory to our findings.

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 no significant 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.

CONCLUSION

The mean intercanine and intermolar widths in our sample show close similarity across all five malocclusion groups, in contrast to earlier research findings that indicated notable variations in these measurements among Class I, Class II, and Class III malocclusions.

There were no statistically significant variances observed in the intercanine and intermolar widths across the three malocclusion groups.

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Table 1: Intermolar Width of Maxilla

	No. PT	Mean ± STD. Devation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
Class I	70	34.66±2.72	.33	43.82	45.72	29.05	41.06
Class II div 1	54	36.06±2.60	.34	43.69	45.90	29.22	40.46
Class II div 2	04	30.71±0.70	.51	25.99	47.60	31.62	32.89
Class III	12	32.07±1.50	2.43	39.81	49.81	31.44	49.96
Class II Sub	12	32.07±1.50	.86	40.81	42.93	41.11	41.99
Total	152	36.80±3.51	.39	38.89	40.99	30.18	48.30

Table 2: Intermolar Width of Mandible

	No. PT	Mean ± STD. Devation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
Class I	50	31.66±2.99	.60	43.99	45.72	29.92	41.06
Class II div 1	42	35.06±3.79	.96	43.82	45.90	29.63	40.46
Class II div 2	04	29.71±0.91	.72	31.00	47.60	31.94	32.89
Class III	10	34.07±3.04	2.73	41.92	49.81	31.79	49.96
Class II Sub	10	34.07±1.99	.92	45.02	42.93	41.98	41.99
Total	116	41.80±4.55	.86	39.03	40.99	30.79	48.30

Table 3: Intercanine Width of Maxilla

	No. PT	Mean ± STD. Devation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
Class I	70	29.35±2.81	.33	43.82	45.72	26.05	41.06
Class II div 1	54	24.91±2.92	.34	43.69	82.59	26.22	40.46
Class II div 2	04	26.71±1.81	.51	-25.99	47.60	22.62	32.89
Class III	12	25.07±2.50	2.43	39.81	49.81	22.44	49.96
Class II Sub	12	32.07±1.50	.86	40.81	42.93	25.11	41.99
Total	152	36.80±3.51	.39	38.89	40.99	30.18	48.30

Table 4: Intercanine Width of Mandible

	No. PT	Mean ± STD. Devation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
Class I	70	23.35±2.81	.33	43.82	21.63	19.37	34.99
Class II div 1	54	23.91±2.92	.34	43.69	25.05	15.98	38.57
Class II div 2	04	25.71±1.81	.51	-25.99	34.42	19.98	25.99
Class III	12	27.07±2.50	2.43	39.81	26.68	18.95	25.96
Class II Sub	12	21.07±1.50	.86	40.81	21.97	19.58	23.15
Total	152	20.80±3.51	.39	38.89	21.72	16.89	29.58