ISSN: 2091-2331 (Print) 2091-234X (Online)

Journal of Nobel Medical College

Volume 14, Number 02, Issue 27, July-December 2025, 17-21

Original Article

Intercanine and Intermolar Widths in Class I, II And III Malocclusions

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Article Received: 5th August, 2025; Accepted: 25th November, 2025; Published: 31st December, 2025

DOI: https://doi.org/10.3126/jonmc.v14i2.87581

Abstract

Background
Transverse malocclusions are quite common in almost all population. Abnormal intermolar and intercanine width results in transverse malocclusions.

Materials and Methods
Study models of 83 orthodontic patients attending orthodontic department of Nobel Medical College Teaching Hospital from 2021 Jan to 2024 Sep were segregated according to Angle's classification of malocclusion. The intercanine and intermolar widths were assessed on the dental casts. The data were subsequently analyzed using SPSS version 20. A one-way ANOVA analysis was conducted to compare the intercanine and intermolar widths across the five malocclusion groups.

Results
The mean intercanine width of maxilla among all types of malocclusions is 24.837 mm whereas it is 18.172 mm in mandible. Similarly, the mean intermolar width of maxilla is 33.973mm and 29.771mm in mandible among all types of malocclusions. There was no any statistically significant difference in intermolar and intercanine width of both maxilla and mandible among different 5 types of malocclusion groups.

Conclusion
Class I malocclusion had maximum maxillary and mandibular intermolar width whereas Class III maloclussion had minimum maxillary and mandibular intermolar width. However, no significant difference was present in the intercanine and intermolar width among the different malocclusion groups.

Keywords: *Angle class I, Angle class II, Angle class III, Dental arch, Malocclusion*

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Citation
Acharya A, Giri N, Bhagat T, Intercanine and Intermolar Widths in Class I, II And III Malocclusions, JoNMC. 14:2 (2025) 17-21. DOI: https://doi.org/10.3126/jonmc.v14i2.87581.

Introduction

Malocclusion is a condition in which there is a departure of the normal relation of teeth to the other teeth in the same arch and/or to the teeth in the opposing arch [1]. Malocclusion can occur in three different planes i.e., sagittal, vertical and transverse. Transverse malocclusions are quite common in almost all population [2]. Transverse malocclusion include crowding, posterior cross bites, and class III malocclusion. It occurs in combination of sagittal or vertical malocclusion. Abnormal intermolar and intercanine width results in transverse malocclusions.

Intercanine and intermolar width vary among the different malocclusion groups. Some authors have found the intercanine and intermolar width can change after orthodontic treatment [3]. Depending upon the underlying condition, the malocclusion is addressed. Howe suggested measures to increase arch dimension could address transverse malocclusion [4].Transverse malocclusions needs correction prior to sagittal correction. Intermolar width increases 7-8mm between the deciduous dentition (5 years of age) and the early mixed dentition (8 years of age) and an additional 1-2 mm between the early mixed and early permanent dentition (12.5 years of age) [5]. There is an increase in the intermolar width in maxilla and mandible as the transition from deciduous to permanent dentition occurs. Class II div 1 malocclusion has narrower maxillary and mandibular intercanine and intermolar width both in males and females [6]. Uysal et al shows that the maxillary interpremolar width, maxillary canine, premolar and molar alveolar widths, and mandibular premolar and molar alveolar widths were significantly narrower in subjects with Class II division 1 malocclusion than in the normal occlusion sample[7]. Anser et al found that intercanine width was least in class I malocclusion and widest in class II div 2 malocclusion [8]. Luca Lombardo et al in meta-analysis found that no statistically significant differences in arch width were found between the different classes analysed [9].

Our study aimed at investigating the intercanine and intermolar widths of maxillary and mandibular arches of patients having Angle class I, II and III malocclusion attending Orthodontic department at Nobel Medical College Teaching Hospital. Additionally, our study also aimed to investigate any associations among these groups of malocclusions.

Materials and Methods

The study models of orthodontic patients attending orthodontic department of Nobel Medical College Teaching Hospital from 2021 January to 2024 September were retrieved from the archives. Among these patients only 83 patient's models were in good condition that fulfilled the inclusion criteria and were considered for the study. Non probability purposive sampling method was used. Inclusion criteria were models of orthodontic patients without previous orthodontic treatment, having permanent dentition, and presence of all permanent first molars and canines. Exclusion criteria were caries, trauma, attrition of the occlusal surfaces, asymmetric maxillary or mandibular arch forms, missing teeth, prosthetic replacements, periodontally compromised dentition and models which are not intact or in good conditions. Ethical approval was taken from the IRC Nobel Medical College. (IRC No.114/2024). Duration of the study was 2 months. The study models were segregated according to Angle's classification of malocclusion: 25study models as class I, 25 as class II div 1, 3 as class II div2, 25 as class II subdivision and 5 as class III. All dental casts were available in green dental stone. The study models fulfilling above criteria were included in the study. The intercanine and intermolar widths were assessed on the dental casts using a Vernier caliper (Guo genR, manufactured in China) featuring pointed measuring tips with an accuracy of 0.1 mm. Measurements were taken at the midpoint of the cervical region of each molar and canine on their lingual surfaces, extending to the corresponding points on their respective antimere.

The data were subsequently analysed using SPSS version 20. A one-way ANOVA analysis was conducted to compare the intercanine and intermolar widths across the five malocclusion groups.

Results

Table 1 and 2 present the average inter canine widths for the maxillary and mandibular arches across various malocclusion classifications, including Class I, Class II division 1, Class II division 2, Class III, and Class II subdivision. These tables also include the corresponding standard deviations and ranges. Meanwhile, Tables 3 and 4 illustrate the average intermolar widths for the maxillary and mandibular arches, respectively, along with their standard deviations and ranges for the aforementioned malocclusion categories. Finally, Table 5 highlights the significance of the differences in intermolar and intercanine widths among the five malocclusion classifications.

Table 1: Intercanine width of maxilla

Type of Malocclusion	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for mean Upper	Lower	Minimum	Maximum
Class I	25	25.644	3.102	0.620	26.860	24.428	20.500	31.300
Class II div 1	25	23.828	2.450	0.490	24.788	22.868	20.200	29.700
Class II div 2	3	24.600	27.300	1.480	27.500	21.700	22.200	27.300
Class II subdiv	25	24.940	2.865	0.573	26.063	23.817	21.100	31.900
Class III	5	25.480	1.859	0.832	27.110	23.850	23.100	27.600
Total	**83**	**24.837**	**2.801**	**0.307**	**25.440**	**24.235**	**20.200**	**31.900**

Table 2: Intercanine width of mandible

Type of Malocclusion	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for mean Upper	Lower	Minimum	Maximum
Class I	25	19.048	3.132	0.626	20.276	17.820	13.500	25.900
Class II div 1	25	17.060	3.202	0.640	18.315	15.805	11.400	22.400
Class II div 2	3	17.367	4.409	2.546	22.356	12.377	12.800	21.600
Class II subdiv	25	18.508	4.375	0.875	20.223	16.793	10.200	32.700
Class III	5	18.160	3.495	1.563	21.223	15.097	12.400	21.600
Total	**83**	**18.172**	**3.635**	**0.399**	**18.954**	**17.390**	**10.200**	**32.700**

Table 3: Intermolar width of maxilla

Type of Malocclusion	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for mean Upper	Lower	Minimum	Maximum
Class I	25	34.992	4.566	0.913	36.782	33.202	28.200	49.200
Class II div 1	25	33.424	2.297	0.459	34.324	32.524	30.100	38.600
Class II div 2	3	33.867	3.723	2.150	38.080	29.653	31.100	38.100
Class II subdiv	25	33.640	3.232	0.646	34.907	32.373	26.400	43.400
Class III	5	33.360	2.356	1.054	35.426	31.294	30.600	35.600
Total	**83**	**33.973**	**3.432**	**0.377**	**34.712**	**33.235**	**26.400**	**49.200**

Table 4: Intermolar width of mandible

Type of Malocclusion	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for mean Upper	Lower	Minimum	Maximum
Class I	25	30.280	3.109	0.622	31.499	29.061	25.100	37.700
Class II div 1	25	29.260	3.314	0.663	30.559	27.961	21.300	35.500
Class II div 2	3	30.467	1.872	1.081	32.585	28.349	29.100	32.600
Class II subdiv	25	29.680	3.117	0.623	30.902	28.458	22.300	36.600
Class III	5	29.820	1.618	0.723	31.238	28.402	28.500	32.500
Total	**83**	**29.771**	**3.047**	**0.334**	**30.426**	**29.116**	**21.300**	**37.700**

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 maxilla	Between groups	38.179	4	9.545	.803	.527
	Within groups	927.543	78	11.892		
	Total	965.722	82			
Intermolar width of mandible	Between groups	14.676	4	3.669	.383	.820
	Within groups	746.395	78	9.569		
	Total	761.071	82			
Intercanine width of maxilla	Between groups	44.205	4	11.051	1.552	.196
	Within groups	548.440	77	7.123		
	Total	592.645	81			
Intercanine width of mandible	Between groups	54.867	4	13.717	1.040	.392
	Within groups	1028.659	78	13.188		
	Total	1083.526	82			

Discussion

Out of 83 subjects, 31 were males and 52 were females with average age of the subjects 20.22 years. The size and shape of the dental arch have considerable implication in the diagnosis and manangement of malocclusion as this affects the stability and esthetics of the dentition. Unfortunately, less number of researches have been conducted regarding arch width evaluation in different malocclusion. In this study, the method to measure the arch width was the same used by Howe as the buccolingual width variation of molars and canines was nullified[4]. The mean maxillary intercanine width in all malocclusion group in our sample is 24.837mm. The study by Dinakaran et al found it as 42.22mm for males whereas 34.72mm for females[12]. Similarly mean mandibular intercanine width in all malocclusion groups in our sample was 18.172mm with maximum 32.7mm and minimum 10.2 mm both occurring in class II subdivision malocclusion (Table 4). This suggests huge variation in the features of class II subdivision malocclusion in our study sample. However narrowest maxillary arch was seen in class II div 1 malocclusion as studied by Patel et al. [12]. However, the study by Dinakaran et al showed mean mandibular intercanine width as 26.48mm in males and 26.18mm in females [11]. The difference in ethnicity and geographical location can account for such variation. In the study by Garg H et al intercanine and intermolar widths were higher in Class II div 1 malocclusion than Class I maloc-

clusion [3]. The different population samples and difference in ethnicity could be the reason.

The mean intermolar widths in maxillary arch was 33.973mm with maximum 49.2mm (class I malocclusion) and minimum 35.6mm in class III malocclusion. This was less than the result obtained by Sundas Anser et al in his study, where he found the mean intermolar distance as 45.239 [8]. Similarly, Azlan et al found this value as 49.36 for males and 46.75 for females[10]. The discrepancy in the findings can be attributed to different geographical location of the study resulting in different ethnicity of the study sample. Similarly, the mean intermolar widths in mandibular arch was 29.7mm with maximum 37.7mm in class I malocclusion and minimum 32.5mm in class III malocclusion. In the study by Patel et al class III group showed larger mandibular intermolar and intercanine width as compared to other malocclusion groups [12]. ANOVA analysis was done to compare the intercanine and intermolar widths among the different malocclusion groups. There was no significant difference found in intercanine and intermolar widths in maxillary and mandibular arches among different malocclusion groups. This was due to different dental malocclusion had compensatory underlying skeletal relation which did not correlate with one another. Unlike our study, studies by, Staley et al, Patel et al and Huth et al showed Class I group showed significantly higher intercanine widths than Class II div 1 group [6,12,13]. However, our study was concurrent with the findings of Sayin MO et al and Al-Khateeb SN et al [14,15].

Overall, the variation of intermolar and intercanine width among this and other studies could also be attributed to the method of measurement as our study used Howe's method of measurement where buccolingual width variation of molars and canines are nullified. This study was limited to the departmental archives of patients who underwent orthodontic treatment after thorough investigation. Further researches are encouraged to evaluate the changes in the intercanine and intermolar widths in different malocclusion groups after completion of the comprehensive treatment. The similar studies done in the centers, which has acquired latest technological methods for storage of patient records, would provide more promising results. Lastly, less frequently occuring malocclusions such as Angle class III and class II div 2 need large sample size for achieving greater reliability of the research.

Conclusion

The study concluded that class I malocclusion had maximum maxillary and mandibular intermolar width whereas class III malocclusion had minimum maxillary and mandibular intermolar width. Class II subdivision malocclusion had both maximum and minimum mandibular intercanine width. However, no significant difference was present in the intercanine and intermolar width among the different malocclusion groups.

Acknowledgement: I thank Department of Orthodontics for providing with the patients' records from the archives.

Conflict of interest: None

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