

A comparative Study of Arch Widths Between Class I Crowded With Normal Occlusions

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ABSTRACT

Objectives: To test the hypothesis that there is no difference between adults with Class I crowded (CICR) and Class I normal (CIN) occlusions with respect to width of the maxillary and mandibular arches and gender comparisons.

Materials and Method: In this cross sectional study, 52 pairs of study models were selected from the patients and students of the Orthodontics and Dentofacial Orthopedics Department of Dhaka Dental College and Hospital and were divided into two groups, 27 pair of dental casts with normal occlusion, 25 pair of dental casts with Class I crowded malocclusion including equal males and female samples.

Results: The result of this study evaluated two study groups (Normal occlusion and Class I crowded). Between different arch dimension maxillary arch widths were found to have significantly smaller in Class I crowded malocclusion compared with Normal Class I occlusion.

Conclusion: In conclusion, the hypothesis was partially rejected by the finding of the study.

Key words: Arch width, Normal occlusion; Crowding

INTRODUCTION

The dental arches have historically been described by investigators in simple geometric term such as ellipse, parabola, segments of circles joined to straight line or modified spheres. The proposed ideal arrangement of the teeth was described geometrically by Angle as the line of occlusion.¹

Angle's postulate that the upper first molars are the key to occlusion and that the upper and lower molars should be related so that the mesiobuccal cusp of the upper molar occludes in the buccal groove of the lower molar .If this molar relationship existed and the teeth are arranged on a smoothly curving line of occlusion then normal occlusion would result. Normal occlusion and Class I malocclusion share the same molar relationship but differ in the arrangement of the teeth relative to the line of occlusion .The line of occlusion may or may not be correct in Class II and Class III.²

Normal occlusion is commonly defined as "an occlusion within the accepted deviation of the ideal". This definition gives no clear limit to the range of normal occlusion . However an occlusion which satisfies the requirements of function and aesthetic even though there may be minor irregularities of individual teeth may be accepted as normal occlusion. Criteria in normal occlusion are described below .The mandibular teeth are set one inclined plane in advance of the maxillary teeth(because the mandibular incisors are narrower than the maxillary incisor). The maxillary teeth are set half a cusp buccal to the mandibular teeth. The mesio-buccal cusp of the upper first permanent molars occludes with the anterior buccal groove of the lower first

permanent molar. The upper permanent canines occlude in the embrasure between the lower permanent canine and first premolar. The lower incisors edges occlude with the middle third of the palatal surface of the upper incisors. This should produce normal overbite and over jet.³

Crowding of the teeth the most common type of malocclusion at present, undoubtedly is related in part to the continuing reduction in jaw and tooth size in human evolutionary development ,but that can not be a major factor in increased crowding of quite recent years. Increased out breeding can explain at least part of the increase in crowding in recent centuries.

Environmental factors must have played some role in the recent increase in crowding of the dental arches, however and it is not clear what these are. Perhaps the relatively recent alteration in diet which without question have reduced the functional demands on the jaws have accelerated the trend.² (Profit WR.2001)

Class III malocclusion was recognized as early as the 18th century .In the year1978, John Hunter in his book the natural history of the human teeth stated" "It is not unknown to find out the lower jaw projecting too forward".⁴

There are many definition of Class III malocclusion .The most common is "an occlusion in which the buccal groove of the mandibular first molar occludes mesial to the mesiobuccal cusp of the maxillary permanent first molar". A Class III

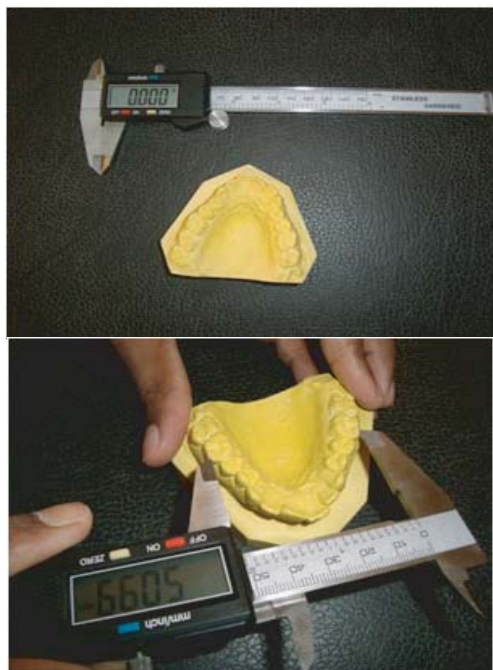


Figure-2 Example of arch width measurement with digital caliper.

Maxillary measurement

Maxillary intercanine width-Distance between the cups tips of right and left maxillary permanent canine.

Maxillary inter premolar width-Distance between the buccal cusps tips of right and left maxillary permanent first premolar.

Maxillary intermolar width-Distance between the mesio-buccal cusps tips of right and left maxillary permanent first molar.

Maxillary alveolar width-Maxillary alveolar width at the mucogingival junction above the mesiobuccal cusp tips of the first molars.

Mandibular measurement

Mandibular inter canine width-Mandibular inter canine width between cusp tips.

Mandibular inter premolar width-At the top of the buccal cusp of the first premolars.

Mandibular intermolar width-Mandibular intermolar width between the mesiobuccal cusp tips of the first molars.

Mandibular alveolar width-Mandibular alveolar width at the mucogingival junctions below the buccal groves of the first molars.

DATA COLLECTION AND PROCESSING

Dental casts measurement were performed by a digital dial caliper to the nearest 0.01mm. All measurements of all subjects were carried out again four weeks later by same operator to evaluate measurements error. Almost all the measurements were same, where differed, average was taken. After collection of data the obtained data was checked, verified & edited. These were entered in a personal computer using the SPSS (statistical package for social science) software. Entered data were cleaned, edited and appropriate statistical tests were done depending on the distribution of data.

DATA ANALYSIS

All data analyzed through standard statistical methods by using SPSS / STATA 10 software.

ANALYSIS OF ERROR

To ensure measurements accuracy, one month later 30 pairs of dental casts were randomly selected (ten from each group) and the widths were again measured by the same investigator. No statistically significant differences were found between the first and second measurement.

RESULTS

This study was a cross sectional study conducted among the dental casts of 52 patients and students of the department of Orthodontics and Dentofacial Orthopedics, Dhaka dental College and Hospital. The occlusion of these subjects was class I crowded and Class I normal occlusion. The statistical tests to be used for analysis of data were ‘t’ test and ‘f’ test. In this analytical test the level of significance p value <0.005 was considered.

Table 1: Comparison of Maxillary and Mandibular measurement Class I normal Verses Class I Crowding.

Variable	Mean ± SD		P-value
	Class I Normal N-27	Class I Crowding N-25	
Maxillary			
Intercanine	35.0±2.33	33.5±3.23	0.0211
Interpremolar	42.4±2.35	40.1±3.48	0.0002*
Intermolar	52.9±2.98	51.3±4.54	0.0002*
Alveolar	58.4±2.85	54.6±3.92	0.0004*
Mandibular			
Intercanine	25.6±1.41	25.8±2.21	0.5257
Interpremolar	33.9±2.71	32.4±3.20	0.0501
Intermolar	45.2±2.86	44.0±2.92	0.0050
Alveolar	58.4±2.88	56.8±3.04	0.0022*

Level of p-value significant = <0.005
 This table shows maxillary interpremolar, intermolar, alveolar and mandibular intermolar and alveolar widths were significantly smaller in Class I crowded group than Normal occlusion.

Table 02: Comparison of maxillary measurements between Normal occlusions and Class I crowding male and female

Different arch width	Normal occlusions		Class I crowded	
	Male n=13 Mean±SD	Female n=14 Mean±SD	Male n=13 Mean±SD	Female n=12 Mean±SD
Intercanine	35.9±2.0	34.2±2.3	34.2±3.8	32.8±2.2
Interpremolar	43.4±1.8	41.4±2.4	42.4±2.7	37.74±2.4*
Intermolar	54.4±2.5	51.6±2.8	52.8±3.2	47.7±4.3*
Alveolar	59.8±2.5	57.2±2.5	57.2±3.6	54.2±2.2*

*p<0.005 NS other not significant

Table shows maxillary inter premolar, inter molar and alveolar width were significantly smaller in female than male in crowded group. Maxillary inter canine and alveolar width were significantly smaller in female than male in Class III group.

Table 3 :Comparison of mandibular measurements between Normal occlusions, Class I crowded male and female

Different arch width	Normal occlusions		Class I crowded	
	Male n=13 Mean±SD	Female n=14 Mean±SD	Male n=13 Mean±SD	Female n=12 Mean±SD
Intercanine	26.1±1.4	25.2±1.3	25.9±2.6	25.6±1.7
Interpremolar	35.1±1.9	32.9±3.1	32.6±4.1	32.2±1.9
Intermolar	46.2±2.4	44.2±2.9*	45.2±2.8	42.7±2.5*
Alveolar	57.7±2.4	55.4±2.9*	56.6±2.8	53.8±2.6*

*p<0.005 NS other not significant

Table shows mandibular intermolar and alveolar width were significantly smaller in female than male in all three groups.

DISCUSSION

This cross sectional study was conducted in the department of orthodontics and Dentofacial Orthopedics at Dhaka Dental Collage and Hospital. This study was carried out to compare the arch width of Bangladeshi subjects with class I crowded and normal occlusion. The subjects of the study were selected on the basis of inclusion and exclusion criteria. This study consisted of using 52 pairs of casts with permanent dentition divided into two groups 27 pairs of dental casts with normal occlusion (13 male and 14 females), 25 pairs of dental casts with Class I crowded (13 male and 12 female). The comparison was made between the intercanine, interpremolar, intermolar and alveolar width of both dental arches. The casts were selected from archives of Dhaka Dental college & hospital. The minimum age of the subjects chosen for this study based on evidence reporting no significant change in the first molar and canine arch widths after age 13 in females and 16 in male¹¹

The result of this study revealed that in the maxilla no significant difference were found in inter canine arch width in all

two groups. The inter premolar, intermolar and alveolar arch width in class I crowded group were significantly smaller than Class I normal occlusion.

In the mandible it was found that inter molar and alveolar width were smaller in Class I crowded group than normal occlusion. In the mandible it was revealed that male had a significantly larger inter molar and alveolar arch width than female in all two groups. Comparison of maxillary and mandibular measurements with in the class among male it was revealed that maxillary and mandibular intermolar width were significantly smaller in Class I crowded male. With in the class among the female it was found that maxillary inter molar, alveolar and mandibular intermolar width were significantly smaller in Class I crowded female than Class I normal female.

The finding of this study agreed with those of Mills⁷. He compared the arch widths of crowded and well aligned Class I

occlusion in young American white men. He found significantly smaller maxillary and mandibular interpremolar arch width in crowded group than well aligned Class I occlusion. But we found only maxillary interpremolar arch width are significantly smaller in class I crowded group than class I normal occlusion. This may be due to racial variation. Radzic (1988) compared the maxillary and mandibular intermolar width in 60 Pakistani boys and found maxillary intermolar width were significantly smaller in the crowded group than in the normal occlusion.

The result of our study agreed with this. Chang et al¹⁰ compared the arch width of 74 males and females with crowded arches and 89 Chinese male female with good alignment. They reported maxillary inter canine width of both groups were similar in male larger in crowded female. The result of our study disagreed with this.

Our study showed maxillary inter canine width of both groups had no significant differences in male and female. They also found maxillary and mandibular inter molar arch width were smaller in the crowded group in both gender, our study agreed with this.

A few studies conducted in Bangladesh on arch width by Rahman M.M¹²; Jahan H¹³; in the Department of orthodontics and Dentofacial Orthopedics. Dhaka Dental College and Hospital, Dhaka. The result of my study coincide with their study. They also found maxillary and mandibular intermolar arch width significantly smaller in Class I crowded group than normal occlusion.

Howe et al¹⁴ compared the arch width of Class I normal subjects with subjects having gross dental crowding (no Angle class was given). Maxillary and mandibular canine and molar alveolar arch width were significantly larger in the Class I normal occlusion in both gender. The result of our study disagreed with the study by How et al. Our result showed no significant differences in maxillary and mandibular inter canine width in both gender.

LIMITATION OF STUDY

1. The study group was selected from Dhaka Dental College & Hospital. So the findings might be specific area, which may not represent the whole national situation.
2. The study was not done in a specific race of population.
3. The size of the sample of the study was very small to represent the situation prevailing nationality.
4. Specific age was not included in the study.

CONCLUSION

The result of this study evaluated under two study groups (normal occlusion and class II crowded a).

Among different arch dimension maxillary arch widths were found to have significantly smaller in class I crowded compared with normal occlusion.

In conclusion, the hypothesis was partially rejected by the findings of this study. It may be suggested that Orthodontist who is aware of these differences in arch dimension will be beneficial to diagnose and treatment planning of orthodontic cases more accurately.

RECOMMENDATION

As the size of the sample of this study was very small so recommendation is put forward for future researcher to do additional depth research consisting of large sample group for greater acceptability of the study.

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