DENTAL CROWDING AND ITS RELATIONSHIP TO TOOTH SIZE AND ARCH DIMENSIONS

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ABSTRACT

Tooth size arch length discrepancy (TSALD) is a well defined means of assessing dental crowding. In previous literature conflicting evidence exists regarding the part played by tooth size and arch dimension in causing dental crowding.

The objective of present study were to; examine the relationship between tooth size and arch dimension in crowded and non crowded arches, and to find out the major contributing factor in dental crowding of each. Eighty patients, 20 males and 20 female in crowded and non crowded group comprising of 40 patients each, with an age range of 14-18 years, reporting to outdoor of orthodontic department, was selected. All subject met the following criteria; 1) No cast with missing or impacted teeth. 2) No history of previous orthodontic treatment, 3) No cast showing any dental anomalies.

The study included on clinical examination, crowding was assessed clinically in crowded arches with gross mal-alignment of teeth and non crowded arches showing no or mild crowding. Arch dimensions was measured from left to right First permanent molar at the intersection point of lingual groove with gingival margin on the dental cast and tooth size measurement were taken from the anatomical contact points with the help of Vernier caliper. Similarly inter premolar width was measured. Inter canine width was recorded from canine tips. Arch length was taken with the help of Brass wire directly from the dental cast following the curve of occlusion from mesial marginal ridge of first permanent molar.

Data was analyzed by using SPSS (version 10) in personal computer. Paired and independent t-test was used to find out the group differences in crowded and non crowded arches.

Results showed that overall no significant differences (p>0.05) were found in tooth size between the non crowded and crowded arches, regardless of whether the tooth size was compared individually or collectively. Statistically significant differences (p<0.05) were observed when arch dimension of crowded and non crowded groups were measured particularly lingual arch width at the inter molar and inter premolar area. No statistically differences were found between the males and females comparison except that female showed smaller values as compared to males in every aspect of measurement.

Key words: Crowding, Tooth size, Arch Dimensions

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INTRODUCTION

Crowding of teeth is considered as the most common type of malocclusion'. Dental crowding can be defined as a disparity in the relationship between the tooth size and jaw size which result in the imbrications and rotation of teeth. Tooth size-arch length discrepancy (TSALD) is a well defined means of assessing dental crowding[2]. The factors that may predispose to crowding of teeth are large sized teeth, small bony bases or the combination of the above two', or as the result of an evolutionary trend towards a reduced facial skeletal size without a corresponding decrease in tooth size.

Crowding can be relieved by creation of space via extraction or arch expansion. Recently use of dento-alveolar distraction osteogenesis to gain arch length has gained popularity'. Other techniques to relieve dental crowding include posterior molar movement and incisor flaring'. Vander linden classified crowding on the basis of etiology as primary, secondary and tertiary crowding'. In a Pakistani sample study, it was found that 78% of sample showed crowding of varying degree in upper arch'.

In previous literature conflicting evidence exists regarding the part played by tooth size and arch dimension in causing dental crowding. This study was conducted to examine the extent to which arch size and tooth size each contribute to dental crowding.

MATERIALS & METHODS

This comparative cross sectional study was conducted on 80 patients. (40 males, 40 females). Dental casts of 80 patients were selected from out patient department of Orthodontics, de,Montmorency College of Dentistry / Punjab Dental Hospital, Lahore, Pakistan. Each subject had a normal class—I molar relation in centric occlusion (dental). Subjects **included** in our study had a complete set of permanent dentition from 1st to opposite 1st permanent molar with an age range of 14-18 years having mean age of 16.2 yrs. The sample was divided in two equal groups based on the presence or absence of crowding on the basis of clinical examination, the sex distribution in each group was equal. None of the subject had previous history of orthodontics treatment. Subject with missing, impacted, broken, grossly carious teeth or showing other dental abnormalities were **excluded** from the study. No numerical value of arch length or crowding was made in either group until the selection procedure was completed.

PARAMETERS MEASURED: Plaster casts were measured by one investigator with vernier caliper (Dentauram), read out were rounded to 0.1mm

TOOTH SIZE MEASUREMENT: The mesio-distal width of all maxillary and mandibular permanent teeth excluding second and third permanent molar were measured with the help of sharpened points of vernier calipers from the anatomical contact points.

ARCH LENGTH: Arch length was measured with the help of brass wire from mesial marginal ridge of left to right Ist. permanent molar passing over the premolar and canine regions following the respective curve of occlusion in each arch

ARCH WIDTH: Arch width was measured from left to right First permanent molar at the intersection point of lingual groove with gingival margin on the dental cast with the help of vernier caliper tips. Similarly inter premolar width was measured. Inter canine width was recorded from canine tips.

STATISTICAL ANALYSIS: Description statistics including the means, standard deviation, minimum and maximum values were calculated for each measurement the data was analyzed by using the statistical analysis for social sciences (SPSS version10 for windows, spss inc; 1998)

METHOD ERROR: Method error was estimated by choosing twenty pairs of dental casts, randomly selected from the study sample measurements were recorded twice, by the same operator after two weeks intervals results were compared and the t-value of the correlated sample were determined to indicate the difference between the means of computed measurements no significant difference were found between the two readings

RESULTS

In this study, tooth size of crowded and noncrowded adult dentition was compared. The results indicate that no significant difference exists between the crowded

TABLE 1: TOOTH SIZE; COLLECTIVE MESIODISTAL SUMS OF TEETH

n = 40

Group	Maxillary Arch			Mandibular Arch		
	Mean	S.D	P-value	Mean	S.D	P-value
Crowded Arches	104.44	4.4	>.05	93.79	3.54	>.05
Non-Crowded Arches	103.67	6.57		92.68	4.38	

P>.05 = Non significant
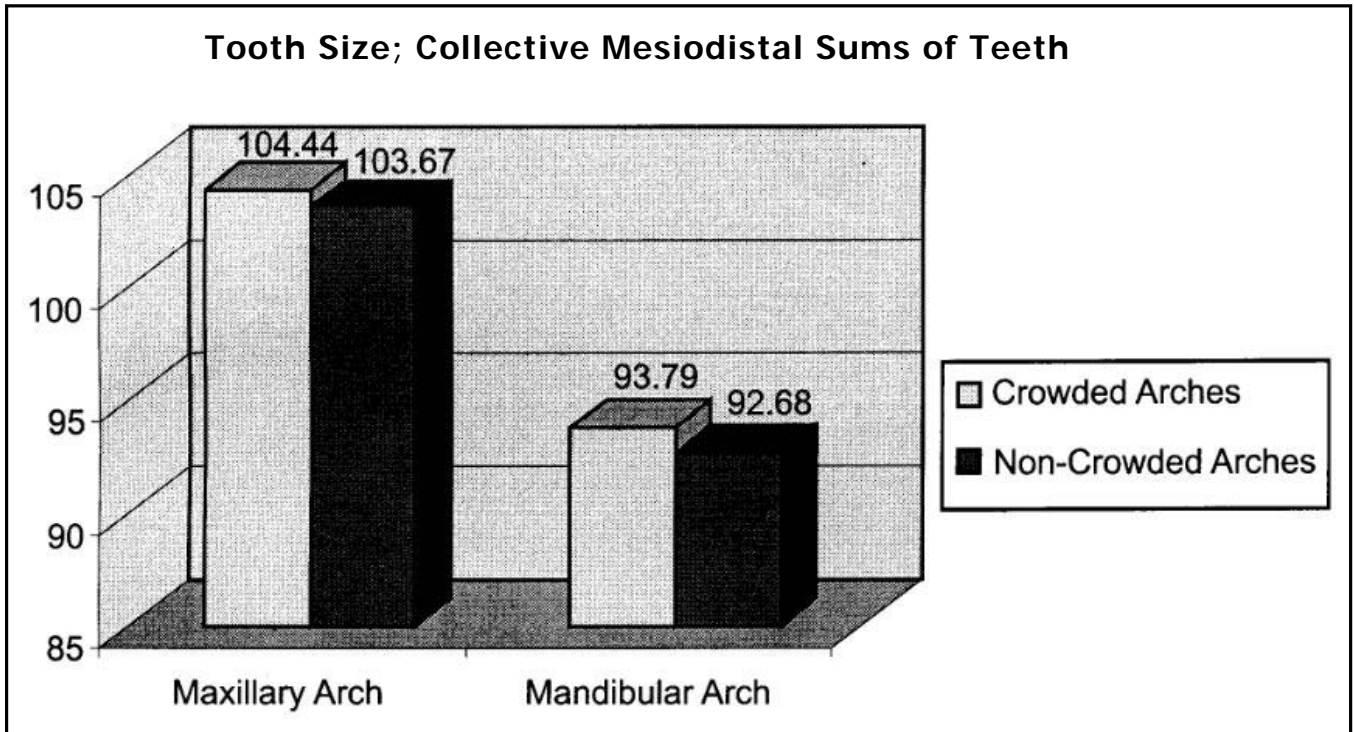
Graph-I

and noncrowded tooth size (Table 1), regardless of whether tooth size was compared individually or whether the mesiodistal sums of entire arches were compared. However, significant differences were found when the arch dimensions of the crowded and non crowded groups were compared, particularly inter molar, inter per molar width lengths length. As per data measured it was found that arch dimension of noncrowded group were generally larger than that of crowded group. Arch widths and arch leno;ths were greater in the noncrowded group than in the crowded group. (For results see, Table-1, 2, 3.

TOOTH SIZE: The difference in the mean values collective of maxillary mesiodistal tooth ameters between the crowded and the non crowded group was found to be 0.77mm and in the mandibular arch was 1.11mm. In all results these differences were not statistically significant P>0.05 (See Table **1).**

ARCH WIDTH: When arch width was measured for crowded and non crowded a significant difference was found between inter molar, inter premolar width (Table 2) as per data it was found the arch width of non crowded group was generally larger than crowded group. However when inter canine distance was compared the difference was not significant (p>0.05). Transverse lingual measurement of maxillary width at first molar site was 31.82 for crowded & 36.35 for non crowded group thus 4.53mm larger inter molar width was found in non crowded arch. Similarly in mandibular arch the corresponding lingual measurement averaged 35.23 in non crowded arches and 31.48 in crowded arches. In both sexes the difference between crowded

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TABLE 2: ARCH WIDTH

n= 40

Group	Area	Maxillary Arch			Mandibular Arch		
		Mean	S.D	P-value	Mean	S.D	P-value
C	Inter-canine	34.16	3.23	>.05	26.86	2.47	>.05
N		33.87	1.86		27.75	1.68	
C	Inter-1st premolar	24.35	2.83	<.05	23.77	1.74	<.05
N		28.55	3.19		26.77	2.28	
C	Inter- molar	31.82	1.88	<.05	31.48	1.88	<.05
N		36.35	1.61		35.23	1.76	

C = Crowded Arch, N = Non crowded

Arch P-value <.05 = Significant

Arch Width
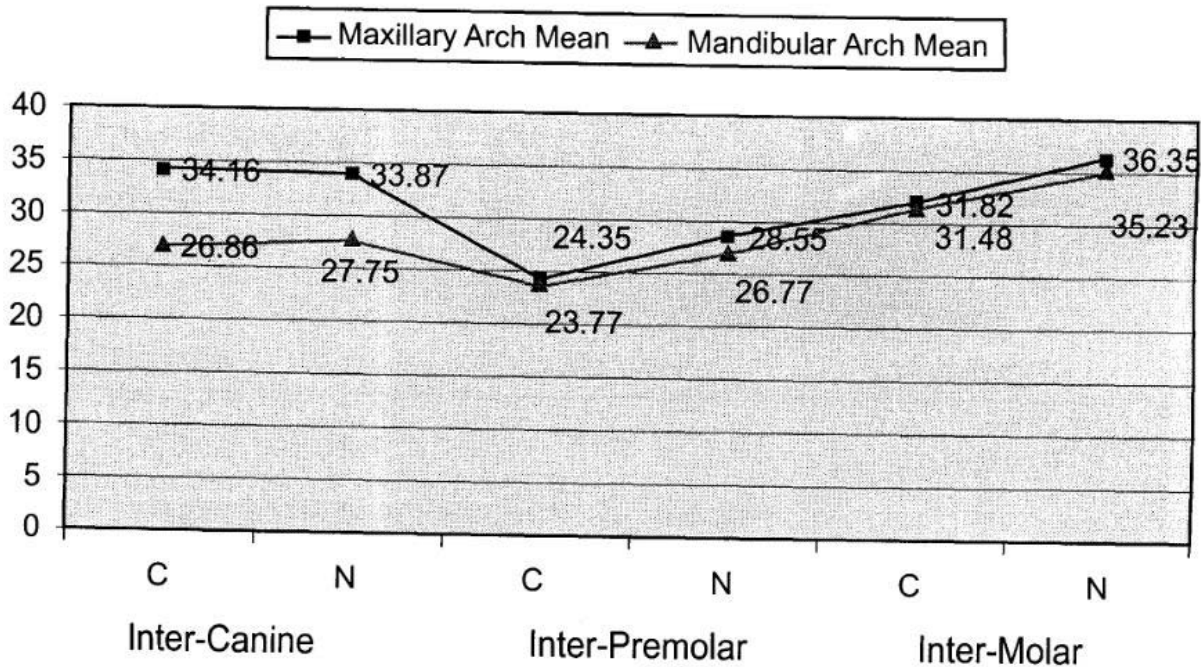
Graph-II

and non crowded arches was found statistically significant (P<0.05). Similar value differences were recorded in the inter-premolar width. However inter canine width in the non crowded group was not found statistically significant larger from crowded group. The mean value for maxillary arch was 34.16 in non crowded group similar results were found in crowded group (p>0.05, Table-2).

ARCH LENGTH: Significant differences were found in the arch length measurement for the maxillary and mandibular arches between the crowded & non crowded Arch length for the maxillary arch in the non crowded group averaged 79.91 and was significantly (P<0.05) larger than that mean value 74.24mm in the crowded arches. Similarly significant differences were found in mandibular arches. However the arches length find-

TABLE 3: ARCH LENGTH

Group	Maxillary Arch			Mandibular Arch		
	Mean	S.D	P-value	Mean	S.D	P-value
Crowded Arches	74.24	4.51	<0.05	65.76	3.59	<0.05
Non-Crowded Arches	79.91	5.11		68.85	3.27	

P-value <.05 = Significant

ARCH LENGTH
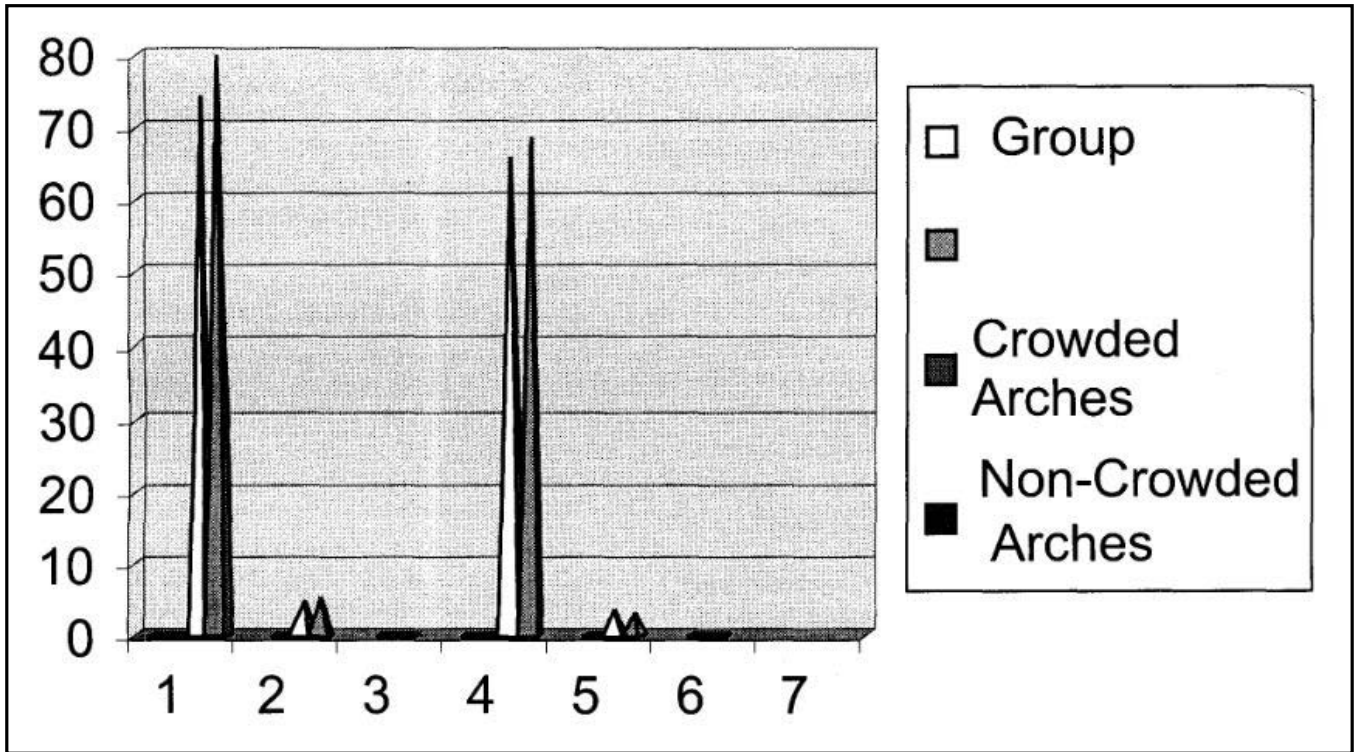
Graph-III

ings for the mandibular arches were not found to be as much different as in maxillary arches in the two groups (Table 3).

DISCUSSION

One of the most perplexing phenomenons in orthodontics is the crowding of the teeth before as well as after the completion of orthodontics treatment. The current emphasis on non extraction therapies has result in significant reduction in number of teeth extracted for the orthodontic treatment. The aim of the present study was to quantify crowding by assessing the tooth size arch size discrepancy in crowded and non crowded arches.

The finding of this study shows that subjects with dental crowding were more lMckwewn10o have smaller

dental arch measurements than subjects with littFastlisht12ntal crowding. The results in this study are in agreements with those of Mills[9], Mckwewni[°] and How" et al while disagrees with the findings presented by Fastlisht'[2], Norderval ancoworkers15s[13] and Doris" and his coworkers.

Fastlisht's finding showed a significant relationship between crowding and mesiodistal width of incisor. Gilmore and coworkers[16] findings showed that there is a weak correlation between mesiodistal width of incisors and irregular alignment of teeth over long term study but previous authors have suggested that well aligned mandibular incisor are narrower mesiodistally than incisors which are crowded.

Radnzic[16] in a study on indigenous British and Pakistani immigrants group reported that in both

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ethnic groups there were significant correlation between certain arch dimensions and the degree of crowding, while there was no significant correlation between cumulative mesiodistal crown width and dental crowding. However this study was conducted on primary dentition.

Similarly in a study[17] on deciduous dentition it was concluded that absolute width of the arch is the determining factor in the creation of crowding.

The results of the current study suggest further investigation because the findings of this study shows that arch width and arch length are associated factors in contribution of dental crowding. However some important differences between the two groups may have been overlooked. Clinical examination of the two groups was used to differentiate the crowded and non crowded arches. The selection procedure was intestinally based to produce two dissimilar groups, one with dental crowding and other with well aligned arches. Although this procedure made comparison of the two groups convenient, it is possible that non random selection procedure may have affected the results.

The findings of our study may have some clinical importance in the treatment planning of dental crowding. If crowding in a patient is due to small arches and arch length than that of larger teeth, considerations should be given to increase arch dimensions by expansion particularly in younger patients or other latest techniques may be used to increase arch perimeters.

CONCLUSIONS

Following conclusions were observed in current study:

1 A highly significant relation was found between the crowded and noncrowded arches on the basis of arch dimensions particularly in relation to inter molar and inter premolar width (P<0.05).

2 Arch length was also found greater in noncrowded arches as compared to crowded group and the differences were statistically significant (P<0.05).

3 Non significant association was found between crowded and noncrowded arched on the basis of inter canine width (P>0.05).

4 Statistically the crowded and non crowded arches can not be distinguished on the basis of mesiodistal collective tooth size (P>0.05).

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