THE RELATION BETWEEN THE MESIODISTAL CROWN WIDTHS OF THE DECIDUOUS SECOND MOLARS AND THE PERMANENT FIRST MOLARS

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ABSTRACT

The objective was to determine the relation between mesiodistal dimension of primary second molars and permanent first molars in local population of Peshawar.

One hundred children from age 4 to 11 years with healthy and fully erupted primary second molars and permanent first molars were included in the study. After taking impression in alginate and pouring in the dental stone, maximum mesiodistal width was measured with digital vernier caliper for primary second molars and first permanent molars. Data were analyzed using SPSS version 20.0. Pearson co-efficient test was applied for relation between the mesio-distal crown widths of the deciduous second molars and the permanent first molars t-test was used to compared tooth sizes between males and females.

One hundred cases; 50 males and 50 females were included in this study. The mean age was 8±1.2 years. Males had larger mesiodistal widths of than females(p<0.05). A significant strong correlation existed between primary second molars and first permanent molars. The correlation was weaker in the females than males.

A concordance was found between the sizes of the deciduous second molars with the size of the permanent first molars, this might be helpful in prediction for arch length discrepancy.

Key Words: *Primary second molars, permanent first molar,mesio-distal width.*

INTRODUCTION

The knowledge of growth, development, space analysis and other diagnostic tools are pre-requisite for optimal orthodontic therapy. The primary teeth play role in esthetics, phonetic, mastication, alveolar growth and guiding occlusion to optimal state.[1]

Deciduous teeth, forming from the first trimester until about 3 years of age, are a record of prenatal development. They also express genetic traits and may reflect environmental effects including maternal health, childhood disease and nutrition.[2] Deciduous teeth erupt until about 30 month of age and their replacement begins around 6 years of age, being completed by around 12 years of age.[2]

The mesio-distal crown diameter of teeth is an important factor, which affects the alignment of teeth in the bony arches, and the development of occlusion during transition of the dentition.[3] Tooth size is polygenic in nature, environment act as epigenetic factor.[4,5] Mesiodistal crown diameter, also called tooth size, provides significant information on human evolution and biological problems as well as in forensic and clinical dentistry. Anthropologists use mesiodistal diameter to draw the evolution of tooth size. Tooth size provides a perception of connection between populations and environmental adaptation.[6]

The most widely studied crown dimension in the literatures is the mesio-distal diameter. This dimension is key to optimal occlusion as it determines the dental-bone discrepancy because dental dimension and bone dimension must be in accordance to achieve

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correct alignment and occlusion.[7] Studies are lacking to measure the mesio-distal width of the deciduous dentition in Pakistan, which relate the size of deciduous teeth to those of permanent teeth.

Posterior teeth are important determinant for occlusion. As primary teeth are replaced by permanent teeth as developmental phenomena, changes in occlusal relation occurs due to many factors. One important factor is loss of leeway space due to early loss of primary molars. Other factor may be the size variation in primary versus permanent teeth. Previous studies shows that small correlation exists between sizes of primary and permanent teeth (r=0.2 to r=0.5).[8-13]

The objective of the current study was to determine the relation between primary second molars and permanent first molars in local population of Peshawar.

METHODOLOGY

This cross-sectional descriptive study was carried out on 100 children aged ranges from 4 to 11 years from February 2015 to December 2015 who visited the department of Orthodontics, Khyber College of Dentistry, Peshawar. The sample was selected based on the following exclusion and inclusion criteria.

Inclusion criteria

- Children with pure Pakistani nationality

- The tooth with no caries

- Completely erupted first permanent molar and second primary molars

- Sound first permanent molar and second primary molars

Exclusion criteria

- Anomalies of tooth size and shape

- Infra-occluded molars/submerged teeth

- Pathologic occlusal erosion or crown fractures

- Molars treated with preformed crowns/teeth which are part of fixed orthodontic appliances/fixed space maintainers.

After taking institutional ethical committee clearance, the parents/guardians of the children were thoroughly explained regarding the study procedure. All the selected samples were initially subjected to oral prophylaxis, impressions were made with Alginate and casts were poured immediately with dental stone. The maxillary and mandibular models thus obtained were inspected and those with voids, cracks, fractures or irregularities were discarded. Only 100 sets of high quality models (50 male and 50 female subjects) were selected and study models were prepared. Electronic

digital caliper calibrated to the nearest 0.01 mm was used to measure the mesiodistal dimension of primary second molars(E) and permanent first molar(6). The maximum distance between the mesial and distal points of contact, measured with the caliper placed parallel to the occlusal surface.

All the measurements were noted by a single examiner and the values thus obtained were tabulated and subjected to statistical analysis using the statistical package for social sciences SPSS version 20.0. Pearson correlation test was applied for relation between primary second molars and permanent first molars. To check the intra and inter examiner variability and to determine the reliability of the measurements, 20 study models were randomly picked and measured by the initial examiner and by a separate investigator who was unaware of the prior measurements. No significant variation in the measurements was obtained. As the correlation co-efficient was very high, (r = 0.97) all the subsequent measurements were taken only once.

RESULTS

One hundred patient were included in the study. Fifty females and 50 male with gender ratio of 1:1. The mean age was 8±1.2 years. Mesiodistal widths of primary molars showed sexual dimorphism. Male's teeth mesiodistal widths are larger than female's, which was statistically significant. (Table 1)

Mean mesiodistal widths of permanent first molars in males ranged from 10.31 to 11.11mm while in females from 10.16 to 10.93mm. Male's teeth mesiodistal width of first permanent molars was also larger than female's, which was statistically significant. (Table 2). A significant strong correlation existed between primary molars and first permanent molars. The correlation was weaker in the females than males. (Table 3)

TABLE 1: COMPARISON OF MESIODISTAL-WIDTHS OF PRIMARY SECOND MOLARS BY GENDERS (N=100)

Tooth	Mesiodistal widths(mm) Male (n=50)		Mesiodistal widths(mm) Female (n=50)		p-value
	Mean	SD	Mean	SD	
Upper right E*	8.6	0.63	8.3	0.62	0.03
Upper Left E	8.7	0.61	8.1	0.67	0.01
Lower right E	9.44	0.59	9.12	0.60	0.02
Lower left E	9.33	0.62	9.11	0.58	0.04

*Primary second molar

TABLE 2: COMPARISON OF MESIODISTAL-WIDTHS OF PERMANENT FIRST MOLARS BY GENDERS (N=100)

Tooth	Mesiodistal widths(mm) Male (n=50)		Mesiodistal widths(mm) Female (n=50)		p-value
	Mean	SD	Mean	SD	
Upper right 6*	10.31	0.43	10.19	0.44	0.02
Upper Left 6	10.41	0.41	10.16	0.47	0.04
Lower right 6	11.11	0.49	10.93	0.51	0.01
Lower left 6	11.20	0.02	10.80	0.32	0.03

*Primary first molar

TABLE 3: RELATION BETWEEN THE MESIO-DISTAL WIDTH OF THE PERMANENT FIRST MOLARS AND DECIDUOUS SECOND MOLARS IN BOTH GENDERS

Gender	Male	Female
Correlation coefficient (r)	0.82	0.78
Co-efficient of determination (r^2)	0.67	0.60
p-value	0.01	0.00

DISCUSSION

Tooth size measurements provide valuable data for anthropology, forensic and clinical purposes as this data provides useful information for providing extra coronal restorations on the teeth and for understanding the occlusion of deciduous dentition in the pediatric population. Studies on tooth size measurements are abundant in the literature but relatively low in the primary dentition. But with respect to Pakistan population very sparse information is available. Thus, this present study was carried out to measure the average mesiodistal of primary molars in a sample of Peshawar children. It is very difficult to measures mesiodistal for same individual for both full primary and permanent dentition because both are not available at a time. To measure mesiodistal widths of primary molars and permanent first molars is good idea to know whether a size correlation exist between sets of dentition.

Tooth measurements can be determined by using direct in mouth of patients and indirect (plaster models) methods. Although many researcher used plaster models, there were few studies in which measurements were obtained directly from the mouth of the individual.[4,11,13,14] Anderson compared both these techniques in his odontometric study and stated that there was no statistically significant difference between the two methods.[15] Hunter and Priest stated that measuring maxillary molars directly in the mouth poses certain difficulties due to anatomical factors and they proved that mesiodistal measurements if obtained directly from the mouth yielded lesser values when compared to the indirect method. They also stated that the measurements performed on soaped cast models are not significantly larger than those performed on non-soaped models.[16] Hence indirect and non-soaped casts were considered for this odontometric study.

Different methods have been used to measure tooth dimensions, many authors employed sliding caliper with a Vernier scale to obtain the metrical data of the teeth, due to its accuracy over other methods.[16] The use of digital Vernier calipers can virtually eliminate measurement transfer and calculation errors when compared with divider and calculator. Although, some measurement errors may associate with the positioning of the calipers on the mesial and distal surfaces of the teeth, this method is certainly more reliable than manual measurements. In the present study, the tooth measurements were done by contact method indirectly on the casts using digital Vernier calipers with error of 0.01 mm since it is easy, fast and accurate and also the errors were minimal with this method.

In the current study male's teeth were larger in size than females. Tikku et al[17] reported a statistically significant difference of mesiodistal width of teeth that males had larger teeth in Indian population. Memon et al[18] showed a similar results in a Karachi, Pakistan population.

According teeth to Horowitz and Hixon[8] correlations in size between a single primary tooth and its successor range from r = 0.2 to r = 0.6. This means that anywhere from 4% to 36% of the successors are favorably correlated in size to the primary teeth. In other words, if the primary tooth is small, its successor will be small. According to Arita and Iwagaki[9], Hixon and Old father[10], Lewis and Lehman[11], Moorrees and Chadha[12] and Moorrees et al[13] the size correlation between all the primary teeth and their permanent successors is approximately r = 0.5. Therefore 25% of the time a positive relationship exists. That is not too favorable for optimal space analysis. While the current study showed high correlation between primary and permanent teeth (r=0.82-male, r=0.78-female). Many factors may be responsible for this variation. In present study we calculated correlation between primary second molars and first permanent molars while other authors[8-13] used many teeth from both primary and permanent dentition. Racial, environmental and genetic factors may play role as well.

Al-Dulayme[19] reportd a relation between the mesio-distal crown diameters of the deciduous second molars and the permanent first molars in an Iraqi sample from Baghdad city. The sample consisted of 54 Iraqi children aged 8-9 years at the mixed dentition stage. The results revealed absence of the side difference of the widths of teeth measured. High significant gender difference was detected for the permanent first molars and the deciduous second molars except mandibular permanent first molar. On the other hand, high significant difference was found between the maxillary and mandibular arches for the permanent first molars and the deciduous second molars except for the permanent first molar in males. A direct strong significant correlation was found between the width of the permanent first molars and the deciduous second molars. These are consistent with present study.

CONCLUSION

A concordance was found between the sizes of the deciduous second molars with the size of the permanent first molars, this might be helpfulin prediction for arch length discrepancy which may result for possible crowding and occlusal relation in the permanent dentition.

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