ORIGINAL ARTICLE

MESIODISTAL CROWN SIZE ASYMMETRY BETWEEN RIGHT AND LEFT QUADRANTS IN ORTHODONTIC PATIENTS

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ABSTRACT

It has been demonstrated that, dental asymmetry is present in most populations, but this is usually clinically insignificant .This asymmetry might be due to difference in the size of the teeth on right and left sides of the human mouth. Orthodontists should be vigilant to bilateral tooth size asymmetry in treatment planning stage, as this may pose some problem in occlusal settling in finishing phase of orthodontic treatment. The aim of this study was to find out any asymmetry in the mesio-distal crown dimensions in orthodontic patients.

A total of 250 plaster dental casts were collected from the Department of Orthodontics, Sardar Begum Dental Hospital, Peshawar. Mesiodistal dimensions of all permanent teeth (except 3rd molars) were measured in both arches with digital Vernier caliper with accuracy of 0.01mm. Paired t test was used for comparison of right and left side tooth size differences in both upper and lower arches. Result showed that in maxillary arch statistically significant crown size asymmetry was found in central incisors, canines and 1st molar (p = .001, .000, .006 respectively). No significant differences were found in mesiodistal crown dimensions in mandibular arch.

It was concluded that statistically significant dental asymmetry was present in upper central incisors, canines and 1st molars while no dental asymmetry was found in mandibular arch. However, these differences in crown sizes were not clinically significant (more than 0.25mm).

Key Words: *Asymmetry, Vernier caliper, Frequency, Dental Cast*

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INTRODUCTION

Although each person shares many characteristics with the rest of population but there are enough differences to make each human being a unique individual.[1] Variation in size, shape and relationship of dental, skeletal and soft tissue facial structures are important for providing each individual with his or her identity. Asymmetry is a usual finding in human craniofacial bones and is present in patients and normal individuals as well.[2] The left and right-side differences that occur in variable degrees in the population may cause interference with the normal dental function and esthetic appearance, or may be so insignificant that it cannot be detected by mere observation. Therefore, it seems that soft tissues try to compensate underlying asymmetry.[3]

Regarding the trivial asymmetry in body's paired organs and also the trivial asymmetry on right and left sides of face, asymmetry is seen in teeth sizes in both sides of the dental arch, as a part of head and face hard tissue.[4,5] Considering these facial asymmetries, it might occur that teeth arranged on left and right sides of human mouth might be asymmetric too. Tooth size asymmetry generally does not involve an entire side of the arch.[5] On the other hand, teeth in the same morphological class tend to have same direction of asymmetry e.g. if the upper first premolar is larger on the right side, then the upper right 2nd premolar also tends to be larger on that side. In addition asymmetry tends to be greater for the distal teeth in each morphological class. i.e. lateral incisors, second premolars and third molars.[6,7]

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A study on anteroposterior cephalogram of 63 normal people showed that there was an asymmetry in all cases in which the left side was bigger, unlike the other studies.[8] But much of these skeletal asymmetries are clinically ignorable, therefore it seems soft tissues try to minimize underlying asymmetry.[9]

All the asymmetries are divided in two classes: quantitative asymmetry (difference in number of teeth in each half-arch) and qualitative asymmetry, (difference in size of teeth mesiodistal width or their location in the dental arch).[10] Also it has been stated that the asymmetry of tooth size on right and left side would be due to congenital, environmental factors or both of them. Difference in one or more teeth size on the right and left sides in 90% of the cases have been reported.[10]

According to Garn and coworkers,[11] asymmetries may be a major contributing factor to malocclusion. Significant asymmetry means imbalance. More symmetric patients have a greater likelihood for good occlusion. Patients with an increased fluctuating asymmetry tend to have more dental crowding and more severe malocclusion.[12]

The existence of size asymmetry within the dentition has long been recognized. Difference in one or more teeth size on the right and left side in 90% of cases has been reported.[13] A tooth on one side of jaw may be larger or smaller than its counterpart by 0.1 mm to 0.4mm or even more. More than 0.25mm asymmetry has been considered clinically significant in a previous study.[13]

The mesiodistal crown size asymmetry has important implications in orthodontics. Such asymmetry is of great concern to orthodontist in case evaluation and treatment planning.[14] If this is not diagnosed at the start of orthodontics treatment, it can lead to midline shift and difficulty in occlusal settling during finishing phase. At the conclusion of orthodontic treatment, when there is more than 2 mm asymmetry, the occlusion is difficult to settle.[15] The unsettled occlusion can be unstable and prone to relapse.

The aim of this study was to determine asymmetry in mesiodistal crown dimension of permanent teeth between right and left sides of upper and lower dental arches (excluding 3rd Molars) in orthodontic patients.

MATERIALS AND METHODS

This descriptive (Cross Sectional) study was conducted at the Department of Orthodontics, Sardar Begum Dental Hospital, Peshawar from January 2017 to February 2018. Consecutive samples of people who needed orthodontic treatment were collected. A total of 250 dental casts were included in this study.

Inclusion criteria were

- Age range from 15 to 60 years,
- Patients with full complement of permanent teeth present from right side to left side of arch (excluding 3rd Molars),
- No history of previous orthodontic treatment or serious health problem.

Exclusion criteria were

- Cleft patients or syndrome patients
- Observable anomaly in tooth size (e.g. peg shape, macrodontia, microdontia), with any
- loss of tooth structure (attrition, abrasion, carries or restoration) which affect the mesiodistal diameter of the crown.

The greatest mesiodistal diameters from anatomic mesial contact point to anatomic distal contact point of all permanent teeth (except wisdom tooth) were measured parallel to occlusal plane using a digital Vernier caliper with accuracy of 0.01mm. The data collected was recorded on a data collection form designed for this study. All teeth were numbered according to universal numbering system.

Statistical analysis was performed using Microsoft Office Excel 2007 and SPSS Statistics version 20 software. Descriptive statistics including means, standard deviation and ranges were calculated for all numerical variables. Paired t test was used for comparison of sizes between right and left sides in upper and lower dental arches. Statistical significance was pre-determined at $P < 0.05$. Intra-observer reliability was checked using Kappa statistics. To test the level of error involved in this study, 30 casts were randomly selected and measurements were repeated one month apart by same operator to check for intra-examiner reliability.

RESULTS

A total of 250 casts were included in this study where 94 were males and 156 were females. The intra observer reliability was found to be excellent with a Kappa value of 0.912. No clinically significant difference (more than 0.25mm) between right and left side was found in this sample.

Mean mesiodistal sizes of teeth in upper and lower arch are given in Table 1 and Table 2. In maxillary arch statistically significant differences were found in mesiodistal crown dimensions of central Incisors (P=.001), canines (P=.000) and 1st molar (P=.006), between right and left side of the arch as shown in table 3. Comparison of sizes in the mandibular arch found no significant differences between the left and right

TABLE 1: MEAN AND STANDARD DEVIATIONS OF MESIODISTAL DIMENSIONS OF UPPER TEETH

Tooth	N	Mean ± SD	SE Mean
UR central incisor	250	8.7894±.63321	.04005
UL central incisor	250	8.7137±.61049	.03861
UR lateral incisor	250	7.0285±.77029	.04872
UL lateral incisor	250	7.0278±.70563	.04463
UR canine	250	7.9008±.55453	.03507
UL canine	250	7.8002±.50470	.03192
UR 1st premolar	250	7.1485±.57459	.03634
UL 1st premolar	250	7.1853±.54861	.03470
UR 2nd premolar	250	6.9247±.54165	.03426
UL 2nd premolar	250	6.8843±.53980	.03414
UR1st molar	250	10.5514±.72301	.04573
UL1st molar	250	10.6350±.69150	.04373
UR 2nd molar	250	9.8675±.75375	.04767
UL 2nd molar	250	9.9168±.80525	.05093

UR, upper right; UL, upper left

TABLE 2: MEAN SIZES OF TEETH IN LOWER ARCH

Tooth	N	Mean ± SD	Std. Error Mean
LR central incisor	250	5.5906±.44694	.02827
LL central incisor	250	5.5791±.40301	.02549
LR lateral incisor	250	6.1524±.46328	.02930
LL lateral incisor	250	6.1582±.45779	.02895
LR canine	250	6.9032±.50917	.03220
LL canine	250	6.8682±.49373	.03123
LR 1st premolar	250	7.2229±.61320	.03878
LL 1st premolar	250	7.2040±.58670	.03711
LR 2nd premolar	250	7.2852±.62821	.03973
LL 2nd premolar	250	7.2207±.53180	.03363
LR1st molar	250	11.1311±.80559	.05095
LL1st molar	250	11.1957±.71450	.04519
LR 2nd molar,	250	15.1404±.71450	4.80298
LL 2nd molar,	250	10.4745±.76259	.04823

*LR, lower right; LL, lower left

mandibular dentition (Table 4).

An independent assessment of the mesiodistal tooth size asymmetry was also done separately in males and females subjects. In male subjects significant tooth size differences were found in maxillary canines (P=.001), first molars (P=.029) and second molars (P=.005) (Table 5). However, in mandible, only the differences in the canine size (P=.028) was statistically significant (Table 6).

In females the differences in sizes of central incisors (P=.000), canines (P=.003) and 1st premolars (P=.024) were found to be statistically significant in maxilla (Table 7). In the mandible the 2nd premolar (P=.005) difference was found to be significant in females (Table 8).

DISCUSSION

The discrepancy in mesiodistal crown dimensions between right and left side can pose problem in achieving good interdigitation in finishing stages of orthodontic treatment.[10] If the disharmony is greater and clinically

TABLE 3: A COMPARISON OF TEETH SIZES BETWEEN RIGHT AND LEFT SIDES IN MAXILLARY ARCH

Upper Right & left	N	Mean diff ± SD	SE Mean	P-value*
Central incisor	250	.0756±.35853	.02268	.001
Lateral incisor	250	.00072±.44382	.02807	.980
Canine	250	.1006±.35792	.02264	.000
1st premolar	250	-.0368±.34912	.02208	.097
2nd premolar	250	.0404±.42955	.02717	.138
1st first molar	250	-.083±.47954	.03033	.006
2nd molar	250	-.0492±.64167	.04058	.226

*Paired t test; Level of significance P < 0.05

TABLE 4: A COMPARISON OF TEETH SIZES BETWEEN RIGHT AND LEFT SIDES IN MANDIBULAR ARCH

Lower Right & left	N	Mean diff ±SD	S.E. Mean	P-value*
Central incisor	250	.0115±.326	.02068	.577
Lateral incisor	250	-.0058±.346	.02194	.792
Canine	250	.0350±.2844	.01799	.053
1st premolar	250	.0188±.3942	.02494	.451
2nd premolar	250	.0645±.5185	.03280	.059
1st first molar	250	-.0647±.5619	.03554	.070
2nd molar	250	4.6659±75.83	4.79633	.332

*Paired t test; Level of significance P < 0.05

TABLE 5: COMPARISON OF RIGHT AND LEFT SIDE ASYMMETRY IN MALES IN MAXILLARY ARCH

Difference between right & left	N	Mean diff ± SD	SE. Mean	P-value*
Central incisors	250	.01457±34381	.03546	.682
Lateral incisors	250	.04043±.40969	.04226	.341
Canines	250	.11564±.31638	.03263	.001
1st premolars	250	.01457±.30222	.03117	.641
2nd premolars	250	.03170±.27033	.02788	.258
1st first molars	250	-.09681±.42394	.04373	.029
2nd molars	250	-.17819±.59744	.06162	.005

*Paired t test; Level of significance P < 0.05

TABLE 6: COMPARISON OF RIGHT AND LEFT SIDE ASYMMETRY IN MALES IN MANDIBULAR ARCH

Difference between right & left	N	Mean diff ± SD	S.E. Mean	P-Value*
Central incisors	250	-.00745±.28218	.02911	.799
Lateral incisors	250	.02628±.24925	.02571	.309
Canines	250	.05894±.25647	.02645	.028
1st premolars	250	-.00915±.30807	.03178	.774
2nd premolars	250	-.04787±.36103	.03724	.202
1st first molars	250	-.05787±.61807	.06375	.366
2nd molars	250	05794±.25647	.02178	.326

*Paired t test; Level of significance P < 0.05

TABLE 7: COMPARISON OF RIGHT AND LEFT SIDE ASYMMETRY IN FEMALES IN MAXILLARY ARCH

Difference between right & left	N	Mean diff ± SD	S.E. Mean	P-Value*
Central incisors	250	.1125±0.3632	.02908	.000
Lateral incisors	250	-.0232±0.4628	.03705	.532
Canines	250	.0915±.03818	.03054	.003
1st premolars	250	-.0677±0.372	.02979	.024
2nd premolars	250	.0457±0.5025	.04023	.258
1st first molars	250	-.0757±0.5113	.04094	.066
2nd molars	250	.0284±0.6566	.05257	.590

*Paired t test; Level of significance P < 0.05.

TABLE 8: COMPARISON OF RIGHT AND LEFT SIDE ASYMMETRY IN FEMALES IN MANDIBULAR ARCH

Difference between right & left	N	Mean diff ± SD	S.E. Mean	P-Value*
Central incisors	250	.02301±.3515	.02814	.415
Lateral incisors	250	-.02513±.3937	.03152	.427
Canines	250	.02058±.299	.02402	.393
1st premolars	250	.03571±.438	.03509	.310
2nd premolars	250	.13218±.584	.04679	.005
1st first molars	250	-.06872±.527	.04222	.106
2nd molars	250	-.10821±.722	.05781	.063

*Paired t test; Level of significance P < 0.05

significant, then it should be considered during treatment planning stages for proper management.

This study was conducted to find out the amount of dental asymmetries in orthodontic patients. Findings of present study showed that in maxillary arch statistically significant differences were found in mesiodistal crown dimensions of central incisors, canines and 1st molars between right and left side of the dental arch while in mandibular arch, no statistically significant difference was found. However, this difference in crown sizes between right and left quadrants was not clinically significant (more than 0.25mm) as shown in a previous study.[13] In a similar study Naseri et al[10] also reported no clinically significant difference (more than 0.25mm) between right and left sides in his population group.

Results of current study showed that the differences were found in the sizes between central incisors (P=.001), canines (.000) and 1st molars (.006) in maxilla. These teeth are important both from esthetic and occlusion point of view. Naseri et al[10] found highest difference in mesiodistal widths between first premolars and second molars in maxillary arch. Ballard[16] showed that the asymmetry of mesiodistal width was present between lateral incisors and first molars in maxilla. This lack of concordance with our results may be due to genetic, ethnic and racial variations in teeth sizes.

In this study no significant tooth size asymmetry in mandible arch was found. In contrast to present study Ballard[16] showed that the greatest asymmetry of mesiodistal width was present between canine and first premolar in the mandible . Naseri et al[10] also found highest difference in mesiodistal width of crown at the second molar and second premolar in mandible. These differences from this study can be due to genetic, ethnic and racial variations.

In present study more asymmetry was found in maxillary arch. Garn et al[11] showed that the asymmetry of maxillary teeth is slightly more than mandibular teeth which is in accordance with present study. Scanavini et al[17] found higher level of asymmetry in dental arch dimensions in the mandible than in the maxilla. Similar findings were obtained by Rose and Jason et al[18,19] in their studies. This is in contrast to this study.

CONCLUSION

Statistically significant dental asymmetry was found in maxillary central incisors, canines and 1st Molars. No significant dental asymmetry was found in mandible. However, these differences in sizes between right and left sides in maxillary arch were not clinically significant (more than 0.25mm). In males mesiodistal tooth size asymmetry was found in maxillary canines,

first molars, second molars and mandibular canines. In females the differences in sizes of maxillary central incisors, canines, 1st premolars and mandibular 2nd premolars were found.

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