



Comparison of Mesiodistal Tooth Dimension in Dentitions With Ectopic Canines- A Genetic Study

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ABSTRACT

Objective: Influence of genes on tooth dimension and palatal canine displacement is well documented. The present study thus aims to compare the mesiodistal dimension of teeth in patients with ectopic canines.

Materials and Methods: 40 patients with bilateral buccally displaced canines (BDC) and 40 patients with bilateral palatally displaced canines (PDC), aged between 15-25 years, were selected from the records of 1602 patients referred to the Department of Orthodontics and Dentofacial Orthopedics between 2005 and 2015. The control group comprised of 40 age and sex matched consecutively treated patients, exhibiting normally erupted and undisplaced maxillary canines.

Results: The mesiodistal width of lateral incisor in palatally displaced canine (PDC) group was significantly smaller than those in the buccally displaced canine (BDC) and the control group.

Conclusion: Patients with palatally displaced canines have a smaller mesiodistal dimension of lateral incisor as compared to BDC and the control group.

KEYWORDS

Ectopic canines, buccally displaced canines, palatally displaced canines, mesiodistal dimension

INTRODUCTION

Displacement/ ectopic eruption are a divergence from the normal path of eruption. However, if a tooth does not erupt for more than a year beyond its normal eruption period or cause root resorption of adjacent teeth within its eruption period, it is termed as impaction.¹⁻⁶

Several studies⁷⁻⁹ have reported the presence of sufficient space for eruption in palatal displacement cases, while insufficient space is mostly seen in buccal displacement cases. Palatal canine displacement is known to be associated with anomalous lateral incisors¹⁰⁻¹² and smaller mesiodistal dimension of maxillary incisors.¹³⁻¹⁵

Oliver et al¹⁶ found that palatally displaced canine was more frequent among Caucasians whereas buccally displaced canine was 2-3 times more frequent in Asians of Korean and Chinese descent. There are ethnic differences in the pattern of ectopic canines and tooth dimensions, thus this study is conducted in Indian population.

AIM & OBJECTIVES

To compare the mesiodistal dimension of teeth in patients with ectopic canines.

MATERIALS AND METHODS

Prior to the commencement of this study ethical clearance was obtained from the ethical committee of the institution. The pretreatment records of patients referred to the Department of Orthodontics and Dentofacial Orthopedics, in the period between 2005 and 2015, were taken. This experimental sample (Table 1), aged between 15- 25 years.

Table 1: Distribution of study population according to groups:

S.No.	Group	Males N	Females N	Total N
1	Control group	20	20	40

2	Buccally displaced canine group	20	20	40
3	Palatally displaced canine group	20	20	40
4	Total	60	60	120

Selection criteria for sample collection:

Exclusion criteria for all the 3 groups included: (1) less than 15 years old, (2) history of prior orthodontic treatment, (3) history of injury to the dentition, (4) cleft lip and/or palate, (5) craniofacial syndromes, (5) history of severe medical illness or systemic diseases, (6) patients with several impacted teeth or congenitally missing teeth.

Inclusion criteria for PDC and BDC group included: (1) bilateral palatally/ buccally impacted or erupted maxillary canine, (2) unerupted canine more than 1 year after all permanent teeth had erupted.

Measurement of mesiodistal tooth widths:

A digital vernier gauge was used to measure the mesio-distal widths of all the erupted maxillary permanent teeth, from first molar forward, to an accuracy of 0.01mm. Partially erupted, carious and restored teeth were excluded.

Statistical Analysis

Statistical Package for Social Sciences (SPSS- version 21) was used to analyze the data. Descriptive statistics included calculation of means and standard deviation (S.D). Significance of differences between the tooth measurements was tested using One-way ANOVA test. In case of significant differences found from one-way ANOVA test, Tukey's post-hoc pairwise comparison was then employed to test which specific groups differed from each other. All values were considered statistically significant for a value of $p < 0.05$.

RESULTS

Mesiodistal measurements

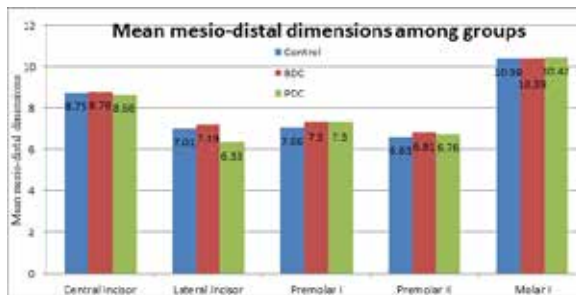
The mean, standard deviation and comparison of mesiodistal width of maxillary teeth among the control group, buccally displaced canine (BDC) group and Palatally displaced canine group (PDC) has been shown in Table 2 and figure 1.

Table 2: Comparison of Mesiodistal width of maxillary teeth among the control group, BDC group and PDC group.

Tooth	Control group (N=40)		Buccally Displaced Canine group (BDC) (N=40)		Palatally displaced canine group (PDC) (N=40)		F-value	p-value
	Mean	S.D	Mean	S.D	Mean	S.D		
CI	8.75	0.55	8.79	0.78	8.66	0.53	4.29	0.652 ^{NS}
LI	7.01	0.49	7.19	0.70	6.33	0.53	24.165	<0.001**
PM1	7.36	0.39	7.30	0.43	7.30	0.35	4.88	0.759 ^{NS}
PM2	6.63	0.45	6.81	0.52	6.76	0.46	1.488	0.230 ^{NS}
M1	10.39	0.59	10.39	0.63	10.42	0.56	0.018	0.982 ^{NS}

Central incisor (CI); lateral incisor (LI); first premolar (PM1); second premolar (PM2); first molar (M1)

Fig 1: Comparison of mean mesiodistal dimension of maxillary teeth among the control group, BDC group and PDC group.



A statistically significant difference (p value<0.001) (Table 2), in the Mesio-distal dimensions of Lateral Incisors was found among the three groups. Tukey's post hoc comparison among the three groups confirms that the mesiodistal width of lateral incisor of PDC group is significantly lower than the control group and BDC group.

In male subjects, for the Central Incisor, BDC group has a significantly higher M-D dimension than PDC group (p=0.01) and there is no difference in M-D dimension of control group and BDC group. In lateral incisor, PDC group has a highly significantly lower M-D dimension than Control group and BDC group (p<0.001) (Table 3).

Among the females, there is no statistically significant difference in the mesio-distal dimension of maxillary teeth between the groups (p>0.05) (Table 4).

Table 3: Comparison of Mesio-distal dimensions of maxillary teeth in males among the control group, buccally displaced canine (BDC) and palatally displaced canine (PDC) groups:

Tooth	Control group Mean ± SD	Buccally Displaced Canine group (BDC) Mean ± SD	Palatally displaced canine group (PDC) Mean ± SD	F	p-value
CI	8.89±0.58	9.27±0.53	8.72±0.62	4.674	.013*
LI	7.07±0.50	7.54±0.79	6.07±0.36	32.819	<0.001**

PM1	7.14±0.41	7.35±0.35	7.37±0.36	2.109	.131 ^{NS}
PM2	6.67±0.59	6.98±0.48	6.85±0.41	1.890	.160 ^{NS}
M1	10.70±0.42	10.62±0.66	10.54±0.49	.445	.643 ^{NS}

Central incisor (CI); lateral incisor (LI); first premolar (PM1); second premolar (PM2); first molar (M1)

Table 4: Comparison of Mesio-distal dimensions of maxillary teeth in females among the control group, buccally displaced canine (BDC) and palatally displaced canine (PDC) groups:

Tooth	Control group Mean ± SD	Buccally Displaced Canine group Mean ± SD	Palatally displaced canine group Mean ± SD	F value	p-value
CI	8.62±0.51	8.31±0.68	8.61±0.41	2.037	0.140 ^{NS}
LI	6.95±0.48	6.85±0.34	6.60±0.54	2.989	0.058 ^{NS}
PM1	6.98±0.36	7.25±0.50	7.24±0.34	2.808	0.069 ^{NS}
PM2	6.59±0.26	6.64±0.52	6.66±0.49	0.147	0.863 ^{NS}
M1	10.09±0.58	10.17±0.51	10.29±0.61	0.637	0.533 ^{NS}

Central incisor (CI); lateral incisor (LI); first premolar (PM1); second premolar (PM2); first molar (M1)

DISCUSSION

Peck and Peck⁹ suggest that bilateral occurrence of PDC suggest strong genetic etiology and Stewart et al¹⁷ proposed that a bilateral impaction may be a more severe expression of a genetic disorder than a unilateral impaction, thus only those cases were selected from the sample of orthodontic patients who had bilateral ectopic canines (buccal/palatal).

Mesiodistal tooth dimension (MDD) and arch length plays an important role in determining extraction and nonextraction treatment in orthodontics. We assessed mesiodistal dimension of maxillary tooth because there has been conflicting results^{8,10,11-14,18-22,25-27,29,30} regarding the association between palatally displaced canines and diminished mesiodistal dimension of maxillary dentition.

In our study also, we have found a difference between the the MDD of teeth between the groups. The MDD of lateral incisor in PDC group is lesser than the control group and the BDC group and this finding is consistent with the studies of Becker et al,^{8,10,21,22} Peck et al²³, Brenchley, Oliver²⁴ and Paschos et al²⁵. Cone Beam Computerized Tomographic studies by Liuk et al²⁷, Yan et al²⁸ and Hong et al³¹ also suggest the presence of diminished lateral incisor adjacent to PDC. Our review of literature showed only two studies, one by Mossey et al¹¹ and other by Chalakkal et al²⁶ that concluded that there is no significant difference in crown width or thickness of the lateral incisor between the PDC and control group.

Results from the present study suggest that smaller mesiodistal dimension lateral incisor in both males and females are strongly associated with palatal canine displacement. This anatomic feature may serve as an easy and early sign of palatal canine displacement.

CONCLUSION

Following conclusions were drawn from the present study:

Among the three groups the mesiodistal width of lateral incisor of PDC group is significantly lower than the control group and BDC group

In male subjects, for the Central Incisor, BDC group has a significantly higher M-D dimension than PDC group, and there is no difference in M-D dimension of control group and BDC group. In lateral incisor, PDC group has significantly lower M-D dimension than Control group and BDC group.

Among the females, there is no statistically significant difference in the mesio-distal dimension of maxillary teeth between the groups.

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