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Original Research Article

A retrospective analysis of maxillary tooth size variation in dentitions with palatal canine displacement among northern Indian female population

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Abstract: Palatally displaced maxillary canines are more prevalent among females than males. Many a times 3D CBCT facilities are not available, in that scenario findings of this study may be utilized as an adjunct to diagnose a PDC case more precisely. The aim is to ascertain the maxillary tooth size variation in dentitions with palatal canine displacement among northern Indian female population. This retrospective study was executed by the Department of Orthodontics, KD Dental College from 1st January 2015 to 31st December 2015. In this study a total of 100 subjects (50 cases and 50 controls) were studied. The diagnosis was made on the basis of clinical examination and standardized radiographs and confirmed visually at the time of surgical exposure. Bilateral and Unilateral Subjects were analyzed using study model casts for measuring the M-D and B-L dimensions of the maxillary dentition using a Digital Verniercaliper. Among 50 cases in the PDC sample examined there were 66.0% cases were unilateral and remaining 34.0% were bilateral. In unilaterally affected cases of PDC, there are no M–D or B–L size differences between the central and lateral incisors on the affected and unaffected sides. All the maxillary teeth in PDC subjects were significantly narrower (Bucco -Lingually) as compared to controls. The tooth which presented the highest significance and consistency in bucco lingual narrowing was the lateral incisor. The maxillary first premolars and molars were significantly smaller (M-D and B-L) as compared to the controls in PDC subjects. Statistically significant differences were observed between unilateral and bilateral affected PDC cases in this study. Positive association between tooth size reduction and occurrence of PDC was observed. Findings emerging out of this study i.e. tooth size variation may be utilized as an additional diagnostic tool in resource constrained settings to determine the position of the canine in canine displacement cases.
Keywords: Tooth abnormalities, Palatal, Canine, Impacted, Tooth size

INTRODUCTION

Palatally displaced maxillary canine teeth (PDC) are frequently found in dentitions that exhibit various anomalies. These anomalies include small, peg-shaped, and missing lateral incisors, other missing teeth, spaced dentitions, late developing dentitions, and several other features. Most of these associated anomalies are themselves linked with a reduction in size of other teeth in the dentition [1, 2]. These anomalies are almost entirely genetic in origin. It is believed that the association of these anomalies with PDC has a similar genetic association [3] although there is evidence to show that palatal displacement can occur due to local environmental factors related to the absence, anatomic abnormalities, or late development of the adjacent lateral incisor tooth [4].

In dentitions featuring PDC, reduction in tooth size, particularly lateral incisors, has noted by previous studies [5, 6]. Very few studies have described the size of additional teeth and especially the mandibular central and lateral incisor. Another report stated that Mesio-Distal (M-D) and Bucco–Lingual (B-L) measurements of the maxillary and mandibular incisors only were reported for the sample as whole but unilateral / bilateral differences were not studied [7]. In dentitions featuring PDC, reduction in tooth size, particularly lateral incisors, has been recorded. Most of the PDC cases are characterized as being ‘non-extraction’ cases, and the question arises as to whether this is due to small teeth or to large jaw size.

Palatally displaced maxillary canines are more prevalent among females than males. Many a times 3D CBCT facilities are not available, in that scenario findings of this study may be utilized as an adjunct to diagnose a PDC case more precisely. Therefore the present study was planned to conduct with an objective to analyze and ascertain the maxillary tooth size variation in dentitions with palatal canine displacement among northern Indian female population. Paucity of literature also warrants this study.

MATERIALS AND METHODS

The present retrospective study was planned and executed by the Department of Orthodontics, KD Dental College, and Mathura. Retrospective cohort of patients exhibiting PDC and seeking care at this tertiary care dental hospital during 1st January 2015 to 31st December 2015 formed the study population.50 treated cases exhibiting PDC were included in this study. Controls were chosen according to 1:1 ratio. Controls were treated subjects with normally erupted maxillary canines. The diagnosis was made on the basis of clinical examination and standardized radiographs and confirmed visually at the time of surgical exposure.

KD Dental College is a tertiary care dental teaching hospital equipped with ultra-modern multi super specialty facilities and referral unit of western Uttar Pradesh. This dental hospital receives major chunk of its patients not only from western region of Uttar Pradesh but also from other regions of Uttar Pradesh as well as from neighboring states especially Haryana and Rajasthan. Hospital caters mainly to rural and semi-urban patients, with a significant number of them being below the poverty line (BPL) income group patients. Thus this tertiary care hospital provided us a perfect base to study such an objective.

Casts of the maxillary dental arch were available for each of the patients of both groups. The M–D and B–L widths of all the erupted permanent teeth mesial to the first molars were measured directly on the plaster casts, to an accuracy of 0.1 mm using a Digital Verniercaliper. Teeth that were not fully erupted were excluded and measurements were not carried out where caries or restorations obscured one of the surfaces. Measurements were obtained on both sides of the dental arch.

Study tools were records of the patients such as information from Medical Records Department (MRD) and information from Department of Orthodontics. The study adhered to the tenets of the Declaration of Helsinki for research in humans. Permission of Institutional ethics committee (IEC) was sought before the commencement of the study. All the proforma were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 20 (IBM, Chicago, USA). The results were expressed using appropriate statistical methods. P value of <0.05 was considered to be statistically significant for any given measures.

RESULTS

In this study a total of 100 subjects were studied. Among 50 cases in the PDC sample examined there were 33 (66.0%) cases were unilateral and remaining 17 (34.0%) were bilateral. Controls were chosen according to 1:1 ratio. Controls were treated subjects with normally erupted maxillary canines. (Table 1)

Table 1: Distribution of study subjects with palatally displaced canines (PDC)

Sex	No. of subjects	Bilateral cases	Unilateral cases
Female Cases	50	17 (34.0%)	33 (66.0%)
Controls (1:1)	50	Treated subjects with normally erupted maxillary canines	
Total	100		

M–D measurements

In unilateral PDC cases, measurement of the M–D width of the central and lateral incisors yielded similar results for the affected and unaffected sides (Table 2). In general, the M–D width of female teeth with bilateral PDC was smaller than the M–D width in females with unilateral PDC, although statistical significance was reached only for the central and lateral incisors (P < 0.01; Table 3).

Table 2: Unilateral PDC subjects: comparison between mesio-distal (M–D) and bucco-lingual (B–L) width of the upper incisors in affected and unaffected sides.

Sex	Side	Central incisor			Lateral incisor		
		Affected	Unaffected	P value	Affected	Unaffected	P value
Female (n = 50)	M–D	8.5 ± 0.85	8.6 ± 0.84	NS	6.6 ± 0.73	6.5 ± 0.67	NS
	B–L	6.6 ± 0.77	6.8 ± 1.17	NS	5.3 ± 0.72	5.4 ± 0.64	NS
NS - Not Significant p>0.05							

B–L measurements

In unilateral PDC cases, B–L widths of the central and lateral incisors were similar for the affected and unaffected side for both sexes (Table 2). Accordingly, the B–L width of the affected and unaffected sides in unilateral cases was combined for further comparisons. The B–L width of teeth in PDC bilateral female patients was significantly smaller than in unilateral patients ($P < 0.01$; Table 3). Comparison of the bilateral cases and the control group also revealed significantly smaller B–L dimensions in the PDC bilateral group, which were obscured when the unilateral and bilateral cases were taken together.

Table 3: Mesio-distal (M–D) and bucco-lingual (B–L) tooth dimensions in females with palatally displaced canines (PDC), total (T), unilateral (U), or bilateral (B), compared with the control group (C).

Tooth no.	Side	Total	Unilateral	Bilateral	Controls	P value			
						Total-Controls	Unilateral-Bilateral	Unilateral-Controls	Bilateral-Controls
1	M–D	8.4 ± 0.81	8.5 ± 0.88	8.1 ± 0.55	8.1 ± 0.31	NS	<0.01	<0.05	NS
	B–L	6.5 ± 0.90	6.6 ± 0.77	6.1 ± 0.72	6.7 ± 0.63	NS	<0.01	NS	<0.01
2	M–D	6.4 ± 0.60	6.6 ± 0.73	6.2 ± 0.50	6.3 ± 0.53	NS	<0.01	NS	NS
	B–L	5.2 ± 0.69	5.4 ± 0.71	5.1 ± 0.74	5.7 ± 0.74	<0.01	<0.01	<0.05	<0.001
4	M–D	6.5 ± 0.67	6.6 ± 0.76	6.4 ± 0.65	6.5 ± 0.36	NS	NS	NS	NS
	B–L	8.6 ± 0.64	8.8 ± 0.45	8.4 ± 0.68	8.8 ± 0.65	NS	<0.01	NS	<0.01
5	M–D	6.4 ± 0.63	6.7 ± 0.74	6.3 ± 0.42	6.4 ± 0.30	NS	NS	NS	NS
	B–L	9.1 ± 0.44	9.3 ± 0.51	9.1 ± 0.33	9.2 ± 0.51	NS	<0.01	NS	NS
6	M–D	9.8 ± 0.87	9.7 ± 0.71	9.8 ± 0.55	9.8 ± 0.44	NS	NS	NS	NS
	B–L	9.9 ± 0.54	9.6 ± 0.54	9.9 ± 0.60	9.6 ± 0.42	NS	0.05	NS	NS
Mesio-distal (M–D) and bucco-lingual (B–L) tooth dimensions									

DISCUSSION

Its well-known fact that palatally displaced maxillary canines is more prevalent among females than males. This is in agreement with previous study from Europe [8]. We observed that in unilaterally affected cases of PDC, there are no M–D or B–L size differences between the central and lateral incisors on the affected and unaffected sides. A similar finding was recorded by Brenchley Z *et al.;* in his study [9].

It was observed in the present study that all the maxillary teeth in PDC subjects were significantly narrower (Bucco -Lingually) as compared to controls. The tooth which presented the highest significance and consistency in bucco lingual narrowing was the lateral incisor. The maxillary first premolars and molars were significantly smaller (M-D and B-L) as compared to the controls in PDC subjects. On the other hand these teeth are ontogenetically 'stable' teeth [10] and this trend was not reflected in M-D width of the more variable second premolar in a study from Karnataka [11].

Statistically significant differences were observed between unilateral and bilateral affected PDC cases in this study. The teeth in the unilaterally affected females are larger than those in bilaterally affected females. Our findings confirm the results of another study from Scotland [12]. This finding advocates that more severe expression of size reduction is compatible with a more severe expression (i.e. bilateral occurrence) of the trait. This investigation revealed that the teeth in unilateral affected subjects were larger than those in bilateral affected subjects. It can be stated that more severe expression of size reduction is compatible with a more severe expression (i.e. bilateral occurrence) of the trait [13]. Our findings confirm the results of several other studies on the existence of PDC in association with spaced dentitions [5, 10, 14]. This study reveals that small teeth may be responsible for spacing in many instances.

Regarding strengths of this study, this study has several strengths. First, to best of my knowledge, maxillary tooth size variation in dentitions with palatal canine displacement has not been studied in depth by experts of the field among northern Indian female population. This is first study in this geographical area. Second, it adds to existing literature as there is real paucity of literature on this topic. On the other hand, there are some limitations as well. First, small sample size is an evident limitation of this investigation. Second, only female study subjects were included. Therefore gender comparison was not possible.

CONCLUSION

On the basis of empirical findings of this study, it can be concluded that there is positive association between tooth size reduction and occurrence of PDC. Findings emerging out of this study i.e. tooth size variation may be utilized as an additional diagnostic tool in resource constrained settings to determine the position of the canine in canine displacement cases.

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