To Determine the Association of Maxillary Tooth Size Variation with Palatal Canine Displacement In Mysore Population

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Abstract

From earlier studies, it is known that dentitions featuring PDC (palatally displaced canine) showed various anomalies such as peg shaped and missing laterals incisors, other missing teeth and spaced dentitions. These anomalies which have associated genetic origin have similar association with PDC. In dentitions featuring PDC, reduction in tooth size, particularly lateral incisors was recorded. A recent Study was done in Israel to investigate the connection between palatal canine displacement and tooth size reduction in other teeth in maxilla. The present study was done to put this study into Indian context within Mysore population. The records of patients attending Farooqia Dental College were collected. The diagnosis was made on basis of clinical examination and standardized radiographs. Bilateral and Unilateral Subjects were analysed using study model casts for measuring the M-D and B-L dimensions of the maxillary dentition using a Digital Vernier Calliper.

The mean B-L width of all maxillary teeth in PDC subjects were significantly smaller by approximately 0.5 mm than in the control group. The B-L width of Lateral incisors was found to be significantly smaller for PDC subjects which was statistically significant. There was a distinct trend towards narrower teeth in the PDC group which was statistically significant for the maxillary first premolar and first molar.

Based on the results of the study it can be safely assumed that the results can be applied to Indian context. The tooth size variation information can be used as an additional diagnostic tool in clinical settings to determine the position of the canine in canine displacement cases.

Keywords: Canine, Impacted, Palatal, Tooth abnormalities, Tooth size.

Introduction

A Recent study [1] was done which attempted to investigate the correlation between maxillary lateral incisor tooth size reduction and PDC and unilateral /bilateral differences to degree of lateral incisor tooth size reduction and it was concluded that maxillary lateral incisor tooth size reduction and PDC cases had a high correlation and the severity of tooth size reduction increased with the severity of the expression of PDC.

From earlier studies, it is known that 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 [2,4,7,18,27] other missing teeth [8,23], spaced dentitions [15,27], late developing dentitions [5,19,27] and several other features. Most of these associated anomalies are themselves linked with a reduction in size of other teeth in dentition.

These anomalies are almost entirely genetic in origin. It is believed that the association of these anomalies with PDC has a similar genetic association [23]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.[6,10,18,25,27]

In dentitions featuring PDC, reduction in tooth size, particularly lateral incisors, has been recorded [6,10,17,21,25,27]. In the English literature only a single investigation reported the size of additional teeth and this was restricted to mandibular central and lateral incisor [17]. In that study the Mesio-Distal (M-D) and Bucco–Lingual (B-L) measurements of the maxillary and mandibular incisors only were reported for the sample as a whole. There was no attempt to investigate unilateral/ bilateral differences.

The present study was conducted to correlate the same in Indian population Viz Mysore population and to investigate whether same correlation exists for such population and the possibility of using this information as an adjunct to diagnose a PDC case more accurately in instances of non-availability of 3D CBCT

Materials and Method

The records of patients attending Farooqia Dental College comprising 48 patients are collected. The diagnosis was made on the basis of clinical examination and standardized radiographs [8,14,24]. Twenty four Bilateral PDC subjects and Twenty four Unilateral Subjects were analyzed using study model casts for measuring the M-D and B-L dimensions of the maxillary dentition.

Fig. 1: Bilateral PDC subject: Cast and OPG

Fig. 2: Unilateral PDC Subject: Cast and OPG

A second group of 24 patients in whom the maxillary canine had erupted normally as diagnosed from plaster casts were used as controls.

The M-D and B-L widths of all the erupted permanent teeth mesial to second molars were measured directly on plaster casts using a Digital Vernier Calliper (Fig. 3). 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.

Fig. 3: Digital Vernier Calliper (Indian Aeronautics Limited)

The significance of differences was tested by a student's t-test.

Experimental errors were analysed by a trial in which 10 casts, selected at random, were measured on two occasions. A student's t- test was used to assess the significance of the differences between the determinations. The experimental error was determined by calculating the standard deviation of a single determination (Dahlberg, 1940).Measurement errors ranged from 0.08 to 0.13, the weighted average standard deviation of a single determination being 0.1mm for both B-L and M-D dimensions was not significant. It was concluded that experimental error was unlikely to bias the accuracy of tooth measurement

Results

Table 1 shows the distribution of unilateral and bilateral cases in the PDC sample examined.

Table 1: Distribution of subjects with Palatally Displaced Canines (PDC)

No. of subjects	Bilateral	Unilateral
48	24	24

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

	Central incisor			Lateral incisor		
Side	**Affected side**	**Unaffected side**	**P**	**Affected side**	**Unaffected side**	**P**
M-D	8.85±0.53	8.96±0.45	NS	6.85±0.68	7.0±0.53	NS
B-L	6.18±0.63	6.2±0.57	NS	5.97±0.78	6.1±0.48	NS

M-D Measurements: In unilateral PDC cases, measurements of the M-D width of the central incisors and Lateral Incisors yielded similar results for the affected and unaffected sides (Table 2).These were therefore combined together for further comparisons.

The PDC group showed narrower teeth Mesio-distally which was statistically significant for the maxillary lateral incisor, first premolar and first molar.

In general the M-D width of teeth with Bilateral PDC was smaller than M-D width with Unilateral PDC although statistical significance reached only for central and lateral incisors(P< 0.01)(Table 3, Table 4)

B-L Measurements: Lateral incisors showed significantly reduced dimensions Bucco-lingually for both Unilateral PDC and Bilateral PDC subjects which was statistically significant P<0.01 (Table 4)

The mean B-L width of all maxillary teeth in PDC subjects were significantly smaller by approximately 0.5 mm than in the control group(Table 3, Table 4)

The B-L width of Lateral incisors was found to be significantly smaller for bilateral PDC subjects than Unilateral PDC subjects which was statistically significant (P<0.01, Table 3, Table 4)

Table 3: Mesio-Distal (M-D) and Bucco-Lingual (B-L) tooth dimensions in Palatally Displaced Canines (PDC)

Tooth number		Unilateral n=24	Bilateral n=24	Control n=24
1	M-D	8.85± 0.85	8.36± 0.76	9.1± 0.78
	B-L	6.18± 0.63	6.78± 0.47	7.4± 0.52
2	M-D	6.85± 0.68	6.26± 0.65	7.43± 0.85
	B-L	5.97± 0.78	5.4±0.59	6.5± 0.48
4	M-D	7.0± 0.23	6.92±0.51	7.57± 0.65
	B-L	9.23± 0.45	9.1±0.77	9.77± 0.67
5	M-D	7.0± 0.36	6.84± 0.49	7.19±0.28
	B-L	9.3± 0.58	9.0±0.42	9.8±0.56
6	M-D	10.28±0.57	10.18± 0.33	10.61±0.58
	B-L	10.66±0.89	10.48± 0.93	11.30±0.98

Table 4: Statistical significance of the compared results

Tooth number		P U/C	P B/C	P U/B
1	M-D	<0.05	<0.01	<0.01
	B-L	<0.01	<0.01	<0.01
2	M-D	<0.01	<0.01	<0.01
	B-L	<0.01	<0.01	<0.01
4	M-D	<0.01	<0.01	NS
	B-L	<0.01	<0.01	NS
5	M-D	NS	NS	NS
	B-L	<0.01	<0.01	NS
6	M-D	<0.01	<0.01	NS
	B-L	<0.01	<0.01	NS

Discussion

In the present study, all the maxillary teeth in PDC subjects were significantly narrower (Bucco -Lingually) than the controls. The tooth which showed the highest significance and consistency in bucco lingual narrowing was the lateral incisor.

The maxillary first premolars and molars are significantly smaller (M-D and B-L) than the controls in PDC subjects, this is despite the fact that these teeth

are ontogenetically 'stable' teeth [26] and this trend is not reflected in M-D width of the more variable second premolar .

The teeth in unilateral affected subjects are larger than those in bilateral affected subjects (Table 3, Table 4) suggesting that a more severe expression of size reduction is compatible with a more severe expression (i.e. bilateral occurrence) of the trait [16,18].

Several authors have commented on the existence of PDC in association with spaced dentitions [3,15,23,27]. From the evidence in the present study, it becomes clear that small teeth may be responsible for spacing in many instances.

Conclusion

In studies of random population PDC samples, the following are noted.

In Bilateral and Unilateral PDC cases, all the maxillary teeth were narrower Bucco -Lingually, the most remarkable and consistent was the bucco-lingual narrowing of the lateral incisor.

The Mesio-distal and Bucco-lingual dimensions of maxillary first premolar and first molar were significantly smaller in PDC subjects.

A more severe expression of size reduction (Bucco-Lingually) in lateral Incisors was noted with a more severe expression of the canine impaction (bilateral occurrence).

The present study concludes that the positive correlation found between tooth size reduction and occurrence of PDC in Israeli population [1] holds true in case of Mysore population too. The present study can be used as an adjuvant for clinical diagnosis between Buccal and Palatal impaction of canines in situations where appropriate CBCT imaging is not available due to availability or economic constraints but the clinician can utilise the above information in clinical settings to quickly make an assumption on the location of canines as to its Buccal or palatal location.

Conflict of Interest: None
Source of Support: Nil

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