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CBCT Assisted Comparison of Dentoalveolar Angular Dimensions in Patients with Unilateral Palatally Impacted Canine between Impacted Side and Contralateral Non-Impacted Side

Mudasir Yaqoob[1], *Mohamad Aslam Baidar Gull[2], Syed Zameer Khurshaid[3]
[1](*PG Scholar, Department of Orthodontics & Dentofacial Orthopaedics, Government Dental College & Hospital, Srinagar, J&K, India)*
[2](*Registrar, Department of Orthodontics & Dentofacial Orthopaedics, Government Dental College & Hospital, Srinagar, J&K, India)*
[3](*Associate Professor, Department of Orthodontics & Dentofacial Orthopaedics, Government Dental College & Hospital, Srinagar, J&K, India)*

Abstract
Background: *The palatal eruption or the impaction of the maxillary permanent canine is an important chapter of oral pathology and represents frequently faced problems in clinical orthodontics.*
Objective*: To study the comparison of dentoalveolar angular dimensions in patients with unilateral impacted canines, between impacted side and contralateral non impacted side.*
Material and methods*: A cross-sectional study that included 42 CBCTs with unilaterally impacted maxillary canines was performed. Angulation was measured with respect to tangent to nasal floor. Of the total of 42 CBCT samples in the study, 15 were of males and 27 were of females.*
Results*: Angulation of impacted canine (mean = 120 degrees, S.D = 12.86) was greater than non-impacted canine (mean = 90.7, S.D = 3.91). Angulation of central incisor was greater on non-impacted side (mean = 90.0, S.D = 3.04) as compared to impacted side (mean = 87.0, S.D = 4.68). Similarly, angulation of lateral incisor was greater on non-impacted side (mean = 88.9, S.D = 3.64) as compared to impacted side (mean = 85.5, S.D = 5.41).*
Conclusion: *Values of dentoalveolar angular dimensions are significantly different on impacted side when compared to non-impacted side.*
Keywords*: Cone beam computed tomography, Dentoalveolar, Impaction*

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I. Introduction

The palatal eruption or the impaction of the maxillary permanent canine is an important chapter of oral pathology and represents frequently faced problems in clinical orthodontics.

Two major theories have been proposed to explain the occurrence of palatally displaced maxillary canines (PDC), i.e., the ‘‘guidance’’ theory and the ‘‘genetic’’ theory. According to the guidance theory, local conditions are responsible for the displacement of the canine.[1–6] While erupting, the canine lacks the guide that, in normal conditions, would be provided by the root of the lateral incisor because of hypoplasia or aplasia of this tooth. The genetic theory assigns the eruption anomaly of the upper permanent canine to a multifactorial complex that controls the expression of other, possibly concurrent, tooth anomalies.

The literature has little information about how the morphology and maxillary dimensions can affect the eruption and subsequent impaction of maxillary canines.[7-10] For these reasons, the aim of this investigation was to compare dentoalveolar angular dimensions in a sample with unilateral palatally impacted canines versus the unaffected side. Analyzing the characteristics of these dimensions and determining how they influence the impacted canines on vertical and transverse measurements using coronal and axial views on CBCT have been little reported in the scientific literature.

II. Material And Methods

The study was carried out on the patients registered for undergoing fixed orthodontic treatment in the Department of Orthodontics & Dentofacial Orthopaedics, Government Dental College & Hospital, Shireen Bagh, Srinagar. Inclusion criteria included patients with a unilateral maxillary palatal canine impaction, patients more than 12 years of age, complete eruption of the contralateral canine, and no prior orthodontic treatment. Exclusion criteria included patients with craniofacial anomalies and syndromes, cleft lip and cleft palate patients, cases with congenitally missing teeth, CBCT scans showing supernumerary teeth, enlarged/cystic follicle, or any other pathology, history of facial trauma and previous history of orthodontic treatment.

The data was obtained using the NewTom GiANO NNT Scanner. All the scans were taken using the same machine by the same operator. The NewTom GiANO Scanner is based on a cone-beam technique that uses X-ray emissions efficiently, thus reducing the dose absorbed by the patient.

The following analysis and measurements were performed for every included subject:

1. Angulations of long axis of Canines with respect to tangent to nasal floor.

Value of the external angle of the longitudinal axis of the impacted canine and canine which is not impacted, with respect to the tangent of the nostril floor was measured (Fig. 1).

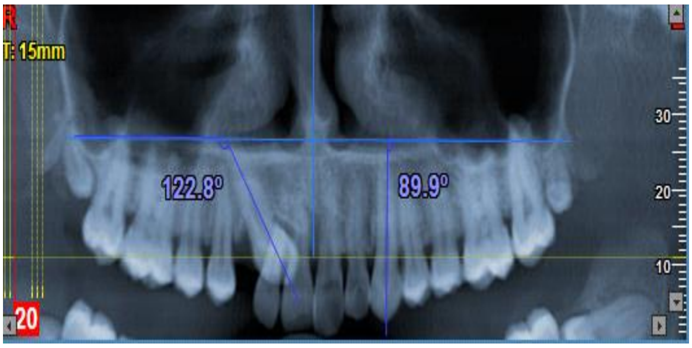

Figure 1: *Lateral angulation of long axis of canines with respect to the nasal horizontal plane.*

2. Angulations of long axis of Central Incisors with respect to tangent to nasal floor.

Value of the external angle of the longitudinal axis of the central incisors of both quadrants with respect to the tangent of the nostril floor was measured (Fig. 2).

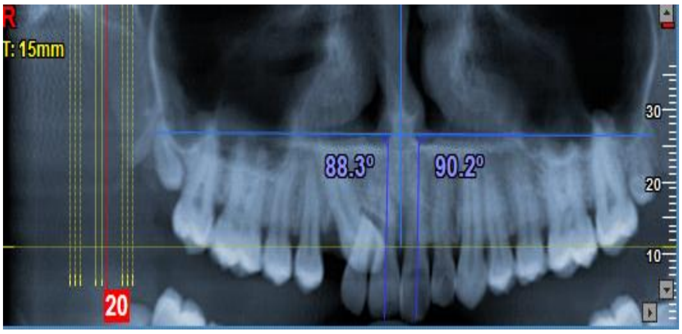

Figure 2: *Lateral angulation of long axis of the central incisors with respect to the nasal horizontal plane.*

3. Angulations of long axis of Lateral Incisors with respect to tangent to nasal floor.

Value of the external angle of the longitudinal axis of the lateral incisors of both quadrants with respect to the tangent of the nostril floor was measured.

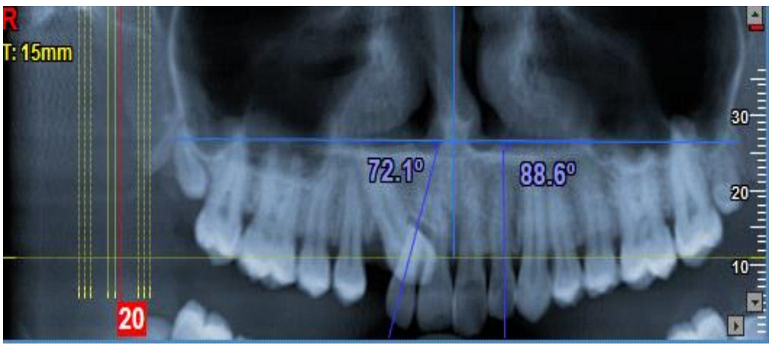

Figure 3: *Lateral angulation of long axis of the lateral incisors with respect to the nasal horizontal plane.*

Statistical analysis

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were summarized in the form of means and standard deviations and categorical variables were summarized as percentages. Chi-square test or Fisher's exact test, whichever appropriate, was used for comparison of categorical variables. A P-value of less than 0.05 was considered statistically significant. All P-values were two tailed.

Determination of sample size: Using GPOWER software (Version 3.0.10), it was estimated that the least number of samples required in each group with 80% power and 5% significance level is 21. Since we had two groups in our study, therefore a total of 42 samples were included in our study.

III. Results

Value of the external angle of the longitudinal axis of the impacted canine and normally erupted canine, with respect to the tangent of the nostril floor was measured. Also value of the external angle of the longitudinal axis of the central incisors as well as lateral incisors of both quadrants with respect to the tangent of the nostril floor was measured (Table 1). Angulation of impacted canine (mean = 120 degrees, S.D = 12.86) with respect to tangent to nasal floor was greater than non-impacted canine (mean = 90.7, S.D = 3.91). Angulation of central incisor to tangent to nasal floor was greater on non-impacted side (mean = 90.0, S.D = 3.04) as compared to impacted side (mean = 87.0, S.D = 4.68). Similarly angulation of lateral incisor to tangent to nasal floor was greater on non-impacted side (mean = 88.9, S.D = 3.64) as compared to impacted side (mean = 85.5, S.D = 5.41). All differences were statistically significant.

Table 1 : Comparison of angulations of canine, central Incisor and lateral Incisor between impacted and non-impacted side (degrees)

Parameter	Impacted Side			Non-Impacted Side			P-value
	Mean	SD	Range	Mean	SD	Range	
Angulation of canine	120.2	12.86	96.8-161	90.7	3.91	82-101.7	<0.001*
Angulation of central Incisor	87.0	4.68	61.6-93.7	90.0	3.04	83.7-100.7	0.002*
Angulation of lateral Incisor	85.5	5.41	75-104.9	88.9	3.64	72.4-97	0.001*

Table 1: *Comparison of angulations of canine, central Incisor and lateral Incisor between impacted and non-impacted side*

IV. Discussion

Statistically significant differences were observed when the lateral angulations of the long axis of incisors were compared between normal side and side of the impacted canine. The lateral angulation of the long axis of the incisors was lower on the impacted side presenting disto-angulated incisors on the side of impacted canine and mesial-angulated on the non-impacted side. Meanwhile, the lateral angulation of the long axis of the canines showed greater angulations on the impacted side compared to the non-impacted side with mesial tipping in the impacted canine. This was similarly presented in the study of Hanke et al. where the inclinations and lengths of vectors for impacted canines were higher (mesial tipping) than in those non-impacted canines.[11] The inclinations of the long axis of the canines in relation to the three reference planes are particularly suitable for comparisons, and in their study, significant differences were detected ($p < 0.001$). Similarly, this was also reported by Kanavakis et al., where the crown root angulation of lateral incisors adjacent to palatal impacted canines differ compared to that of lateral incisors adjacent to normally erupted canine, but this study was made on the panoramic radiographs, where the long axis of the root of the lateral incisors adjacent to palatal impacted canines form a more mesial angle to the crown (approximately 2.5°), when compared to the lateral incisors adjacent to normally erupted canines.[12] The present study included palatally impacted canines without any distinction of sectors as rated by Ericson and Kurol; because occurrence of impacted canine in some sectors are less frequent than the other and this could have had a bearing on less sample size of that particular sector. Ideally, we should form different groups according to the sector condition and it is recommended to use this classification on future research.

Probably, the orthodontic treatment in unilateral palatally impacted canine requires its previous traction; the alignment of the incisors without distancing the impacted canine could expose the roots of the incisors with the impacted canine due to their distal angulation with respect to the opposite side without impaction.

V. Conclusion

- The lateral angulation of the long axis of the incisors was lower on the impacted side presenting disto-angulated incisors on the side of impacted canine and mesial-angulated on the non-impacted side. Meanwhile, the lateral angulation of the long axis of the canines showed greater angulations on the impacted side compared to the non-impacted side with mesial tipping in the impacted canine.
- Care should be taken to prevent the contact of the root of the incisors with impacted canines due to the disto-angulation of the lateral and central incisors on the affected side.

References

[1]. Miller BH. The influence of congenitally missing teeth on the eruption of the upper canine. Dent Pract Dent Rec. 1963;13:497–504.
[2]. Becker A, Smith P, Behar R. The incidence of anomalous maxillary lateral incisors in relation to palatally-displaced cuspids. Angle Orthod. 1981;51:24–29.
[3]. Becker A, Zilberman Y, Tsur B. Root length of lateral incisors adjacent to palatally-displaced maxillary cuspids. Angle Orthod. 1984;54: 218–225.
[4]. Brin I, Becker A, Shalhav M. Position of the maxillary permanent canine in relation to anomalous or missing lateral incisors: a population study. Eur J Orthod. 1986;8: 12–16.
[5]. Zilberman Y, Cohen B, Becker A. Familial trends in palatal canines, anomalous lateral incisors, and related phenomena. Eur J Orthod. 1990;12:135–139.
[6]. Becker A, Sharabi S, Chaushu S. Maxillary tooth size variation in dentitions with palatal canine displacement. Eur J Orthod. 2002; 24:313–318.
[7]. Tadinada A, Mahdian M, Vishwanath M, Allareddy V, Upadhyay M, Yadav S. Evaluation of alveolar bone dimensions in unilateral palatally impacted canine: a cone beam computed tomographic analyses. Eur J Orthod. 2015; 37(6):596–602.
[8]. Kanavakis G, Curran KM, Wiseman KC, Barone NP, Finkelman MD, Srinivasan S, Lee MB, Trotman CA. Evaluation of crown-root angulation of lateral incisors adjacent to palatally impacted canines. Prog Orthod. 2015;16:4.
[9]. Mischkowski, R.A. et al. (2007) Geometric accuracy of a newly developed cone-beam device for maxillofacial imaging. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics, 104, 551–559.
[10]. Timock, A.M. et al. (2011) Accuracy and reliability of buccal bone height and thickness measurements from cone-beam computed tomography imaging. American Journal of Orthodontics and Dentofacial Orthopedics, 140, 734–744.
[11]. Hanke S. 3D CT based rating of unilateral impacted canines. J Craniomaxillofac Surg. 2012 ; 40 : 268–76.
[12]. Kanavakis G, Curran KM, Wiseman KC, Barone NP, Finkelman MD. Evaluation of crown-root angulation of lateral incisors adjacent to palatally impacted canines. Prog Orthod. 2015 ; 16 : 44-51

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