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

Mudasir Yaqoob[1], Mohamad Aslam Baidar Gull[2], Syed Zameer Khurshaid[3]

[1]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.

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ABSTRACT

Background: To study the comparison of dentoalveolar linear dimensions in patients with unilateral impacted canines, between impacted side and contralateral non impacted side. **Methods**: A cross-sectional study (split mouth design) that included 42 CBCTs (i.e., 84 sides) with unilaterally impacted maxillary canines was performed. Of the total of 42 CBCT samples in the study 15 were of males and 27 were of females. Anterior alveolar ridge height was measured between mid-sagittal plane and central incisors and between central and lateral incisors on impacted side and compared with measurements on non-impacted side. Similarly, anterior dentoalveolar height was measured on the side of the impacted canine and the side without impaction and compared. **Results**: The ridge height between midsagittal plane and central incisor was greater on non-impacted side (mean = 16.6, S.D = 2.98) as compared to impacted side (mean = 15.7, S.D = 2.54). The ridge height between central and lateral incisors was greater on non-impacted side (mean = 16.0, S.D = 2.25) as compared to impacted side (mean = 15.1, S.D = 2.18). The dentoalveolar height was greater on non-impacted side (mean = 25.4, S.D = 2.76) as compared to impacted side (mean = 24.6, S.D = 2.99). **Conclusion**: Values of dentoalveolar linear dimensions are not significantly different on impacted side when compared to non-impacted side.

Keywords: Cone-beam computed tomography, Dentoalveolar, Impacted canine.

INTRODUCTION

An impacted tooth can be defined as an abnormal state in which the tooth is completely or partially covered by mucoperiosteum and bone, distant from the site and time that it should be erupted in the oral cavity.[1-3] Impacted canine in the palatal position occurs 3 to 6 times more often than buccal position.[4,5] Impacted canines are twice as common in women as in men, and the incidence in the maxilla is more than double compared to the lower jaw.[6] Unerupted canines are the second most common group suffering impaction surpassed only by impacted third molars, its reported prevalence varies from 0.2% to 2.8%.[2,3] Two main theories have been proposed to explain the emergence of palatal impacted maxillary canines: the "orientation" and "genetic" theories.[7] The lack of space in the dental arch can prolong retention of deciduous canines. Absence of adjacent lateral incisors, root dilaceration, and ankylosis of the permanent canines are the most common local factors associated with maxillary impacted canines.[8-10]

The literature has little information about how the morphology and maxillary dimensions can affect the eruption and subsequent impaction of maxillary canines. For these reasons, the aim of this investigation was to compare dentoalveolar linear 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.

Name & Address of Corresponding Author
Dr. Mudasir Yaqoob
Department of Orthodontics & Dentofacial Orthopaedics,
Government Dental College & Hospital,
Srinagar, J&K, India
Email: mudas1ry9b@gmail.com

MATERIALS AND METHODS

The study was carried out on the patients registered for undergoing fixed orthodontic treatment at 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:

Anterior alveolar ridge height (between mid-sagittal plane and central incisors and between central and lateral incisors): It was measured in millimeters from the bony ridge of upper incisors by drawing a straight line parallel to the mid-sagittal plane till the floor of the nostrils and from the bony ridge between the central and lateral incisors by drawing a straight line parallel to the midsagittal plane till the floor of the nostrils on the side of the impaction and the side without impaction [Figure 1(a) & (b)].

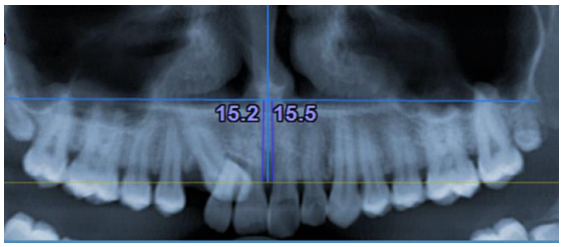

Figure 1(a): Anterior alveolar ridge height between mid-sagittal plane and central incisors

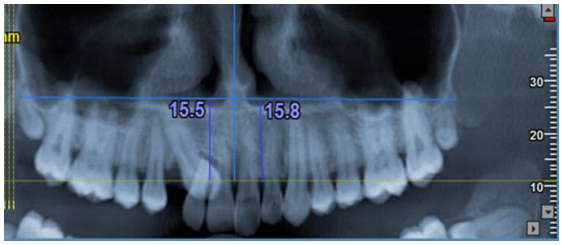

Figure 1(b): Anterior alveolar ridge height between the central and lateral incisors

Anterior dentoalveolar height: It was measured in millimetres from the incisal edge of upper incisors by drawing a straight line parallel to the mid-sagittal plane till the floor of the nostrils on the side of the impacted canine and the side without impaction [Figure 2].

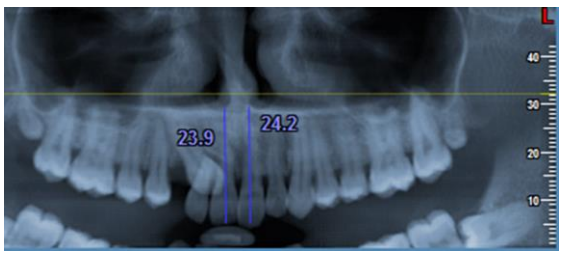

Figure 2: Anterior dentoalveolar height from the incisal edge of upper incisors

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.

RESULTS

The ridge height between midsagittal plane and central incisor was greater on non-impacted side (mean = 16.6, S.D = 2.98) as compared to impacted side (mean = 15.7, S.D = 2.54). Maximum and minimum alveolar ridge height between central incisor and mid-sagittal plane on non-impacted side were 26.6 and 12.4 respectively and 21.7 and 12.2 respectively on impacted side. The difference was statistically insignificant.

Table 1: Comparison of alveolar ridge height between central incisor (CI) & mid sagittal (MS) plane on impacted and non-impacted side (mm)

Alveolar ridge height between CI & MS	Mean	SD	Min	Max	P-value
Impacted Side	15.7	2.54	12.2	21.7	0.137
Non-Impacted Side	16.6	2.98	12.4	26.6	

The ridge height between central and lateral incisors was greater on non-impacted side (mean = 16.0, S.D = 2.25) as compared to impacted side (mean = 15.1, S.D = 2.18). Maximum and minimum alveolar ridge height between central incisor and lateral incisor on non-impacted side were 20.9 and 11.9 respectively and 20.3 and 11.2 respectively on impacted side. The difference was statistically insignificant.

Table 2: Comparison of alveolar ridge height between central incisor (CI) & lateral incisor (LI) on impacted and non-impacted side (mm).

Alveolar ridge height between CI & LI	Mean	SD	Min	Max	P-value
Impacted Side	15.1	2.18	11.2	20.3	0.087
Non-Impacted Side	16.0	2.25	11.9	20.9	

The dentoalveolar height was greater on non-impacted side (mean = 25.4, S.D = 2.76) as compared to impacted side (mean = 24.6, S.D = 2.99). Maximum and minimum dentoalveolar heights on non-impacted side were 31.7 and 21.8 respectively and 31.7 and 21.1 respectively on

impacted side. The difference was statistically insignificant.

Table 3: Comparison of dentoalveolar height between impacted and non-impacted side (mm)

Dentoalveolar height	Mean	SD	Min	Max	P-value
Impacted Side	24.6	2.99	21.1	31.7	0.202
Non-Impacted Side	25.4	2.76	21.8	31.7	

DISCUSSION

The present study chose CBCT as the preferred measurement technique for determining the alveolar dimensions as it provides a highly accurate method to evaluate bone architecture.[11] The orthodontic literature has reported a high degree of accuracy in measurement of alveolar bone dimensions using CBCT.[11,12]

When comparing the bone heights between mid-sagittal plane and central incisor and between central and lateral incisor and dentoalveolar height from incisal edge of central incisor to nasal floor between impacted and non-impacted side, no statistically significant differences were found. The study of Oleo-Aracena showed similar results; the differences between all these dimensions between impacted and non-impacted side showed statistically insignificant differences.[13] The study of Tadinada et al however showed different results, the alveolar bone dimensions (from nasal floor to the alveolar ridge) were significantly lower on the impacted side, compared to that on the non-impacted side.[14] However, in this study, measurements were done in the region of canine. Based on this we think that the incisor heights should not be affected because the sequence of eruption of incisors is prior to canines. In our study, all subjects had almost a similar ethnic origin, and great variability related to the crown size was not expected; finally, we did not find difference into these heights between both sides (with and without impaction). To our knowledge this is only the second study where alveolar and dento-alveolar bone dimension comparison in the region of incisors using CBCT has been done.

CONCLUSION

When comparing the bone heights between mid-sagittal plane and central incisor and between central and lateral incisor and dentoalveolar height from incisal edge of central incisor to nasal floor between impacted and non-impacted side, no statistically significant differences were found.

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