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Localization of Impacted Maxillary Canines and Root Resorption of Neighbouring Latral Incisor Using Cone Beam Computed Tomography

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ABSTRACT

Canine impaction is one of the most prevalent impactions and it affects aesthetic and function of the oral cavity. Recent advances in 3D imaging has provided new facilities for precise localization of the impacted teeth and their effect on adjacent roots. The aim of this study was to assess the location of impacted canine and adjacent root resorption by CBCT in an Iranian adolescent population. In this retrospective, descriptive-analytic study, CBCT images of 25 orthodontic patients (seven had bilateral canine impaction) and the bucco-lingual and vertical position of teeth and tooth location to the adjacent teeth were evaluated using CBCT. A total of 32 impacted canines were examined (24 females,8 males). Of these, 11 (34.4%) were located buccally, 11 (34.4%) mid-alveolar and 10 (31.1%) palatally .in vertical position, 7 of the impacted canines (21.9%) were coronal and 16 (50%) in the cervical 2/3 and 8 teeth (25%) were positioned in cervical one third and one of them (3.1%) was positioned apically. Among 32 studied teeth, 6 (%8.8) of them did not cause incisor degeneration and 8 (%25) teeth cause mild degeneration and none of them caused intense incisor resorption. The average size of follicle was 3.6mm. According to the results, CBCT is a good tool for evaluation of impacted canine location and its effect on adjacent roots. Another important finding was the high prevalence of root resorption (90%), which implies immediate treatment of impacted canines.

Keywords: CBCT, impacted canine, lateral root resorption

INTRODUCTION

Impaction is defined as a failure of tooth eruption at its appropriate site in the dental arch, within its normal period of growth. Impacted maxillary canines are the most frequently impacted teeth after the third molars, with a prevalence ranging from approximately 1% to 3% [1,2].Localization of impacted canines and its possible effect on adjacent tooth roots has a paramount importance in treatment planning and prognosis of different treatment modalities [2].

Several authors have used computed tomography (CT) particularly spiral CT for localization of the impactions and for evaluation of resorption of incisors, due to the excellent tissue contrast and precise three dimensional images afforded by this technique [3,4]. Newer imaging techniques such as cone beam computed tomography (CBCT) has provided more efficient tools for evaluation of craniomandibular structures with a lower dose and higher precision. CBCT is now widely used for evaluation of different structures in this region. One of the most important advantages of CBCT is the 3D reconstruction of studied structures which gives the clinician the opportunity to evaluate the

relation of impacted teeth to the adjacent teeth [5]. Previous studies have evaluated the location of impacted teeth using CBCT technique in different ethnic groups, but no study has reported the location of impacted canine in Iranian population and the prevalence of root resorption in teeth adjacent to the impacted canines. Therefore, the aim of this study was to evaluate the location of impacted canine and the prevalence of lateral root resorption in a sample of Iranian adolescent population.

MATERIALS AND METHODS

All the procedures performed in the current study were approved by Kerman university of medical sciences ethics committee (Ethics code: KMU/94/875). Parents of the subjects were informed regarding the objective of the study and informed consent was obtained from them prior to use of the CBCT cliché for the current study.

This cross sectional study was performed on CBCT cliché of 25 patients (13 to 18 years old) whom were referred to a radiology clinic in Kerman, Iran in 2015 for evaluation of impacted canine and the possible lateral root resorption.
The CBCT images were obtained by Planmeca-3D (Made in US) using the following protocol: 12-14 mA, 80-86 Kv with high resolution. The 3D images were analyzed by Romexis 3.1.1 software Romexis Inc., US) In axial sectional and 3D reconstruction views. After reconstruction of impacted canine and its adjacent lateral root, the following parameters were evaluated:

A) The labio-palatal position of the impacted canine, Which was scored as either labially, palatally or in the middle of the alveolus.
B) Canine angulation to the midline. A dental midline was constructed in the image and a second line was drawn through the canine root apex and canine tip [6] (Figure 1).
C) Canine angulation to the occlusal plane, D) Distance between tip of impacted canine and the dental midline, E) Vertical position of the cusp tip in relation to the occlusal plane grouped as: ,Coronal, Cervical , one third of root or two third of root, Apical or Supra apical, F) Presence or absence of root resorption of the related incisors grouped as :Without resorption (intact root surface), Mild resorption (root resorption without pulp exposure), Moderate resorption (pulp exposure and the root resorption less than 1/3 of root length), Severe resorption (pulp exposure and the root resorption more than 1/3 0f root length) and G) Follicle size(the widest widths of follicle around the crown.

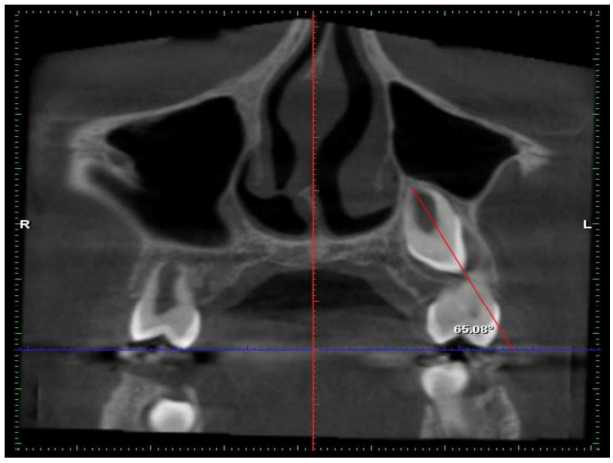

Figure 1: Canine angulation to occlusal plane was calculated by measuring the angle made between a line drawn in the midline and another line drawn in the longitudinal axis of the impacted canine

3. ETHICAL CONSIDERATIONS

Data were collected and analyzed using SPSS V.16 (IBM Inc., USA). The qualitative data were scored and analyzed by using chi-square test. $P<0.05$ was considered statistically significant.

RESULTS

A total of 32 impacted maxillary canines were studied in the current study. The majority of cases were female subjects (n=24, 75%). Regarding the Labiopalatal position, 11 teeth (34.4%) were labially. 11 teeth (34.4%) were in the mid of the alveolus and 10 (31.3%) were palatally. There was no significant difference in labiopalatal location of impacted teeth ($p>0.05$, Chi-square test).

In vertical dimension, 7 teeth (21.9%) were positioned coronally, 16 (50%) were in two third of root length, eight (25%) were in one third of root length and one (3.1%) was in the root apical portion. Among 32 studied teeth, in six (8.8%) impaction cases, no adjacent tooth resorption was observed. In 18 (56.3%) cases, mild resorption was observed and eight (25%) of the cases had moderate resorption, while none of the cases revealed severe resorption. Average distance from midline was 9.26 ± 4.87 (mm) and the mean angle to the dental midline was 23.75 ± 9.87 ◦.The mean distance to the dental midline was 12.9 ± 5.72 (mm) in men and 8.04 ± 3.99 (mm) in women and the distance from midline was significantly different between men and women(P=0.012).The mean angle to the occlusal plane was 65.92 ±10.41 ◦ and the mean size of dental follicle was 3.6 ± 0.6 mm.

Table 1: Relation between impacted canine and maxillary structures

	Distance to midline(mm)	Angulation to midline)◦	Angulation to occlusal plane)◦
Number	32	32	32
Mean	9.26	23.75	65.92
Mid	8.55	25.23	65.96
SD	4.87	9.87	10.41
Min	1.80	0	49.40
Mix	19.65	40	90

Table 2: Relation between impacted canine and maxillary structures in two sex

	Sex	Number	Mean	SD	P-value
Distance to midline(mm)	M	8	12.90	5.72	0.012
	F	24	8.04	3.99	
Angulation to midline)◦	M	8	21.25	8.55	0.395
	F	24	24.59	10.30	
Angulation to occlusal plane)◦	M	8	68.85	8.27	1.377
	F	24	64.95	11.01	

DISCUSSION

Tooth impaction is a pathological condition defined by the failure of eruption of a tooth in the oral cavity within the time and physiological limits of the normal eruption process based on clinical and radiological examination [6]. According to the literature, the incidence of maxillary canine impaction ranges between 1% and 3% in the general population [7].

Early diagnosis and intervention could save the time, expense, and more complex treatment in the permanent dentition. Today, clinicians are beginning to appreciate the advantages that the third dimension gives to clinical diagnosis and treatment planning of impacted teeth [8,9].

CONCLUSION

In the present study, the buccolingual positions of the crowns of the impacted canines were 34.4% labial, 31.3% palatal, and 34.4% mid alveolus, however Liu et al. recorded 45.2% labial, 40.5% palatal and 14.3% mid alveolus [10]. The difference from our study may be due to different population samples or race variations.

Abdel-salam et al analysed 28 pateints with impacted canine and in their study, 7.1 % were labially 57% palatally and 35.7% mid alveolus positioned and the rate of root resorption was 57% but in the present study, resorption was observed in 91% of the studied cases. The differences in the result may be due to different sample size and mean age of the patients[11].

Oberoyet al. showed that 40% of the impacted canines didn't demonstrate any sign of resorption, 37.55% had mild resorption, 14% had moderate resorption and 4% had severe resorption . The majority of cases were in palatal position which is consistent with findings of the current study [12].

Oana et al showed that 67.5% of impacted canines were positioned palatally and 15.4% were labially. the differences between our results may be due to not considering mid alveolar position in their study and different population samples or race variations [13].

Ericson et al recorded that rate of root resorption in latral incisor was 38% and the mean size of follicle was 6 mm. they showed that big size of follicle didn't cause resorption. but in our study rate of resorption was 91% and mean size of follicle was 3.6 mm [14].

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