

The Pattern of Maxillary Canine Impaction in Relation to Anomalous Lateral Incisors

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Objective: To investigate the probability and pattern of maxillary canine impaction in relation to anomalous adjacent lateral incisors. **Subjects and Method:** A total 66 patients (M=24, F=42) in the age range of 12 to 18 years who had at least one impacted maxillary canine were included for the study. The maxillary lateral incisor anomalies and nature of canine impactions were diagnosed from the radiographs and study models. Maxillary lateral incisors were classified as normal, peg shaped, impacted and congenitally missing. The maxillary canine impactions were classified as buccal and palatal impaction. Each affected maxillary side was considered separately. This resulted total 88 cases for which the probabilities of different canine positions adjacent to the different categories of lateral incisor anomalies were evaluated statistically. **Results:** The occurrence of palatal canine impaction was almost 1.6 times more than the buccal canine impaction. Total 11.76% of the buccally impacted canines and 38.89% of the palatally impacted canines were associated with anomalous lateral incisors. There was no positive association between anomalous lateral incisors and maxillary canines. In relation to anomalous lateral incisor, the probability of palatal canine impaction was more than the buccal canine impaction. **Conclusions:** There was no positive association between lateral incisor anomalies and maxillary canine impaction. However, there was a high probability of palatal canine impaction when adjacent lateral incisors were anomalous.

Keywords: Canine, Impaction, Anomalous, Lateral Incisors.

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INTRODUCTION

Impaction of one or more teeth is a common problem in dental patients.¹⁻⁶ There are also considerable variations in the prevalence and distribution of impacted teeth in different regions of the jaw.¹⁻¹⁰ The maxillary canines are the second most commonly impacted teeth after the third molars.^{4,7,11-20} There are many etiologies to the maxillary canine impaction and most of them are local to the canine area.²¹ Disturbance in the dental lamina,^{16,22} precocious development of the canine in the maxilla²³ and microform of the cleft lip and palate²⁴ are the possible etiology of the impacted maxillary canines. The eruption path of the maxillary canine follows the distal surface of the lateral incisor root and chances of maxillary canine impaction are more with missing lateral

incisors.²² The abnormal morphology of the maxillary lateral incisor is also responsible for displacement of the adjacent canines.²⁵⁻²⁸ When adjacent lateral incisor is anomalous or missing, the frequency of palatal impaction is higher.^{25,28-30} However, there is no definitive consensus in the literature regarding the nature of canine impaction in relation to the anomalous adjacent lateral incisor. Thus the present study was conducted to evaluate the probability and pattern of maxillary canine impaction in adjacent to an anomalous lateral incisor, and also to find out the association between maxillary canine impaction in relation to anomalous adjacent lateral incisors.

MATERIALS AND METHOD

This cross-sectional study was conducted on North Indian Orthodontic patients who reported for orthodontic treatment in the Department of Orthodontics and Dentofacial Orthopedics, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi. Total 66 orthodontic patients (Male=24, Female=42) who had at least one impacted maxillary canine were included in the study. All the patients were aged between 12 and 18 years. The study models, intraoral periapical radiographs of the impacted canine region, occlusal radiograph of the anterior maxilla and panoramic radiograph of each patient were collected. The dentition of each individual patient was examined from the study models. The maxillary lateral incisor anomalies

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and nature of canine impactions were diagnosed from the radiographs and study models. Maxillary lateral incisors were classified as suggested by the Becker *et al*,²⁷ as normal lateral incisor, peg shaped lateral incisor, impacted lateral incisor and congenitally missing lateral incisor. The maxillary canine impactions were classified as buccal impaction and palatal impaction.

Each maxillary side was considered as a separate case. The unilateral anomalies to either lateral incisor or canine were considered as one affected lateral incisor or canine case, where as bilateral anomalies to either lateral incisors or canines were considered as two separate cases. This resulted total 88 cases for which the probabilities of different canine positions adjacent to the different categories of lateral incisor anomalies were evaluated statistically.

RESULTS

The distribution of various categories of maxillary canine impaction by sex is shown in Table 1. The occurrence of maxillary canine impaction was 1.78 times more common in females than males. The occurrence of palatal canine impaction was almost 1.6 times more than the buccal canine impaction.

The distribution of various categories of maxillary lateral incisor by sex is shown in Table 2. Among 32 lateral incisor cases in male patients, 62.50% were normal, 6.24% were peg shaped, 21.88% were congenitally missing and 9.38% were impacted. In female patients among 56 lateral incisor cases, 76.78% were normal, 14.29% were peg shaped, 3.57% were congenitally missing and 5.36% were impacted. The occurrence of lateral incisor anomalies was equally distributed among the males and females. The occurrence of peg shaped lateral incisor was four times more common

among females where as the occurrence of congenitally missing lateral incisors were 3.5 times more common in males. The distribution of maxillary canine impaction categories in relation to the lateral incisor categories is shown in Table 3. When various categories of canine impactions were examined in relation to the various categories of lateral incisors, it was found that 11.76% of the total buccally impacted canines were associated with anomalous lateral incisors and 38.89% of the total palatally impacted canines were associated with anomalous lateral incisors. The probability of getting buccal and palatal impaction of canines adjacent to the various categories of lateral incisor is shown in Table 4. The probability of buccal and palatal canine impactions with normal lateral incisors was 47.62% and 52.38% respectively, with peg shaped lateral incisors was 10.00% and 90.00% respectively, with congenitally missing lateral incisors was 11.11% and 88.89% respectively and with impacted lateral incisors was 33.33% and 66.67% respectively.

DISCUSSION

The result of the present study provided that maxillary canines could get impacted either buccally or palatally when the lateral incisors were normal. However, when lateral incisors were anomalous, the chance for palatal canine impaction was more than the buccal canine impaction. This finding was consistent with a hypothesis that the anomalies of tooth agenesis, tooth size reduction and palatally displaced canines are three of the covariables in a complex of genetically controlled dental disturbances often occurring in combination.³⁰ Becker, Smith and Behar reported 2.4 times increased incidence of palatal canine impaction adjacent to the missing lateral incisor.²⁷ Brin *et al* also observed a highly

Table 1. Distribution of maxillary canine impaction categories.

Canines	Males		Females		Total Sample	
	No.	%	No.	%	N	%
Buccal canine impaction	13	40.62	21	37.50	34	38.64
Palatal canine impaction	19	59.38	35	62.50	54	61.36
Total	32	100.00	56	100.00	88	100.00

Table 2. Distribution of maxillary lateral incisor categories.

Canines	Males		Females		Total Sample	
	No.	%	No.	%	N	%
Normal lateral incisors	20	62.50	43	76.78	63	71.59
Peg shaped lateral incisors	2	6.24	8	14.29	10	11.36
Missing lateral incisors	7	21.88	2	3.57	9	10.23
Impacted lateral incisors	3	9.38	3	5.36	6	6.82
Total	32	100.00	56	100.00	88	100.00

Table 3. Distribution of maxillary canine impaction categories versus lateral incisor categories.

Canines	Lateral incisor categories				
	Normal	Peg shaped	Missing	Impacted	Total
Buccal canine impaction	30 (88.24%)	1 (2.94%)	1 (2.94%)	2 (5.88%)	34 (100.00%)
Palatal canine impaction	33 (61.11%)	9 (16.67%)	8 (14.81%)	4 (7.41%)	54 (100.00%)
Total	63 (71.59%)	10 (11.36%)	9 (10.23%)	6 (6.82%)	88 (100.00%)

Table 4. The probability of different canine impactions adjacent to different categories of lateral incisor.

Canines	Lateral incisor categories			
	Normal	Peg shaped	Missing	Impacted
Buccal canine impaction	47.62%	10.00%	11.11%	33.33%
Palatal canine impaction	52.38%	90.00%	88.89%	66.67%
Total	100.00%	100.00%	100.00%	100.00%

significant relationship (42.7%) between anomalous lateral incisors and palatal canine impaction.²⁵ However, Mossey, Campbell and Luffingham found a weak support for the association between palatal canine impaction and lateral incisor anomalies.²⁹ The association between canine impaction and lateral incisor is believed to be attributable to the guidance theory, i.e. the root of the lateral incisor serves as a guide along which the canine erupts, and when it is not present or malformed, the canine fails to erupt.³¹

In the present study, when the possible relationship between anomalous lateral incisors and various impactions of maxillary canines were investigated, no positive association was found. (Table 3) Becker *et al* however reported an exceptionally high prevalence of palatal displacement of the maxillary canines in the presence of anomalous lateral incisors.²⁷ They found that approximately half of the cases with palatally positioned canines presented with anomalous lateral incisors. However, in the present study 38.89% of the total palatally impacted canines were associated with anomalous lateral incisors. Among them, 16.67% were associated with peg shaped lateral incisors, 14.81% with congenitally missing lateral incisors and 7.41% with impacted lateral incisors. (Table 3)

In our study only 11.76% of the total buccally impacted canines were associated with anomalous lateral incisors. This resulted a weak association between maxillary buccal canine impaction and lateral incisor anomaly. However, there was a relatively higher association between palatal canine impaction and lateral incisor anomaly than between buccal canine impaction and lateral incisor anomalies. The palatal canine impaction in association with anomalous lateral incisors was equal among males and females. However, the findings of many previous studies showed that the impacted canines associated with anomalous lateral incisors were more common in females than males.^{32,33} Thus the present study showed a high probability of palatal canine impaction when adjacent lateral incisors were anomalous.

An indication of the chances of finding the type of canine impaction adjacent to an anomalous lateral incisor can be gathered from Table 4. When adjacent lateral incisors were normal, the probability of buccal and palatal canine impaction was 47.62% and 52.38% respectively. In relation to the peg shaped lateral incisors, the probability of buccal and palatal canine impaction was 10.00% and 90.00% respectively. Brin, Becker and Shalhav reported that when lateral incisors were peg shaped, in 11.5% of cases, a palatally displaced canine was expected.²⁵ In the present study the high probability could be due to the difference in the sample selection. The probabilities of buccal and palatal canine impaction when lateral incisors were congenitally missing were 11.11%, and 88.89% respectively. Thus there was a high probability of palatal canine impaction with congenitally missing lateral incisors. When lateral incisors were impacted, the probability of buccal and palatal canine impaction was 33.33% and 66.67% respectively. Thus, there was also a high probability of palatal canine impaction with congenitally missing lateral incisors.

CONCLUSIONS

The following conclusions were drawn from the present study:

1. The maxillary canine impaction in association with anomalous lateral incisors was equal among males and females.
2. There was no positive association between lateral incisor anomalies and maxillary canine impaction.
3. There was a high probability of palatal canine impaction rather than buccal canine impaction when adjacent lateral incisors were anomalous.

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