

PREVALENCE AND PATTERNS OF IMPACTED MAXILLARY CANINES: A CBCT BASED RETROSPECTIVE STUDY

¹HARIS KHAN, ²AYESHA ASHRAF, ³AYESHA ANWAR, ⁴EESHA NAJAM, ⁵FAYYAZ AHMAD
⁶TAIMOOR KHAN

ABSTRACT

Maxillary canines are considered as the cornerstone of the mouth. This study aims to estimate the prevalence and unfold various patterns present in maxillary canine impactions using cone beam computed tomography (CBCT).

Digital records of 3469 patient were collected from two different radiological units. Sorting of CBCT data was done for identification of maxillary impacted canine's cases. Data were analyzed statistically, and descriptive statics were generated for age, gender, quadrant, and position of impacted canines. Chi-square test was used to check the difference in the distribution of impacted canines regarding gender, quadrant and position of impacted teeth. A p-value of <0.05 was taken as significant.

One hundred and eighty-seven patients were identified with impacted maxillary canines making a prevalence of 5%, with a mean age of 17.9 +2.65 years. 117 impacted canine cases were located in females while 70 impacted canine cases were in males. Female to male ratio was 1.67:1. Statistically, a significant difference was noted between genders (p-value =0.00). No difference was noted between genders regarding quadrant and position of impacted canines.

Higher prevalence of impacted canine was noted in females, while left side predominance was found in both genders. Palatal impactions were most common while a higher prevalence of buccal impaction, than previously reported was noted in the present study.

Key Words: *Canine impaction, CBCT, Palatal impacted canine, Buccal impacted canine*

INTRODUCTION

Canines are taken as the cornerstone of the dental arch and play an important role in biting food, guiding the occlusion and supporting the upper lip. Maxillary canines are also part of the esthetic zone, and their presence is key to a consonant smile. If the maxillary canines are missing or unerupted due to any reason functional, esthetic and occlusal problem would be

encountered.

Impaction of a tooth is defined as its failure to erupt within the expected time of its eruption.¹ Maxillary canine impaction is usually encountered in clinical orthodontics and is considered to be the most impacted teeth after the third molar.^{2,3} Impaction of maxillary canine can be due to local obstruction, local pathology, disturbances of normal development, lack of guidance from adjacent lateral incisor and genetic reasons.² The prevalence of maxillary canine impaction ranges from 0.27% to 2.4% in general population^{4,5} while incidence of up to 5% have been reported in orthodontic population with female predisposition.⁶ Palatally impacted canine is usually considered more prevalent than buccal impacted canine.⁷ However Oliver⁸ reported greater prevalence of buccal impacted canines in the Asian population.

Impacted maxillary canines can lead to root resorption of adjacent teeth, transposition of canines, decrease in arch length or development of cystic masses causing infection and pain.^{9,10} Diagnosis of impacted canine is done both clinically and radiographically. Two-dimensional radiographs such as periapical, upper occlusal

¹ Dr Haris Khan, BDS, FCPS, FFDRCSI Associate Professor Orthodontics, CMH Lahore Medical College, Institute of Dentistry, Abdur Rehman Road, Lahore Cantt Postal Address: 210 A GOR5, Faisal Town, Lahore. Cell: 0333-6159951 Email: drhariskhan@gmail.com

² Dr Ayesha Ashraf, BDS, FCPS, Assistant Professor Orthodontics, FMH Lahore Medical and Dental College, Shadman, Lahore

³ Dr Ayesha Anwar BDS, FCPS, Morth. (Former Assistant Professor Orthodontics, AFID Rawalpindi)

⁴ Dr Eesha Najam, Post Graduate Resident in Orthodontics. CMH Lahore Medical College, Institute of Dentistry, Abdur Rehman Road, Lahore Cantt

⁵ Dr Fayyaz Ahmad, BDS, FCPS, Morth RCS, FFDRCSI, FDS. Consultant Orthodontist, Security forces Hospital, Dammam, Saudi Arabia.

⁶ Dr Taimoor Khan, Post Graduate Resident in Orthodontics. CMH Lahore Medical College, Institute of Dentistry, Abdur Rehman Road, Lahore Cantt

Received for Publication: May 25, 2018

Revised: June 26, 2018

Approved: June 28, 2018

and orthopantomograms have traditionally been advised for detection of impacted canines. However, it is nearly impossible to judge the buccolingual position of impacted teeth on a single two-dimensional radiograph. To counter this problem two plain radiographs or a single three-dimensional radiographic image scan (CT or CBCT) is required. CBCT is most commonly used in contemporary orthodontics because of its greater sensitivity and specificity for detection of impacted canines.¹¹

Early detection of impacted canines can help the orthodontics for timely interceptive treatment and prevent potential problem associated with this anomaly. The purpose of this study was to quantify the prevalence and patterns of different types of impacted canine in Pakistani population using CBCT.

METHODOLOGY

A total of thirty-four hundred and sixty-nine digital records (. dcm format) of the patient were collected from Armed Forces Institute of Dentistry Rawalpindi (AFID) and Advanced digital imaging center in Lahore. All the DICOM files were imported to Romexis viewer version 4.6.0. R (Planmeca, Finland) and sorting of CBCT data were done for identification of impacted maxillary canine cases. The patient's having incomplete root development of unerupted canine, supernumerary teeth, local pathology, orofacial clefts or obvious signs of other syndromic conditions were excluded from the study. Unilateral maxillary canine cases were categorized into buccal, palatal or middle of arch impaction according to the position of their crowns.

The data were analyzed statistically using IBM SPSS Statistics Version 22.0. Descriptive statistics were generated for age, gender, quadrant, and position of impaction. Chi-square test was performed to reveal whether there is any association between presence of impacted canines in the two genders and association of gender with quadrant (left versus right) and position (buccal versus palatal) of unilateral impacted canines. A p-value ≤ 0.05 was taken as significant.

RESULTS

Out of 3469 image scans of patients, 187 had impacted maxillary canines. The mean age of the sample in the impacted canine group was 17.9 ± 2.65 years. 157 cases were having unilateral impaction while 30 cases show bilateral impaction. 117 impacted canine cases were present in females out of which 97 were unilateral, and 20 were bilateral. In males, 70 impacted canine cases were present in which only 10 cases were bilateral.

Position and quadrant distribution of unilateral impacted canines are given in table 1. Unilateral pal-

atally impacted canines in females were most common pattern while in males buccally impacted canines were predominant. 92 unilateral impactions were present on the left side while 65 impactions were present on the right side. On left side, palatally impacted canines in females were most common while buccally impacted canines in males were predominant. Opposite trend was noted on the right side of the maxilla where buccal impactions were common in females and palatal impactions were common in males. Middle of arch impacted canines were least found position on both sides.

Position distribution of bilateral impacted canines is given in table 2. Bilateral impacted canines were more predominant in females with equal proportion bilateral palatal and buccal impactions. In males, bilateral palatal impaction was most common. Different combination of palatal and buccal impaction was also noted in both genders.

The results of the Chi-square test are given in table 3. A significant difference was noted between males and females when total sample was tabulated for the presence of impaction with females reporting more impacted canines. No difference (p-value >0.05) was noted when gender was cross-tabulated with quadrant and position of impaction.

DISCUSSION

Maxillary canine impaction occurs more than twice than mandibular canine impactions.¹ It is important to understand the prevalence and patterns of impacted canines for its timely diagnosis. In the present study, the prevalence of impacted canine was found to be 5%. A similar incidence was found for the orthodontic population in a study conducted in Turkey.^{6,12} A prevalence rate of 4% was found for orthodontic population in a Pakistani study conducted specifically on a Peshawar population.¹³ The difference between these two studies is that in the present study a larger data was collected which usually incorporated many different ethnic groups of Pakistan while the study on Peshawar population by Kifayatullah¹³ was mostly limited to a specific ethnic group.

The present study revealed the female to male ratio of 1.67:1. This ratio is similar to the previously reported ratio of 1.85: 1 in Pakistani population.¹³ The international reported gender distribution for an impacted canine is in the range of 1.3:1 to 2.:1.^{1,14,15} Left side predominance was found for both palatal and buccal impacted canine in males and females respectively in the present study. This is in accordance with international reported trends for this anomaly.¹⁶ Bilateral impactions were found in 16% of the total sample. In literature, it has been reported in the range of 10 -25%.¹⁶⁻¹⁸ In the present study, 50.3 % (n=79) of the unilateral impacted

TABLE 1: POSITION AND QUADRANT DISTRIBUTION OF UNILATERAL IMPACTED CANINES

| Position of impaction | Gender | Quadrant of impaction | Frequency | Percent (%) |
|-----------------------|--------|-----------------------|-----------|-------------|
| Buccal | Female | Left | 26 | 59.1 |
| | | Right | 18 | 40.9 |
| | | Total | 44 | 100.0 |
| | Male | Left | 16 | 55.2 |
| | | Right | 13 | 44.8 |
| | | Total | 29 | 100.0 |
| Palatal | Female | Left | 36 | 70.6 |
| | | Right | 15 | 29.4 |
| | | Total | 51 | 100.0 |
| | Male | Left | 13 | 46.4 |
| | | Right | 15 | 53.6 |
| | | Total | 28 | 100.0 |
| Mid of arch | Female | Right | 2 | 100.0 |
| | Male | Left | 1 | 33.3 |
| | | Right | 2 | 66.7 |
| | | Total | 3 | 100.0 |

TABLE 2: POSITION DISTRIBUTION OF BILATERAL IMPACTED CANINES

| Gender | Position of impaction | Frequency | Percent |
|--------|--------------------------------|-----------|---------|
| Male | Both Palatal | 6 | 60.0 |
| | Both Buccal | 3 | 30.0 |
| | Left Buccal, Right Palatal | 1 | 10.0 |
| | Total | 10 | 100.0 |
| Female | Both Palatal | 7 | 35.0 |
| | Both Buccal | 7 | 35.0 |
| | Left Buccal ,Right Palatal | 2 | 10.0 |
| | Left mid of arch, Right Buccal | 2 | 10.0 |
| | Mid of arch | 2 | 10.0 |
| | Total | 20 | 100.0 |

TABLE 3: ASSOCIATION BETWEEN DIFFERENT VARIABLES IN IMPACTED CANINES

| Tested variables | *P value |
|-------------------------------------|----------|
| Gender versus presence of impaction | 0.000 |
| Gender versus position of impaction | 0.514 |
| Gender versus maxillary quadrant | 0.085 |

*Chi-Square test value. A p-value < 0.05 was taken as significant.

canines were palatally placed, 46.5% (n=73) were buccally placed while rest were present in the middle of the arch. These percentages of palatal and buccal impaction are different from reported data in international literature on Caucasian population which is usually 85%

palatal, and 15 % buccal impactions.^{19,20} In contrast to previous Pakistani study¹³ the findings of present study are in accordance with many international studies^{17,21} that palatal impactions are common in females while buccal impactions are common in males.

In the present study statistical difference was noted between males and females when the overall sample was compared for the presence of impacted canines. Similar findings were reported in other studies.^{13,16,22} No difference was found between gender and position of impaction. Similar findings were reported on impacted canines in a Turkish study.²³

CONCLUSION

Prevalence of maxillary canine impaction was 5%

with female and left side predominance. Palatal impacted canines were most common followed by buccal impactions.

REFERENCES

- 1 Manne R, Gandikota C, Juvvadi SR, Rama HR, Anche S. Impacted canines: Etiology, diagnosis, and orthodontic management. *J Pharm Bioallied Sci.* 2012;4(Suppl 2):234-38.
- 2 Becker A, Chaushu S. Etiology of maxillary canine impaction: a review. *Am J Orthod Dentofacial Orthop.* 2015;148(4):557-67.
- 3 Hou R, Kong L, Ao J, Liu G, Zhou H, Qin R, et al. Investigation of impacted permanent teeth except the third molar in Chinese patients through an X-ray study. *J Oral Maxillofac Surg.* 2010;68(4):762-67.
- 4 Takahama Y, Aiyama Y. Maxillary canine impaction as a possible microform of cleft lip and palate. *Eur J Orthod.* 1982;4(4):275-77.
- 5 Sacerdoti R, Baccetti T. Dentoskeletal features associated with unilateral or bilateral palatal displacement of maxillary canines. *Angle Orthod.* 2004;74(6):725-32.
- 6 Celikoglu M, Kamak H, Oktay H. Investigation of transmigrated and impacted maxillary and mandibular canine teeth in an orthodontic patient population. *J Oral Maxillofac Surg.* 2010;68(5):1001-6.
- 7 Richardson G, Russell KA. A review of impacted permanent maxillary cuspids-diagnosis and prevention. *J Can Dent Assoc.* 2000;66(9):497-501.
- 8 Oliver RG, Mannion JE, Robinson JM. Morphology of the maxillary lateral incisor in cases of unilateral impaction of the maxillary canine. *Br J Orthod.* 1989;16(1):9-16.
- 9 Becker A, Smith P, Behar R. The incidence of anomalous maxillary lateral incisors in relation to palatally-displaced cuspids. *Angle Orthod.* 1981;51(1):24-29.
- 10 Bedoya MM, Park JH. A review of the diagnosis and management of impacted maxillary canines. *J Am Dent Assoc.* 2009;140(12):1485-93.
- 11 Al-Homsy HK, Hajeer MY. An evaluation of inter- and intraobserver reliability of cone-beam computed tomography- and two dimensional-based interpretations of maxillary canine impactions using a panel of orthodontically trained observers. *J Contemp Dent Pract.* 2015;16(8):648-56.
- 12 Topkara A, Sari Z. Impacted teeth in a turkish orthodontic patient population: prevalence, distribution and relationship with dental arch characteristics. *Eur J Paediatr Dent.* 2012;13(4):311-16.
- 13 Kifayatullah J, Bangash TH, Ayub A, Khan DB. Prevalance and patterns of impacted maxillary canine in a peshawer sample. *Pak Oral Dental J.* 2015;35(1):57-60.
- 14 Patil S, Maheshwari S. Prevalence of impacted and supernumerary teeth in the North Indian population. *J Clin Exp Dent.* 2014;6(2):e116-20.
- 15 Jacobs SG. The impacted maxillary canine. Further observations on aetiology, radiographic localization, prevention/interception of impaction, and when to suspect impaction. *Aust Dent J.* 1996;41(5):310-16.
- 16 Gashi A, Kamberi B, Ademi-Abdyli R, Perjuci F, Sahatciu-Gashi A. The incidence of impacted maxillary canines in a Kosovar population. *Int Sch Res Notices.* 2014;130(1):1-4.
- 17 Bishara SE. Impacted maxillary canines: a review. *Am J Orthod Dentofacial Orthop.* 1992;101(2):159-71.
- 18 Sajnani AK, King NM. Prevalence and characteristics of impacted maxillary canines in Southern Chinese children and adolescents. *J Investig Clin Dent.* 2014;5(1):38-44.
- 19 Shastri D, Nagar A, Tandon P. Alignment of palatally impacted canine with open window technique and modified K-9 spring. *Contemp Clin Dent.* 2014;5(2):272-74.
- 20 Coulter J, Richardson A. Normal eruption of the maxillary canine quantified in three dimensions. *Eur J Orthod.* 1997;19(2):171-83.
- 21 Hong WH, Radfar R, Chung CH. Relationship between the maxillary transverse dimension and palatally displaced canines: A cone-beam computed tomographic study. *Angle Orthod.* 2015;85(3):440-45.
- 22 Alkadhi OH. Prevalence of different impacted maxillary canine locations in a Saudi population in Riyadh city. *EC Dent Sci.* 2017;13:261-65.
- 23 Aktan AM, Kara S, Akgunlu F, Malkoc S. The incidence of canine transmigration and tooth impaction in a Turkish subpopulation. *Eur J Orthod.* 2010;32(5):575-81

| CONTRIBUTIONS BY AUTHORS | |
|---------------------------------|--|
| 1 Haris Khan: | Conception, writing and data collection. |
| 2 Ayesha Ashraf: | Methodology, results (data analysis and interpretation) and editing. |
| 3 Ayesha Anwar: | Methodology, results (data analysis and interpretation) and editing. |
| 4 Eesha Najam: | Collection of the data and its entry in SPSS. |
| 5 Fayyaz: | Proof reading, expert research opinion in finalizing the manuscript. |
| 6 Taimoor Khan: | Collection of the data, proof reading in finalizing the manuscript. |