Original Research Article

3D radiographic assessment of impacted maxillary canine in orthodontic population of Bihar: a CBCT retrospective study

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ABSTRACT

Background: this study was conducted with an objective to assess the pattern of distribution of impacted maxillary canine in orthodontic Bihar population using CBCT.
Methods: The study included CBCT scans of total 1080 patients in the age group of 13-40 years who came for orthodontic correction in Buddha Institute of Dental sciences and Hospital. The scans were evaluated for the presence of any impacted maxillary canines from July 2021 to July 2022.
Results: Out of 1080 scans, in the age range of 13-40 years, the prevalence of impacted maxillary canine was 2.77% in Bihar population. Out of these 30 impacted maxillary canines, 19 impactions were present in females and 11 were in males. Out of 30 subjects, 21 had unilateral impactions and 9 had bilateral impactions. The incidence of mesioangular impactions (type II) were maximum (46.7%) followed by horizontal impaction (type IV) was 23.3%.
Conclusions: The incidence of maxillary canine impaction in Bihar population was 2.7% and the type of impaction which was commonest was mesioangular impaction (Type II), which was in the accordance with many other studies.

Keywords: 3D radiographic assessment, Impacted maxillary canine, Orthodontic population

INTRODUCTION

An impacted tooth can be defined as a tooth retained in the maxillary or mandibular jaw beyond its date of eruption and is surrounded by its pericoronal sac with no contact with the oral cavity[1] or tooth impaction can also be defined as the Infraosseous position of the tooth after the expected time of eruption. Although, the anomalous infraosseous position of the canine before the expected time of eruption can be defined as a displacement of canine and palatal displacement of the maxillary canine results in impaction of the tooth.[2] Maxillary canine plays very vital role in patient's aesthetics and development of the dental occlusion, however delayed dental development with respect to age of the patient have been proposed as indicators of eventual impaction of the tooth[3].Several other studies have proposed many other factors responsible for impaction such as long path of eruption of canine, peg shaped laterals, and agenesis of adjacent teeth. Impaction of the maxillary permanent canines is the most common form of tooth impaction, second only to third molars.[4]The incidence of impaction of maxillary canine varies between 0.8% and 3.3%% depending on the population studied.[5].Most studies indicate that maxillary canine impactions are higher (20 times more frequent) than mandibular canine impactions and is twice more common in females than in males[6].This study aims at determining the prevalence of impacted maxillary canine and its pattern of distribution through radiological evaluation by CBCT in Bihar population.

METHODS

This retrospective observational study was conducted using random selection methods. The study included total

of 1080 previously scanned CBCT data patients who came for orthodontic correction from the radiology department of Buddha Institute of Dental Sciences and Hospital between July 2021 to July 2022. The patients were in the age range of 13-40 years. Patient below the 13 years of age were excluded as an unerupted canine at this age could be a normal variation in timing of eruption and the scans showing any pathology were excluded from the study.

All the scans were visualized for impacted maxillary canines. All the impacted maxillary canines were grouped according to Yamamoto et al classification system. The analysis of the collected data was done in relation to age, gender, side either unilateral or bilateral, and classification of impacted maxillary canines according to Yamamoto et al classification.[7]

Statistical analysis

The data were entered on Microsoft excel sheet and were analyzed in relation to gender, side either unilateral or bilateral and group classification. All data were presented as percentage (%).

RESULTS

Out of 1080 CBCT scans in this study, 30 individuals had maxillary canine impaction (2.7%). In our study 36.70% (n=11) were male and 63.30% (n=19) were female wherein 70% (n=21) had unilateral impaction and 30% (n=9) had bilateral impaction which implies more prevalence of impacted maxillary canine in females than males and more unilateral than bilateral impaction.

Table 1: Gender wise number and percentage of unilateral and bilateral impaction.

Gender	Criteria	Impaction		Total
		Unilateral	Bilateral	
Male	Count	9	2	11
	Percentage	81.80	18.20	100.00
	Total (%)	30.00	6.70	36.70
Female	Count	12	7	19
	Percentage	63.20	36.80	100
	Total (%)	40.00	23.30	63.30
Total	Count	21	9	30
	Percentage	70.00	30.00	100.00

Table 2: Gender wise number and percentage of group type of sample.

Gender	Criteria	Group type					Total
		Type I	Type II	Type III	Type IV	Type V	
Male	Count	3	4	1	3	0	11
	Percentage	27.30	36.40	9.10	27.30	0.00	100.00
	Total (%)	10.00	13.30	3.30	10.00	0.00	36.70
Female	Count	3	10	1	4	1	19
	Percentage	15.80	52.60	5.30	21.10	5.30	100.00
	Total (%)	10.00	33.30	3.30	13.30	3.30	63.30
Total	Count	6	14	2	7	1	30
	Percentage	20.00	46.70	6.70	23.30	3.30	100.00

Table 3: Gender wise number and percentage of group type within unilateral and bilateral impaction.

Gender	Criteria	Unilateral					Bilateral					Total
		Type I	Type II	Type III	Type IV	Type V	Type I	Type II	Type III	Type IV	Type V	
Male	Count	3	4	0	2	0	0	0	1	1	0	11
	Percentage	27.27	36.36	0.00	18.18	0.00	0.00	0.00	9.09	9.09	0.00	100.00
	Total (%)	10.00	13.33	0.00	6.67	0.00	0.00	0.00	3.33	3.33	0.00	36.67
Female	Count	2	6	1	3	0	1	4	0	1	1	19
	Percentage	10.53	31.58	5.26	15.79	0.00	5.26	21.05	0.00	5.26	5.26	100.00
	Total (%)	6.67	20.00	3.33	10.00	0.00	3.33	13.33	0.00	3.33	3.33	63.33
Total	Count	5	10	1	5	0	1	4	1	2	1	30
	Percentage	16.67	33.33	3.33	16.67	0.00	3.33	13.33	3.33	6.67	3.33	100.00

In male group, 81.80% (n=9) had unilateral impaction and 18.20% (n=2) male had bilateral impaction whereas within female 63.20% (n=12) had unilateral impaction and 36.80% (n=7) had bilateral impaction (Table 1). Within male and female group of subjects, 27.30% (n=3) type I, 36.40% (n=4) type II, 9.10% (n=1) type III, and 27.30% (n=3) type IV in male whereas in female we observed 15.80% (n=3) type I, 52.60% (n=10) type II, 5.30% (n=1) type III, 21.10% (n=4) type IV and 5.30% (n=1) type V group sample. Overall, 20.00% (n=6) type I, 46.70% (n=14) type II, 6.70% (n=2) type III, 23.30% (n=7) type IV and 3.30% (n=1) type V impaction in the collected samples (Table 2). There was 16.67% (n=5) type I, 33.33% (n=10) type II, 3.33% (n=1) type III, 16.67% (n=5) type IV and 0% (n=0) type V unilateral impaction and 3.33% (n=1) type I, 13.33% (n=4) type II, 3.33% (n=1) type III, 6.67% (n=2) type IV and 3.33% (n=1) type V bilateral impaction. Hence in our study the mesioangular impactions (type II) were maximum (46.7%).
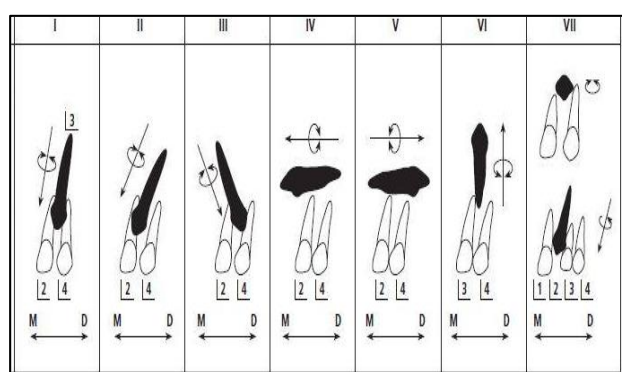

Figure 1: Pattern of distribution of impacted maxillary canine.

Yamamoto et al classification of impacted maxillary canines.

DISCUSSION

Study was conducted for the period of one month i.e. 1st June to 30th June 2013 and people attending RHTC OPD were included in the study. Total 144 participants were included in the study. 75 were females (52%) and rests were males (48%).

Many studies concluded maxillary canines to be often impacted teeth; others have stated it second after the third molars. This can be attributed to the fact that canine travels long and tortuous paths before erupting in the oral cavity.[8] The present study showed the prevalence of impacted maxillary canine to be 2.7% in Bihar population, which is quite similar to other several studies done in Saudi population (3.46%), in Turkey population (0.8%-3.6%), in Iraqi population, (3.95%) and in Indian orthodontic population group (3.8%).[7,9-11] The slight discrepancy shows that variation in proportion is due to various racial and ethnic population studied. In our study, the prevalence of impacted maxillary canine was twice common in females than in males which was in accordance with several studies which stated that females are more affected by impaction than in males.[7,9,12] This difference in prevalence of impaction between both the gender can be attributed to the difference in the facial or skull size proportionately between the both males and females causing the effect.[13] Our study also showed that unilateral impactions were more prevalent in both the gender than bilateral impactions which is also similar to many other studies. This higher prevalence of unilateral canine impaction can be due to a general trait of malocclusion as there is no other scientific explanation for its occurrence.[5,9,12] The prevalence of type II mesioangular canine impactions was most common followed by type IV horizontal impactions, then type I, type III and type V in our study which showed similarity with other studies done in other different populations.[7,9,10]

The limitation of the study conducted includes location specific data and other associated factors like the treatment plan, surgical intervention, etc. Futhermore, the prevalence of impacted canines among the age groups can also be determined with further studies. And the prevalence of any canine impaction varies from one population to another; hence there should be data from more than one population groups.

CONCLUSION

Two theories have been postulated to explain the occurrence of impacted maxillary canines: the "guidance theory" and the "genetic theory". The guidance theory proposes that the canine erupts along the root of the lateral incisor, which serves as a guide, and if the root of the lateral incisor is absent or malformed, the canine will not erupt. The genetic theory points to genetic factors as a cause for impacted maxillary canines.[14] Maxillary canine impaction may cause deleterious effects on jawbones development and can cause occlusion instability and moreover its treatment is also multidisciplinary, hence it is very important to assess the impaction properly at earliest to implicate better interceptive treatment based on 3D images.[15] Cone-beam computed tomography is one of the most accurate diagnostic methods to identify the localization of affected maxillary canines.[10] Hence, this study has been conducted to properly assess the pattern of the impacted canine for instituting better treatment plan.

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