Proximity of The Maxillary First Molar And Maxillary Sinus Floor Using Cone Beam Using Cone Beam Computed Tomography: A Comprehensive Study.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: To investigate the proximity of maxillary first molar root to maxillary sinus.

Objectives

1. The objective of this study is to determine the relationship between floor of maxillary sinus and the apices of the maxillary first molar roots in a selected bihar population using Cone Beam Computed Tomography.

2. To measure the distance of maxillary first molar roots and the sinus floor.

Method: We analysed 40 CBCT images of 30 patients which were obtained from the Oral Radiology Department of Buddha Institute of Dental Science and Hospital, Patna. The scan are obtained using ICAT 17-19 machine and vision software . The study comprises of 60 maxillary scans taken in I-CAT CBCT machine in 30 patient of age group 20 – 30 years. The distance from roots of maxillary first molar and sinus floor were measured in sagittal section.

Results: Stastical analysis revealed that Class 1 showed the highest prevalence. The Palatal root had highest percentage (70.0%). followed by MB root(50.0%)then DB root (50.0%).

Conclusion: The results from present study suggest that the palatal roots of maxillary first molar is in close proximity to floor of maxillary sinus.Clinician should be aware of the anatomical details of the apices of maxillary first molar roots and maxillary sinus floor.

Introduction

The development of maxillary sinus and growth ends with the eruption of 3rd molars approximately at 20 years of age.[1]Maxillary sinus starts developing during intrauterine fetal life which is continued to devlop even after

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birth.[2]The floor of maxillary sinus is formed by alveolar process of maxilla.[3]

Size and shape of maxillary sinus are variable and it may differ according to age of an individual, their size and degree of pneumatisation.[1,3]

Sinus anatomy is variable in the extension toward the alveolar ridge.In about half of the population , the sinus floor extends between adjacent teeth creating elevations in antral surface commonly known as "hillocks".[3]

The close proximity between maxillary posterior teeth may lead to unwanted oroantral connection during the extraction of posterior teeth, The relative position of dental roots to inferior sinus wall influences orthodontic treatment.[4]

A periapical and periodontal infections of upper premolar and molars may spreadbeyond the confines of supporting dental tissue into maxillary sinus.[5]Protuded roots into the sinus may cause post extraction pneumatisation which reduces bone density available at the implant or denture site.[6]

Understanding the anatomical and pathological relationship between maxillary posterior teeth and maxillary sinus is significant in diagnosis and treatment planning.[5]

The present study is aimed to investigate the proximity of the floor of maxillary sinus and apices of maxillary first molar roots in selected population of Bihar using CBCT.

Material and Method

This is a retrospective, randomized observational study with measurement taken from CBCT scans of 30 patients with normally erupted right and left maxillary first molar.

Source of Data

The present study will be conducted on CBCT scans available in Oral Medicine and Radiology Department of Buddha Institute of Dental Sciences and Hospital. The scans are obtained using ICAT 17-19 machine and Vision

software (Imaging Science International). CBCT scans will be acquired with ICAT 17-19 Cone Beam 3D Imaging machine operating at 120 kVp, 37.07 mAs with 0.25mm voxel size and a field of view of 16 cm x 6 cm maxilla.

The study comprises of 60 maxillary scans taken in I-CAT CBCT machine in 30 patient of age group 20 – 30 years.

The distance from roots of maxillary first molar and sinus floor were measured in sagittal section.

Inclusion criteria for the study included the CBCT scan of patient with normal erupted right and left maxillary first molar with no sign of teeth extraction or surgery involved sinus, orthodontic treatment including teeth movements or any other treatment intervention that affects morphologic situation of maxillary posterior region.
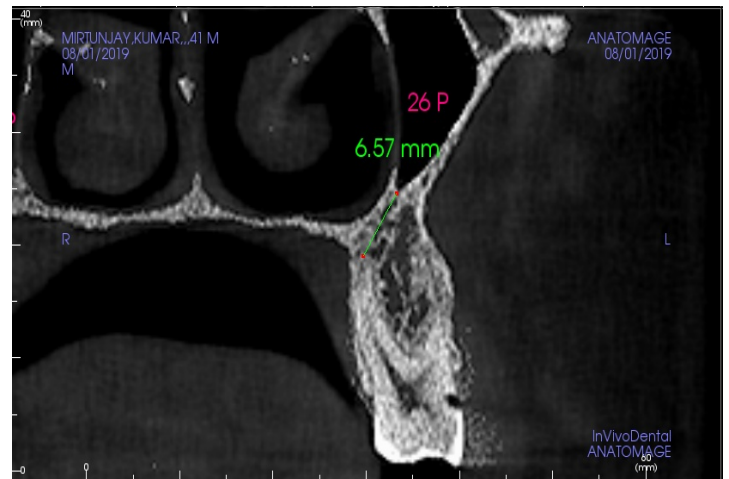
On cross sectional images were , lines were drawn in between the deepest point of the maxillary sinus floor and root tips maxillary first molar , and the distance is measured using built measurement tools. Images were grouped, based on the distance measured between the root tips and the maxillary sinus floor as follows Class 0= distance (d)= 0 mm; Class 1:0mm<d<2mm ; Class 2= 2mm <d <4 mm; Class 3= 4 mm <d< 6 mm; Class 4 =6mm< d.
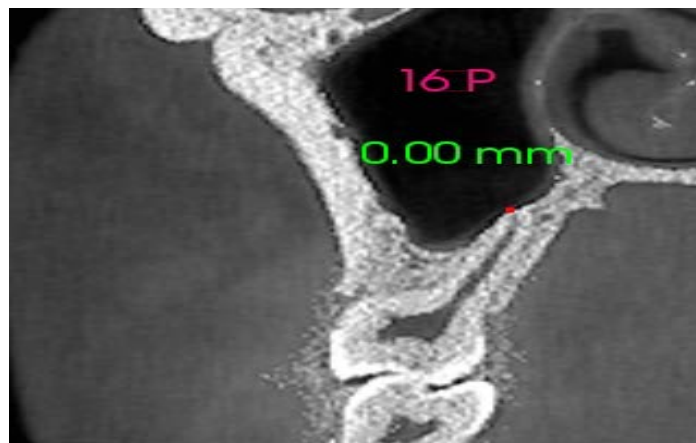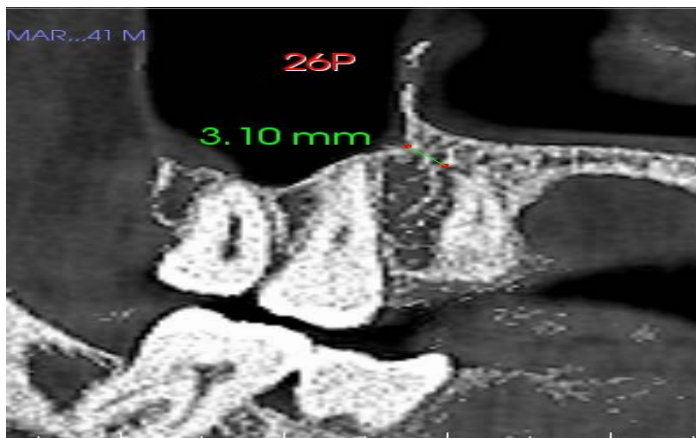

Class 0 Relationship between the maxillary first molar palatal root and sinus floor .
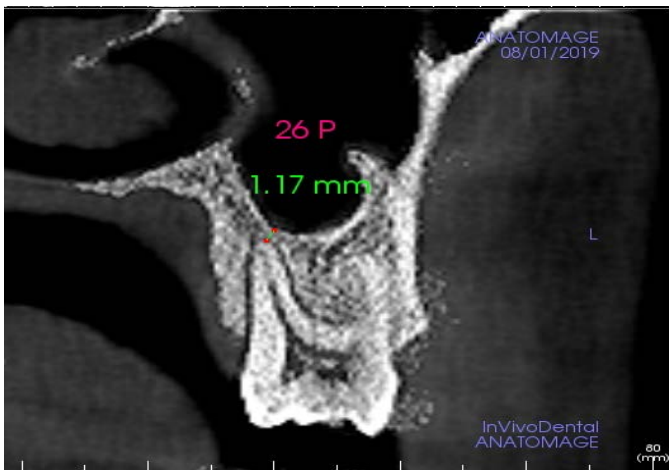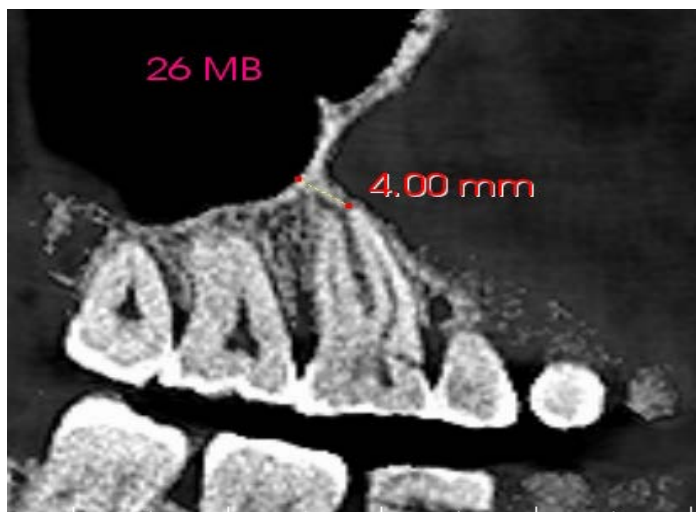
Class 1 relationship between the maxillary first molar palatal root and the sinus floor (1.17 mm distance).

Class 2 relationship between the maxillary first molar palatal root and sinus floor.(3.10 mm)

Class 3 relationship between the maxillary first molar mesio buccal root and palatal floor.(4.00mm)

Class 4 relationship between the maxillary first molar palatal root and sinus floor.(6.57mm).

Results

Bilateral relation of 1st molar apices with maxillary sinus were studied in 30 patient forming 60 cases. The data was analyzed using SPSS version 23. Frequencies and Chi sq test was done for inter age group and inter gender comparison.

Age	N	Minimum	Maximum	Mean	Std. Deviation
Female	14	20	46	28.21	8.350
Male	16	19	41	26.75	7.317
Overall	30	19	46	27.43	7.713

Table 1: Showing Mean age of the study population
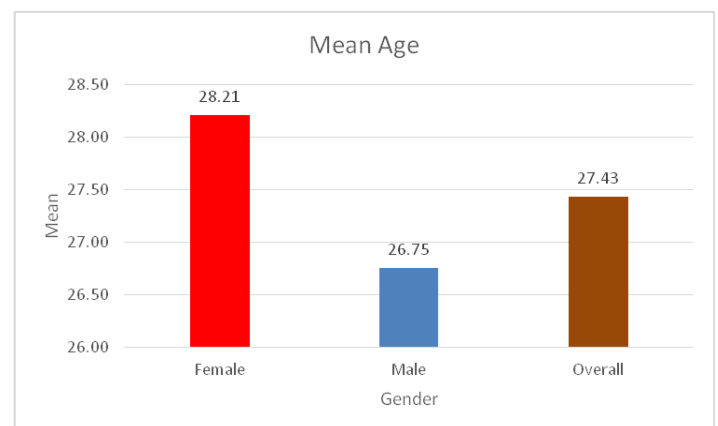
Figure 1: Showing mean age of female, male and overall population.

Tooth	Root	N	Minimum	Maximum	Mean	Std. Deviation
16	Palatal	30	0.00	6.08	1.21	1.60
	MB	30	0.01	10.09	2.52	2.52
	DB	30	0.01	6.82	2.00	2.09
26	Palatal	30	0.00	5.00	1.29	1.51
	MB	30	0.00	7.11	2.33	1.99
	DB	30	0.00	10.72	2.19	2.24

Table 2 showing frequency mean ,minimum , maximum and standard deviation of each variable.
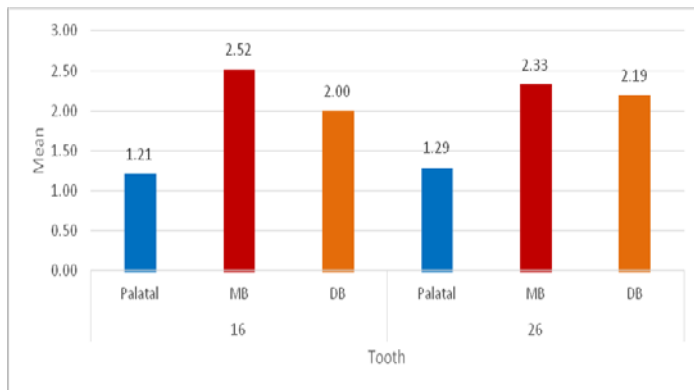

Figure 2: Mean distance of Maxillary sinus from root tip.

Tooth		Male		Female		P value
		Mean	SD	Mean	SD	
16	Palatal	1.26	1.67	1.17	1.58	0.883 NS
	MB	3.09	2.50	1.86	2.47	0.186 NS
	DB	2.52	2.33	1.40	1.67	0.144 NS
26	Palatal	1.28	1.66	1.29	1.37	0.991 NS
	MB	2.63	2.18	1.98	1.76	0.376 NS
	DB	2.44	1.83	1.91	2.68	0.531 NS

NS- Not significant (p>0.05)

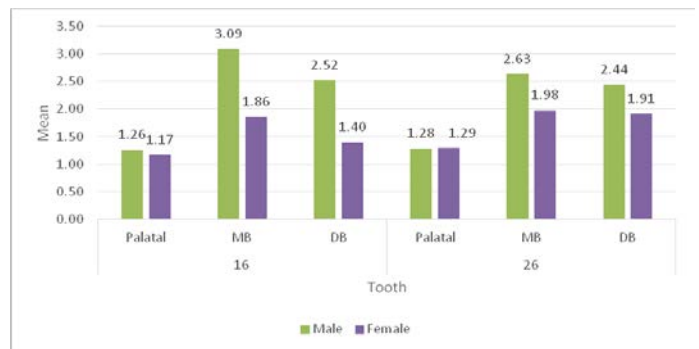Table no 3 showing Comparison of Mean distance of Maxillary sinus from root tip among gender.

Figure 3: Showing comparision of mean distance among genders.

The relationship between gender, side (right and left) and distance measured at measured at the apices of 3 roots. There is no statistically significant difference present in mean distance from root tip to maxillary sinus among genders.

Class	Mesio Buccal		Disto Buccal		Palatal	
	N	%	N	%	N	%
C0	0	0	0	0	3	10.0
C1	18	60.0	19	63.3	22	70.0
C2	5	16.7	6	20.0	2	6.7
C3	3	10.0	2	6.7	2	6.7
C4	4	13.3	3	10.0	1	3.3
Total	30	100.0	30	100.0	30	100.0

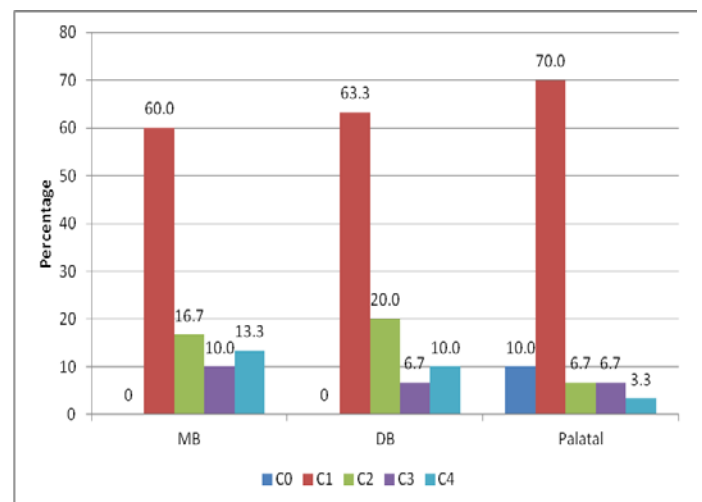Table 4: Distance from root tip to sinus in 16 (Classification wise)

Figure 4: Showing percentage of distance from root tip to sinus in 16 (Classification wise)

Among the various classes, Class 1 showed the highest prevalence. The Palatal root had highest percentage (70.0%), followed by Distobuccal (DB) root   63.3%) then Mesiobuccal (MB) root (60.0%).

Class 2 was the second most prevalent class where the highest percentage was in DB root (20.0%), followed by MB root (16.7%) then palatal (6.7%).

Class	MB		DB		Palatal	
	N	%	N	%	N	%
C0	1	3.0	1	3.3	3	10.0
C1	15	50.3	15	50.0	21	70.0
C2	9	30.0	10	33.3	2	6.7
C3	3	10.0	3	10.0	4	13.3
C4	2	6.7	1	3.3	0	0.0
Total	30	100.0	30	100.0	30	100.0

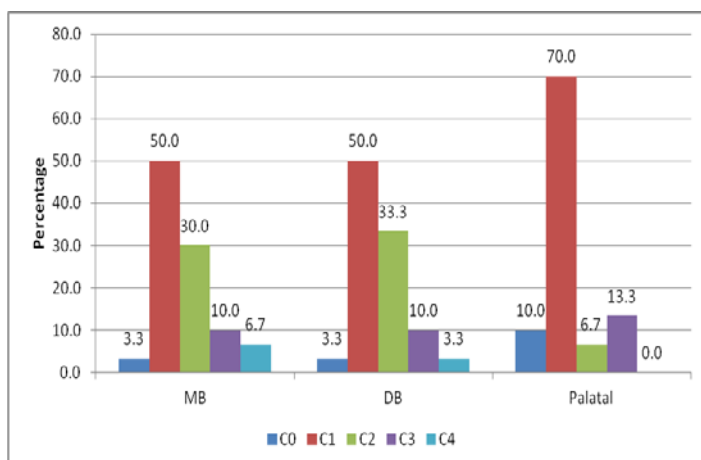Table 5: Distance from root tip to sinus in 26 (Classification wise)

Figure 5: Showing percentage of distance from root tip to sinus in 26 (Classification wise).

Among the various classes, Class 1 showed the highest prevalence. The Palatal root had highest percentage (70.0%), followed by MB root(50.0%)then DB root (50.0%).

Class 2 was the second most prevalent class where the highest percentage was in DB root (33.3%), followed by MB root (30.0%) then palatal (6.7%).

Discussion

In this study anatomical relationship between the apices of first permanent molar roots and the floor maxillary sinus was assessed in 30 patient forming 60 cases. Both right and left side of each patient were evuluted segregately.

Proximity of first permanent molar root apices and maxillary sinus can act as predictor of perforation of maxillary sinus during periapical surgery of maxillary molars.

Proximity of roots to maxillary sins can cause maxillary sinusitis during root canal treatment .

It has been proved that periapical radiographs cannot be used precisely in prediction of sinus perforation, therefore advanced modalities such as cone beam CT are reliable.

According to classification given by Didilesence et al in slected study group the highest percentage was for class1 related to palatal roots followed by MB roots and DB roots.

Didilesce et al in their study in Romanion population found that the most prevalent is class 0 in palatal root followed by DB root. This result differ from our study.

Jung YH and CHO BH in their study reported in Korean population most prevalent location of root apices of 1st molar was there projection into maxillary sinus DB root was closest while palatal root was farthest.

In our study the 2nd most prevalent class was class 2 where highest percentage was of Distobuccal root. This finding was contrary to finding of Didilesce et al who found that 2nd prevalent class was class 1.

Comparing between left and right sides there was no statistically significant differences between sides. Left side showed a more close relationship to the floor of sinus

than the right side. This finding was accordance to finding of Killic et al.

Identification of proximity of maxillary first molar roots and maxillary sinus floor helps in establishment of bone thickness which is essential for surgical procedures.

Conclusion

The results from present study suggest that the palatal roots of maxillary first molar is in close proximity to floor of maxillary sinus. Knowing the anatomical relationship between maxillary sinus and root apices of first molar helps clinician in treatment planning, diagnosing pathologic conditions and post surgical complications.

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