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## ASSESSMENT AND SIGNIFICANCE OF RELATIONSHIP BETWEEN FLOOR OF MAXILLARY SINUS AND MAXILLARY POSTERIOR TEETH ROOT TIPS USING CBCT- A RETROSPECTIVE STUDY

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Article Info	ABSTRACT
Received 15/04/2017	Objectives: The aim of the present study was to assess the relationship between the maxillary sinus
Revised 27/04/2017	floor and the maxillary posterior teeth root tips using dental cone-beam CT. Methods: A total of 170
Accepted 02/05/2017	right and left maxillary sinus regions of 85 patients taken using Planmeca Proface CBCT machine (53
···· <b>F</b> ································	male and 32 female) were examined using cone-beam CT. Images were analyzed by an oral and
Key words:	maxillofacial radiologist. Perpendicular lines were drawn on the cross-sectional images between the
Maxillary sinus	deepest point of the maxillary sinus floor and the root tips of the maxillary first and second premolars
CBCT. Maxillary	and first, second and third molars, and the distances were measured using built-in measurement tools.
posterior teeth. Sinus.	Means, standard deviations and minimum and maximum values were calculated for all right and left
Premolars, Molars.	premolars and molars. T-tests were used to compare measurements between left and right sides and
,	between female and male patients. Results: The distance between sinus floor and root tip was longest
	for the first premolar on both the right left side. Shortest for the third molar mesiobucccal root tip for
	right and distobuccal root for left side. No statistically significant differences were found between the
	right and left side measurements or between female and male patients (P>.05). Conclusion:
	Knowledge of the anatomical relationship between the maxillary sinus floor and the maxillary
	posterior teeth root tips is imperative for the preoperative treatment planning and to avoid
	complications while treating maxillary posterior teeth.

### INTRODUCTION

The maxillary sinus is the first paranasal sinuses to develop. Its growth ends with the eruption of the third molars be the age of 20 approximately, [1] the inferior sinus wall is a curved structure which is formed by the lower third of the medial wall and the buccoalveolar wall. Whereas floor is formed by the alveolar process of the maxilla. In certain cases, the sinus floor extends between adjacent teeth or individual roots, creating elevations in the floor of the maxillary sinus [2-4]. The roots of the maxillary posterior teeth may project into the maxillary sinus [5]. it can have various implications on surgical procedures, which makes it necessary for clinicians to be aware of the relationship between the apical roots of the maxillary teeth and the maxillary sinus floor.

Wehrbein and Diedrich [6] showed a positive correlation between the length of root projection into the maxillary sinus and the amount of pneumatization that occurs after extraction using panoramic radiographs. Sinus pneumatization following extraction decreases the amount of bone height available for implant placement.<sup>1</sup> A periapical or periodontal infection arising from the upper premolars and molars may spread into the maxillary sinus, leading to sinusitis [3,7,8]. Endodontic procedures or extraction of these teeth may lead to penetration [9], oroantral fistulae formation or displacement of the root into the maxillary sinus [10]. The relationship between the roots of the maxillary teeth and the inferior wall of sinus can influence the orthodontic teeth movement,<sup>11</sup> whereas intrusion or bodily movement of teeth across the sinus floor during orthodontic treatment can lead to apical root resorption [6]. The aim of this study was to assess the relationship and determine the significance between the maxillary sinus floor and the maxillary teeth root apex using cone-beam CT.

#### **MATERIALS AND METHODS:**

The study material comprised cone - beam CT images of 85 patients taken using Planmeca Proface CBCT machine were obtained retrospectively from the archives of a Dept of Oral and Maxillofacial Radiology, Meenakshi Ammal Dental College and Hospital. Of these, 53 (62.3%) were male and 32 (37.7%) were female, with an age range of 20 to 60 years. In total, 85 dentulous right maxillary sinus regions and 85 dentulous left maxillary sinus regions (170 regions) were studied. All images were examined by an oral and maxillofacial radiologist. Lines were drawn on the cross sectional images between the deepest point of the maxillary sinus floor and the root tips of the maxillary first and second premolars and first, second and third molars, and the distances were measured using built-in measurement tools in the Romexis viewer. Images were grouped according to the relation between the root tips and the maxillary sinus floor, as follows: Group 1: Root tips in contact with the sinus floor (Figure 1 - a); Root tips penetrating into the sinus (Figure 1 - b); and Group 3: Root tips below the sinus floor (Figure 1 - c). Distances were measured for each side of each tooth root tip. Root tips in Group 1 were numbered as zero, those in Group 2 were given negative numbers and those in Group 3 were given positive numbers. Means, standard deviations and minimum and maximum values were calculated for all right and left premolars and molars. T-tests were used to compare measurements between left and right sides and between female and male patients.

### **RESULTS:**

Means, standard deviations and minimum and maximum values obtained from right and left premolars and molars are given in Tables 1 and 2. The distance between sinus floor and root tip was longest for the first premolar root tip and shortest for the second molar buccodistal root tip for both right and left sides. No statistically significant differences were found between the measurements for right and left sides (P>.05). Totally, for the right side 42.7% of the root tips were included in group 2, 41.3% in group 1 and 15.8% in group 3 whereas on the left side 44.2% were included in group 1, 42.5% in group 2 and 13.1% in group 3.

	Table 1. Desc	criptive stati	stics for the r	ight side	
	N	Descriptive S Minimum	Statistics Maximum	Mean	Std. Deviation
R1PM	85	-9.24	15.67	-1.1156	4.20363
R2PM	85	-9.25	9.92	-1.2054	3.52123
R1MMB	85	-6.64	11.30	0879	3.26037
R1MDB	85	-5.79	8.58	.4919	2.83940
R1MP	85	-6.95	9.86	.1361	2.90945
R2MMB	85	-11.55	6.92	-1.2606	3.31098
R2MDB	85	-10.25	8.86	-1.3252	3.49162
R2MP	85	-12.69	10.14	-2.0235	3.60972
R3MMB	85	-12.00	3.64	-2.2789	3.65819
R3MDB	85	-12.34	4.14	-2.5133	3.84866
R3MP	85	-12.78	4.14	-2.7734	3.90204
	Table 2. Des	scriptive stat	istics for the l	left side	
	N	Descriptive S Minimum	itatistics Maximum	Mean	Std. Deviation
L1PM	85	-7.88	9.93	-1.3699	3.46586
L2PM	85	-7.56	6.75	-1.4794	3.43832
L1MMB	85	-6.30	6.57	4492	2.85577
L1MDB	85	-5.38	7.71	.0219	2.46025
L1MP	85	-6.64	7.27	1474	2.45250
L2MMB	85	-7.61	7.65	-1.1620	2.80146
L2MDB	85	-8.97	7.08	-1.2606	2.92872
L2MP	85	-8.83	6.51	-2.1188	2.98758
L3MMB	85	-11.94	5.93	-1.9316	3.43461
L3MDB	85	-15.22	4.93	-2.4412	3.81854
L3MP	85	-14.93	10.44	-2.4944	3.96518



#### **DISCUSSION:**

In the present study, we have documented the anatomical relationship of the root tips of the maxillary posterior teeth and the floor of maxillary sinus. Both right and left sides of each patient were evaluated.

Surgical procedures for implant placement and preprosthetic surgeries in the region of posterior maxilla is associated with the risk of sinus perforation, [6] pneumatizing of bone leads to reduction in the amount of bone. A panoramic radiograph may not be sufficient for treatment planning [12]. In previous studies which compared the relationship of maxillary teeth roots to the floor of the maxillary sinus, OPG and Computed Tomography. The value obtained from panoramic radiographs were different from those measured from CTs [13]. The present study was conducted using cone-beam CT To avoid this disadvantage of superposition of anatomic structures.

Another study that measured distances between maxillary posterior tooth apex and the maxillary sinus floor using CT, the apex of the maxillary second molar mesiobuccal root appeared to be closest to the sinus floor, apex of the maxillary first premolar buccal root was farthest away from the sinus floor [14]. In the present study the first premolar root tip was the farthest away and the third molar mesiobuccal and distobuccal root tip was the closest to the sinus floor on right and left sides respectively.

Endodontic surgery of premolars and molars can result in accidental oroantral communication [15-17] that can cause acute or chronic sinusitis,<sup>17</sup> Surgical treatment of posterior teeth is also complicated by the restricted space of the oral vestibular region, making it difficult to raise a flap [18].

Various authors have studied the relationship between the maxillary molar and premolar roots and the maxillary sinus, [3,4,14,19] Eberhardt et al [14] found the mean distance between the maxillary posterior teeth and the maxillary sinus floor to be 1,97 mm, The roots of the maxillary first and second molar were in an intimate relationship with the maxillary sinus floor in 40 percent of cases, [20] The palatine roots are closer to the antral floor than to the palate and in close proximity to the maxillary sinus [4]. Although the buccal roots of the upper posterior teeth are also in close contact with the maxillary sinus floor, buccal roots are much easier to access than palatinal roots, which enables the treatment to be carried out without perforating the sinus wall, [3] In some cases, the root apices protrude into the sinus thus necessitating a sinus lift [21].

Complications are encountered during periapical surgery of the maxillary molars and premolars can include damage to a neighboring tooth, [22,23]. Many authors have stated that the introduction of foreign bodies into the maxillary sinus during surgery could lead maxillary sinusitis. Jerome and Hill [24] recommend using gauze to block the maxillary sinus aperture, Friedman et al [25] performed periapical surgery on 94 maxillary teeth roots, 12 of which were maxillary molar roots, and reported an 11,8 percent rate of aperture of the sinus wall or floor, according to Selden, [26] pathological exposure of the maxillary sinus floor during periapical surgery leads to orosinusal communications,

In the present study, no statistical significance was present between the right and left sides or between males and females. It was in accordance with the results obtained by Kilic et al.

#### **CONCLUSION:**

Knowledge of the anatomical relationship between the maxillary sinus floor and the maxillary posterior teeth root tips is important for the preoperative treatment planning of maxillary posterior teeth. In view of the proximity of the maxillary sinus floor and maxillary root tips, clinicians must be particularly cautious when performing dental procedures involving the maxillary posterior teeth. The measurements found in the present study highlight the need for preoperative treatment planning which can be done best using a three-dimensional imaging modality such as CBCT.

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