

# Assessment of the Level of Maxillary Sinus Floor in Dentulous, Edentulous and Free End Cases on a Sample of Malay Population Using Orthopantomogram

Belqees A. Allaw<sup>1</sup>,  
Imad M. Al-Ani<sup>1</sup>,  
Nazih S. Mustafa<sup>2</sup> and  
Muhannad A. Kashmoola<sup>3</sup>

## Abstract

**Introduction:** Knowledge about the relation between the floor of the maxillary sinus and the teeth\area considered an important and essential for dental practitioners for the planning of many surgical procedures in this area.

**Objective:** The purpose of this study was to assess the level of maxillary sinus floor in dentulous, edentulous and free end cases among Malay population based on gender, and age by using panoramic radiographs.

**Methods:** Sample size was 364 cases including 118 dentulous, 192 edentulous, and 54 free ends. Measuring the distance between maxillary sinus floor and either root apices of upper posterior teeth or residual ridge in dentulous cases, edentulous and free end cases, and study the relation of this distance with gender and age.

**Results:** The distance in dentulous have no relation to the age and gender and vice versa in edentulous and free end cases.

**Conclusion:** The distance not affected by age and gender in dentulous cases, while it is effective in edentulous and free end cases.

**Keywords:** Dentulous; Edentulous; Distance; Edentulous; Maxillary sinus; Orthopantomogram

1 Department of Basic Medical Science, Kulliyyah of Medicine, International Islamic University Malaysia, Kuantan, Pahang, Malaysia

2 Department of Oral Surgery, Kulliyyah of Dentistry, International Islamic University Malaysia, Kuantan, Pahang, Malaysia

3 Department of Oral Pathology, Kulliyyah of Dentistry, International Islamic University Malaysia, Kuantan, Pahang, Malaysia

**Corresponding author:** Imad M. Al-Ani

✉ imad\_alani@yahoo.co

Department of Basic Medical Science, International Islamic University Malaysia, Kuantan, Pahang, Malaysia.

**Tel:** 60179776014

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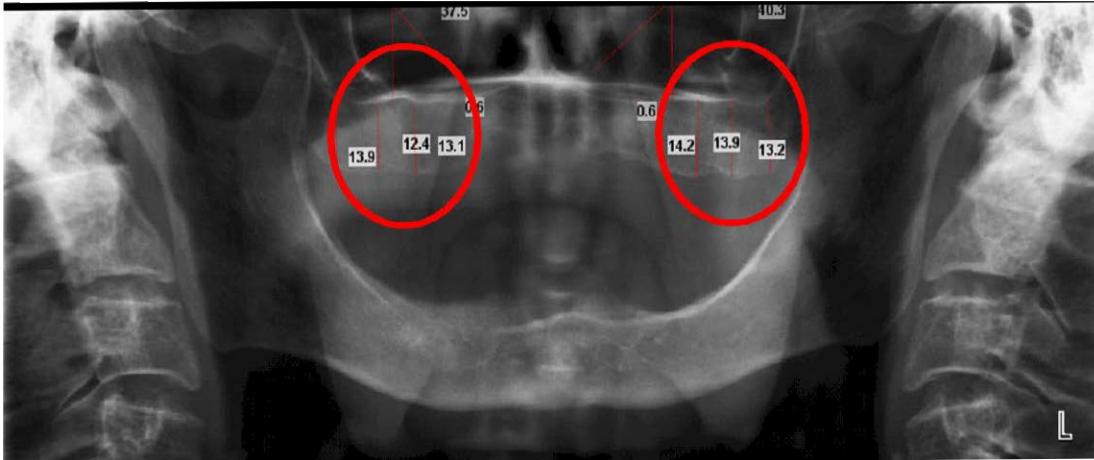
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## Introduction

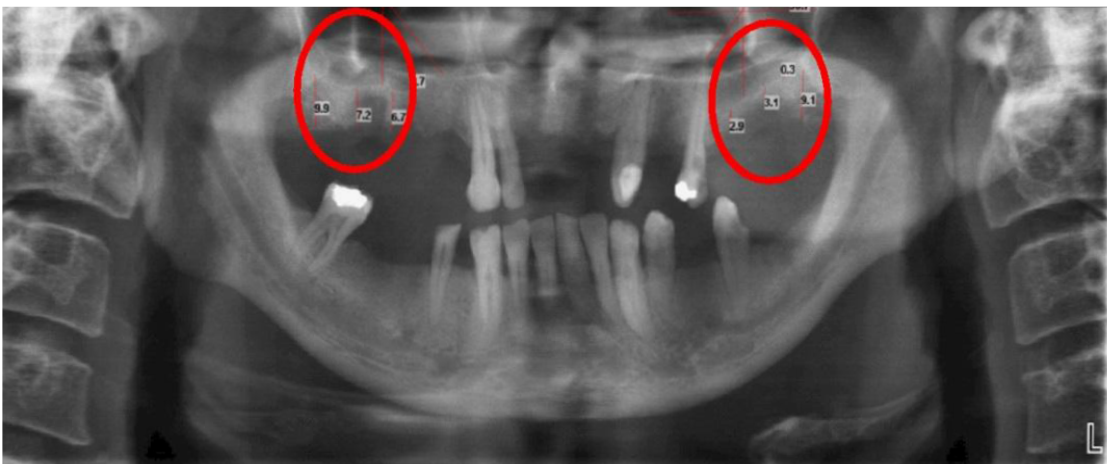
The maxillary sinus is the largest and the first paranasal sinus to develop around the 3rd month of intrauterine life [1]. They enlarge with the facial growth to occupy the space between the posterior maxillary teeth and the floor of the orbits and consist of two spaces, which is air-filled cavity lined with mucosa, mucosal epithelium and lamina propria [2]. In adult, it has a complex pyramidal shape cavity, the floor of maxillary sinus spreads between the neighbouring teeth or between individual roots creating hillocks or protrusions of root apices into the sinus, the roots of the maxillary first and second molars are in intimate relation to the floor of the maxillary sinus in most cases [3, 4]. The topography of the inferior wall with the maxillary root apices differs according to an individual's age, size and degree of pneumatization of the maxillary sinus and the state of dental retention, Accordingly, knowledge of the topography between the

root apex and the inferior wall of the maxillary sinus is important for diagnosing and planning dental implantation, endodontic procedures, and orthodontic treatment [5, 6, 7]. Maxillary edentulism is a pathological condition where the progressive resorption of the alveolar ridge reduces the bone to a thickness of less than 1 mm. Several causes contribute to this phenomenon are metabolic factors, inflammation, hormonal imbalances, and certain systemic pathologies can lead to the bone resorption [8]. As a result of sinus expansion, bone quantity in the maxillary posterior edentulous area may be insufficient for dental implant placement because of the presence of the maxillary sinus which makes the maxillary sinus floor be the danger zone for the oral implantology [9, 10]. The rate and degree of the pneumatization process after tooth loss may be influenced by the protrusion





**Figure 2** Measurement of the distance between the floor of maxillary sinus and residual ridge at upper posterior regions in edentulous patient.



**Figure 3** Measurement of the distance between the floor of maxillary sinus and residual ridge at upper posterior regions in free end patient.

study may be related to the fact that the growth of the maxillary sinus continues until the 3<sup>rd</sup> decade in males and the 2<sup>nd</sup> decade in females [1].

The present study shows a significant reduction in the distance between maxillary sinus floor and residual ridge in edentulous males than females; this might be related to the higher resorption of the bone on the sides of maxillary residual ridge in males among Malay population, and to the pronounced reduction of the distance after teeth extraction due to periodontitis and the factors such as time of being edentulous as well as the upload pressure of the denture which effect the distance of residual ridge after extraction [15, 16, 17]. The reduction in calcium absorption may trigger a feedback mechanism via the Parathyroid Hormone (PTH), increasing bone resorption to maintain the calcium balance in the blood [18, 19]. Another previous study coincides with this result which observed the reduction was more pronounced in males than in females [20]. Otherwise, another studies reported the reduction was significantly more in females than males [13, 21].

The present study has demonstrated a decrement in distance between maxillary sinus floor and residual ridge with aging; this coincides with previous studies and might be related to the increased bone porosity that makes cortical bone becomes more brittle and weaker with aging [17, 22, 23]. Further studies are in progress to measure this distance in dentulous, edentulous and free end cases with large sample size and including all races (Malay, Chinese, and Indian) by using CT scan and compare the accuracy of these results with OPG.

## Conclusion

It is concluded that age and gender have no relation to the distance in dentulous cases while in edentulous and free end cases the distance showed significant differences with age and gender and the reduction are more pronounced in males than females.

**Table 1** The distance between maxillary sinus floor and upper posterior teeth related to the gender in dentulous cases.MB: Mesiobuccal Root; DB: Distobuccal Root; P: Palatal Root; M: Male; F: Female; n: Number. Values are expressed as mean  $\pm$  SD.

Tooth	Root	Gender	n	Mean $\pm$ SD	Mean Diff	P-value
1 <sup>st</sup> molar	MB	M	22	0.07 $\pm$ 0.23	0.02 $\pm$ 0.06	0.74
		F	96	0.09 $\pm$ 0.29		
	DB	M	22	0.09 $\pm$ 0.44	0.04 $\pm$ 0.06	0.64
		F	96	0.13 $\pm$ 0.38		
	P	M	22	0 $\pm$ 0	0.07 $\pm$ 0.27	0.2
		F	96	0.07 $\pm$ 0.27		
2 <sup>nd</sup> molar	MB	M	22	0.07 $\pm$ 0.22	0.04 $\pm$ 0.19	0.64
		F	96	0.11 $\pm$ 0.41		
	DB	M	22	0.20 $\pm$ 0.58	0.02 $\pm$ 0.01	0.91
		F	96	0.22 $\pm$ 0.59		
	P	M	22	0.15 $\pm$ 0.44	0.03 $\pm$ 0.09	0.72
		F	96	0.12 $\pm$ 0.35		
3 <sup>rd</sup> molar	MB	M	22	0 $\pm$ 0	0.25 $\pm$ 0.87	0.17
		F	96	0.25 $\pm$ 0.87		
	DB	M	22	0 $\pm$ 0	0.24 $\pm$ 0.83	0.17
		F	96	0.24 $\pm$ 0.83		
	P	M	22	0 $\pm$ 0	0.20 $\pm$ 0.76	0.20
		F	96	0.20 $\pm$ 0.76		

**Table 2** The distance between maxillary sinus floor and residual ridge in edentulous and free end cases in relation to gender.1<sup>st</sup> M, 2<sup>nd</sup> M and 3<sup>rd</sup> M are referred to the missing teeth of upper posterior area. n: number. Values are expressed as mean  $\pm$  SD. \*Indicates values are statistically significant difference.

Variable	Gender	Edentulous			Free end		
		n	Mean (SD)	P-value	n	Mean (SD)	P-value
1 <sup>st</sup> M	M	62	4.53 $\pm$ 3.94	0.02*	20	2.46 $\pm$ 1.74	0.004*
	F	130	5.91 $\pm$ 3.73		34	5.59 $\pm$ 4.38	
2 <sup>nd</sup> M	M	62	4.88 $\pm$ 3.27	0.04*	20	3.78 $\pm$ 1.76	0.03*
	F	130	5.86 $\pm$ 3.03		34	5.85 $\pm$ 4.00	
3 <sup>rd</sup> M	M	62	7.88 $\pm$ 3.29	0.05*	20	6.90 $\pm$ 3.14	0.001*
	F	130	8.75 $\pm$ 2.67		34	10.68 $\pm$ 3.78	

**Table 3** The distance between maxillary sinus floor and residual ridge in free end cases in relation to the age.1<sup>st</sup> M, 2<sup>nd</sup> M and 3<sup>rd</sup> M are referred to the missing teeth of upper posterior region. Group 3 (40-49), Group 4 (50-59), Group 5 (60-69), and Group 6 (70-79). Values are expressed as mean  $\pm$  SD. \*Indicates values are statistically significant difference.

Cases	Edentulous			Free end		
Molar areas	1 <sup>st</sup> M	2 <sup>nd</sup> M	3 <sup>rd</sup> M	1 <sup>st</sup> M	2 <sup>nd</sup> M	3 <sup>rd</sup> M
Age group 3	4.09 $\pm$ 3.90	6.05 $\pm$ 3.56	9.69 $\pm$ 3.28	8.36 $\pm$ 5.90	8.04 $\pm$ 5.95	11.38 $\pm$ 4.74
Age group 4	5.27 $\pm$ 3.66	4.92 $\pm$ 2.72	8.15 $\pm$ 2.55	4.70 $\pm$ 2.78	5.14 $\pm$ 2.57	9.99 $\pm$ 4.13
Age group 5	5.08 $\pm$ 3.47	5.33 $\pm$ 2.81	8.22 $\pm$ 2.82	2.45 $\pm$ 2.19	4.24 $\pm$ 1.58	7.46 $\pm$ 3.17
Age group 6	8.16 $\pm$ 5.10	8.46 $\pm$ 4.10	9.96 $\pm$ 3.76	2.25 $\pm$ 1.96	2.71 $\pm$ 1.17	7.91 $\pm$ 2.18
P-value	0.01*	0.000*	0.03*	0.001*	0.005*	0.05*

**Table 4** The distance between the floor of the maxillary sinus and apices of the upper posterior teeth in relation to the age in dentulous cases. MB: Mesio Buccal Root; DB: Distobuccal Root; P: Palatal Root; n: Number; Group 1 (20-29) year, group 2 (30-39) years, group 4 (50-59) years. Values are expressed as mean  $\pm$  SD.

Tooth	Root	n	Group 1	n	Group 2	n	Group 4	Total	P-value
1 <sup>st</sup> molar	MB	104	0.10 $\pm$ 0.29	12	0.01 $\pm$ 0.05	2	0 $\pm$ 0	0.09 $\pm$ 0.27	0.44
	DB	104	0.14 $\pm$ 0.42	12	0.01 $\pm$ 0.06	2	0 $\pm$ 0	0.13 $\pm$ 0.39	0.5
	P	104	0.07 $\pm$ 0.26	12	0 $\pm$ 0	2	0 $\pm$ 0	0.06 $\pm$ 0.25	0.53
2 <sup>nd</sup> molar	MB	104	0.1 $\pm$ 0.38	12	0.11 $\pm$ 0.40	2	0.30 $\pm$ 0.14	0.10 $\pm$ 0.38	0.74
	DB	104	0.23 $\pm$ 0.62	12	0.07 $\pm$ 0.26	2	0.30 $\pm$ 0.42	0.21 $\pm$ 0.59	0.67
	P	104	0.13 $\pm$ 0.39	12	0.06 $\pm$ 0.23	2	0.25 $\pm$ 0.07	0.12 $\pm$ 0.37	0.75
3 <sup>rd</sup> molar	MB	104	0.23 $\pm$ 0.84	12	0.04 $\pm$ 0.14	2	0 $\pm$ 0	0.21 $\pm$ 0.79	0.7
	DB	104	0.22 $\pm$ 0.8	12	0.04 $\pm$ 0.14	2	0 $\pm$ 0	0.19 $\pm$ 0.75	0.68
	P	104	0.181 $\pm$ 0.73	12	0.03 $\pm$ 0.11	2	0 $\pm$ 0	0.17 $\pm$ 0.69	0.73

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