International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Assessment of Superio-Inferior, Medio-Lateral Position and Symmetry of Mental Foramen and Its Correlation with Age and Gender among South Indian Population Using Panoramic Radiographs

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ABSTRACT

Objectives: The study was designed to identify the most common position and symmetry of mental foramen and its association with age and gender in selected south Indian population which is of significant importance to avoid mental nerve injuries during osteotomies, implant surgeries and local anesthesia procedures.
Materials and Methods: 300 panoramic radiographs of subjects aged 19-65 years collected from Department of Oral medicine and Radiology database and were traced for mediolateral and superioinferior position, symmetry and were correlated with Age and Gender.
Results: The most common mediolateral position of mental foramen was between the first and second premolars (44.7%). Superioinferiorly the position of mental foramen was located near root tip of the second pre-molars (55.0%). Superioinferiorly there was significant difference in position of mental foramen with reference to age which was not seen in mediolateral position.
Conclusion: Most common site of mental foramen was located mediolaterally between 1st and 2nd premolars, and superioinferiorly about 5mm below from root tip of 2nd premolar. Change in superioinferior position with age was observed and majority of them presenting symmetry with no significant change in position with reference to gender.

Keywords: Mental foramen, mediolateral, superioinferior, panoramic radiographs.

INTRODUCTION

Mental foramen (MF) is a funnel like opening on the lateral surface of the mandible at the terminus of the mandibular canal, it transmits mental nerves and vessels, providing sensory innervations and blood supply respectively. [1] Anatomical position and symmetry of MF is of significant importance while administering local anesthesia, treatments of fractures related to parasymphysis area, osteotomies required for orthognathic surgeries, implant placement and fabricating complete denture in mandible etc. [2] The MF changes its position with age, which is also influenced by demographic factors like sex and the ethnicity. The variations in the position of MF can be attributed to the forward growth of the mandible during the craniofacial development and the differential rates of development of the bone and the periosteum. [3] Preoperative study of MF is

important to prevent damage to the mental nerve which will cause paresthesia, transient or permanent loss of sensation of the lip, chin, and oral mucosa that is often associated with a limited xerostomia. [4]

MATERIALS AND METHODS

300 digital panoramic radiographs (males 183 and 114 females) collected from department of oral Medicine and Radiology database meeting the specific inclusion criteria (visualization of mental foramen at least onone side and patient above 18 years of age) and exclusion criteria (Missing teeth and presence of jaw pathology between 36 and 46) exposed by NewtomGiANO 3D machine with exposure factors customized to each patient with the following exposure factors: 76 kVp, 7.1 seconds exposure time and 8-10 mA electric current were traced for mediolateral and superioinferior position on both right and left side, and were compared for symmetry with age and gender.

The panoramic images were analyzed in NNT viewer software, and the position of the MF was recorded by considering mandible plane and long axis of premolars as reference planes to perpendicular distance of MF and to assess its mediolateral position according to Haghanifar and Rokouei. [5] If the mental foramen was too large or was situated between two teeth, the position of the foramen was established after drawing an imaginary line parallel to the long axis of the teeth (Figure 1).

Position of the radiographic image parameters of the MF was recorded as follows: [5]

Mediolateral Position: [5]

Position 1: Situated anterior to the first premolar

Position 2: In line with the first premolar

Position 3: Between the first and second premolars

Position 4: In line with second premolar

Position 5: Between the second premolar first molar

Position 6: In line with the first molar.

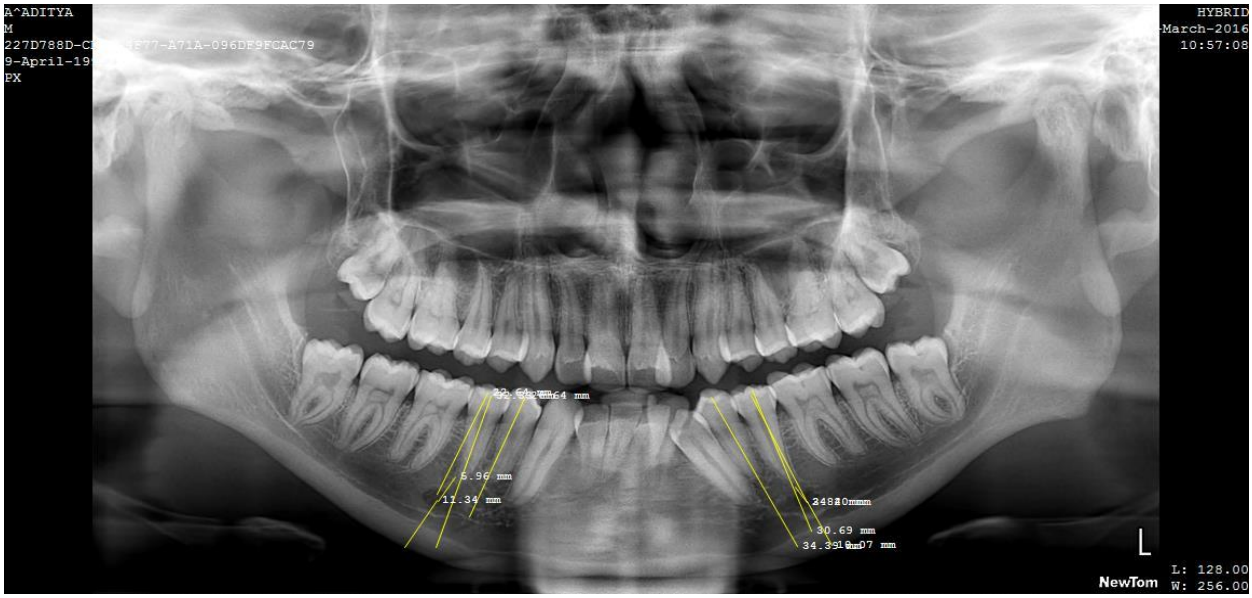

Figure 1: System for measuring Mediolateral and Superoinferior position of MF.

Superoinferior position (Distance between root tip of mandibular 2nd premolar and center of mental foramen] (Figure 1) [5]

Position A: 0.0-5mm from root tip of mandibular 2nd premolar.

Position B: 5-10mm from root tip of mandibular 2nd premolar.

Position C: 10-15mm from root tip of mandibular 2nd premolar.

Position D: >15.0 mm from root tip of mandibular 2nd premolar.

The patient's age ranged from 19- 65 years were further grouped into 5 groups (19-25, 26-35, 36-45,46-55,56-65). The digital panoramic images were observed under ideal viewing conditions and the positions of the foramina were recorded. The symmetry of the foramen and position in right and left side were also assessed.

Statistics analysis: The correlation of the position of MF with age and gender was evaluated using Chi square test.

RESULTS

(a) Mediolateral position of MF: In the present study a total of 300 digital panoramic radiographs were considered and 526MF (264 on right, 262 on left)were assessed, among which 119 (39.7%) on right and 134 (44.7%) on left side were located in between the first and second premolars (position3), 87(29.0%) on right and 68(22.7%) on left side were located between the second premolar and first molar (position5) (Table 1). 36(12%) on right and 38(12.7%) MF were not traceable.

Table 1: Mediolateral position of MF.

Position	Mediolateral position			
	Right	%	Left	%
Position 1	0	0	1	0.3
Position 2	2	0.7	2	0.7
Position 3	119	39.7	134	44.7
Position 4	56	18.7	56	18.7
Position 5	87	29.0	68	22.7
Position 6	0	0.0	1	.3
Not traced	36	12.0	38	12.7

(b) Superioinferior position of MF: Among 600 MF assessed, 157 (52.3%) on right and 102 (34%) on left side were located near root tip of the second premolar (position A) followed by position C.(Table 2).36(12%) on right and 38(12.7%) MF were not traceable.

Table 2: Superioinferior position of MF.

	Superioinferior position			
Position	Right	%	Left	%
A	157	52.3	165	55.0
B	102	34.0	89	29.7
C	5	1.7	8	2.6
D	0	0.0	0	0.0
Not traced	36	12.0	38	12.7

There was no statistically significant difference present in the position of MF in both mediolateral (Table 3) and superior-inferior (Table 4) dimension between male and female on both right and left side.

Table 3: Comparison of mediolateral position of MF with reference to gender.

Position	Mediolateral position			
	Right		Left	
	Male	Female	Male	Female
Position 1	0(0%)	0(0%)	1(0.5%)	0(0%)
Position 2	1(0.5%)	1(0.9%)	2(1.1%)	0(0%)
Position 3	73(39.9%)	45(39.5%)	78(42.6%)	56(49.1%)
Position 4	32(17.5%)	24(21.1%)	43(23.5%)	12(10.5%)
Position 5	51(27.9%)	34(29.8%)	41(22.4%)	27(23.7%)
Position 6	0(0.0%)	0(0%)	1(0.5%)	0(0.0%)
Not traced	26(14.2%)	10(8.8%)	17(9.3%)	19(16.7%)
Total	183	117	183	117
Chi sq	2.542		12.2	
Sig	0.676 NS		0.058 NS	

Table 4: Comparison of superioinferior position of MFwith reference to gender.

Position	Superioinferior position			
	Right		Left	
	Male	Female	Male	Female
A	84(45.9%)	72(63.2%)	102(55.7%)	62(54.4%)
B	69(37.7%)	31(27.2%)	58(31.7%)	31(27.2%)
C	4(2.2%)	1(0.9%)	4(2.2%)	2(1.8%)
D	0(0.0%)	0(0%)	0(0.0%)	0(0.0%)
Not traced	26(14.2%)	10(8.8%)	19(10.4%)	19(16.7%)
Total	183	117	183	117
Chi sq	1.89		1.98	
Sig	0.567NS		0.577 NS	

There was no considerable difference in position of MF in mediolateral direction with reference to age (p=0.292NS). Superioinferiorly there was significant change in position of MF with reference to age in both males and females (P=0.001**).

DISCUSSION

Identification of MF is an important factor when considering the mental nerve anesthetic block and also during implant placement and surgeries involving mandibular premolar region. There is a significant difference reported in the location of MF among different ethnic groups, gender and also from infancy to old age. [5-11] Prior knowledge of MF position among local population may be helpful in effective nerve blocks, surgeries and implant placement in those regions. The present study focused on assessing the common position and symmetry of MF and its association with age and gender using

panoramic radiographs among south Indian population.

In the present study a total of 600 MF were identified among 300 digital panoramic radiographs on both right and left side among which 39.7% on right side and 44.7% on left side were located in between the first and second premolars (position3), followed by 29.0% on right and 22.7% on left side located between the second premolar and first molar mediolaterally (position5). This finding is in agreement with studies conducted by Currie et al (2015) [6] and Kquiku et al (2011). [7] Where in Studies conducted by Gershenson et al(1986) [8] and Khateeb et al(2007) [9] reported common position of MF mediolaterally was in line with second premolar which is not in accordance with results of current study. The reason for the difference in position could also be due to forward growth of the mandible during the craniofacial development, the differential rates of development of the bone and the periosteum and the shape of the foramen itself. The direction of exit of mental foramen through the buccal cortical bone of the mandible is usually in a posterior and superior direction. This is also the area where the mental nerve joins the cortical bone. [10] However, it should be noted that since inter-patient variation with respect to position in the focal plane will always be present, distortion and magnification factors inherent in the orthopantomogram techniques cannot be eliminated. [11]

The most common position of MF superioinferiorly according to our present study was near apex of second premolar (position A) with 52.3% on right side and 34% on left side, followed by position B i.e., 5-10mm from the apex of second premolar in accordance with studies conducted among Saudi and Malay population by Jasser et al (1998), [12] and Ngeow et al (2003) [13] respectively, with advancing age there was an increase in the frequency of more inferior positioning.The diverse in superioinferior position of MF could be attributed to variable length of roots in the population sample, age is a major contributing factor with forward growth of the mandible during the craniofacial development and the differential rates of development of the bone and the periosteum. [3] In children before tooth eruption, the mental foramen is somewhat closer to the alveolar margin. During the eruption period, the foramen acquires a position half way between the alveolar and inferior margins of the mandible. The apparent movement of the foramen is relative and dependent on the deposition of alveolar bone. The foramen is somewhat closer to the inferior border in adults with the teeth preserved. Withloss of teeth and bone resorption the alveolar crest shifts downwards closer to the mental foramen. [4]

An attempt to correlate the position of mental foramen with gender was also made. Gender showed statistically insignificant difference in both mediolateral and superioinferior directions on left side and right side. This is in accordance with studies conducted by MedhaBabshet et al (2015); [14] and Amorim et al(2008) [15] where no co-relation was noticed between gender and position of mental foramen.

CONCLUSION

The most common site of mental foramen mediolaterally is between 1st and 2nd premolars, and in superioinferiorly about below 5mm from 2nd premolar root tip, with majority of them presenting symmetry on both right and left side. Statistically there was no difference in mediolateral position of with respect to gender and age. Superioinferior position of MF varied with age, with advancing age there was an increase in the frequency of more inferior positioning.

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How to cite this article: Jayam R, Sameeulla S, Maddhuru R et.al. Assessment of superio-inferior, medio-lateral position and symmetry of mental foramen and its correlation with age and gender among south Indian population using panoramic radiographs. Int J Health Sci Res. 2018; 8(11):126-130.

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