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Original Research Article.

Evaluation of Gender Based Morphological and Morphometric Features of Mental Foramen Using CBCT Radiographs

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ABSTRACT

Back ground: Awareness regarding varied and detailed morphological and morphometric features of mental foramen is of pivotal importance for orthodontists, cosmetic and reconstructive surgeons etc. for avoidance of any inadvertent trauma, post-surgical neurovascular complications and morbidity.

Aim: To study gender based differences in various morphological and morph metric features of mental foramen.

Method: In this study we have selected 800 patients. The present study was carried out on CBCT scans procured from the Dental Hospitals in Jaipur, Rajasthan. A detailed study of morphometric features of mental foramen along with other parameters of the mandible was carried out on the coronal, axial and sagittal views of CBCT scans using "CS 3D Imaging v3.5.7". Patients were divided in groups based on age.

Results: No significant relationships between age and gender of the patients ($p>0.05$) and position of mental foramen on the right and left side. MF-S to be significantly longer in males as compared to females in Group I whereas in Group III, MF-S was significantly more in males than females on both the sides ($p<0.001$).

Conclusion: Position 6 is considered to be the least common position.

Keywords: Mandibular Foramen, Morphology, Morphometry.

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INTRODUCTION

In routine clinical practice the mental nerve is a key factor in many of the surgical and clinical procedures for example it's an important landmark for administration of anesthesia to give mental block.[1,2] Mental nerve passes through the mental foramen whereas inferior alveolar nerve and vessels after being conveyed through the mandibular canal exit the mental foramen as the mental nerve and vessels which innervates the lower lip, labial mucoperiosteum of the ipsilateral lower incisors, canine and premolars as well as the mentum.[1,3,4] Diagnosis of MF is very important. MF, its density, size and shapes however varies on radiograph and is often misdiagnosed as a radiolucent lesion in periapical area of Mandibular premolars.[5] Accurate knowledge of the position of MF is very necessary to eliminate errors dentistry while administering local or regional anaesthesia, orthodontic tooth movement/surgery, performing periapical surgery and implant placement in the mental region of the mandible.

AIM

To study relative position of the Mandibular foramen in different age groups of adults.

MATERIALS AND METHODS

In this study we have selected 800 patients. Ethical committee approval was obtained from the Institutional Ethics Committee. A written informed consent was obtained from the parents/guardian. The CBCT scans of subjects in the age groups of 18 years or more were included in the study, so that the minimum age of subjects was 18 years and the maximum age was 70 years. Of the 800 patients selected 422 were males and 378 were female subjects. The CBCT scans of subjects with healthy permanent dentition and complete root formation were collected on a Compact Disc. Identity of the patients was concealed and only the age and gender were recorded. Each CD was given a unique identity number. The scans were viewed on the computer having the following configuration: 4 GB RAM with Pentium (R) Dual Core and Hp 19 inch LCD monitor with a screen resolution of 1600 X 900 and true colour of 32 bit. With multi- planar reformatting (MPR), the image is seen in various sections i.e. axial, sagittal and coronal planes.

A detailed study of morphometric features of mental foramen along with other parameters of the mandible was carried out on

the coronal, axial and sagittal views of CBCT scans using "CS 3D Imaging v3.5.7". The values obtained for various measurements were arranged into three groups according to the age of the subjects as follows;

Group I: - 18 -30 years (132 males and 126 females)
Group II: - 31 - 50 years (126 males and 126 females)
Group III: - 51 - 70 years (164 males and 126 females)

Exclusion Criteria

1. CBCT images of subjects under 18 years of age were not included.
2. CBCT images of subjects showing presence of radiolucent/radiopaque lesion in the lower jaw were excluded from the study.
3. CBCT showing presence of periodontal lesions in lower jaw, presence of crowded/spacing of teeth in lower jaw and Observation of Missing teeth/ supernumerary teeth in the lower jaw other than the third molars were not included in the study.
4. Incomplete eruption of permanent teeth other than the third molar in the lower jaw was another exclusion criterion.
5. Non visualization of mental foramen bilaterally.

Statistical Analysis

The values obtained during each session will be assessed, tabulated and subjected to appropriate statistical analysis. The levels of significance tested were P < .05 and P < .01.

Graph 1: Distribution of Group

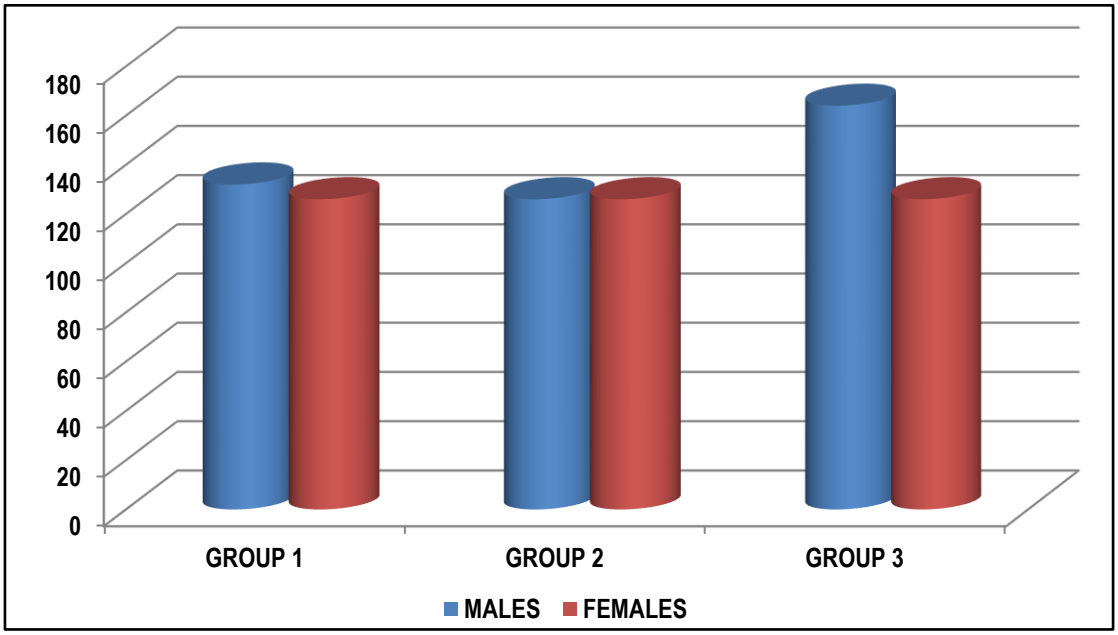

Table 1: Position of mental foramen (MF) in relation to Mandibular teeth (overall frequency & Gender based frequency)

Position of Mental foramen (MF)	Total cases (n=800)	Male (n= 422)			Female (n= 378)		
	Overall Frequency (%)	Right (%)	Left (%)	Combined (%)	Right (%)	Left (%)	Combined (%)
1	-	-	-	-	-	-	-
2	38(2.3)	6 (1.4)	6 (1.4)	12 (1.4)	13 (3.4)	13 (3.4)	26 (3.4)
3	52 (20.47)	120 (28.43)	120 (28.43)	240 (28.43)	44 (11.6)	44 (11.6)	88 (11.6)
4	194 (76.84)	290 (68.65)	290 (68.65)	580 (68.65)	322 (85)	322 (85)	644 (85)
5	12 (.75)	6 (1.4)	6 (1.4)	12 (1.4)	-	-	-
6	-	-	-	-	-	-	-

Table 2: Pattern of side distribution of various parameters of MF

G	MF-S		MF-AC		MF-IB		MF-R	
	R	L	R	L	R	L	R	L
I	19.61±2.45	18.29±3.21	14.98±2.99	14.43±2.48	11.83±1.64	12.44±1.95	57.28* ±7.28	58.24±6.48
III	19.25±2.57	19.47±2.38	14.48±3.58	14.69±3.86	12.04±2.98	12.18±2.66	59.04±4.99	59.07±5.67
IIII	20.32±2.51	20.19±2.22	14.07±3.48	13.87±2.90	11.43±1.90	11.69±1.67	58.48±6.43	58.99±6.03
C	19.79±2.51	19.35±2.72	14.56±3.35	14.34±3.19	11.78±2.24	11.96±2.1	58.27±6.3	58.27±6.3

Table 3: Intermental Foramen Distances (IMFD)

G	IMFD (mm)		
	MALE	FEMALE	MALE+FEMALE
I	35.07 ± 3.26*	31.89 ± 1.84	33.52 ± 3.11
II	36.22 ± 2.19*	33.71 ± 2.41	34.52 ± 2.36
III	37.11 ± 2.69*	34.52 ± 2.11	35.97 ± 2.77
C	35.92 ± 2.88*	33.39± 2.36	34.74 ± 2.95

Table 4: Horizontal (H-MF) and Vertical diameter (V-MF) of **the mental foramen.**

G	H-MF (mm)						V-MF (mm)					
	R(M)	R (F)	Overall (R)	L(M)	L (F)	Overall (L)	R(M)	R(F)	Overall (R)	L (M)	L (F)	Overall (L)
I	3.21 ± 1.14	3.25 ± .66	3.20 ± .91	3.08 ± .89	3.43 ± .94	3.25 ± .92	2.34 ± .46	2.21 ± .29	2.28 ± .06	2.36* ± .32	2.09 ± .36	2.23 ± .36
III	3.53 ± 1.36	2.91 ± .76	3.24 ± 1.13	2.99 ± .92	3.16 ± .74	3.07 ± .83	2.47 ± .49	2.28 ± .33	2.38 ± .06	2.49 ± .46	2.29 ± .40	2.37 ± .08
IIII	2.99 ± .59	3.49* ± .77	3.20 ± .70	3.09 ± .74	3.34 ± .71	3.20 ± .72	2.26 ± .43	2.36 ± .37	2.31 ± .40	2.39 ± .42	2.19 ± .44	2.30 ± .43
C	3.21 ± 1.05	3.20 ± .75	3.21 ± .91	3.05 ± .83	3.29 ± .80	3.17 ± .83	2.35 ± .46	2.28 ± .33	2.32 ± .40	2.41* ± .40	2.18 ± .40	2.31 ± .42

RESULTS

A total of 800 patients were included in our study. Samples were divided in three different groups based on age. Group 1 consisted of 258 patients aged between 18 to 30 years of whom 132 were males and 126 females. Group 2 consisted of 252 patients aged between 31 to 50 years of which 126 were males and 126 were females. Group 3 consisted of 290 patients aged between 51 to 70 years of which 164 were males and 126 were females (Graph 1).

On comparison between the determinations of frequency in position of MF based on gender we found that higher frequency of Position 4 in females as compared to males whereas the frequency of Position 3 in females was reduced by more than half when compared with that of the males. Position 2 showed similar incidence in the males as well as the females whereas Position 5 was not observed in any of female subjects. Position 6 was neither observed in males nor females. However there were no significant relationships between age and gender of the patients ($p>0.05$) and position of mental foramen on the right and left side (Table 1).

The values for MF-S calculated on the basis of gender showed higher values for MF-S in males than in females (Table 2). Detailed evaluation, revealed left sided MF-S to be significantly longer in males as compared to females in Group I whereas in Group III, MF-S was significantly more in males than females on both the sides ($p<0.001$). The combined data for the distance between MF and alveolar crest (MF-AC) was comparable on the right and the left side of the mandible (Table 3), though a steady decrease in MF-AC was evident from Group I to Group III However, determination of MF-AC based on gender revealed longer MF-AC in males on the left side than in females, and the difference in values of MF-AC amongst male and female subjects was especially significant in Group II. Combined MF- AC was found to be 14.56±3.35 on right side and 14.34±3.19 on left side. significantly longer MF-IB in males than females whereas observations noted according to age groups also revealed longer MF-IB in males on the right & left side in Group I and on the right side in Group II $P<0.001$.

An increase in the intermental foramen distance (IMFD) was observed with the increase in age. A statistically significant difference was observed $p<001$ in our study. The values for Horizontal diameter of MF (H-MF) on the right and left side of the mandible were comparable in all the age Groups (Table 6). The values for H-MF calculated on the basis of gender (Table 6) showed H-MF to be significantly longer in females on right side in Group III. The values for Vertical height of MF (V-MF) on the right and left side of the mandible were comparable in all the age Groups. However, the values for V-MF calculated on the basis of gender showed significantly longer V-MF on left in males in age Group I.

DISCUSSION

In current study we found that higher frequency of Position 4 in females as compared to males whereas the frequency of Position 3 in females was reduced by more than half when compared with that of the males. Position 2 showed similar incidence in the males as well as the females whereas Position 5 was not observed in any of female subjects. Position 6 was neither observed in males nor females. However there were no significant relationships between age and gender of the patients ($p>0.05$) and position of mental foramen on the right and left side. Yesilyurt et al, the position of MF may vary in different ethnic groups and gender as seen in the present study.[6] Alam et al while studying the CBCT scans at Virginia University observed somewhat similar incidence for Position 4 and Position 3.[7]

Detailed evaluation, revealed left sided MF-S to be significantly longer in males as compared to females in Group I whereas in Group III, MF-S was significantly more in males than females on both the sides ($p<0.001$). In current study determination of MF-AC based on gender revealed longer MF-AC in males on the left side than in females, and the difference in values of MF-AC amongst male and female subjects was especially significant in Group II. Combined MF-AC was found to be 14.56 ± 3.35 on right side and 14.34 ± 3.19 on left side. Significantly longer MF-IB in males than females whereas observations noted according to age groups also revealed longer MF-IB in males on the right & left side in Group I and on the right side in Group II $P<0.001$. The discrepancy in the values for MF-IB distance could be traced to the actual point taken into consideration for this parameter such as in the present study, the distance measured from midpoint of lower border of MF to inferior border of mandible as reported by Siddiqui et al. (2011) has been considered whereas Kim et al. (2006), who have reported much higher values for this distance have taken into consideration the superior border of MF and inferior border of mandible.[8,9] However, the variation in MF-IB measure as observed in the present study when compared to the study carried out by Sankar et al. (2011) could be traced to regional variation or the material used for the study.[10]

In current study an increase in the intermental foramen distance (IMFD) was observed with the increase in age. A statistically significant difference was observed $p<001$ in our study. The values for Horizontal diameter of MF (H-MF) on the right and left side of the mandible were comparable in all the age Groups. The values for H-MF calculated on the basis of gender (showed H-MF to be significantly longer in females on right side in Group III. The values for Vertical height of MF (V-MF) on the right and left side of the mandible were comparable in all the age Groups. However, the values for V-MF calculated on the basis of gender showed significantly longer V-MF on left in males in age Group I. The observations of the present study regarding IMFD are in accordance with the previous reports in which the distance between the MF (IMFD) has been reported to vary with age, ethnic group, sex and skull size (Kendrick and Wang, 2009).[11] The data provided for IMFD by Madrigal et al. (2008) is 46.5 mm (recorded from CBCT scans) and 41.6 mm (recorded from OPG).[12]

CONCLUSION

The observations of the present study as well as of the earlier studies suggest that Mental Foramen (MF) and the related parameters show both the inter-racial as well as intra-racial variations.

Awareness regarding various morphological and morphometric variations of MF could prove helpful in accurating the anesthetic procedures and improving the functional outcome of various reconstructive surgeries that are undertaken in the parasymphyseal region. Nevertheless, there is a growing need for having wide based multi-racial data collection using the scientifically updated modalities for mandibular parameters including the MF.

REFERENCES

1. Ahlgren FK, Johannessen AC, Hellem S. Displaced calcium hydroxide paste causing inferior alveolar nerve paraesthesia: report of a case. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 96: 734–737, 2003.
2. Aher V, Pillai P, Ali MF, Mustafa M, Ahire M, Mudhol A, Kadri M. Anatomical Position of Mental foramen: a Review. Glob J Med Public Health. 2012 Jan-Fe;1(1):61-4.
3. Ngeow WC, Yuzawati Y. The location of the mental foramen in a selected Malay population. J Oral Sci. 2003 Sep;45(3): 171-5.
4. Juodzbalys G, Wang HL, Sabalys G. Anatomy of Mandibular Vital Structures. Part II: Mandibular Incisive Canal, Mental Foramen and Associated Neurovascular Bundles in Relation with Dental Implantology. J Oral Maxillofac Res. 2010 Apr 1;1(1):e3.
5. Al Faleh W, Zahrani AA. Observer agreement in the radiographic assessment of mental foramen appearance on panoramic radiographs. Pakistan Oral Dent J.
6. Yesilyurt H, Aydinlioglu A et al. Local differences in the position of mental foramen. Folia Morphol (Warsz) 2008;67:32–35.
7. Alam MK et al. 3D CBCT morphometric assessment of mental foramen in Arabic population and global comparison: imperative for invasive and non-invasive procedures in mandible. Acta Odontol Scand. 2018 Mar;76(2):98-104.
8. Siddiqui AU, Daimi SR, Mishra PP, Doshi SS, Date JY, Khurana G. Morphological and morphometric analysis of mental foramen utilizing various assessment parameters in dry human mandibles. International Journal of Students Research.2011;1 (1).
9. Kim IS, Kim SG, Kim YK, Kim JD. Position of the mental foramen in a Korean population: a clinical and radiographic study. Implant Dent. 2006; 15(4):404-11.
10. Sankar DK, Bhanu SP, Susan PJ. Morphometrical and morphological study of mental foramen in dry dentulous mandibles of South Andhra population of India. Indian J Dent. 2011; 22(4):542-6.
11. Wang D, Kendrick S. Treatment options for the edentulous mandible. Implant. 2009: 1-7.
12. Madrigal C, Ortega R, Meniz C, Quiles L. Study of available bone for interforaminal implant treatment using cone-beam computed tomography. Med Oral Cir Bucal. 2008; 13(5):307-12.

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