Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr ICV 2018= 82.06

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Assessment of variation in size of mental foramen in adult population with CBCT: An anatomical study

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ABSTRACT

Background: The mental foramen (MF) is a bilateral opening localized on an anterior surface of the mandible. The present study was conducted to assess the variation in size of mental foramen in adult population with CBCT. **Materials & Methods:** The present study was conducted on 62 patients of both genders. A CBCT scan was performed in all patients using Planmica CBCT machine operating at 90 kVP, 12 mAs and with exposure time of 18 seconds. Vertical size of MF (V) was determined on the cross-sectional CBCT images and the horizontal size of MF (H) was assessed on axial scans. **Results:** Out of 62 mandibles, 32 were of males and 30 were of females. On left side, type I was seen in 18 males and 14 females, type II was 10 in males and 12 in females, type III was 4 in males and 4 in females. On right side, type I was in seen in 13 in males, 14 in females, type II in 14in males, 10 in females, type III in 5 in males and 6 in females. The difference in males and females was non – significant (P> 0.05). On left side, mean horizontal diameter in males was 4.3 mm and in females was 3.5 mm, vertical diameter in males was 3.6 mm and in females was 3.1 mm. On right side, mean horizontal diameter in males was 4.8 mm and in females was 3.9 mm, vertical diameter in males was 3.1 mm and in females was 2.7 mm. The difference was significant (P< 0.05). **Conclusion:** CBCT is useful in detection and assessing vertical and horizontal measurement of mental foramen in both genders. There was variation in both genders in both sides.

Key words: CBCT, mental foramen, Variation

Received: 15 July, 2019 Revised: 19 August 2019 Accepted: 25 August 2019

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This article may be cited as: Gandhi V, Singh D. Assessment of variation in size of mental foramen in adult population with CBCT: An anatomical study. J Adv Med Dent Scie Res 2019;7(9): 25-28.

INTRODUCTION

The mental foramen (MF) is a bilateral opening localized on an anterior surface of the mandible. The most often it is situated between the first and second inferior premolars.[1]The mental nerve (a branch of the inferior alveolar nerve) together with corresponding arteries and veins exit throughthe MF. The inferior alveolar nerve conducts unilaterally the sensory stimuli to the lower lip, labial mucosa, lower canine, and premolar, whereas blood vessels supply soft tissues of the lower jaw.[2]

Variations in the position of the MF have been reported by many authors in different ethnic groups and various shapes have also been noticed. Any foramen which is in addition to MF is considered as an Accessory Mental Foramen (AMF) and it is usually located below the 1st molar teeth.[3] This accessory mental foramen may transmit the branches of the mental nerve. Studying the position and morphological variations of mental foramen is very important because it is a critical and distinctive landmark for localizing the neurovascular bundle passing through it, in order to perform meticulous osteotomies and dental implant placement without causing any neurosensory dysfunction. The most common position of the mental foramen is in line with the longitudinal axis of the second

premolar tooth followed by the location between the first and second premolar tooth.[4]The present study was conducted to assess the variation in size of mental foramen in adult population with CBCT.

MATERIALS & METHODS

The present study was conducted in the department of Anatomy. It comprised of 62 patients of both genders. The study protocol was approved from institutional ethical committee.A CBCT scan was performed in all patients using Planmica CBCT machine operating at 90 kVP, 12 mAs and with exposure time of 18 seconds. Vertical size of MF (V) (Fig- 1) (Fig- 2) was determined on the cross-sectional CBCT images and the horizontal size of MF (H) was assessed on axial scans (Fig- 3). After determining the horizontal and vertical diameter of each MF, a ratio of both diameters (H:V) was calculated. Then, the H:V ratio was used to classify the form of MF into one of three types: Type I (oval horizontal form) was recognized when H:V was over 1.24, Type II (oval vertical form) at H:V value less than 0.76, and Type III (round form) when $0.76 \leq H:V \geq 1.24$. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 62		
Gender	**Males**	**Females**
Number	32	30

Table I shows that out of 62 mandibles, 32 were of males and 30 were of females.

Table II Assessment of type of MF

Type	Left side		Right side		P value
	Males	Females	Males	Females	
Type I	18	14	13	14	0.4
Type II	10	12	14	10	0.1
Type III	4	4	5	6	0.5

Table II, graph I shows that on left side, type I was seen in 18 males and 14 females, type II was 10 in males and 12 in females, type III was 4 in males and 4 in females. On right side, type I was in seen in 13 in males, 14 in females, type II in 14in males, 10 in females, type III in 5 in males and 6 in females. The difference in males and females was non – significant (P> 0.05).

Graph I: Assessment of type of MF

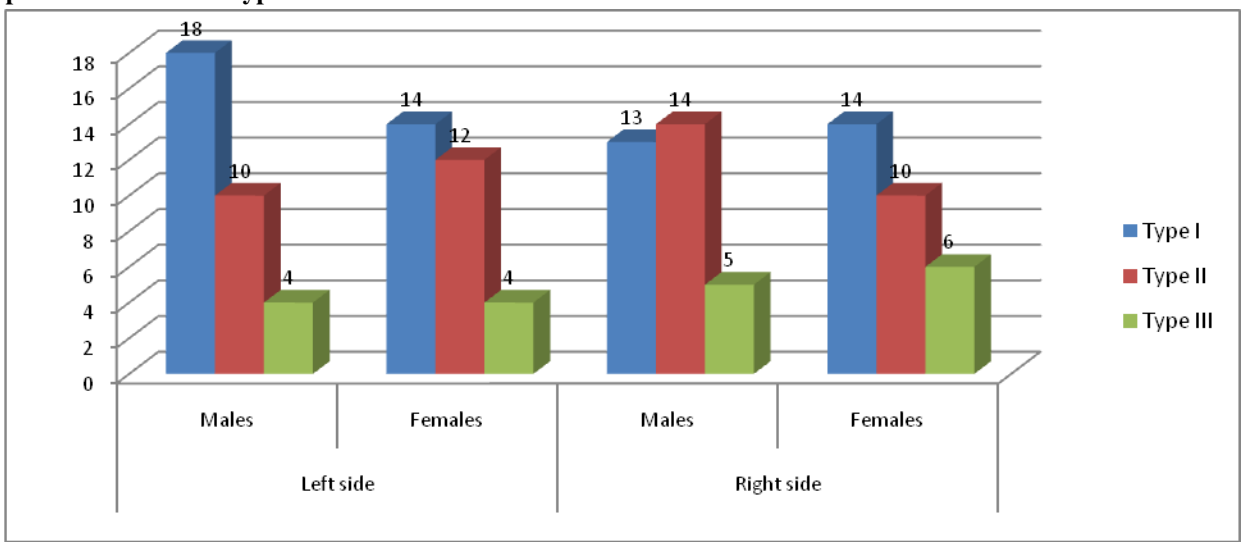

Table III: Comparison of a mental foramen size

Gender	Left side		Right side	
	Horizontal diameter (mm) Mean±SD	Vertical diameter (mm) Mean±SD	Horizontal diameter (mm) Mean±SD	Vertical diameter (mm) Mean±SD
Males	4.3	3.6	4.8	3.1
Females	3.5	3.1	3.9	2.7
P value	0.01	0.001	0.41	0.01

Table III shows that on left side, mean horizontal diameter in males was 4.3 mm and in females was 3.5 mm, vertical diameter in males was 3.6 mm and in females was 3.1 mm. On right side, mean horizontal diameter in males was 4.8 mm and in females was 3.9 mm, vertical diameter in males was 3.1 mm and in females was 2.7 mm. The difference was significant (P< 0.05).

Fig 1: Lateral view of mandible with mental foramen

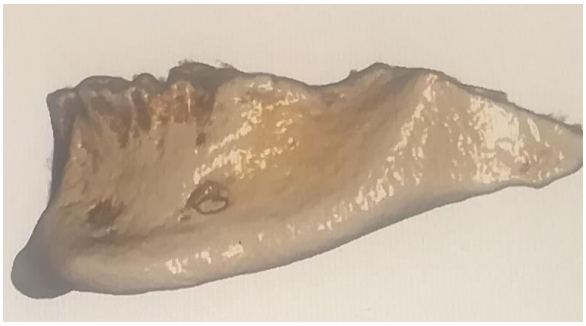

Fig 2: Cross-section view

Fig 3: Location of mental foramen

DISCUSSION

Both a precise location and well-defined shape, size, and number of MF is crucial for different clinical dental procedures.[5] Successful and complication-free dental procedures such as curettage, root canal treatment, periapical surgery, orthognathic surgery, and effective anesthesia during nerve blocks depend on knowledge of an operator. An implant placement in an interforaminal area is strictly related to the location of the MF, because it determines a position of most distal implants. Many studies indicate that a minimum distance between MF and an implant should amount up to 6mm. Any invasive procedure performed in this region may damage the neurovascular bundles and cause serious complications such as paresthesia.[6]

The MF location also shows changes with age. In children before tooth eruption, the MF is somewhat closer to the alveolar margin; during the eruption period, the MF descends to half way between the upper and lower margins and in adults with the teeth preserved, the MF is somewhat closer to the inferior border.[7] With loss of teeth and bone resorption the MF moves upwards closer to the alveolar border. In extreme cases of resorption; the MF and the adjacent part of the mandibular canal are open at the alveolar margin. The mental nerve emerges from the MF closer to or at the alveolar border; according to the degree of resorption. In severe resorption, the mental nerve and the final part of the inferior alveolar nerve may be found directly under the gums.[8] The present study was conducted to assess the variation in size of mental foramen in adult population with CBCT.

In this study, out of 62 mandibles, 32 were of males and 30 were of females. On left side, type I was seen in 18 males and 14 females, type II was 10 in males and 12 in females, type III was 4 in males and 4 in females. On right side, type I was in seen in 13 in males, 14 in females, type II in 14in males, 10 in females, type III in 5 in males and 6 in females.

Santini et al[9] found that in a group of 201 patients (106males and 95 females), no significant differences in values of the horizontal (H) and vertical (V) diameters as well as the H:V ratio on both sides in relation to the age of

participants were found. In males both average values of a horizontal diameter and vertical diameter were significantly higher on the right side than in the female subgroup, whereas on the left side only an average value of a vertical diameter was significantly higher in men in comparison to women. Moreover, the H:V ratio was significantly lower in males on the left side (p=0.032). There were no significant relationships between age and gender of the patients (p>0.05) and the type of mental foramen on the right and left sides.

We found that on left side, mean horizontal diameter in males was 4.3 mm and in females was 3.5 mm, vertical diameter in males was 3.6 mm and in females was 3.1 mm. On right side, mean horizontal diameter in males was 4.8 mm and in females was 3.9 mm, vertical diameter in males was 3.1 mm and in females was 2.7 mm.

Olasoji et al[10] found that a total of 1000 digital orthopantomogram of 635 male and 365 female patients within the age group of 15 to 55years were collected and the position of mental foramen along the vertical and horizontal axis was analyzed. The most common position of mental foramen was found to be in line with second premolar tooth (51%), in the horizontal axis and along the vertical axis, it was inferior to the apex of second premolar (68.1%).

Ngeowet al[11] conducted a study on 90 adult dry human mandibles from the South Indian population, irrespective of age and sex. The location, shape, orientation and the presence of the accessory foramen were studied by visual examination. The size and position of the mental foramen were measured by using a digital vernier caliper. In a majority of the mandibles, the mental foramen was located at the level of the root of the 2nd premolar, midway between the inferior margin and the alveolar margin of the mandible. Most of the mental foramina were oval in shape. The orientation of the foramen was postero-superior in 83% of the mandibles. The accessory foramens were noted in five mandibles.

CONCLUSION

Authors found that CBCT is useful in detection and assessing vertical and horizontal measurement of mental foramen in both genders. There was variation in both genders in both sides.

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