



## **Determination of a Cone-Beam Computed Tomography based Assessment of Mental Foramen Position**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Objective:** To assess the occurrence and location of the mental foramen in relation to gender and age by using cone-beam computed tomography.

**Materials and Methods:** A descriptive case series study was conducted at department of radiology at advance diagnostic care centre, Institute of Dentistry, Liaquat University of Medical & Health Sciences Hyderabad. One hundred and fifty patients of either gender, having age 18-40 years with retained permanent dentition and recommended for cone-beam computed tomography (CBCT) radiograph were selected by non-probability convenient sampling technique. Patients with history of bone disease, old trauma and not willing to participate were excluded. CBCT imaging of each patient will be performed and assessed for occurrence and location of the mental foramen.

**Results:** Out of 150 patients, male were 98 (65.3%) and female were 52 (34.7%) with mean age of  $28.8 \pm 6.9$  (18-40) years. Position 4 was the most common right side horizontal position with 74(49.3%) patients followed by position 3 with 69(46.0%) patients, position 5 with 6(4.0%) patients and position 2 with 1(0.7%) patients. Similarly position 4 was the most common left side horizontal position with 75(50.0%) patients followed by position 3 with 70(46.7%) patients, and position 5 with 5(3.3%) patients. Position 1 was only choice either for right or left side vertical position in all patients i.e., 150 (100.0%).

**Conclusion:** It was concluded from the study that no significant difference was observed in occurrence and location of the mental foramen in relation to gender and age by using cone-beam computed tomography.

*Keywords: Mental foramen; cone-beam computed tomography; bone disease; old trauma.*

## 1. INTRODUCTION

The mental foramen is a prominent anatomic feature that is often seen between the roots of the first and second mandibular premolars, or apical to the second premolars [1,2].

In children, the mental foramen typically located between the first and second deciduous molar [3]. A person has a pair of mental foramen on each side, with a single foramen on each side [4]. The extra foramen is called accessory mental foramen when it is dual or many and narrower than the mental foramen [4].

Based on the neighboring premolars and molars on the skull, traditional radiography, and cone-beam computed tomography, several researchers have identified the vertical and horizontal placements of the mental foramen [5]. Most common cases are multiple foramen in rare cases the mental foramen may not even exist [6]. The mental foramen is an aperture by wherein the mental nerve originates, a somatic afferent sensory offshoot of the inferior alveolar nerve that traverses the mandibular canal and leaves as mental nerve through the body region of either half of the jaw [2,4,7]. This branching of the inferior alveolar nerve transmits sensibility to the teeth, gingiva, buccal vestibule, and lower lip between the mandibular first molar. Extraction of teeth/roots, endodontic surgery, fracture repair, and other surgical procedures are commonly performed in this region [2,4,7].

Accessory mental foramen as reported in the literature as a result of the branching of the mental nerve before it passes through the mental foramen [6]. The nerve comes out of the mental foramen to innervate the frontal teeth and surrounding tissues. The mandibular soft tissues are supplied by blood arteries, and the location of the mental foramen is utilised as a referencing

spot in anaesthetic approaches like the incisive/mental nerve blocking [8].

The mental foramen is found in the anterolateral side of the jaw, roughly similar space (13-15mm) from the superior and inferior mandibular borders. This foramen houses the mental nerve and its related blood tributaries. When administering regional anaesthetic and doing operation in the mental area of the jaw, doctors must be aware of the location of the mental foramen [10]. The mental foramen is positioned in the bottom half of the mandible on the vertical plane, around 2.8-4 cm from the median confluence of the two sides of the jaw (Symphysis menti). The average diameter of the mental foramen is 3.8 mm [11].

Majority of surgeons got difficulty while doing surgery in the mental nerve area. So this study was done to provide an accurate evaluation of osseous monuments such as mental foramen and accessory mental foramen in the maxillofacial region to prevent from injury to the mental nerve.

## 2. MATERIAL AND METHODS

This research of case series descriptive in nature with Non Probability convenient sampling was conducted at department of radiology at Advance Diagnostic Care Centre, Institute of Dentistry, Liaquat University of Medical & Health Sciences Hyderabad from June 2020 to May 2021. Total 150 samples were taken with reference to Punjabi SK et al1. The sample size was taken from Epi Tools epidemiological ([www.epitools.ausvet.com.au/](http://www.epitools.ausvet.com.au/)).

### 2.1 Inclusion Criteria

- 18-40 years of age, irrespective of gender.
- Cone-beam computed tomography radiograph of an adult patient of with retained permanent dentition.

## 2.2 Exclusion Criteria

- History of bone disease.
- History of old trauma.
- Patient not willing to participate.
- Typo error like date or gender issue.

## 2.3 Data Collection Procedure

The patients were selected with the consent of patient for this study which fulfilled the inclusive criteria coming through radiology department of Advance Dental Care Centre Hyderabad. All CBCT imaging were done by single operator / technician and interpreted by the principal investigator and two senior consultant of department of Oral & Maxillofacial Surgery and all three interpretation were collected separately and analysis by taking mean of value mention by investigator (consent of senior faculty member of Oral and Maxillofacial Surgery department is attached).

All cases were assessed in the horizontal position of the mental foramen in respect to the mandibular premolars on both the right and left sides, as well as the vertical position of the mental foramen measured from the upper border of the foramen to the lower boundary of the mandible's body.

## 2.4 Horizontal Position

Position 1: Mental foramen situated anterior to the first premolar tooth.

Position 2: Mental foramen situated in the line with the long axis of the first premolar tooth.

Position 3: Mental foramen situated between the apices of the first and second premolar tooth.

Position 4: Mental foramen situated in the line with the long axis of the second premolar tooth.

Position 5: Mental foramen situated between the apices of the second premolar and first molar teeth.

Position 6: Mental foramen situated in the line with the long axis of the mesial root of a first molar tooth.

## 2.5 Vertical Position

Position 1: Mental foramen situated in the lower half of body viewed on OPG.

Position 2: Mental foramen situated in the upper half of body viewed on OPG.

## 2.6 Type of Machine and its Configuration

The data radiographically was taken via Rotograph EVO 3D by VILLA SISTEMI MEDICALI (Made in Italy) which is a complete panoramic system type machine that enables to perform all type X-rays that are needed in the dentistry and orthodontics as well as volumetric 3D images except the endoral x-rays.

The use of 3D radiographic images of the patient's maxillofacial complex helps the doctor the targeted selection of the appropriate procedures in the treatment as well as diagnosis aid.

A broad range Digital Sensor, commonly known as the Flat Panel, is fitted in this sort of gadget. By capturing a succession of two-dimensional pictures, these detectors may record a region of the maxillofacial complex that includes the essential significant anatomic information.

FOV: 85X85mm Scan time: 1.2s pixel 93um/185um scan volume: Max. 93X82mm (Full Dentition).

## 2.7 Data Analysis Procedure

The statistical package for social science (SPSS Version 20.0) software was used to examine the dataset. The occurrence of position was determined using descriptive statistics in respect to gender and age. The quantitative variables were presented by using mean  $\pm$  standard deviation (SD) & qualitative variables were presented by frequency table & percentage.

## 3. RESULTS

In this study male patients were 98 (65.3%) and female patients were 52 (34.7%) as shown in Table 1.

In this study patients were distributed into age group of  $\leq 25$  years with 56 (37.3%) patients and  $> 25$  years with 94 (62.7%) patients. Mean and standard deviation (SD) of age was  $28.8 \pm 6.9$  (18-40) years Table 2.

Right side horizontal position of patients was position 2 in 1 (0.7%) patients, position 3 in 69 (46.0%) patients, position 4 in 74 (49.3%) patients and position 5 in 6 (4.0%) patients Table 3.

**Table 1. Patients distribution according to gender (n=150)**

Gender	Frequency	Percentage
Male	98	65.3%
Female	52	34.7%
Total	150	100.0%

**Table 2. Descriptive statistics of age (Years) (n=150)**

<b>N</b>	150
<b>Minimum</b>	18
<b>Maximum</b>	40
<b>Mean</b>	28.8
<b>SD</b>	6.9

**Table 3. Patients Distribution according to right side horizontal position (n=150)**

Position	Frequency	Percentage
Position 1	0	0.0%
Position 2	1	0.7%
Position 3	69	46.0%
Position 4	74	49.3%
Position 5	6	4.0%
Total	150	100.0%

**Table 4. Patients distribution according to left side horizontal position (n=150)**

Position	Frequency	Percentage
Position 1	0	0.0%
Position 2	0	0.0%
Position 3	70	46.7%
Position 4	75	50.0%
Position 5	5	3.3%
Total	150	100.0%

**Table 5. Patients distribution according to right side vertical position (N=150)**

Position	Frequency	Percentage
Position 1	150	100.0%
Position 2	0	0.0%
Total	150	100.0%

**Table 6. Patients distribution according to left side vertical position (N=150)**

Position	Frequency	Percentage
Position 1	150	100.0%
Position 2	0	0.0%
Total	150	100.0%

Left side horizontal position of patients was, position 3 in 70(46.7%) patients, position 4 in 75(50.0%) patients and position 5 in 5(3.3%) patients Table 4.

Right side vertical position of all patients was position 1 i.e., 150 (100.0%) patients and no one positioned in position 2 Table 5

Left side vertical position of all patients was position 1 i.e., 150 (100.0%) patients and no one positioned in position 2 Table 6.

#### 4. DISCUSSION

Current study was designed to assess the occurrence and location of the mental foramen in relation to gender and age by using cone-beam computed tomography which will provide an accurate evaluation of osseous land marks such as mental foramen and accessory mental foramen in the maxillofacial region to prevent from injury to the mental nerve.

In current study out of 150 selected patients' male patients were in dominance i.e., 98 (65.3%) and female patients were 52 (34.7%). A similar study by Ahmed QN, et al. reported the 50% male patients and 50% female patients [12]. Another study by Alfaleh WM reported the higher female patients 56% and lower male patients 44% [13]. A similar study by Zmyslowska-Polakowska E, et al reported the 52.7% male patients and 47.3% female patients [14]. Different studies reported the different pattern of patients suffering from disease.

In current study mean age of patients was  $28.8 \pm 6.9$  (18-40) years. Majority of the patients were in age group of  $> 25$  years with 94 (62.7%) patients followed by  $\leq 25$  years with 56 (37.3%) patients. A study by study by Alfaleh WM also reported the similar mean age of patients i.e.,  $32.5 \pm 13.1$  years [13]. Another study by Sheikhi M, et al. reported the higher mean age  $48 \pm 13.9$  years. 80 Difference in mean age depends upon the study inclusion criteria for that select different age group in study.

In current study Position 4 was the most common right side horizontal position with 74(49.3%) patients followed by position 3 with 69(46.0%) patients, position 5 with 6(4.0%) patients and position 2 with 1(0.7%) patients. Similarly, position 4 was the most common left side horizontal position with 75(50.0%) patients followed by position 3 with 70(46.7%) patients and position 5 with 5(3.3%) patients, whereas position 1 was only choice either for right or left side vertical position in all patients i.e., 150 (100.0%). No significant difference was observed in gender and age on different positions including right side horizontal position, left side horizontal position, right side vertical position and left vertical position. Similarly, different pattern of used positions were reported by other studies but

no significant different was observed between gender and age and different positions [12-15]. The difference may be due to using different radiological technologies compared to CBCT in present study which is more accurate and advanced technology and provides a better visualization of the mental foramen.

#### 5. CONCLUSION

It was concluded from the study that no significant difference was observed in occurrence and location of the mental foramen in relation to gender and age by using cone-beam computed tomography. Position 4 was the most common right and left side horizontal position followed by position 3 and position 5, whereas position 1 was always used in right and left side vertical position.

#### CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

#### ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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