

**Original Article****A Morphometric Study of Mental Foramen of Adult Human Dry Mandibles**

Authors

**Sufia Parveen¹, Avanish Kumar², Aman Kumar³, Jyoti P Kulkarni², Binod Kumar⁴,
Rajiv Ranjan Sinha⁴, Md. Jawed Akhtar⁵**

¹Lecturer, Department of Prosthodontics, Dr. B. R. Ambedkar Institute of Dental Sciences & Hospital,
Patna, Bihar

²Additional Professor, ⁴Associate Professor, ⁵Assistant Professor, Department of Anatomy, Indira Gandhi
Institute of Medical Sciences, Patna, Bihar

³Additional Professor, Department of Forensic Medicine & Toxicology, Indira Gandhi Institute of Medical
Sciences, Patna, Bihar
Corresponding Author

Avanish Kumar

Additional Professor, Department of Anatomy, Indira Gandhi Institute of Medical Sciences, Patna, Bihar.

Email: simsavanish.yt@gmail.com

Abstract

Background: The mental foramen is an important anatomical land mark, which is helpful in performing different types of surgical procedures & giving local anesthetics for various types of oral as well as maxillofacial surgeries. The understanding about the anatomy of this region is very helpful in performing effective nerve blocks & avoiding injuries to the neurovascular bundles. Therefore, we study about the anatomical location, directions of exit, size & shape of the mental foramen of the mandible in the population of Bihar & compare it with the findings of the different studies.

Materials & Methods: The present study is a cross sectional study which has been carried out on 140 dried fully ossified dentulous adult human mandibles (280 sides). The age & gender of the bones used in the study was not predetermined.

Result: The most common shape of mental foramen recorded in the present study was round shaped (59.29%). The commonest way of its exit was in the postero superior direction (93.21%) in both the sides. Mean transverse diameter were 3.34 mm on right side & 3.56 mm on left side whereas mean vertical diameter were 2.94 mm and 3.24 mm for right and left side respectively. The most frequent position of foramen in relation to the lower teeth were below the apex of 2nd premolar on both the right (36.79%) as well as the left (37.5%) side. The distance between the mental foramen & symphysis menti were 29.01±1.24 mm on the right side & 28.84±1.12 mm on the left side. The distance between the mental foramen & posterior border of ramus were 72.23±1.28 mm on the right side & 79.61±1.76 mm on the left side. While, the results of the measurement between the mental foramen & alveolar crest were 17.54±1.83 mm on the right side & 17.74±1.36 mm on the left side and between the mental foramen & inferior border of body of the mandible were 17.1±1.43 mm & 17.51±1.25 mm on the right & the left side respectively.

Conclusion: This study provides the necessary data regarding the mental foramen location and its morphometry which may be helpful for the dental surgeons in avoiding injuries of the mental nerve while doing different types of surgeries around this region.

Keywords: Mental Foramen, Morphometry, Mental Anaesthesia, Mandible.

Introduction

On the anterolateral aspect of the mandible, there is a foramen known as mental foramen which transmits mental nerve & mental vessels. Sensation from the skin of the chin as well as the lower lip & the labial mucosa is carried by the mental nerve which is a branch of the inferior alveolar nerve.^[1] This foramen is an important anatomical land mark, which is helpful in performing different types of surgical procedures & giving local anesthetics for various types of oral & maxillofacial surgeries. Therefore, the understanding about the anatomy of this region is very helpful in performing effective nerve blocks as well as avoiding injuries to the neurovascular bundles. The exact identification of anatomical position of mental foramen is also play a important role in surgeries like flap operation of lower teeth, periodontal surgery, retrograde amalgam filling, apicocurretage of the mandibular premolars, surgical orthodontics and other types of lower lip surgical procedures. The dental surgeons must know about the relations of the mental foramen to the lower premolar teeth & the body of ramus in different types of surgeries around this area like apicocurretage of mandibular premolars to prevent the damage the mental nerve. Injuries to this nerve may cause transitory or permanent sensitive, thermal & tactile changes in the areas of its distributions.^[2-4] Therefore, we study about the anatomical location, directions of exit, size & shape of the mental foramen of the mandible in the population of Bihar & compare it with the findings of the different studies.

Materials and Methods

The present study is a cross sectional study which has been carried out on 140 dried fully ossified dentulous adult human mandibles (280 sides), which were collected from the different students of the 1st year MBBS & BDS and Department of Anatomy & Forensic Medicine of different medical & dental colleges of Bihar state of India. The age & gender of the bones used in the study was not predetermined. Only fully ossified dried,

macerated and thoroughly cleaned mandibles which were complete in all respects, in order to give the correct observations, were included in the study while the mandibles having any deformity or pathology were excluded. The mandibles having premortem tooth loss were also excluded from the study because the mental foramen may comes closer to the alveolar crest margin or sometimes to the alveolar area which is may be due to the alveolar bone resorption. Before measurement, the mandibles were placed on a horizontal plane surface to which the lower border of the mandible is in direct contact. Different parameters were measured using a digital vernier caliper, metallic wire and scale on both the right & the left sides.

The following parameters were studied:-

(A) Nonmetric Parameters

1. Shapes of the mental foramen.
2. Direction of exit of mental foramen.
3. Locations in relation to the lower teeth.

(B) Metric Parameters

1. Transverse & vertical diameter of the mental foramen.
2. The distance from the symphysis menti.
3. The distance from the posterior border of the ramus.
4. The distance from the alveolar ridge.
5. The distance from the inferior border of the mandible.

These measurement were taken by a metallic wire & measured it by using a standard scale. The data were collected, tabulated & statistically analyzed. The software Graph Pad Prism version 4.03 was used for statistical analysis of data. Continuous variables were expressed in term of mean & standard deviation while categorical variables were expressed in term of percentage. Representative photographs were taken using a digital mobile camera.

Results

The most common shape of mental foramen recorded in the present study was round shaped (59.29%). The commonest way of it's exit was in

the postero superior direction (93.21%) in both the sides. Mean transverse diameter were 3.34 mm on right side & 3.56 mm on left side whereas mean vertical diameter were 2.94 mm and 3.24 mm for right and left side respectively [Table:1,2&3]. The position of mental foramen in relation to mandibular teeth on both the sides are shown in Table 4. The most frequent position of foramen in relation to the lower teeth were below the apex of 2nd premolar on both the right (36.79%) as well as the left (37.5%) side. The second commonest position were in line between 1st & 2nd premolar (right : 7.14% & left: 6.79%); closely followed by position in the line between 2nd premolar & 1st

molar teeth (right: 6.07% & left: 5.71%) [Figure 1,2 &3]. The distance between the mental foramen & symphysis menti were 29.01±1.24 mm on the right side & 28.84±1.12 mm on the left side. The distance between the mental foramen & posterior border of ramus were 72.23±1.28 mm on the right side & 79.61±1.76 mm on the left side. While, the results of the measurement between the mental foramen & alveolar crest were 17.54±1.83 mm on the right side & 17.74±1.36 mm on the left side and between the mental foramen & inferior border of body of the mandible were 17.1±1.43 mm & 17.51±1.25 mm on the right & the left side respectively [Table 5].

Table 1: Diameters of the mental foramen

Variables (in mm)	Right Side (Mean ± SD)	Left Side (Mean ± SD)
Transverse Diameter	3.34 ± 1.35	3.56 ± 1.90
Vertical Diameter	2.94 ± 1.75	3.24 ± 1.97

Table 2: Shape of the mental foramen

Side	Round	Oval	Total
Right	85 (30.36%)	55 (19.64%)	140 (50%)
Left	81 (28.93%)	59 (21.07%)	140 (50%)
Total	166 (59.29%)	114 (40.71%)	280 (100%)

Table 3: Direction of exit of the mental foramen

Side	Postero Superior	Antero Superior	Total
Right	135 (48.21%)	5 (1.79%)	140 (50%)
Left	126 (45%)	14 (5%)	140 (50%)
Total	261 (93.21%)	19 (6.79%)	280 (100%)

Table 4: Location of the mental foramen in the mandible

Side	Between 1 st & 2 nd Premolar tooth	Below the apex of 2 nd Premolar tooth	Between 2 nd Premolar & 1 st molar tooth	Total
Right	20 (7.14%)	103 (36.79%)	17 (6.07%)	140 (50%)
Left	19 (6.79%)	105 (37.5%)	16 (5.71%)	140 (50%)
Total	39 (13.93%)	208 (74.29%)	33 (11.78%)	280 (100%)

Table 5: Morphometric parameter of the mental foramen

Distance from (in mm)	Right Side (Mean ± SD)	Left Side (Mean ± SD)
Mental Symphysis	29.01 ± 1.24	28.84 ± 1.12
Posterior border of ramus	72.23 ± 1.28	79.61 ± 1.76
Alveolar ridge	17.54 ± 1.83	17.74 ± 1.36
Inferior edge	17.1 ± 1.43	17.51 ± 1.25



Figure 1: Mental foramen Between 1st & 2nd Premolar



Figure 2: Mental foramen Below the apex of 2nd Premolar



Figure 3: Mental foramen Between 2nd Premolar & 1st Molar

Discussion

Many studies have been done globally by different workers on other races & groups of population about the morphometry of mental foramen, their findings are compared by our results & observations. After comparing & evaluating findings of the present study with that obtained by the others workers, several differences as well as similarities found. Normally mental foramen is a single opening present on each side of the mandible. However, in some cases complete absence of mental foramen or multiples foramen is also reported.^[5]

Sankar D K et al^[6] observed double mental foramina were found to be 5.6% on the right & 3.3% on the left side. Singh S K et al.^[7] and Zografos & Mutzuri^[8] found the incidence of double foramina in 11.48% of North Indians & 6.68% of Greek population, respectively. Rajkohila J et al^[9] reported this accessory mental foramina in 8.85% cases in South Indian population. They observed accessory mental foramina were located more on the left side than on the right side. Similar results were also reported by Singh and Srivastav^[10] who found 8% accessory mental foramina on the left side and 5% on the right side; Udhaya et al.^[11] reported 3.33% accessory mental foramina on the left side and 2.22% on right side. Voljevica et al.^[12] reported the presence of four accessory mental foramina, all of which were present on the right side of the mandible. In our present study no any accessory mental foramina was reported. However, in 2.17% of North Indian mandibles triple mental foramen was also reported by Singh S K et al.^[7] Absence of mental foramen is a very rare observation was also reported by de Frietas et al.^[13]

We observed the transverse diameter of mental foramen in right side was 3.34±1.35 mm &

3.56±1.90 mm in left side while the vertical diameter of the mental foramen in right side was 2.94±1.75 mm & 3.24±1.97 mm in left side. While M Janardhan Rao & S Saritha^[14] observed that the horizontal diameter of the mental foramen was 3.12 ±0.43 mm & 2.99±0.26 mm on right & left side respectively. The vertical diameter of the mental foramen was 2.32±0.31mm & 2.21 ±0.23 mm on its right & left side respectively. Nimje D A et al^[15] reported that the average horizontal diameter of the mental foramen was 3.11mm on right side & 3.18mm on the left side. While Udhaya et al^[11] reported it as 2.28mm on the right side & 2.95 mm on the left side.

We observed the commonest shape of the mental foramen was round (59.29%) in right as well as in left side. While M Janardhan Rao & S Saritha^[14] also observed that oval is the commonest shape with incidence of the 69.28%.

We observed the direction of exit of the mental foramen was in postero superior direction in 93.21% cases & antero superior direction in 6.79% cases. While M Janardhan Rao & S Saritha^[14] observed that the incidence of the direction of exit of the mental foramina was 87.85% (123 sides) postero superiorly, 7.14% (10 sides) superiorly & 5% (7 sides) antero superiorly. In our study, the commonest position of the mental foramen was below the apex of second premolar teeth with the incidence of 74.29%. While similar results were also found in other studies but incidences varies which were recorded to be 73.2% in South Indian population,^[6] 68.58% in North Indian population,^[7] 58.9% in Chinese population,^[16] 47.2% in Iranian population,^[17] 52.9% in British population,^[18] 45.3% in Saudi population,^[19] 55.6% in Nigerians,^[20] & 56.1% in Kenyan African mandibles.^[21]

We found the distance between the mental foramen & the symphysis menti was 29.01 ±1.24 mm on the right side and 28.84±1.12 mm on the left side while the distance between the mental foramen & posterior border of the ramus was 72.23±1.28 mm on the right side & 79.61±1.76

mm on the left side. While Sankar DK et al^[6] observed that the distance between the mental foramen & the symphysis menti was 27.2±2.4 mm on the right side and 27.7±2.4 mm on the left side while the distance between the mental foramen & posterior border of the ramus was 70.7±4.2 mm on the right side & 70.7±4.2 mm on the left side.

We measured that the distance between the mental foramen & the alveolar ridge was 17.54±1.83 mm on the right side & 17.74±1.36 mm on the left side and the distance between the mental foramen & the inferior border of body of mandible was 17.1±1.43 mm and 17.51±1.25 mm on right & left sides respectively. While Sankar DK et al^[6] measured the distance between the mental foramen & the alveolar crest was 13.7±2.8 mm on the right side & 16.4±2.9 mm on the left side and the distance between the mental foramen & the inferior border of body of mandible was 16.5±2.1 mm and 14.3±2.1 mm on right & left sides respectively.

Conclusion

The mental foramen is very difficult to identified clinically or palpated externally because is no accurate anatomical landmarks for this foramen. For its anesthetic and surgical intervention, the detailed knowledge about its exact position and various distances of mental foramen becomes necessary. Its location as well as other relative parameter of the mental foramen in the population of Bihar has not been described previously, for which this study was undertaken to determine the different morphometry of the mental foramen. This study provides the necessary data regarding the mental foramen location and its morphometry which may be helpful for the dental surgeons, neurosurgeons and anesthetists to carry out different surgical procedures & nerve block.

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