

A Study of Anatomical Variations of Mental Foramen in Dry Adult Human Mandibles and Its Clinical Importance

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ABSTRACT

Background: Mental foramen is a small foramen situated in anterolateral aspect of the body of the mandible. Normally, mental foramen is located below the interval between the premolars. It transmits mental nerve, artery and vein. Mental nerve is a branch of inferior alveolar nerve which supplies sensation to lower lip and the labial mucosa and lower canines and premolars. The most useful injection for anaesthetising the mandibular teeth is the inferior alveolar nerve block. Any foramen in addition to mental foramen in the body of the mandible is known as accessory mental foramen. Accessory mental foramen transmits the accessory branch of mental nerve.

Materials and methods: The mandibles which were used for our study were procured from the Department of Anatomy, Siddhartha Medical College (Govt), Vijayawada over a period of 6 years. About 70 adult dry South Indian mandibles, irrespective of age and sex, with either all the teeth intact or with preserved alveolar margins, were used for our study. The bones with gross pathological deformities were excluded from our study. The number, shape and the orientation of the MF were determined by a visual examination. The shape of mental foramen in dry human adults was analyzed by visual examination of the both sides of the mandible.

Result: The present study showed that the position of mental foramen from symphysis menti and posterior border of ramus of mandible was more on right side than left side and found to be insignificant while position of mental foramen from inferior border of body of mandible was more on left side than right side and found to be insignificant for right side while significant for left side. The shape of mental foramen on right side was found to be Oval shape – 65.7% and round shape – 34.3% while on left side Oval shape–71.4% and round shape – 28.6%.

Conclusion: Hence, mental foramen plays a pivotal role in performing major facial surgeries and is an important landmark for several facial procedures performed.

Keywords: Mental foramen, Mandible, Position, Shape, Bones

INTRODUCTION

Mental foramen is a small foramen situated in anterolateral aspect of the body of the mandible.^[1] Normally, mental foramen is located below the interval between the premolars. It transmits mental nerve, artery and vein.^[2] Mental nerve is a branch of inferior alveolar nerve which supplies sensation to lower lip and the labial mucosa and lower canines and premolars.^[3] The most useful injection for anaesthetising the mandibular teeth is the inferior alveolar nerve block.^[4]

To anaesthetise the anterior teeth, including the premolars and canines, it is possible to avoid giving inferior alveolar nerve block by injecting anaesthetic solution adjacent to the mental foramen.^[5] So, the study of position and morphological variations of mental foramen is very important because it will be helpful to localise the important neurovascular bundle passing through the mental foramen.^[5]

Any foramen in addition to mental foramen in the body of the mandible is known as accessory mental foramen.^[6] Accessory mental foramen transmits the accessory branch of mental nerve. So, the knowledge of its position and incidence is helpful to dental surgeons to achieve complete anaesthesia because if this nerve is not blocked, anaesthesia will be incomplete. This knowledge will also helpful to prevent accessory nerve injury during periapical surgery.

MATERIALS AND METHODS

The mandibles which were used for our study were procured from the Department of Anatomy, Siddhartha Medical College (Govt), Vijayawada over a period of 6 years. About 70 adult dry South Indian mandibles, irrespective of age and sex, with either all the teeth intact or with preserved alveolar margins, were used for our study. The bones with gross pathological deformities were excluded from our study. The number, shape and the orientation of the MF were determined by a visual examination.

The positions of the mental foramens were measured with respect to the teeth, for which we followed the Tebo and Telford [6] classification. The positions of the mental foramens with respect to the borders were also measured with the help of a digital vernier calipers, at a measuring accuracy of 0.01mm. From the transverse and the vertical diameters which were obtained, the size of the MF was calculated.

For measurement of various parameters of our study, mandible was placed on the horizontal plane and the lower border of mandible interact with greatest force as vertical pressure is applied to the second molar teeth.

The shape of mental foramen in dry human adults was analyzed by visual examination of the both sides of the mandible.

For measuring position of mental foramen in the mandibles of both sides following are the considerations in our study: position of mental foramen from symphysis menti, position of mental foramen from posterior border of ramus of mandible and position of mental foramen from inferior border of the body of mandible.

Statistical analysis

All the measurements were recorded by one of the authors to reduce bias. The SPSS, version 25 software were used for the statistical analysis, to find out the minimum and the maximum incidences, the mean and the standard deviation.

RESULTS

The mean and standard deviation of mental foramen (left and right side) were calculated.

Table-1: Comparison of mean and SD of position of mental foramen from symphysis menti (right and left side).

Side	Position of MF from symphysis menti Mean±SD (n=35)	p-value
Right	22.80±1.4	0.92
Left	21.90±1.3	0.78

In our study, the mean and standard deviation of position of mental foramen from symphysis menti was found to be (22.80±1.4) on right side and (21.90±1.3) on left side. The distance from right side was more than the left side and was found insignificant ($p>0.05$ for both sides) (Table 1).

Table 2: Comparison of mean and SD of position of mental foramen from posterior border of ramus of mandible (right and left side).

Side	Position of MF from posterior border of ramus of mandible Mean SD (n=35)	p-value
Right	59.25±5.5	0.60
Left	59.02±5.3	0.99

The mean and standard deviation of position of mental foramen from the posterior border of ramus of mandible was found to be (59.25± 5.5) on right side and (59.02±5.3) on left side. The distance from right side was more than the left side and was found insignificant (p value >0.10 for left side and $p>0.0900$ for right side) (Table 2).

Table-3: Comparison of mean and SD of position of mental foramen from inferior border of body of mandible (right and left side).

Side	Position of MF from inferior Border of body of mandible Mean SD (n=35)	p-value
Right	10.88±2.5	0.88
Left	10.75±2.5	0.03

The mean and standard deviations of position of mental foramen from inferior border of body of mandible was found to be, (10.88±2.5) on right side and (10.75±2.5) on left side. The distance from right side was less than the left side and was found insignificant for right side while significant for left side value ($p > 0.05$) for right side and p value 0.004 for left side) (Table 3).

Table-4: Comparison of shape of mental foramen

Shape	Right side		Left side	
	(n=35)	Percentage	(n=35)	Percentage
Round	12	34.3	10	28.6
Oval	23	65.7	25	71.4
Total	35	100	45	100

The shape, round and oval of mental foramen was also compared for both the sides and the results for right side was found to be Oval shape – 65.7% and round shape – 34.3% while for left side Oval shape – 71.4% and round shape – 28.6% (Table 4).

**Figure 1: Mental foramen Between 1st & 2nd premolars**



Figure 2: Mental Foramen and Accessory Mental foramen

DISCUSSION

Mental foramen is situated in anterolateral aspect of the body of the mandible. It lies below either the interval between the premolar teeth, midway between the upper and lower borders of the body of the mandible. ^[7] It is an anatomical landmark for facilitating diagnostic, surgical, local and other invasive procedure for dental surgeons performing periapical surgery in the mental region of mandible. ^[8]

Knowledge of position, shape and size of mental foramen is important for performing anesthesia block prior to clinical procedure in lower anterior teeth and to preserve integrity of mental nerve trunk in surgical interventions. ^[9]

Prabodha et al. reported in 24 dry adult mandibles the mean distance of mental foramen from symphysis menti, lower border of the body of mandible and posterior border of the ramus of the mandible were 26.25 mm, 12.25 mm and 65.38 mm respectively. The shape of mental foramen was oval in 66.67% and rounded in 33.33% of mandibles. In contrast to our study the mean distance of mental foramen from symphysis menti were 25.72 mm (right side) and 25.27 mm (left side) from inferior border of body of mandible were 12.53 mm (right side) and 12.68 mm (left side) and from posterior border of ramus were 62.33 mm (right side) and 62.24 mm (left side) while the shape of mental foramen was oval in 70% and rounded in 30% of mandibles.

Ilayperuma et al. ^[10] reported that in 51 adult dry mandibles the mean distance of mental foramen from symphysis menti was 24.86 mm. The most common position for the mental foramen was in line with longitudinal axis of the lower second premolar 52.94% followed by a position between first and second premolar 26.47%. In most of the mandibles the shape of the mental foramen was oval i.e. almost 59%.^[11] In contrast to our study the position of mental foramen from symphysis menti was 25.72 mm (right side) and 25.72 mm (left side). The most common position for the mental foramen was in line with apex of the lower second premolar 68.33% and the second most common position was in line with apex of second premolar and first molar is 15.83%. The shape of mental foramen was oval in 70% and rounded in 30% of mandibles.

Udhaya et al. ^[12] reported that out of 87 dry mandibles, in 75 mandibles (83.33%) the mental foramen was bilaterally showing an oval shape and in the remaining 15 mandible (16.67%) the mental foramen was bilaterally showing a

round shape.^[13] In contrast to our study in 70% mandible the mental foramen was bilaterally showing an oval shape and in 30% mandible the mental foramen was bilaterally showing a round shape.

Sukla et al^[14] reported that the oval shape of mental foramen was 87.1% on right side and 88.6% on left side. Round shape mental foramen was observed to be 12.9% on the right side and 11.4% on the left side while in contrast to our study oval shape of mental foramen is more prominent in both sides.

Vimala et al.^[15] reported that the mean value of position of mental foramen from symphysis menti, lower border of the body of the mandible, and posterior border of the ramus of mandible were 26.67 mm, 11.25 mm and 62.35 mm. The most common position for the mental foramen was in line with apex of the lower second molar (61.4%) followed by a position between second premolar and first molar was (28.2%) coincides with Deepa et al. study.^[16] The shape of mental foramen was oval in 61.2% and rounded in 38.5% of mandibles in most of the studies while in contrast to our study the position of mental foramen from symphysis menti were 25.72 mm (right side) and 25.72 mm (left side), from inferior border of the body of the mandible were 12.53 mm (right side) and 12.68 mm (left side) and from posterior border of ramus of mandible were 62.33 mm (right side) and 62.24 mm (left side). The most common position for the mental foramen was in line with apex of the lower second premolar 68.33% on both sides. The oval shape of mental foramen was more prominent.

Suman et al^[17] observed that the most common position of mental foramen in relation to lower (mandibular) teeth was below the apex of second premolar teeth in 56.86% of mandibles followed by space between second premolar and first molar teeth. While in present study the most frequent position of the mental foramen was in line with apex of the lower second premolar 68.33% on both left and right sides, respectively.

Hence, its deep awareness is necessary while performing various surgical procedures and in applying anaesthesia to the patients to avoid any complications. Mainly dentists must take proper care and precautions of that important bone to avoid any type of injuries.

CONCLUSION

Knowledge of position, shape and size of mental foramen is important for performing anesthesia block prior to clinical procedure in lower anterior teeth and to preserve integrity of mental nerve trunk in surgical interventions while knowledge of the morphology of the mental foramen is important when administering regional anaesthesia, performing periapical surgery, dental implant surgery and endodontic treatments in the mandible. Its understanding is also useful in preserving and avoiding injury to the mental nerve and vessels during surgical procedures and in interpreting anatomical landmarks in oral pathology and forensics. In the present study we also discovered already non-common insignificant variations associated with position of mental foramen from symphysis menti, lower inferior border of the body of mandible and from posterior border of ramus of the mandible.

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