

Original Research

A study on Clinical Significance of Anatomical Variations of the Mental Foramen in Dry Adult Human Mandibles

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ABSTRACT:

Background: The mental foramen is a tiny foramen located in the mandibular body's anterolateral side. The mental foramen is often situated underneath the space between premolars. It transmits veins, arteries, and mental nerves. Lower canines, premolars, the labial mucosa, and the lower lip are all sensed by the mental nerve, a branch of the inferior alveolar nerve. The inferior alveolar nerve block is the most effective injection for mandibular tooth anaesthesia. An auxiliary mental foramen is any foramen that is present in the mandibular body in addition to the mental foramen. The auxiliary branch of the mental nerve is transmitted via the accessory mental foramen. **Materials and methods** 90 adult dry Indian mandibles, regardless of age or sex, that had either retained alveolar borders or all of the teeth intact. We did not include bones with severe pathological abnormalities in our analysis. A visual inspection was used to identify the MF's number, shape, and orientation. By visually inspecting both sides of the jaw, the morphology of the mental foramen in dry adult humans was determined. **Result:** The mean and standard deviations of position of mental foramen from inferior border of body of mandible was found to be, (11.87±3.4) on right side and (11.74±3.4) 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). **Conclusion:** As a result, the mental foramen is a crucial landmark for many face treatments and plays a crucial role in major facial surgeries.

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

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INTRODUCTION

The mental foramen is a tiny foramen located in the mandibular body's anterolateral side. [1] The mental foramen is often situated under the space between premolars. It transmits veins, arteries, and mental nerves. [2] Lower canines, premolars, the labial mucosa, and the lower lip are all sensed by the mental nerve, a branch of the inferior alveolar nerve. [3] The inferior alveolar nerve block is the most effective injection for mandibular tooth anaesthesia. [4]

By injecting an anaesthetic solution next to the mental foramen, it is feasible to anaesthetise the front teeth, including the canines and premolars, without doing an inferior alveolar nerve block. [5] Because it will be useful to locate the crucial neurovascular bundle that passes through the mental foramen, it is crucial to investigate the location and morphological changes of the mental foramen. [5]

An auxiliary mental foramen is any foramen that is present in the mandibular body in addition to the

mental foramen. [6] The auxiliary branch of the mental nerve is transmitted via the accessory mental foramen. Therefore, dental surgeons may obtain full anaesthesia by knowing its location and incidence, since an incomplete anaesthesia would result from not blocking this nerve. During periapical surgery, this information will also aid to avoid accessory nerve damage.

MATERIALS AND METHODS

Our research included around 90 adult dry Indian mandibles, regardless of age or sex, that had either retained alveolar borders or all of the teeth intact. We did not include bones with severe pathological abnormalities in our analysis. A visual inspection was used to identify the MF's number, shape, and orientation.

We used the Tebo and Telford [6] categorisation to estimate the locations of the mental foramens in relation to the teeth. Using digital vernier callipers, the

locations of the mental foramina in relation to the boundaries were also measured with a precision of 0.01 mm. The size of the MF was computed using the obtained transverse and vertical diameters.

The jaw was positioned on a horizontal plane to assess the different characteristics of our investigation. The bottom border of the mandible interacts more forcefully with the second molar teeth when vertical pressure is applied.

By visually inspecting both sides of the jaw, the morphology of the mental foramen in dry adult humans was determined.

The following factors were taken into account in our research in order to measure the location of the mental foramen in the mandibles on both sides: The location

of the mental foramen comes from the symphysis menti, the inferior boundary of the mandibular body, and the posterior border of the mandibular ramus.

STATISTICAL ANALYSIS

To minimise bias, one of the writers recorded every measurement. To determine the mean, standard deviation, and lowest and maximum occurrences, statistical analysis was conducted using SPSS software, version 25.

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=45)	p-value
Right	23.81±2.3	0.93
Left	22.89±2.2	0.79

In our study, the mean and standard deviation of position of mental foramen from symphysis menti was found to be (23.81±2.3) on right side and (22.89±2.2) 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	60.2±6.4	0.61
Left	60.01±6.2	0.98

The mean and standard deviation of position of mental foramen from the posterior border of ramus of mandible was found to be (60.2±6.4) on right side and (60.01±6.2) 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=45)	p-value
Right	11.87±3.4	0.87
Left	11.74±3.4	0.04

The mean and standard deviations of position of mental foramen from inferior border of body of mandible was found to be, (11.87±3.4) on right side and (11.74±3.4) 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	Rightside		Leftside	
	(n=45)	Percentage	(n=45)	Percentage
Round	17	35.5	15	29.7
Oval	28	66.9	30	72.6
Total	45	100	45	100

The shape, round and oval mental foramen was also compared for both the sides and the results for right side was found to be Oval shape – 66.4% and round shape – 35.2% while for left side Oval shape – 72.3% and round shape – 29.5% (Table 4).

DISCUSSION

The mental foramen is located in the mandibular body's anterolateral side. It is situated halfway between the top and bottom margins of the mandibular body, under the space between the

premolar teeth. [7] For dental surgeons doing periapical surgery in the mandibular mental area, it serves as an anatomical marker that facilitates diagnostic, surgical, local, and other invasive procedures. [8]

Understanding the location, dimensions, and structure of the mental foramen is crucial for maintaining the integrity of the mental nerve trunk during surgical procedures and for applying anaesthesia block on lower anterior teeth before a clinical operation. [9]

The mean distances of the mental foramen from the symphysis menti, the lower border of the mandible's body, and the posterior border of the mandible's ramus were 26.25 mm, 12.25 mm, and 65.38 mm, respectively, according to Prabodha et al.'s study of 24 dry adult mandibles. 33.33% of mandibles had a rounded mental foramen, whereas 66.67% had an oval one. In contrast to our study, the average distance between the mental foramen and the symphysis menti was 25.72 mm on the right side and 25.27 mm on the left, 12.53 mm on the right side and 12.68 mm on the left, and 62.33 mm on the right side and 62.24 mm on the left side. The shape of the mental foramen was oval in 70% of mandibles and rounded in 30%.

According to Ilayperuma et al. [10], the average separation between the symphysis menti and the mental foramen in 51 adult dry mandibles was 24.86 mm. The mental foramen was most often found at a position between the first and second premolars (26.47%), followed by a position parallel to the longitudinal axis of the lower second premolar (52.94%). The mental foramen was oval in form in the majority of mandibles, or almost 59%. [11] The mental foramen from the symphysis menti was located 25.72 mm on the right side and 25.72 mm on the left side, in contradiction to our findings. 68.33% of the time, the mental foramen was in alignment with the apex of the lower second premolar, and 15.83% of the time, it was in alignment with the apex of the second premolar and first molar. In 70% of mandibles, the mental foramen had an oval form, whereas in 30%, it was rounded.

According to Udhaya et al. [12], of the 87 dry mandibles, 75 (83.33%) had a bilaterally oval-shaped mental foramen, while the remaining 15 (16.67%) had a bilaterally oval-shaped mental foramen.

circular form. [13] In contrast to our findings, the mental foramen in 70% of mandibles showed an oval form on both sides, whereas in 30% of mandibles, it showed a round shape on both sides.

The oval form of the mental foramen was 87.1% on the right side and 88.6% on the left, according to Sukla et al. [14]. In contrast to our research, where oval-shaped mental foramina are more predominant on both sides, round-shaped mental foramina were found to be 12.9% on the right side and 11.4% on the left.

According to Vimala et al. [15], the average location of the mental foramen from the symphysis menti, the lower border of the mandible's body, and the posterior border of the mandibular ramus was 26.67 mm, 11.25 mm, and 62.35 mm, respectively. According to the Deepa et al. research, the most frequent site for the mental foramen was in line with the apex of the lower second molar (61.4%), followed by a position

between the second premolar and the first molar (28.2%). [16] In contrast to our study, the position of the mental foramen from the symphysis menti was 25.72 mm (right side) and 25.72 mm (left side); from the inferior border of the mandible's body, it was 12.53 mm (right side) and 12.68 mm (left side); and from the posterior border of the mandible's ramus, it was 62.33 mm (right side) and 62.24 mm (left side). In contrast, the majority of the studies showed that the shape of the mental foramen was oval in 61.2% and rounded in 38.5% of the mandibles. On both sides, the mental foramen most often lined up with the tip of the lower second premolar (68.33%). The mental foramen's oval form was more noticeable.

According to Suman et al. [17], the mental foramen was most often found below the apex of second premolar teeth in 56.86% of mandibles, followed by the gap between second premolar and first molar teeth. On both the left and right sides of the research, the most common location of the mental foramen was in line with the apex of the lower second premolar, which was 68.33%.

Therefore, in order to prevent any difficulties, it is essential to be deeply aware of it while conducting different surgical operations and giving patients anaesthesia. To prevent any kind of accidents, dentists must primarily take the right care and safeguards for that vital bone.

CONCLUSION

While understanding the morphology of the mental foramen is crucial when performing periapical surgery, dental implant surgery, regional anaesthesia, and endodontic treatments in the mandible, understanding the position, shape, and size of the mental foramen is crucial for performing anaesthesia block prior to clinical procedures in lower anterior teeth and for maintaining the integrity of the mental nerve trunk during surgical interventions. Its comprehension is also helpful in identifying anatomical landmarks in oral pathology and forensics, as well as in protecting and preventing damage to the mental nerve and veins during surgical operations. The current investigation also found hitherto unrecognised, negligible differences in the location of the mental foramen from the symphysis menti, the lower inferior border of the mandibular body, and the posterior border of the mandibular ramus.

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