

Original article

Mental Foramen – an Anatomical study in dry Dentulous and Edentulous Mandibles in the Population of Eastern India

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Abstract:

Aim: The aim of this study is to determine the position of mental foramen with reference to surrounding anatomical landmark in Eastern India.

Materials and Methods: Eighty one dry dentate and edentulous mandibles were examined in this study. Several Parameter were measured by using Vernier Caliper. Forty eight dentate and thirty three edentulous mandibles were examined.

Result : In this study distance between upper border of mandible and lower margin of the mental foramen in dentate mandible was $10.25\text{mm} \pm 2.64\text{ mm}$ on right side and $9.88 \pm 2.5\text{ mm}$ on left side in edentulous it was $6.82\text{mm} \pm 1.72\text{mm}$ on right side and $7.73\text{mm} \pm 3.06\text{ mm}$ at left Side.

Distance between anterior margin of mental foramen and symphysis menti in dentate mandible was $25.2\text{mm} \pm 1.78\text{ mm}$ on right side and $24.93\text{mm} \pm 1.69\text{ mm}$ on left side and in edentulous mandible it was $23.82\text{mm} \pm 2.11\text{mm}$ on right side and $23\text{mm} \pm 1.29\text{ mm}$ on left side. Distance between lower border of mandible and lower margin of mental foramen in dentate mandible was $12.44\text{mm} \pm 1.75\text{mm}$ on right side and $12.37\text{mm} \pm 1.42\text{mm}$ on left side and in edentulous mandible it was $10.09\text{mm} \pm 2.30\text{mm}$ on right side and $10.82\text{mm} \pm 1.87\text{mm}$ on left side.

Conclusion: Knowledge of position of mental foramen is necessary to avoid neurovascular complication during regional anaesthesia, Peri-apical Surgery, nerve repositioning and dental implant placement.

Key Words: Dry dentate mandible, dry edentulous mandible, Mental Foramen.

Introduction:

The mandible is the largest, strongest and lowest bone in the face. The mandible consist of a horse-shoe-shaped body and a pair of rami. Two halves of mandible fuse by the end of 1st year at midline forming a faint ridge externally known as symphysis menti.¹ Mental foramen is situated in the antero-lateral aspect of the body of the mandible. The mental foramen in situated midway between the upper and lower border of the mandible in presence of teeth and in edentulous person this foramen lies near the upper border of mandible.² The distance between foramen and lower border of mandible remains relatively constant throughout life.³ The mental foramen lies below either the interval between the premolar teeth or the second premolar tooth, the midway between the upper and lower border of the body.⁴ However, studies have reported variations in the position of the mental foramen.⁵⁻¹⁵ The

mental foramen transmit mental nerve and vessels. Mental nerve is the terminal branches of the inferior alveolar nerve which provide sensory innervations to the skin and mucous membrane of lower lip, and labial gum from the midline to about the second premolar tooth.¹⁶ So knowledge about the location of the mental foramen is essential to avoid injury to the neurovascular bundle passing through mental foramen in administration of local anesthetics, in third molar surgery, mandibles osteotomies and dental implant surgery.⁴ Locatization of mental foramen is difficult radiographically because of lack of consistent anatomic landmark for reference and foramen cannot be clinically visualized or palpated.

So knowledge of the most common position of the mental foramen many give additional information.

Materials and Method

This study was conducted in the anatomy department of IPGME&R, Kolkata. A total 81 dry mandible (48 dentate and 33 dry edentulous mandible) were examined in this study.

Various parameter were measured on both sides of mandibles with the help of Verniers caliper.

The parameter assessed were :

- (i) (UBM – MF) Distances between upper border of mandible and lower margin of mental foramen.
- (ii) (LBM – MF) Distance between lower border of mandible and lower margin of mental foramen.
- (iii) (SM – MF) Distance between Symphysis menti and anterior margin of mental foremen.
- (iv) (PBR – MF) Distance between Posterior border of ramus of mandible and anterior margin of mental foramen.
- (v) Shape of mental foramen was observed visually and recorded.



Figure 1 : Distance between UBM – MF, LBM – MF, PBR - MF

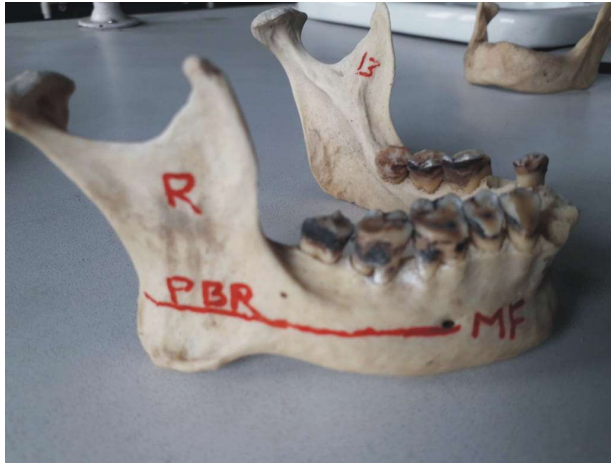


Figure – 2 : Distance between PBR - MF

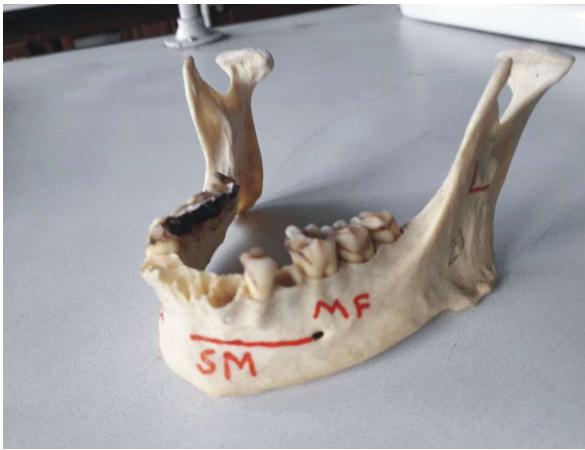


Figure – 3 : Distance between SM - MF

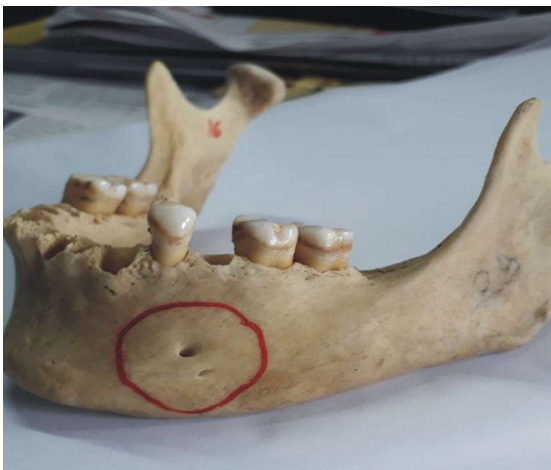


Figure – 4 : Accessory mental foramen.

Statistical Analysis:

All the parameters were carefully tabulated and statistically analysed. The mean values were expressed as mean \pm standard deviation with confidence interval of 95%. Mean values of right and left side were compared using students “t” test.

Observation and Result:

All the parameters were measured to locate mental foramen precisely in reference to surrounding anatomical landmark and all the parameters were tabulated.

Table – 1

Values of all parameters.

		Type of Mandible	Number	Mean \pm SD	Std. error mean
UBM-MF	Right	Dentulous	48	10.25mm \pm 2.64mm	.381mm
	Left	Dentulous	48	9.88mm \pm 2.5mm	.360mm
	Right	Edentulous	33	6.82mm \pm 1.72mm	.299mm
	Left	Edentulous	33	7.73mm \pm 3.06mm	.533mm
LBM – MF	Right	Dentulous	48	12.44mm \pm 1.75mm	.252mm
	Left	Dentulous	48	12.37mm \pm 1.42mm	.204mm
	Right	Edentulous	33	10.09mm \pm 2.30mm	.400mm
	Left	Edentulous	33	10.82mm \pm 1.87mm	.325mm
SM - MF	Right	Dentulous	48	25.2mm \pm 1.78mm	.256mm
	Left	Dentulous	48	24.93mm \pm 1.69mm	.243mm
	Right	Edentulous	33	23.28mm \pm 2.11mm	.367mm
	Left	Edentulous	33	23mm \pm 1.29mm	.224mm
PBR – MF	Right	Dentulous	48	65.31mm \pm 3.82mm	.551mm
	Left	Dentulous	48	63.88mm \pm 2.81mm	.405mm
	Right	Edentulous	33	65.27mm \pm 4.88mm	.850mm
	Left	Edentulous	33	63.18mm \pm 6.70mm	1.167mm

SD = Standard Deviation

Distance between upper border of mandible and lower margin of mental foramen (UBM – MF) in dentate mandible was 10.25 mm \pm 2.64 mm on the right side and 9.88 mm \pm 2.5 mm on the left side. In edentulous mandible this values was 6.82 mm \pm 1.72 mm on the right side and 7.73 mm \pm 3.06 mm on the left side lower than the dentulous mandible. Distance between lower border of mandible and lower margin of mental foramen (LBM – MF) in dentate mandible was 12.44 mm \pm 1.75 mm on the right side and 12.37 mm \pm 1.42 mm on the

left side whereas in edentulous mandible this values was $10.09 \text{ mm} \pm 2.30 \text{ mm}$ on the right side and $10.82 \text{ mm} \pm 1.87 \text{ mm}$ on the left side slightly lower than the dentulous mandible.

Distance between symphysis menti and anterior margin of mental foramen (SM – MF) in dentate mandible was $25.2 \text{ mm} \pm 1.78 \text{ mm}$ on the right side and $24.93 \text{ mm} \pm 1.69 \text{ mm}$ on the left side whereas in edentulous mandible this values was $23.82 \text{ mm} \pm 2.11 \text{ mm}$ on the right side and $23 \text{ mm} \pm 1.29 \text{ mm}$ on the left side slightly lower than the dentulous mandible. In this study in dentate mandible the distance between posterior border of ramus of mandible and anterior margin of mental foramen (PBR – MF) was $65.31 \text{ mm} \pm 3.82 \text{ mm}$ on the right side and $63.88 \text{ mm} \pm 2.81 \text{ mm}$ on the left side. In edentulous mandible this values was $65.27 \text{ mm} \pm 4.88 \text{ mm}$ on the right side and $63.18 \text{ mm} \pm 6.70 \text{ mm}$ on the left side. In case of edentulous mandible this values were slightly decreased than dentulous mandible.

Discussion:

Position of mental foramen changes with age. At birth mental foramen opens below the first deciduous molar and is directed forward. During first and second year, the mental foramen alter direction and faces backwards in the adult mandible.⁴ For children the mental foramen opens towards the lower border of mandible. In adult mental foramen appears midway between the upper and lower border. In old age when teeth are lost mental foramen come to lie closer to the superior border.⁴

To avoid injury to the mental nerve location of mental foramen is necessary while performing periapical surgery, endosseous implant, mandibles body osteotomy.

In addition the knowledge of location of mental foramen allows for accurate administration of local anaesthesia during surgical procedure. Most common site of mental foramen is the either interval between two premolar teeth or second premolar tooth. In this study common site of foramen lies along the axis of second premolar in dentate mandible on the right side and also left side but in edentulous mandible most common site was the interval between the second premolar and first molar on the right side and left side also. In same cases (4%) of edentulous mandible foramen lies along the long axis of first molar tooth.

Santini and Land et al¹⁷ reported that in Chinese the mental foramen was in line with second premolar and British between first and second premolar. The position of the mental foramen varies depending on various factors like maturing of the human mandible, anthropologic features of the facial skeleton in different population.

In this study most common shape of foramen in dentate mandible was round and in edentulous mandible it was oval. According to Al-Khateeb et al¹⁸ majority of foramina were round in shape. Accessory mental foramen may present very rarely. In this study 12% of dentulous mandible present accessory foramen on the right side and 11% dentulous mandible present accessory foramen on left side. In edentulous mandible accessory foramen present 2.2% on right side and 1% on left side. A study done by Moogala et al¹⁹ shows that dentulous mandible present 13.97% and edentulous mandible present 2.7% accessory foramen nearly similar to this study. Double or more than two foramen were not found in this study. Gershenson et al²⁰, reported 7.51% double foramen in Indian and Israeli mandible.

Distance between upper border of mandible and lower margin of mental foramen (UBM – MF) in edentulous mandible is lower than the dentulous mandible. Mental foramen moves towards upper border in old age.⁴ This study suggest that mental foramen moves towards upper border of mandible and this is due to the change of position of foramen from midlevel to upper border of mandible because of bone resorption and teeth loss.

Gershchenson et al²⁰ reported that the location of the mental foramen in relation to the border of mandible and teeth depended on age, tooth condition and degree of resorption. In adult as age advances mental foramen shift towards the upper border. In this study distance between lower border of mandible and lower margin of mental foramen in dentate mandible was 12.44mm ± 1.75 mm on right side and 12.37mm ± 1.42 mm for left side and in edentulous mandible it was 10.09mm ± 2.30mm on right and 10.82mm ± 1.87mm on the left side almost similar to the study done by Chung et al.²¹

The distance between symphysis menti and most anterior margin of mental foramen (SM – MF) in dentate mandible on right side was 25.2mm ± 1.78mm and 23 ± 1.69 on left side and in edentulous mandible this was 23.82mm ± 2.11mm on right side and 23 ± 1.29 on left side. These results were nearer to a study done by Moogala et al.¹⁹ Mental foramen can be located if the distance from the symphysis menti is known. The distance between posterior border of ramus and anterior margin of mental foramen in dentate mandible was 65.31mm ± 3.82mm on right side and 63.88mm ± 2.81mm on left side. In edentulous mandible this was 65,27mm ± 4.88mm on right side 63.18mm ± 6.70mm on the left side almost similar to the values of dentate mandible. These values near to the study conducted by Sankar et al¹². In this study shows variation in position and shape of mental foramen. The Knowledge of exact position and various distances of mental foramen is necessary for anasthetic & surgical intervention.

Conclusion:

Knowledge of position of mental foramen is helpful in avoiding neurovascular complication during anesthetic and surgical intervention. Various parameters in relation to mental foramen can be of assistance in the localization of important maxillofacial neurological structure.

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