

Morphometric Analysis of Mandibular Foramen in Dry Adult Human Mandibles

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Abstract

Introduction: The proper knowledge about the location of mandibular foramen (MF) is very much essential for dentists to anesthetize mandibular teeth, mandibular gingival, and lower lip by blocking inferior alveolar nerve (IAN). This study aims to find out the size and location of MF.

Materials and Methods: 100 dry mandibles were collected for the study.

Results: Size of the MF was measured by taking vertical and horizontal diameters of the foramen. The mean vertical diameter on right side was 9.23 ± 1.81 mm and on left side 8.89 ± 1.81 mm. The mean horizontal diameter on right side was 3.54 ± 0.65 mm and on left side 3.40 ± 0.82 mm. The mean distance between MF to mandibular notch, posterior border of the ramus and inferior border of ramus is little higher on right side compared to left side. However, the distance between MF to anterior border of ramus was higher on left side. Statistically significant difference was not found between right and left sides which indicate bilateral asymmetry.

Conclusion: The results of this study may be helpful in developing new or alternative techniques of IAN block and may also be useful in reconstructive surgery and anthropological assessments.

Key words: Anesthesia, Inferior alveolar nerve, Mandible foramen

INTRODUCTION

The mandibular foramen (MF) is located above the center on the medial surface of the ramus of the mandible. The mandibular canal starts at the MF and descends obliquely forward in the ramus and later in the body of mandible containing the inferior alveolar neurovascular bundle. Inferior alveolar nerve (IAN) is a branch of posterior trunk of the mandibular nerve. After its origin, it descends behind lateral pterygoid muscle. At the lower border of lateral pterygoid, the nerve passes between the sphenomandibular ligament and ramus of the mandible. The IAN enters the mandibular canal via the MF. Before entering into MF, it gives off a small mylohyoid branch. Within the mandibular

canal, it gives branches to mandibular teeth, gingiva of mandible and lower lip.¹ IAN block is the most frequently used nerve block technique in dental practice. It is fundamental for achieving local anesthesia for mandibular restorative and surgical procedure.² The technique IAN block anesthetize the nerve before entering into the MF. Approximately, 20-25% of failure of the IAN block is due to improper knowledge of the location of MF.³ Location of MF is clinically important in IAN anesthesia, dentoalveolar surgery planning, and endodontic treatments.⁴ This study was undertaken to find out the size and location of MF.

MATERIALS AND METHODS

The study was conducted at Deccan College of Medical Sciences, Hyderabad, Telangana. This study was a cross-sectional study consisting of 100 dry adult human mandibles consisting of 200 MFs (100 right and 100 left). Size was determined by measuring vertical and horizontal diameter of MF. Location was determined by measuring following parameters with digital vernier calipers: (Figure 1)

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(a) Center of MF to mandibular notch (MN), (b) center of MF to posterior border of ramus of mandible, (c) center of MF to inferior border (IB) of mandible, and (d) center of MF to anterior border (AB) (Figures 2-5).

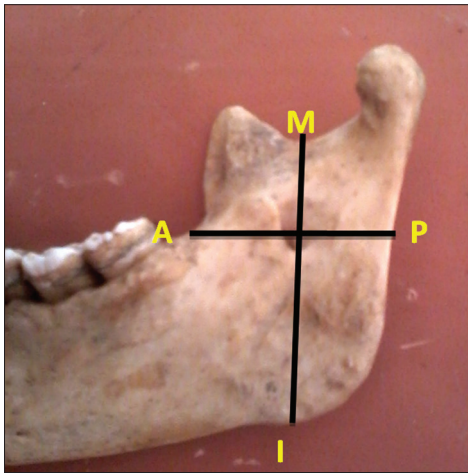


Figure 1: Location of mandibular foramen (MF) from various landmarks (anterior border, mandibular notch, posterior border and inferior border) from MF



Figure 2: Center of mandibular foramen to posterior border



Figure 3: Center of mandibular foramen to inferior border

RESULTS

Size of the MF was measured by taking vertical and horizontal diameters of the foramen. The mean vertical diameter on right side was 9.23 ± 1.81 mm and on left side 8.89 ± 1.81 mm. The mean horizontal diameter on right side was 3.54 ± 0.65 mm and on left side 3.40 ± 0.82 mm. Bilateral symmetry was observed.

To locate the MF four parameters were measured. The mean and standard deviation values of various parameters are shown in Table 1. It was found that there was no significant difference in the values on the right and left sides.

DISCUSSION

The proper knowledge on the location of MF is important as it is used to anesthetize mandibular teeth, gingiva of the mandible and lower lip to carry out many surgical procedures.

In this study, the mean distance between MF and AB of ramus was 16.52 ± 2.25 mm in right side and 17.77 ± 2.5 mm in left side. Thangavelu *et al.* reported that the MF is at an average distance of 19 ± 2.34 mm from AB of ramus of the mandible and concluded that the deposition of anesthetic solution at a distance of 23 mm from the AB in IAN block in IAN block. But based on this study, the deposition of anesthetic solution at a distance of 21 mm from the AB of the mandible. When a patient opens the mouth, the IAN may move few millimeters posteriorly. Therefore, 17 plus 4 mm (21 mm) distance of needle insertion inside the tissue from the AB of ramus would take the needle tip nearer to the IAN (Table 2).⁵

The distance between the MF and IB in the present study shows similarity with Thangavelu *et al.*, (an Indian study) but differs with Valente *et al.*. In Brazilian population, the distance is longer than the Indians. The distance from the

Table 1: Distance between MF and adjoining morphological landmarks

Parameter	Side	Mean±SD (mm)
MF to MN	Right	20.14±2.5
	Left	19.85±3.15
MF to PB	Right	14.05±2.19
	Left	13.90±2.35
MF to IB	Right	27.41±4.16
	Left	26.76±4.14
MF to AB	Right	16.52±2.25
	Left	17.77±2.51

MF: Mandibular foramen, MN: Mandibular notch, PB: Posterior border, AB: Anterior border, IB: Inferior border, SD: Standard deviation

Table 2: Comparison of the present study results with previous studies

Author	MF to AB		MF to PB		MF to MN		MF to IB	
	Right	Left	Right	Left	Right	Left	Right	Left
Thangavelu <i>et al.</i> , ⁵ 2012 (India)	18.9	18.88	14.31	14.39	-	-	27.62	27.3
Vitor Bonetti Valente 2012 (Brazil)	16.94	17.32	14.24	14.03	24.12	23.65	39.88	40.0
Md Mesbahul <i>et al.</i> , ⁶ 2013 (Bangladeshi)	16.34	16.27	14.14	14.04	22.29	22.18	-	-
Padmavathi <i>et al.</i> , ⁹ 2014 (India)	16.8	16.9	11.7	12.1	22.0	22.3	-	-
Present study 2015 (India)	16.62	17.7	14.05	13.90	20.1	19.85	27.4	26.7

MF: Mandibular foramen, MN: Mandibular notch, PB: Posterior border, AB: Anterior border, IB: Inferior border, SD: Standard deviation



Figure 4: Center of mandibular foramen to mandibular notch



Figure 5: Center of mandibular foramen to mandibular notch

center of MF to AB in the present study was similar to the Hoque *et al.*, Padmavathi *et al.* However, Thangavelu

et al. reported higher values. The distance from MF to MN was less in the present study when compared to other studies. Thangavelu *et al.*, Padmavathi *et al.*, and Mesbahi *et al.* found bilateral symmetry of the MF which is similar with the present study.⁵⁻⁷

CONCLUSION

The MF was at the same distance from each anatomical landmark on both sides showing bilateral symmetry. This study results suggest that the needle can be inserted 21 mm distance from the AB of MF to anesthetize the IAN. The results of this study may be helpful in IAN block, reconstructive surgery, and anthropological assessments.

REFERENCES

1. Beale TJ, Robinson PD. Infratemporal and pterygopalatine fossae and temporomandibular joint. In: Standring S, Boreley NR, Healy JC, Collins P, Johnson D, Crossman AR, *et al.* editors. Gray's Anatomy: The Anatomic Basis of Clinical Practice. 40th ed. UK: Elsevier Churchill Livingstone; 2008. p. 530-3, 543.
2. Aglarci OS, Gungor E, Altunsoy M, Nur B, Ok E. Three - Dimensional analysis of mandibular foramen location: A cone beam computed tomography study. OMICS J Radiol 2015;4:179.
3. Quinn JH. Inferior alveolar nerve block using the internal oblique ridge. J Am Dent Assoc 1998;129:1147-8.
4. Ono E, Medici FE, Moraes LC, Castilho JC, Moraes ME. Anteroposterior location of the mandibular foramen of 7 to 12 year old children in panoramic radiographs. Braz Dent J 2005;8:6-12.
5. Thangavelu K, Kannan R, Kumar NS, Rethish E, Sabitha S, Sayeeganesh N. Significance of localization of mandibular foramen in an inferior alveolar nerve block. J Nat Sci Biol Med 2012;3:156-60.
6. Hoque M, Ara S, Begum S, Kamal AH, Momen A. Study of morphometric analysis of mandibular foramen in Bangladeshi dry adult human mandible. Bangladesh J Anat 2013;11:58-61.
7. Padmavathi G, Tiwari S, Varalakshmi KL, Roopashree R. An anatomical study of mandibular and accessory mandibular foramen in dry adult human mandibles of South Indian origin. IOSR J Dent Med Sci 2014;13:83-8.

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