

# Study of Mandibular Foramen from Different Bony Landmarks in Dry Human Mandibles

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**Abstract:** The inferior alveolar nerve block is the commonest local anesthetic technique which is used for anaesthetizing the lower jaw in various surgical & dental operations on the mandible and mandibular teeth such as removal of impaction, reductions of fractures and extraction of teeth. The success of this technique highly depends on the proximity of the needle tip to the MF at the time of the anesthetic injection. The aim of the study was to find exact location of mandibular foramen from different anatomical landmark. In present study we took 80 dry human mandibles & all the distance were measured from center of mandible to different landmark on both sides. The mean of AB-MF distance on right side is 16.31mm & on left side is 16.33mm. Mean of PB-MF distance are 14.74mm & 14.64mm on right side and left side respectively. 22.98mm and 23.06mm are the mean of MN-MF on right and left side respectively. The mean of AG-MF is 26.45mm on right side & 26.03mm on left side. Although there are great variation found in the position of MF in previous studies. The present study helps in dental anaesthesia and also would help dental surgeons to avoid complications.

**Keywords:** Mandibular foramen, Landmark, Anaesthesia, Inferior alveolar nerve, Distance

## 1. Introduction

The mandible is the strongest and largest bone of the face which forms the lower jaw. It has a 'U' shaped anterior part, the body of the mandible and a quadrilateral bony plate which is known as the ramus. The mandibular foramen (MF) is an irregular foramen which is located just above the center of the medial surface of the ramus of the mandible.<sup>[1]</sup> The inferior alveolar nerve (IAN) and the vessels enter through the MF to reach the mandibular body and give fine branches that supply the mandibular teeth, gums and the lower lip.<sup>[2]</sup> The MF leads into the mandibular canal (MC), a canal which traverses the body of the mandible. The inferior alveolar nerve block is the commonest local anesthetic technique which is used for anaesthetizing the lower jaw in various surgical & dental operations on the mandible and mandibular teeth such as removal of impaction, reductions of fractures and extraction of teeth.

Unfortunately the failure rate of this technique is high and commonest cause being inaccurate localization of mandibular foramen.<sup>[3]</sup> The success of this technique highly depends on the proximity of the needle tip to the MF at the time of the anesthetic injection<sup>[4]</sup>. IAN block failure is not uncommon and it occurs even with experienced hands.<sup>[5,6,7]</sup> Failure with this procedure could be as high as 45%.

Variations in the location of the MF have been suggested in various studies. Some studies of adult mandibles in different races have given varied results regarding the location of the MF from the anterior and posterior borders, angle of the mandible and the lowest point on the mandibular notch.<sup>[3,8,9,10]</sup>

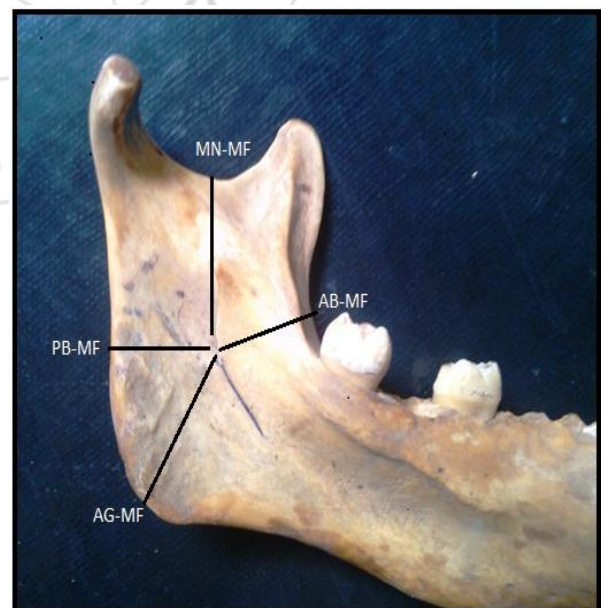
## 2. Materials and Methods

A total of 80 human dry mandibles were obtained from the Department of Anatomy, G.R. Medical College, Gwalior

M.P. All the distance was measured from center of mandible to different landmark on both sides of mandible by using Digital Verniercalipers. These are

- 1) AM-MF- Distance from the midpoint of the anterior margin (AM) of mandibular foramen (MF) to the nearest point on the anterior border of mandibular ramus.
- 2) PM-MF- Distance from the midpoint of the posterior margin (PM) of mandibular foramen (MF) to the nearest point on the posterior border of mandibular ramus.
- 3) MN-MF- Distance from the lowest point of mandibular notch (MN) to the inferior limit of mandibular foramen.
- 4) AG-MF- Distance from the inferior limit of mandibular foramen to the angle (AG) of the mandible.

All the measurements were recorded in millimeters.



**Figure 1:** Picture showing measurements of mandibular foramen (MF) from various mandibular landmarks like, a) anterior boarder of ramus (AB-MF), b) posterior boarder of

ramus(PB-MF), c) lowest point of mandibular notch (MN-MF) and d) angle of the mandible (MF-AG)



**Figure 2:** Digital Vernier caliper

### 3. Result & Observation

The mean and standard deviation for each distance were calculated separately for right and left sides. Mean and standard deviation were calculated by statistical formulas separately on each side. The mean of AB-MF on right side is 16.31mm & on left side is 16.33mm. mean of PB-MF are 14.74mm & 14.64mm on right side and left side respectively. 22.98mm and 23.06mm are the mean of MN-MF on right and left side respectively. The mean of AG-MF is 26.45mm on right side & 26.03mm on left side. Different measurement are following;

**Table 1:** Min- Max.distance of the mandibular foramen from various landmarks

Dist.	Side	Min.- Max.(mm)
AB-MF	Right	11.56-21.68
	Left	11.08-22.3
PB-MF	Right	7.48-20.16
	Left	8.49-21.55
MN-MF	Right	16.3-30.17
	Left	15.11-31.03
AG-MF	Right	20.21-34.1
	Left	19.45-32.88

**Table 2:** Studies on mandibular foramen by various authors.

Author	Side	AB-MF	PB-MF	MN-MF	AG-MF
Pranjanaparamitasamanta (2013) <sup>12</sup>	Rt.	15.72±2.92	13.29±1.74	22.70±3.0	21.54±2.92
	Lt.	16.23±2.88	12.73±2.04	22.27±2.92	21.13±3.43
Prado et al (2010) <sup>13</sup>	Rt.	19.2±3.6	14.2±8.4	23.6±3.1	
	Lt.	18.8±3.8	13.0±2.6	23.1±3.0	
Qudusia Sultana et al.(2016) <sup>14</sup>	Rt.	17.69±2.7	11.39±1.9	23.87±4.5	17.9±3.5
	Lt.	17.94±2.7	22.39±3.1	23.66±4.3	17.6±3.7
Presnt study	Rt.	16.31±2.51	14.74±2.47	22.98±3.09	26.45±3.51
	Lt.	16.33±2.54	14.64±2.41	23.06±3.15	26.03±3.62

### 5. Conclusion

The present stud help in localization of the position of mandibular foramen. The precise location will increase the success rate of dental anaesthesia and also would help dental surgeons to avoid injury to the neurovascular bundles followed by complications. Although there are great

**Table 1:** Distance of the mandibular foramen from various landmarks

Dist.	Side	Mean(mm)	Standard Deviation(SD)
AB-MF	Right	16.31	2.51
	Left	16.33	2.54
PB-MF	Right	14.74	2.47
	Left	14.64	2.41
MN-MF	Right	22.98	3.09
	Left	23.06	3.15
AG-MF	Right	26.45	3.51
	Left	26.03	3.62

AB-MF:- Distance from the midpoint of the anterior margin of mandibular foramen.

PB-MF:- Distance from the midpoint of the posterior margin of mandibular foramen.

MN-MF:- Distance from the of mandibular notch to mandibular foramen

MF-AG:- Distance from the mandibular foramen to the angle of the Mandible.

### 4. Discussion

Grate variation are found in the position of MF with different landmark. The variability of the position of MF makes it difficult to anaesthetize the inferior alveolar nerve.[8,11] variation may be due to different age, sex, and difference in the methods used to measure the distance. A study on 34 adult Turkish mandibles showed that the AB-MF was 16.9 mm and 16.78 mm on the right and left sides respectively. The PB-MF was found to be 14.09 mm on the right side and 14.37 mm on the left side. The MI-MF was 22.37 mm on the right side and 22.17 mm on the left side. The of MF- MB is 30.97 mm on the right side and 29.75 mm on the left side [3]. According to the present study, the mean AB-MF is 16.31±2.51mm on right side & 16.33±2.54mm on left side. PB-MF is 14.74±2.47mm & 14.64±2.41mm on right & left side respectively. MN-MF is 22.98±3.09mm & 23.06±3.15 on right & left side. AG-MF is 26.45±3.51mm on right side and 26.03±3.62mm found on left side. Other variation found compare to present study are given in following chart.

variations found in MF position, its most frequent location lies in the mean third of ramus in compare to anterior & posterior border and mandibular notch to lower angle.

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