

## STUDY OF DISTANCE OF MANDIBULAR FORAMEN FROM THIRD MOLAR TOOTH IN DRY ADULT MANDIBLE

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### ABSTRACT

**Background:** Inferior alveolar nerve (IAN) and vessels passes through mandibular foramen (MF). Hence it is important to know the location of the mandibular foramen during dental and oral surgical procedures like inferior alveolar nerve blocks, mandibular osteotomies and implant treatment. The aim of our study was to determine the distance of mandibular foramen from 3rd molar tooth in dry adult mandible.

**Materials and Methods:** Sixty adult dry mandibles having 3<sup>rd</sup> molar tooth were studied with Vernier calipers to measure the distance of mandibular foramen from 3rd molar tooth.

**Results:** The mean distance of the MF from 3rd molar tooth in the mandibles was  $2.55 \pm 0.33$ cm and  $2.51 \pm 0.37$ cm on right and left side respectively.

**Conclusion:** The knowledge of location of mandibular foramen from the 3<sup>rd</sup> molar tooth is useful in preventing neurovascular complications during dental and oral surgical procedures.

**KEY WORDS:** Mandibular Foramen; Third Molar Tooth; Inferior Alveolar Nerve; Nerve Block.

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DOI: 10.16965/ijar.2016.195

**Web site:** International Journal of Anatomy and Research  
ISSN 2321-4287  
[www.ijmhr.org/ijar.htm](http://www.ijmhr.org/ijar.htm)

Received: 06 Apr 2016      Accepted: 09 May 2016  
Peer Review: 06 Apr 2016      Published (O): 31 May 2016  
Revised: None                      Published (P): 31 May 2016

### INTRODUCTION

Mandibular foramen (MF) is located on the medial surface of the ramus of the mandible. It transmits inferior alveolar nerve and vessels into the mandibular canal which curves downwards and forwards into the body of the mandible up to the mental foramen to supply the mandibular teeth [1]. Inferior alveolar nerve block technique is commonly used in dental practice and also in reconstructive surgery. The success of inferior alveolar nerve block depends on placing the needle tip close to the mandibular foramen. The absence of a specific anatomic bony landmark

is one of the reasons for the failure to achieve adequate Inferior alveolar nerve block. Some authors have estimated the failure rate of inferior alveolar nerve blocks to be approximately 20-25% [2].

Since the days of beginning of local anaesthesia for the desensitization of the inferior alveolar nerve, there has been continuous interest in locating the mandibular foramen [3, 4]. According to Marzola *et al.*, the literature is scarce regarding the anatomical reference points for locating the mandibular foramen in the medial surface of the mandibular ramus [5].

The knowledge of location of mandibular foramen is also important for surgeries like mandibular osteotomies and implant treatment. For example, during the osteotomy of the mandibular ramus, the location of the mandibular foramen is important to avoid injuries of the neurovascular bundle that are in the mandibular canal [6-8].

Many authors have studied the position of mandibular foramen. Hwang TJ et al and Oliver Trost have used radiographs to study the position of mandibular foramen [9, 10]. Authors like Mbajiorgu and Narayana Kilarkaje have studied on dry mandibles to determine the position of mandibular foramen [11, 12]. Different authors have used various methodologies to determine the location of the mandibular foramen in dry mandible, like distance from anterior border, posterior border, base of ramus and from mandibular notch. But in living subjects all are covered by soft tissues [13]. So we have used only visible 3rd molar tooth as land mark for measurement of distance of MF from it. Hence, the goal of this study was to find exact distance of the mandibular foramen from the 3rd molar tooth in dry adult mandible.

**Objectives:** The aim of our study was to determine the distance of mandibular foramen from 3rd molar tooth in dry adult mandible.

**MATERIALS AND METHODS**

Sixty adult human dry mandibles were collected from the department of anatomy, Navodaya Medical College, Raichur and Navodaya Dental College, Raichur, India. The mandibles with intact 3<sup>rd</sup> molar were included in the study. Damaged and mandibles without 3<sup>rd</sup> molar tooth were excluded from the study. Measurements were based on the methodology of Minarelli & Ramalho. The V-shaped depression located above the mandibular foramen, called “mandibular foramen fossa” by Minarelli & Ramalho, presents clear margins and limits that converge, inferiorly, to one apex, point F (Fig 1), was considered as mandibular foramen [14]. The position of the mandibular foramen from the midpoint of the 3rd molar tooth was recorded on both the sides of the mandibular ramus using a Vernier calipers of 1/20 accuracy. Measurements were recorded to the nearest

millimeter. The measurements were taken by same author to avoid inter observer bias. All the measurements were then tabulated and statistically analysed to calculate the mean and standard deviation (SD) in Microsoft office excel 2007. Student’s t test was used for the paired and independent samples. p value < 0.05 was considered as statistically significant.

**Ethical Considerations:** The study got clearance by the Institutional Ethical Committee of our medical college before its commencement.

**Fig. 1:** Distance measurement from mid-point of 3rd molar tooth to mandibular foramen (point F) of right side of mandible.



**RESULTS**

In our study we observed that, the mean distance of the MF from 3rd molar tooth in the mandibles was 2.55 ± 0.33cm and 2.51 ± 0.37cm on right and left side respectively (Table 1). The lowest distance on the right side was 1.9 cm and on the left side was 2.0 cm. The highest distance on the right side was 3.2 cm and on the left side was 3.3 cm. There was no significant difference between the distances on the right and left sides (p value= 0.53). The 95% confidence interval for difference of mean was -0.09 to 0.17. The t value was 0.62 and the standard error of difference was 0.064.

**Table 1:** Distance of mandibular foramen (MF) [point F] from centre of 3rd molar tooth in centimeter (cm).

	Right	Left
Mean	2.55	2.51
Std. Deviation	0.33	0.37
Lowest Value	1.9	2
Highest Value	3.2	3.3

P value= 0.53. 95% confidence interval for difference of mean = -0.09 to 0.17 t value=0.62, Std error of Difference=0.064

## DISCUSSION

The knowledge of location of mandibular foramen is very much important for regular dental procedures like tooth extraction. It is also very useful for oral surgeons during procedures like vertical ramus osteotomy and inverted L osteotomy [15]. The IAN is at a greater risk of injury during the surgical procedure. The development of implant techniques increased the interest in the mandible anatomy, specially the mandibular foramen localization [16].

Different authors have used various methodologies to determine the location of the mandibular foramen in dry mandible, like distance from anterior border, posterior border, base of ramus and from mandibular notch. But in living subjects all are covered by soft tissues [13]. So we have used only visible 3rd molar tooth as land mark for measurement of distance of MF from it.

In a study by Lavanya Varma et.al, the mean distance of MF from 3rd molar tooth was 1.5 cm and 1.8 cm in right and left side of mandible respectively [15]. Haque Md.M et al. in their study in Bangladesh reported that the mean distance of MF from posterior margin of 3rd molar socket was  $16.70 \pm 2.18$  mm and  $16.72 \pm 2.16$  mm right and left side of mandible respectively [17]. The findings in the above two studies slightly differs from our study as in both these studies, the distance was taken from the posterior border of the socket for 3rd molar tooth instead of centre of 3rd molar tooth as was done in our study. Kilarkaje et al. reported that mandibular foramen maintains bilateral symmetry in dry mandible in all ages and the foramen was within 2.5 cm from 3rd molar tooth [12]. According to the results of our study also, it can be concluded that the right and left mandibular rami presented symmetry in the location of the mandibular foramen (p value= 0.53). In our study we observed that, the mean distance of the MF from 3rd molar tooth in the mandibles was  $2.55 \pm 0.33$ cm and  $2.51 \pm 0.37$ cm on right and left side respectively. Thus the findings of our study are similar to the findings of the study by Kilarkaje et al [12].

In our study there was no significant difference of distance of the MF in both sides of mandible

(p value= 0.53). This result is similar to the findings of Oliver et al. in his radiological study on Mandibular foramen [10].

In his study on 57 formalin-preserved non-Asian hemi-mandibles, Daw J.L, found that great variability exists in the position of mandibular foramen [6]. Nicholson's study also stated that the positions of the mandibular foramen were found to be variable; and concluded that the marked variability in the position of the MF may be responsible for an occasional failure during the inferior alveolar nerve block [18]. Besides the variability in the methodology, the different authors values related to the mandibular foramen may be due to the variation in size and form of the studied mandibles.

In our study, we have used only visible 3rd molar tooth as land mark for measurement of distance of MF from it. The internal oblique ridge on the medial surface of ramus of mandible can also be used as a landmark for measuring the distance of mandibular foramen from it. Further studies in this regard will be helpful in innovation of a new inferior alveolar nerve block technique using the internal oblique ridge as the main landmark.

## CONCLUSION

It can be concluded that the inferior alveolar nerve anesthesia failures are due to the operator error and not due to the anatomical variation. Our study gives a fair knowledge of position of MF from 3rd molar tooth in living human beings. This knowledge is useful in preventing complications and failures during nerve blocks and mandibular surgeries.

## ABBREVIATIONS

**MF** - Mandibular Foramen

**IAN** - Inferior alveolar nerve

**Conflicts of Interests: None**

## REFERENCES

- [1]. Williams P.L., Bannister L.H., Berry M.M., Collins.P., Dyson.M., Dussek.J.E.et.al. Gray's anatomy 38th. ed.churchill Livingstone, 2000, 576-7.
- [2]. Kanan Shah, Pratik Shah, Ajay Parmar, Study of the Location of the Mandibular Foramina in Indian Dry Mandibles, Global Research Analysis, 2013;2(7):128-30.

- [3]. Figún, M. E. & Garino, R. R. Anatomia Odontológica Funcional e Aplicada. 2a ed. São Paulo, Medicina Panamericana Editora do Brasil Ltda, 1989.
- [4]. Madeira, M. C. Anatomia da Face Bases Anatomofuncionais para a Prática Odontológica. 5a ed. São Paulo, Sarvier, 2004.
- [5]. Marzola, C.; Frare, P. H. B.; Toledo Filho, J. L. & Navarro, J. A. C. Forame da mandíbula: contribuição sobre sua localização para as técnicas anestésicas. Revista ATO, 2005;7:235-58.
- [6]. Daw, J. L. Jr.; de La Paz, M. G.; Han, H.; Aitken, M. E. & Patel, P.K. The mandibular foramen: anatomic study and its relevance to the sagittal ramus osteotomy. J. Craniofac. Surg., 1999;10:475-9.
- [7]. Kaffe, I.; Ardekian, L.; Gelerenter, I. & Taicher, S. Location of the mandibular foramen in panoramic radiographs. Oral Surg. Oral Med. Oral Pathol., 1994;78:662-9.
- [8]. Keros-Naglic J.; Panduric J. & Buntak-Kobler, D. Some anatomical and anthropological measures of mandibular ramus in our population. Coll. Antropol., 1997;21:203-10.
- [9]. Hwang TJ, Hsu SC, Huang QF, Guo MK. Age changes in location of mandibular foramen. Zhonghua Ya Yi Xhe Za Zhi 1990 Sep;9(3):98-103.
- [10]. Oliver Trost. Spatial relationships between lingual nerve and mandibular ramus. Surgical and Radiological Anatomy 2009;31(6):447-452.
- [11]. Mbajjorgu EF. A study of the position of mandibular foramen in adult black Zimbabwean mandibles. Central Africa Journal of Medicine 2000 July;46(7):184-190.
- [12]. Narayana Kilarkaje, Soubhagya Ranjan Nayak, Prashanthi Narayan, Latha Venkaraya Prabhu. The location of the mandibular foramen maintains bilateral symmetry in mandibles of different age groups. Hong Kong Dental Journal 2005; 2:35-37.
- [13]. Ghorai S, Pal M, Jana S. Distance of mandibular foramen from 3rd molar tooth in dry adult mandible of west Bengal population. Anatomy Journal of Africa. 2016;5:640-643.
- [14]. Minarelli, A. M. & Ramalho, L. R. T. Estudo da localização do forame da mandíbula, através de mandíbulas maceradas de crianças. Rev. Odontol. UNESP, 1991;20:119-27.
- [15]. C. Lavanya Varma, Imtiazul Haq, T.rajeshwari. Position of Mandibular Foramen In South Indian Mandibles. Anatomica Karnataka, 2011;5(1):53-56.
- [16]. Padmavathi G, Suman Tiwari, Varalakshmi KL, Roopashree R. An Anatomical Study of Mandibular and Accessory Mandibular Foramen in Dry Adult Human Mandibles of South Indian Origin. IOSR Journal of Dental and Medical Sciences. 2014;13(4):83-88.
- [17]. Haque Md.M, Ara S, Begum S, Kamal A.H.M.M, Momen Md.A. Study of Morphometric Analysis of Mandibular Foramen in Bangladeshi Dry Adult Human Mandible. Bangladesh J. Anat. 2013;11:58-61.
- [18]. Nicholson ML. A study of the position of the mandibular foramen in adult human mandible. Anat Rec. 1985;212:110-2.

#### How to cite this article:

Deepa G, Shrikrishna B H. STUDY OF DISTANCE OF MANDIBULAR FORAMEN FROM THIRD MOLAR TOOTH IN DRY ADULT MANDIBLE. *Int J Anat Res* 2016;4(2):2277-2280. DOI: 10.16965/ijar.2016.195