

An Anatomical Study on the Location of Mandibular Foramen in 50 Dry Adult Human MandiblesSunil Kumar¹, Amrita Kumari², Birendra Kumar Sinha³¹Junior Resident, Department of Anatomy, Patna Medical College and Hospital, Patna, Bihar, India²Assistant Professor, Department of Anatomy, Patna Medical College and Hospital, Patna, Bihar, India³Professor and HOD, Department of Anatomy, Patna Medical College and Hospital, Patna, Bihar, India

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Corresponding Author: Dr Amrita Kumari

Conflict of interest: Nil

Abstract

Background: Mandibular foramen is leading to mandibular canal through which inferior alveolar nerve and vessels will transmit and supply the teeth of lower jaw. Inferior alveolar nerve block is common anesthetic procedure prior to dental surgeries on lower jaw. Failure in mandibular anesthesia or injury to neurovascular bundle may be resulted by inaccurate localization of mandibular foramen. Hence this study is aimed to locate the mandibular foramen and its distances from different bone landmarks on internal surface of ramus of dry mandible.

Objective: Study to determine the precise position of mandibular foramen in 50 dry mandibles, which is essential for successful inferior alveolar nerve block prior to dental procedures.

Materials and Methods: This descriptive study was done on 50 dentulous from Department of Anatomy, Patna Medical College and Hospital, Patna, Bihar, India adult dry human mandibles of unknown sex and age. Distance of mandibular foramen from the mandibular notch, anterior border of the ramus of mandible, posterior border of the ramus of the mandible (angle of mandible), posterior border of the 3rd molar socket and meeting point of base with posterior border of ramus were measured. Further observation regarding the presence of accessory mandibular foramen was done. The observations were tabulated and descriptive statistics was used analyze the data.

Result: In the present study, totally 50 mandibular foramina and 18 accessory foramina were observed in the 30 mandible. The mean distance of mandibular foramina to anterior border of ramus is 14.63 ± 3.16 (R) mm and 15.31 ± 3.11 mm(L), to posterior border is (R): 12.34 ± 3.10 mm and (L): 13.51 ± 3.92 mm, to mandibular notch is (R): 21.23 ± 4.56 mm and (L): 21.16 ± 3.12 mm, to angle of mandible (R): 22.14 ± 3.18 mm and (L): 22.1 ± 4.12 mm, to posterior border of 3rd molar socket is (R): 14.37 ± 3.16 mm and (L): 19.26 ± 2.57 mm.

Conclusion: The present study on the precise location of mandibular foramen and on the incidence of accessory mandibular foramen will help the dental surgeons for more successful anesthesia and to perform safer surgeries on the ramus of mandible.

Keywords: Mandibular Foramen, Inferior Alveolar Nerve Block, Mandibular Notch.

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Introduction

In humans mandible is only a movable bone forms lower jaw of the skull. It articulates with the temporal bone at the synovial temporomandibular joint. Mandible broad rami projecting upward from the posterior end of body. Each ramus of mandible presents two surfaces, external and internal.

Near the centre of internal surface of each ramus presents mandibular foramen guarded by tongue like projection known as lingula. Mandibular foramen continuous as mandibular canal in the ramus of mandible and then in the body of mandible for a short distance. Mandibular canal conveys the inferior alveolar nerve and vessels. Inferior alveolar nerve is a branch of posterior

division of mandibular nerve. Inferior alveolar nerve innervates the lower jaw, teeth and periodontal tissue. Inferior alveolar nerve also innervates soft tissue of the premolars, incisors, canines and skin of chin. Inferior alveolar nerve is blocked during anaesthesia in various dental surgeries and facial reconstruction. [1] In dental surgeries technique failure during anaesthesia of inferior alveolar nerve is due to inappropriate setting of needle because of inaccurate location of mandibular foramen. [2] Anatomical variation of the location of the mandibular foramen may result in failure in dental and maxillofacial procedures and may In advanced surgical techniques for the

correction procedures the knowledge of location of mandibular foramen is must. [3,4] For this purpose the qualitative and quantitative measurements are required. It is now clear that facial reconstruction from the skull remnants in forensic medicine for medico legal purpose is more accurate when the mandible is present. as well as facial reconstruction for medico legal purpose in forensic medicine as well as in Anthropological study features o mandible can be useful to determine age, sex and race of the individual in various medico-legal cases as well as in other anthropological studies. [5]

Despite numerous studies have been conducted on Morphometric measurements for location of the mandibular foramen in the various countries and the other regions of India, it is observed that there are So it is important to study the location of the mandibular provide valuable and precise information to our clinician and dental professional

The aim of the study is to identify the location of mandibular foramen in relation to the limits of mandibular ramus

Materials and Methods:

A total of 50 dentulous adult dry human mandibles of unknown sex and age were collected and studied in Department of Anatomy, Patna Medical College and Hospital, Patna, Bihar, India. Anterior border of the ramus of mandible. Posterior border of the ramus of the mandible. Posterior border of the 3rd molar socket .Meeting point of base with posterior border of ramus (Angle of mandible). Further observation was done for the presence of accessory mandibular

foramen. The distances from the mandibular foramen to various bone landmarks were recorded as an average of three independent measurements. The mean and standard deviation were calculated separately for right and left sides and tabulated [8].

Results

A total of 50 dentulous adult dry human mandibles were studied for the position of mandibular foramen. The minimum, maximum, average and standard deviation values of the various parameters which were studied on either side of the mandible. Mandibles with sockets for third molar teeth, those regular in shape, and devoid of deformities were selected. The damaged bones and those having pathological abnormalities were excluded. The mandibles were observed for the presence, prevalence rate and laterality of mandibular foramen. Magnifying lens, metallic probe, Vernier calipers of 1/20 mm accuracy were used for taking measurements. Irrespective of shape of lingula, the center of mandibular foramen was taken as reference point. The position of the center of mandibular foramen was measured from various landmarks like,

1. Mandibular notch
2. Anterior border of the ramus of mandible
3. Posterior border of the ramus of the mandible
4. Posterior border of the 3rd molar socket.
5. Meeting point of base with posterior border of ramus (Angle of mandible).

Further observation was done for the presence of accessory mandibular foramen. The distances from the mandibular foramen to various bone landmarks were recorded as an average of three independent measurements. [8].

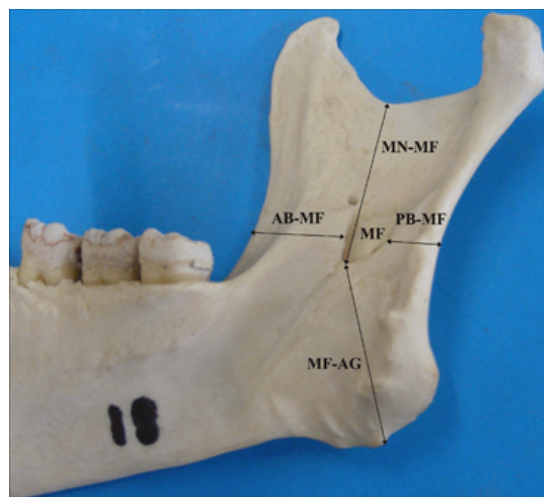


Figure 1:

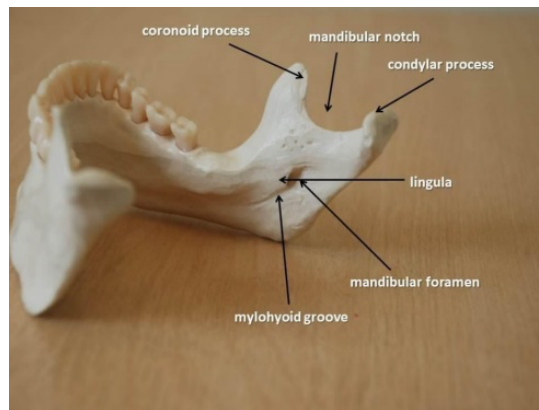


Figure 2: morphological view of mandibular foramen

Results:

In the present study, the position of the mandibular foramen in 50 dry human mandibles of unknown age and sex were located by measuring the distance between mandibular foramen from anterior border of ramus, posterior border of ramus, mandibular notch and angle of mandible. Measurements were taken on both the sides of mandible. According to the study it is seen that, there is no symmetry between the location of mandibular foramen on right and left side of the same mandible. In this study, the mean distance of MF from the anterior border is 17.58 mm on right side and 17.22 mm. on left side. The mean distance of MF from the posterior border is 13.61 mm on right side and 13.30 mm. on left side.

So the mandibular foramen is more nearer to the posterior border than the anterior border of ramus. The mean distance of MF from the mandibular angle is 26.86 mm on right side and 27.31 mm. on left side.

So the mandibular foramen is more nearer to the mandibular angle on right side than on the left side. The mean distance of MF from the mandibular notch is 19.54 mm on right side and 19.84 mm. on left side. So mandibular on right side than on left side. The location of mandibular foramen with reference to various landmarks varies mandible to mandible.

Discussion :

The location of mandibular foramen is clinically crucial in achieving inferior alveolar block. Failure of locate neurovascular bundle will result due to inaccurate localization of mandibular foramen. In the present study, the location of the mandibular foramen and its distances from different bony landmarks on mandibles of South Indian origin was done. This study was compared with the studies done in other parts of India. According to Pragma Paramitha et al [9] study on 60 mandibles from North part of India, the mandibular foramen was located 15.75±2.92 mm (R) and 16.23±2.88mm(L) from the anterior border, 13.29±1.74mm (R) and

12.73±2.04mm (L) from the posterior border. It was positioned 22.7±3.0mm (R) and 22.27±2.62mm (L) from mandibular notch. The distance of mandibular foramen from the angle of mandible was 21.54±2.92mm (R) and 21.13±3.43mm (L).

Karan Shah et al [10] studied on 100 human mandibles from Ahmadabad and found the average distance of mandibular foramen was 23-25mm from mandibular notch, 16-18mm from anterior border, 12-13mm from posterior border and 27-30mm from the angle of mandible. A study done on mandibles from South Indian population by C. Lavanya Varma et al [11], the following observations were made. The average PadmavathiG et al [12] studied on mandibles from South Indian population found that the distance of mandibular foramen from various landmarks are 16.9±2.5mm (R), 16.8±2.8mm (L) from anterior border; 12.1±2.4mm (R), 11.7±2.0 (L) from posterior border; 22.3±3.4mm (R), 22.0±3.0 (L) from mandibular notch; 22.2±2.9mm (R), 22.6±3.4 (L) from the angle of mandible. Another study from Pakistan by AsmoSaher Ansari et al [13] on 152 panoramic radiograph of mandibles, it was found that mean distance from mandibular foramen to anterior border was 17.69±0.61mm on right side, 17.65±0.63mm on left side in females and was 17.55±0.68mm on right side, 17.56±0.81mm on left side in males. From posterior border it was 12.03±1.02mm on right side, 11.84±0.70mm on left side in females and was 12.66±1.23mm on right side, 12.52±1.84mm on left side in males. From mandibular notch the distance was 20.51±0.92mm on right side, 21.03±0.90mm on left side in females and was 20.45±1.02mm on right side, 21.28±0.85mm on left side in males. The values recorded in the present study on 100 mandibles on South Indian population maintains bilateral symmetry which is in parallel to other studies. The geographical difference in the position of MF was ruled out in this assessment by considering studies from South and North Indian population with the present study. The reported cases of accessory mandibular foramina is less. Other South Indian study reported 16.5% of the cases. The presence of

accessory mandibular foramen could be associated with additional branches of inferior alveolar nerve. Branch arising from inferior alveolar nerve proximal to the mandibular foramen or in the infratemporal fossa will transmit through this foramen to supply the 3rd molar teeth [14-17]. Hence it will escape local anesthesia and result with inadequate or failure to achieve nerve block. Also accessory mandibular foramina may provide a route for the spread of infections and tumor following radiotherapy.

Conclusion:

Clinically very important to achieve effective inferior alveolar nerve block, prior to dental surgeries in the lower jaw like osteotomy, orthognathic reconstruction surgeries of the mandible and dental implant procedures[18] and to avoid injury to the neurovascular contents passing through it. Accessory mandibular foramina will serve as a route for spread of infection and tumor cells [19].The present study concludes that the pinpoint knowledge on the position of mandibular foramen with its normality and laterality is important for planning and conducting dental surgeries, which will help for effective management, better result and prognosis.

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