

STUDY OF SHAPE AND POSITION OF MANDIBULAR FORAMEN IN CENTRAL INDIAN DRIED MANDIBLES

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Abstract:

Introduction: Mandibular foramen is an opening on the medial surface of the ramus of mandible, through this inferior alveolar nerve and vessels passes.

Aim: To determine morphology and morphometry of mandibular foramen of Central Indian population.

Material & Methods: 100 mandibles 53 male and 47 female dry dentulus, without deformities were examined for position, shape of mandibular foramen.

Results: The vertical distance between MDF and mandibular notch was 20.06 mm and 20.55 mm on left and right sides in male, 19.45 mm and 19.81 mm on left and right sides in female. The horizontal distance between the MDF and anterior border of ramus was 16.80 mm and 17.10 mm on left and right sides in male, 15.74 mm, and 15.91 mm on left and right sides in females. Distance between MDF and posterior border was 13.56 mm and 13.15 mm on left and right sides in male and 11.82 mm and 11.43 mm on left and right sides in females. Distance between MDF and third molar tooth 23.08 mm and 23.34 mm on left and right side in male and 22.51 mm and 22.38 mm on left and right side in females. The distance between MDF and mandibular base 25.93 mm and 25.78 mm on left and right side in males and 23.11 mm and 23.02 mm on left and right side in females.

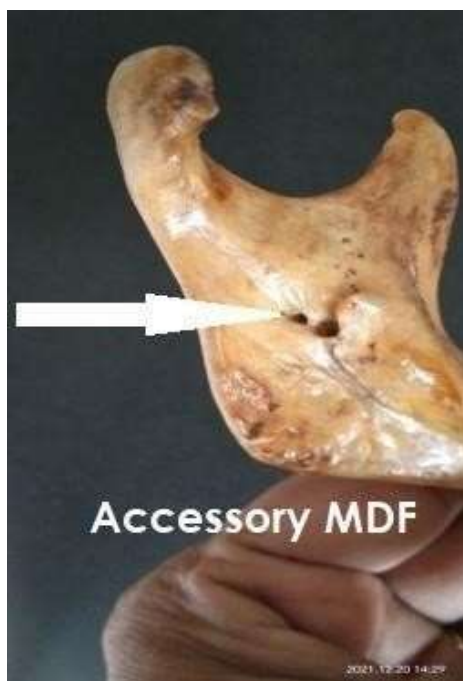
Conclusion: Most common shape of the mandibular foramen is observed 'round' and the most common position of the mandibular foramen on medial side of the ramus of the mandible is upper

and posterior quadrant and observed 15% male and 12% females have accessory mandibular foramen. which will help for effective management, better clinical results, and prognosis. Comparison from other studies shows that geographical, genetic, and dietary variations does exist and hence knowing its position in native population is essential as it plays a crucial role in success of “pain-less” and “patient friendly” surgical procedures.

Keywords: Mandible, mandibular foramen (MDF), central India.

Introduction:

The mandibular foramen (MF) is an irregular foramen located a little above the center of the medial surface of the mandibular ramus. The inferior alveolar nerve and vessels pass through the MF and traverse the mandibular canal and divides into mental and incisive branches to supply the mandibular teeth and participates in the formation of the anterior loop [1,2]. Inferior alveolar nerve block is a common local anesthetic technique used in dental practice. But the failure rate of this technique is reported to be as high as 20%-25% [3]. The commonest cause for inferior alveolar nerve block failure is inaccurate localization of MF [4]. The main complications during this technique are hemorrhage, injury to the neurovascular bundle, fractures, and necrosis of mandibular ramus [5]. Hence, thorough knowledge of the mandibular ramus is very essential. Clarke and Holmes [6], have reported that the position of the MDF is 1cm above the occlusal plane of the lower molars, and is also at the same height of the gingival papillae of the upper teeth when the individual is with his mouth closed. But, Nicholson [7], has said that, there is variability of the two mandibular rami in the same person, and it is not possible to standardize the foramen identification. Studies have conclusively proved that there are significant morphological differences in the mandibular anatomy among the three major racial groups-Caucasoid, Mongoloid, and Negroid [8,9]. Accessory MDF is any opening in the mandible other than the MDF, mental foramen, lingual foramen, and sockets of teeth [10]. The presence of accessory MDF and additional branches of inferior alveolar nerve may lead to increased rate of failure of inferior alveolar nerve blocks as all the branches may not be anaesthetized [11]. The accessory MDF has also been reported to be the site for the spread of tumors following radiotherapy in the lateral surface of mandible [12]. So, the knowledge of accessory MDF (Fig.3) is vital to radiotherapists when planning for radiation therapy in the lateral mandibular region.



Study design is observational study done in L.N. Medical college and research centre and data collected from Department of anatomy and Department of forensic medicine of L.N. Medical college and research centre and also from various medical and dental collages in central India.

Exclusive criteria: Mandibles with deformities.

Sample size: 100

Material & Methods:

100 dry adult human dentulous mandibles of known sex, male 53 and female 47 were obtained from the department of anatomy and forensic medicine of L.N. Medical collage and Research Centre and from various medical colleges of central India.

To incisively locate the mandibular foramen, the following parameters were measured on both

sides of the mandible with a digital Vernier callipers of 0.1mm accuracy.

AB-MDF: distance from the midpoint of anterior margin of Mandibular foramen to the nearest point on the anterior border of the ramus of mandible.

PB MDF: distance from the midpoint of posterior margin of mandibular foramen to the nearest point on the posterior border of the ramus of mandible.

MN-MDF: distance from the lowest point of mandibular notch to the inferior limit of mandibular foramen.

MB-MDF: distance from inferior limit of Mandibular foramen to the base of the mandible. III

Molar –MDF: distance from the midpoint of third molar tooth or socket to anterior margin of Mandibular foramen.

RMT-MDF-distance from anterior margin of Mandibular foramen to Apex of Retromolar Trigone.

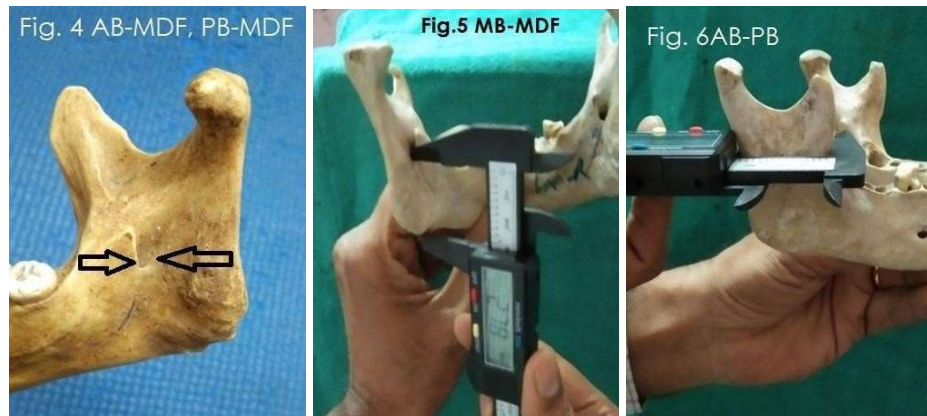
These are also observed for the presence of accessory mandibular foramen in and around mandibular foramen on the medial surface of mandibular ramus by means of a simple visual observation with the help of a magnifying lens on right and left sides and their prevalence rate was noted and analysed.

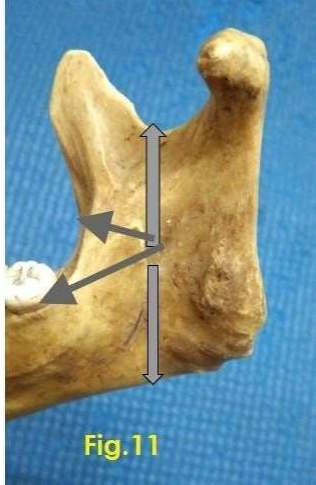
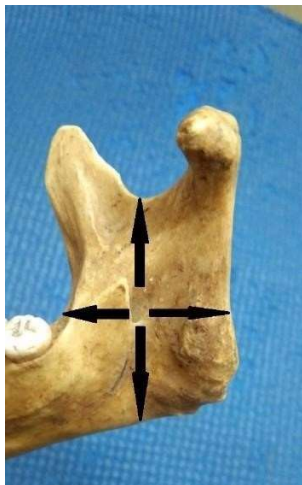
Also observed for the shape of mandibular foramen.

All the above parameters were carefully tabulated and statistically analysed.

SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis of this study.

Student's t test was used as test of significance to compare the mean values of right and left sides and in male and female and a P-value less than 0.05 was taken to be statistically significant.





Results:

	Gender				Total		P-value
	Male		Female		Mean	SD	
	Mean	SD	Mean	SD			
MDF-MN Rt	20.56	3.18	19.82	2.48	20.21	2.88	0.199
MDF-MN Lt	20.06	3.04	19.46	2.51	19.78	2.80	0.282
MDF-AB Rt	17.11	2.28	15.92	1.96	16.55	2.21	0.006
MDF-AB Lt	16.81	2.25	15.74	1.97	16.31	2.18	0.014
MDF-PB Rt	13.16	1.81	11.43	1.66	12.35	1.94	<0.001
MDF-PB Lt	13.57	1.82	11.83	1.67	12.75	1.95	<0.001
MDF-IIIIMT Rt	23.34	4.10	22.41	3.13	22.91	3.69	0.209
MDF-IIIIMT Lt	23.09	4.50	22.52	3.59	22.82	4.09	0.489
MDF-MB Rt	25.76	3.31	23.03	3.29	24.46	3.56	<0.001
MDF-MB Lt	25.93	3.48	23.12	3.10	24.61	3.58	<0.001
MDF-RMT Rt	19.16	3.36	17.65	2.43	18.45	3.04	0.013
MDF-RMT Lt	19.35	2.87	18.19	2.46	18.80	2.73	0.034
AB-PB Rt	32.73	2.69	29.96	2.41	31.43	2.90	<0.001
AB-PB Lt	32.51	2.70	29.99	2.17	31.32	2.76	<0.001

With the help of the above measurements, the most common position of the mandibular foramen on medial side of the ramus of mandible is upper and posterior quadrant. In the present study the most common shape of the mandibular foramen is round in 71% on right side and 83 % on left side in females, 68% on right side and 63% on left side in males. Accessory mandibular foramen is present in 12.7% on right and left sides in females, 9.5% on right side and 13% on left side in males.

The results of the present study were compared with the results of previous studies done on various ethnic groups.

Discussion:

Precise localization of mandibular foramen is very important to achieve a successful inferior alveolar nerve block, prior to the dental surgeries, in the mandible like osteotomy, orthognathic reconstruction surgeries and dental implant procedures, and also to avoid injury to the neurovascular bundle passing through it. Accessory mandibular foramen will serve as a route for spread of infection and tumor cells.(R.Shalini,C. Ravi Vatman, et.all 2016). In the present study location of the MDF is in the posterior and upper quarter of the mandibular ramus on medial surface with mean distance from anterior border is 17.11 +_2.8 mm on right and 16.81+_2.25 mm on left side in male and in female 15.92+_1.96mm on right and 15.74+_1.97 mm on left side is statistically significant. Distance of MDF-PB distance is 13.16+1.81 mm on right and 13.57+_1.82 mm on left side in male and 11.43 +_1.97mm on right side and 11.83+_1.66 mm on left side is also statistically significant. Distance MDF-MB in male on right side is 25.76 +_3.31 mm and 25.93 mm on left side, in female 23.03+_3.29 mm on right side and 23.12 +_3.10 mm on left side is significant difference

between male and female. during growth mandibular ramus and condyle are the sites, which are associated with greatest morphological changes in size and remodeling, hence most dimorphic (11). osteometric standards for practical use in forensic context over Indian population using mandibular ramus (12). mandible of unknown gender can be sexed to the extent of 75% accuracy by six dominating parameters and not to consider these for complete sex determination of the mandible bone in osteometric studies (13). 200 adult mandibles of known sex and age (100 males, 100 females, age range from 20 to 86 years, mean age 39 years) belonging to a modern Romanian population. Three standard mandibular measurements were taken; Chin Height, Bigonial Width and Bicondylar Breadth. They found all three measurements to show significant difference between genders. They also concluded that a larger study sample allows similar accuracies of sex determination with fewer measurements, which in turn can improve the assessment of sexual dimorphism by using a time-efficient method (14). 100 (Males 50, Females 50) human mandibles of known sex for the sexual dimorphism with the help of 14 different morphometric parameters. Amongst the parameters studied bigonial width, bicondylar breadth, maximum ramus height, mandibular angle and intermolar distance were found to be statistically significant for determination of sex of mandible with 95% confidence interval. Out of these significant five parameters maximum ramus height and intermolar distance showed highly significant p value. They concluded that Accuracy of determination of sex of human could be increased when measurement of these significant mandibular parameters correlated with parameters of another sex determining bone like pelvis, skull in osteometric studies (15).

Conclusion:

Most common shape of the mandibular foramen is observed 'round' and the most common position of the mandibular foramen on medial side of the ramus of the mandible is upper and posterior quadrant and observed 15% male and 12% females have accessory mandibular foramen. which will help for effective management, better clinical results, and prognosis. Comparison from other studies shows that geographical, genetic, and dietary variations does exist and hence knowing its position in native population is essential as it plays a crucial role in success of "pain-less" and "patient friendly" surgical procedures.

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