International Journal of Research in Medical Sciences
Acharya S et al. Int J Res Med Sci. 2021 Jan;9(1):230-235
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20205850

Original Research Article

Study of anatomical variations of mental foramen in dry adult human mandible

Sunita Acharya[1], Rupali Mehta[2]*, Prabhakaran Pearl Kattimuthu[3]

[1]Department of Anatomy, Pacific Institute of Medical Sciences, Udaipur, Rajasthan, India
[2]Molecular Biology, MGM School of Biomedical Sciences, Kamothe, Navi Mumbai, Maharashtra, India
[3]Department of Anatomy, Nootan Medical College and Research Centre, Gujarat, India

Received: 16 November 2020
Revised: 16 December 2020
Accepted: 17 December 2020

***Correspondence:**
Dr. Rupali Mehta,
E-mail: mehtarupali978@gmail.com

ABSTRACT

Background: Mandible also known as the largest and inferior, primary facial bone of the face giving a curved shape to it. It changes its shape and gives variations to the bony structure of the face from birth till older age. Mental foramen is known as the ventage of the mandible and is an important mark of the face for carrying out many diagnostics and surgical processes along with anesthetic procedures of the face. Thus, the present study is designed with an aim to get insight knowledge of position and shape of mental foramen in dry adult human mandible.
Methods: Totally, 60 bones were studied in 2 years duration. The study was carried out in the Department of Anatomy of Geetanjali Medical College and Hospital and Rabindranath Medical College. The position of mental foramen was studied using an instrument known as digital Vernier Calliper (in mm) while shape was analyzed visually. Position of mental foramen was calculated using Statistical package for social sciences (SPSS) software.
Results: The present study showed that the position of mental foramen from symphysis menti and posterior border of ramus of mandible was more from right side than left side and found to be insignificant while position of mental foramen from inferior border of body of mandible was more from left side than right side and found to be insignificant for right side while significant for left side. The shape of mental foramen from right side was found to be (Oval shape- 68.33% and round shape – 31.66%) while for left side was found to be (Oval shape- 71.66% and round shape – 28.33%).
Conclusions: Hence, mental foramen plays a pivotal role in performing major facial surgeries and is an important landmark for several facial procedures performed.

Keywords: Mental foramen, Mandible, Position, Shape, Bones

INTRODUCTION

Mandible is the largest, strongest and lower bone of the face having a curved body that is convex forwards with two broad ramus ascending posteriorly. Rami of the mandible carries coronoid & condylar processes.[1] Mental foramen of mandible is situated in anterolateral aspect of the body. It lies below either the interval between the premolar tooth, midway between the upper and lower borders of the body of the mandible.[2] On the inner surface of the body of mandible lies mandibular foramen that leads into the mandibular canal and opens on the outer surface of the mandible as mental foramen.[3] Mental foramen transmits mental nerve, artery and vein through its canal. Mental nerve is a branch of inferior alveolar nerve supplying sensations to lower lip, labial mucosa, lower canines and premolars.[2]

It has been seen that the shape of the mandible undergoes definitive variations from birth till the old age and with that

the relative position/location of the mental foramen changes; thus, providing a clue to the age of an individual. In infancy, the mental foramen is located relatively far posteriorly, below the first molar bud and with the eruption of permanent teeth, the mental foramen moves anteriorly, reaching its final destination that corresponds to the level of the second premolar tooth; Thus, accounting for its relative anteroposterior movement. With regard to its relative vertical movement, the mental foramen appears closer to the alveolar margin in neonates, and with eruption of teeth it descends between the alveolar and inferior border while in adult the mental foramen is nearer to the inferior border and moves upwards. As mental foramen moves upwards, it gets closer to the alveolar border representing an old age. Along with an increase in age it shows the loss of teeth and bone resorption in elderly people.[4,5]

Mental foramen is an anatomical landmark for mandible facilitating diagnostic, surgical, local anesthetic and other invasive procedure for dental surgeons performing periapical surgery in the mental region of mandible.[6] Also, it is an important region for performing anesthetic block prior to clinical procedures in lower anterior teeth and to preserve integrity of mental nerve trunk in surgical interventions.[7,8]

Precise knowledge of position, shape, and number of mental foramen can be of much use for dental surgeons for performing surgical procedures of mandible such as curettage of the premolars, filling procedures, dental implants for root canal treatments etc.

Many studies have been reported by various authors, performing studies on different ethnic groups and on population of different races. To put more emphasis on an important foramen, present study is designed to deal with measurements of position and shape of mental foramen in dry adult human mandibles (Right side as well as left side).

METHODS

The present study was designed as a comparative and descriptive study, which was started after obtaining ethical clearance from institutional ethical committee. Total 60 bones were included in the study for consideration. Unknown mandibles with intact alveolar sockets removed from cadavers and unknown mandibles from storage room of dry adult mandibles were obtained in 2 years (i.e. August 2016 to August 2018). Thus, a total of 60 mandibles were obtained from Geetanjali Medical College (Udaipur) and R.N.T. Medical College (Udaipur) from the Department of Anatomy after getting permission.

Inclusion criteria

Normal adult human mandibles with intact alveolar processes and without any apparent damage or congenital anomaly was included in the study.

Exclusion criteria

Abnormal human mandible with incomplete alveolar processes, with congenital or Pathological anomalies, damaged specimen, pediatric mandibles were excluded from the study.

Methodology followed during study

For measurement of various parameters of our study, mandible was placed on the horizontal plane and the lower border of mandible interact with greatest force as vertical pressure is applied to the second molar teeth.

The shape of mental foramen in dry human adults was analysed by visual examination of the both sides of the mandible.

Figure 1: Position of mental foramen from symphysis menti.

Figure 2: Position of mental foramen from posterior border of ramus of mandible.

For measuring position of mental foramen in mandible of both sides following are the considerations in our study: position of mental foramen from symphysis menti. (Figure 1), position of mental foramen from posterior border of ramus of mandible. (Figure 2) and position of mental foramen from inferior border of the body of mandible. (Figure 3)

Figure 3: Position of mental foramen from inferior border of body of mandible.

Figure 4: Digital vernier calliper.

Position was measured using Digital Vernier Calliper (in mm).[9] (Figure 4)

Statistical analysis

Mean and standard deviation of the position of mental foramen was calculated using Statistical package for social sciences (SPSS) software for comparison.

RESULTS

In the present study, the statistical analysis was evaluated as mean and standard deviation. The mean and standard deviation of mental foramen (left and right side) were calculated. It was done using SPSS software and $p>0.05$ was considered insignificant while $p<0.05$ was considered significant.

In our study, the mean and standard deviation of the mean and standard deviation of position of mental foramen from symphysis menti was found to be (25.729±1.927) on right side and (25.277±1.977) on left side. The distance from right side was more than the left side and was found insignificant ($p>0.10$ for both sides) (Table 1).

The mean and standard deviation of position of mental foramen from posterior border of ramus of mandible was found to be (62.333±5.045) on right side and (62.248±5.423) on left side. The distance from right side was more than the left side and was found insignificant (p value >0.10 for left side and $p>0.0900$ for right side) (Table 2).

The mean and standard deviation of position of mental foramen from inferior border of body of mandible was found to be, (12.531±1.994) on right side and (12.684±2.273) on left side. The distance from right side was less than the left side and was found insignificant for right side while significant for left side ($p>0.10$ for right side and p value 0.024 for left side) (Table 3).

The shape round and oval of mental foramen was also compared for both the sides and the results for right side (Oval shape – 68.33% and round shape – 31.66%) while for left side (Oval shape – 71.66% and round shape – 28.33%) (Table 4).

Table 1: Comparison of mean and SD of position of mental foramen from symphysis menti (right and left side).

Side	No.	Range		Position of MF from symphysis menti		P value	Remark
		Minimum	Maximum	Mean	SD		
Right	60	19.900	30.320	25.7293	1.927	>0.10	Insignificant
Left	60	20.800	29.480	25.2771	1.977	>0.10	Insignificant

Table 2: Comparison of mean and SD of position of mental foramen from posterior border of ramus of mandible (right and left side).

Side	No.	Range		Position of MF from posterior border of ramus of mandible		P value	Remark
		Minimum	Maximum	Mean	SD		
Right	60	50.330	75.970	62.3336	5.045	0.090	Insignificant
Left	60	50.330	75.970	62.2488	5.423	>0.10	Insignificant

Table 3: Comparison of mean and SD of position of mental foramen from inferior border of body of mandible (right and left side).

Side	No.	Range		Position of MF from inferior border of body of mandible		P value	Remark
		Minimum	Maximum	Mean	SD		
Right	60	5.640	16.440	12.5316	1.994	>0.10	Insignificant
Left	60	7.010	22.220	12.6843	2.273	0.024	Significant

Table 4: Comparison of shape of mental foramen.

Shape	Right side	Percentage	Left side	Percentage
	N (no. of mandibles)	(%)	N (no. of mandibles)	(%)
Round	19	31.66%	17	28.33%
Oval	41	68.33%	43	71.66%
Total	60	100%	60	100%

DISCUSSION

Mental foramen is situated in anterolateral aspect of the body of the mandible. It lies below either the interval between the premolar tooth, midway between the upper and lower borders of the body of the mandible.[2] It is an anatomical landmark for facilitating diagnostic, surgical, local anesthetic and other invasive procedure for dental surgeons performing periapical surgery in the mental region of mandible.[6]

Knowledge of position, shape and size of mental foramen is important for performing anesthetists block prior to clinical procedure in lower anterior teeth and to preserve integrity of mental nerve trunk in surgical interventions.[7,8]

Prabodha et al. reported in 24 dry adult mandibles the mean distance of mental foramen from symphysis menti, lower border of the body of mandible and posterior border of the ramus of the mandible were 26.25 mm, 12.25 mm and 65.38 mm respectively. The shape of mental foramen was oval in 66.67% and rounded in 33.33% of mandibles.[10] In contrast to our study the mean distance of mental foramen from symphysis menti were 25.72 mm (right side) and 25. 27 mm (left side), inferior border of body of mandible were 12.53 mm (right side) and 12.68 mm (left side) and from posterior border of ramus were 62.33 mm (right side) and 62.24 mm (left side) while the shape of mental foramen was oval in 70% and rounded in 30% of mandibles.

Ilayperuma et al. reported that in 51 adult dry mandibles the mean distance of mental foramen from symphysis menti was 24.86 mm. The most common position for the mental foramen was in line with longitudinal axis of the lower second premolar 52.94% followed by a position between first and second premolar 26.47%. In most of the mandibles the shape of the mental foramen was oval i.e. almost 59%.[11] In contrast to our study the position of mental foramen from symphysis menti was 25.72 mm (right side) and 25.72 mm (left side). The most common position for the mental foramen was in line with apex of the lower second premolar 68.33% and the second most common position was in line with apex of second premolar and first molar is 15.83%. The shape of mental foramen was oval in 70% and rounded in 30% of mandibles.

Udhaya et al. reported that out of 87 dry mandibles, in 75 mandibles (83.33%) the mental foramen was bilaterally showing an oval shape and in the remaining 15 mandible (16.67%) the mental foramen was bilaterally showing a round shape.[12] In contrast to our study out of 120 mandibles, in 70% mandible the mental foramen was bilaterally showing an oval shape and in 30% mandible the mental foramen was bilaterally showing a round shape.

Sukla et al reported that the oval shape of mental foramen was 87.1% on right side and 88.6% on left side. Round shape mental foramen was observed to be 12.9% on the right side and 11.4% on the left side13 while in contrast to our study oval shape of mental foramen is more prominent in both sides.

Vimala et al. reported that the mean value of position of mental foramen from symphysis menti, lower border of the body of the mandible, and posterior border of the ramus of mandible were 26.67 mm, 11.25 mm and 62.35 mm. The most common position for the mental foramen was in line with apex of the lower second molar (61.4%) followed by a position between second premolar and first molar was (28.2%) coincides with Deepa et al. study. The shape of mental foramen was oval in 61.2% and rounded in 38.5% of mandibles in most of the studies2 while in contrast to our study the position of mental foramen from symphysis menti were 25.72 mm (right side) and 25.72 mm (left side), from inferior border of the body of the mandible were 12.53 mm (right side) and 12.68 mm (left side) and from posterior border of ramus of mandible were 62.33 mm (right side) and 62.24 mm (left side). The most common position for the mental foramen was in line with apex of

the lower second premolar 68.33% on both sides. The oval shape of mental foramen was more prominent.

Suman et al observed that the most common position of mental foramen in relation to lower (mandibular) teeth was below the apex of second premolar teeth in 56.86% of mandibles followed by space between second premolar and first molar teeth.[14] While in present study the most frequent position of the mental foramen was in line with apex of the lower second premolar 68.33%on both left and right side, respectively.

Hence, its deep awareness is necessary while performing various surgical procedures and in applying anaesthesia to the patients to avoid any complications. Mainly dentists must take proper care and precautions of that important bone to avoid any type of injuries.

CONCLUSION

In conclusion, we observed the mean value of position of mental foramen from the symphysis menti is 25.72±1.927 on the right side and 25.27±1.977 on left side, and from the posterior border of the ramus of mandible was 62.33±5.045 on the right side and it was 62.24±5.423 on the left side, and position from the lower border of the body of mandible was 12.53±1.994 on the right side and 12.68±2.273 on the left side respectively. When it comes to the shape of mental foramen it was observed that oval shape is more markable in right side with 68.33% while rounded shape is less marked with 31.66%. On contrary, oval shape is again more dominant on left side with 71.33% while rounded shape is less dominant with 28.33%. No variations were found in the number of mental foramen.

In hypothesis, knowledge of position, shape and size of mental foramen is important for performing anesthetic block prior to clinical procedure in lower anterior teeth and to preserve integrity of mental nerve trunk in surgical interventions while knowledge of the morphology of the mental foramen is important when administering regional anaesthesia, performing periapical surgery, dental implant surgery and endodontic treatments in the mandible. Its understanding is also useful in preserving and avoiding injury to the mental nerve and vessels during surgical procedures and in interpreting anatomical landmarks in oral pathology and forensics. In the present study we also discovered already non-common insignificant variations associated with position of mental foramen from symphysis menti, lower border of the body of mandible and from posterior border of ramus of the mandible. The future scope of the study can be to properly identify all the variations by extensive review of published articles.

ACKNOWLEDGEMENTS

We acknowledge the support of technical staff of Department of Anatomy of Geetanjali Medical College and Hospital and R.N.T. Medical College for helping in conduction of this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Standring S. Grays anatomy: The anatomical basis of medicine and surgery. 40th edition, churchill livignstone New York. 2008;527-60.
2. Vimala V, Rohinidevi M, Mekala D. Anatomical variations of mental foramen in dry adult human mandibles & its clinical importance. IOSR Journal of dental and medical sciences. 2015;14(09):40-44.
3. Samanta, Paramita P, Kharb P. Morphometric analysis of mandibular foramen and incidence of accessory mandibular foramina in adult human mandibles of an Indian population 2013;5(2):60-6.
4. A Gershenson, H Nathan, E Luchanskyy. Mental foramen and mental nerve: changes with age. ActaAnat. 1986;126 (1):21-28.
5. M Lipski, IM Tomaszewska, W Lipska, GJ Lis, KA Tomaszewski. The mandible and its foramen: anatomy, anthropology, embryology and resulting clinical implications. 2013;72(4):285-92.
6. Parmar A, Shah K, Patel B, Jadav J, Trivedi B. Morphological and Morphometric Analysis of Mental Foramen in dry Human Mandibles. Int J Med Sci Public Health. 2013;2:640-44.
7. D.L. Mwaniki, J. Hassanali, The position of mandibular and mental foramina in Kenyan African mandible. East African Medical Journal. 1992;69:210-13.
8. B. Cutright, N. Quillopa, and W. Schubert. An anthropometric analysis of the key foramina for maxillofascial surgery. Journal of Oral and Maxillofacial Surgery. 2003;6:354-57.
9. Balakrishnan Y.A., S.Vikram, Rao C.P., Revankar S.K. Position of mental foramen in dry human mandibles and its significance. International journal of Anatomy and Research 2018;(6):5228-32.
10. Prabodha LBL, Nanayakkara BG. Galle Medical Journal. 2006;11(1):13-15.
11. Ilayperuma I, Nanayakkara G, & Palahepitiya N. Morphometric Analysis of the Mental Foramen in adult Sri Lankan Mandibles. Int J Morphl. 2009;27(4):1019-024.
12. Udhaya K., Saraladevi K.V., Sridhar J. The Morphometric analysis of mental foramen in dry human mandible: a case report journal of clinical and Diagnostic Research. 2013;(8):1547-551.
13. Shukla R.K., Gupta P, Hussain M, Hussain F, Singh A.B. Morphometric Measurement of Foramen in Dry Human Mandible in North India population. Int J Anet Res. 2015;3(1);899-05.

14. Suman P, Mahato R.K., Singh S. Morphological and Morphometrical variations of mental foramen in dry human mandibles. 2015;1:13-16.

Cite this article as: Acharya S, Mehta R, Kattimuthu PP. Study of anatomical variations of mental foramen in dry adult human mandible. Int J Res Med Sci 2021;9:230-5.