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Mental Foramen - A Morphological Evaluation of Dry Adult Human Mandible in Indian Population

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ABSTRACT

Background: Mental foramen is an important anatomical and surgical landmark. Mental nerve and vessels emerge from it. Knowledge of variations in morphology of mental foramen in various populations is important, as it is a common site for regional anaesthesia in various dental and maxillofacial surgical procedures.
Aim: Aim of present study is to look into the morphological differences in mental foramen of dry adult mandibles in Indian.
Material and Method: Forty-one (41) dry adult human mandible of known sex obtained from the Department of Anatomy, Phulo-Jhano Medical College Dumka, Jharkhand and students of this institution were studied. Shape, direction and position of mental foramen were visually assessed. Distance from mental foramen to symphysis menti and distance from alveolar crest to mental foramen was measured.
Results: Oval shape was the most common type. Position below second premolar tooth was most common. Direction of opening of MF was postero-superior in 88.6% and in the rest, it was antero-superior.
Conclusion: This study reaffirms that morphological variations of mental foramen do exist between different populations and knowledge of these variations is important for various anaesthetic and surgical procedures.

Key Words: Morphology, Morphometry, Mental Foramina, Mandible, Mental Nerve

INTRODUCTION

Mental foramen (MF) is a small opening in the anterolateral aspect of the mandible. It is most often present bilaterally. It is the anterior end of the mandibular canal. The posterior end of the mandibular canal present on the inner aspect of mandible, termed mandibular foramen. Mandibular canal gives passage to inferior alveolar nerve and vessels. Near to the mental foramen the inferior alveolar nerve divides into mental nerve and incisive nerve. Mental nerve and mental vessels emerge from mental foramen. This nerve innervates the skin and soft tissues of the adjacent regions. The position of the mental foramen is usually described at a point on the middle of vertical line between first and second inferior premolars in adults, roughly 2.5 cm lateral to symphysis menti and 1.25 cm above the lower border of mandible [1, 2]. Position of MF varies with age and sex [1, 2]. Sometimes a smaller foramen is seen adjacent to it, termed as accessory mental foramen (AMF). Rarely mental foramina may be absent.

Aim of present study is to look into the morphological differences in mental foramen of dry adult mandibles in Indian. Knowledge of morphology of mental foramen is very important as it is the site of nerve block for anaesthesia during various maxillofacial reconstructive surgery and dental procedures. It is also used as a reference point for surface marking of mandibular canal for various surgical procedures [1, 2].

MATERIAL AND METHODS

This study was conducted on 41 dry adult human mandible of known sex. Mental foramens on both the sides of mandible were studied. Mandibles were obtained from the Department of Anatomy, Phulo Jhano Medical College, Dumka, Jharkhand and from students of this college. Mental foramen was visually assessed for its shape and was described as either oval or rounded. Mandible was placed on a horizontal surface and perpendicular lines to it were drawn along first premolar (Position I: P-I), between first premolar and second premolar (Position II: P-II), along second premolar (Position III: P-III) and between second premolar and first molar interdental space (Position IV: P-IV). Direction of opening of MF was also assessed and classified as either antero-superior or postero-superior. Various morphometric measurements were recorded using vernier calliper. Distance between symphysis menti to anterio border of MF was measured. Distance between alveolar crest and superior margin of MF was also measured. Horizontal and vertical diameter of MF was measured.

RESULT

Mental foramen was present bilaterally in all the 41 mandibles. *Accessory mental foramen* was present in 3 mandibles and was present unilaterally. Both on the right and left side, most common *shape* was oval – 59.5% and 61% respectively. Regarding *position*, on the right side most commonly, observed position was on the longitudinal line along the second premolar tooth i.e., position III - 78%, followed by position II-15 % and position IV-7%. On the left side most, common observed position was on the longitudinal line along the second premolar tooth i.e., position III- 84%, followed by position II-14 % and position IV-2%. *Direction* of opening of MF was postero-superior in 88.6% and in the rest, it was antero-superior.

Figure 1: Various morphological features of Mental Foramen

Average distance from symphysis menti to anterior margin of MF was 26.07 mm on right side and 25.36 on left side. Average of measurement of distance from upper border of MF to alveolar crest was 11.54 mm and 12.08 mm on right and left side respectively. Mean horizontal diameter of MF on right and left sides were 3.08 mm and 3.34 mm respectively. Mean vertical diameter of MF on right and left sides were 2.36 mm and 2.16 mm respectively.

Table 1: Shapes of Mental Foramen

Sides	Shapes (%)	
	Oval	Round
Right	60.97 (n=25)	39.02 (n=16)
Left	58.53 (n=24)	41.46 (n=17)

n- means number

Table 2: Position of Mental Foramen

Sides	Positions (%)			
	P-I	P-II	P-III	P-IV
Right	-	15 %	78 %	7 %
Left	-	84 %	14 %	2 %

DISCUSSION

Knowing the applied importance of shape, size, position, direction and morphometric measurements related to mental foramen the result of this present study was compared with other such studies in India and other countries. Ethnic variations relating to these variables have been described in earlier literatures. Variations may also be due to different food and chewing habits, which have effect on morphology of mandible and MF.

In the present study the most common shape observed was oval. This finding was consistent with some other such studies, but varied from few of them e.g., Singh R et al. and S Kumar N et al. Sing R et al. reported round shape as most common, 94% and 87% in right and left side respectively. S Kumar N et al. reported round shape as most common, 95%.

In the present study the most common position of mental foramen was P-III i.e., below second mandibular premolar. This finding is consistent with most other such studies in India except for few e.g., Balakrishnan YA et al. reported P-III (52%) on left side and P-II (48%) on right side as most common position. The findings of present study are consistent with other such studies in Korean, Malaysian and Sri Lankan population, but differed from a study on Turkish population (Yeşilyurt et al.) which reported P-II as most common position, 55.7 % and 61.4% on right and left sides respectively and also differs from standard text books which describe P-II as most common position. Direction of opening of MF was postero-superior in 88.6% of samples.

Average distance between symphysis menti and anterior border of mental foramen was 26.07 mm and 25.36 mm on right and left sides respectively. While average distance between alveolar crest and superior margin of mental foramen was 11.544 mm and 12.08 mm on right and left side respectively.

Table 3: Comparison of shapes of Mental Foramen

Authors	Year	Side	Shapes (%)	
			Rounded	Oval
Singh R. et al. [3]	2010	Right	94	6
		Left	87	13
Budhiraja V et al. [4]	2013	-	25.7	74.3
Roy PP et al. [5]	2014	-	34.67	53.3
S Kumar N et al. [6]	2019	-	95	5
Yeşilyurt et al. [7]			34.5	65.5
Present Study		Right	39.02	60.97
		Left	41.46	58.53

Table 4: Comparison of various positions of Mental Foramen in percentage (%)

		Positions				
Authors	Side	P-I	P-II	P-III	P-IV	Population
Yeşilyurt et al. [7]	Right	-	55.7	34.3	4.3	Turkish
	Left	-	61.4	25.7	5.7	
Singh R et al. [3]	Either	2.1	17.8	68.8	11.52	Indian
Budhiraja V et al. [4]	Right	3.8	20.0	61.0	14.3	Northern Indian
	Left	2.9	20.9	59.1	15.2	
Roy PP et al. [5]	Either		23.33	52		Indian
Balakrishnan YA et al. [8]	Right	8	48	32	12	Southern India
	Left	8	24	52	12	
Ilayperuma et al. [9]	Either	-	26.47	52.94	-	Srilankan
Kim et al. [10]	Either	-	26.8	64.3	-	Korean
Ngeow et al. [11]	Either	-	19.6	69.2	-	Malaysia
Present study	Right		15	78	07	Indian
	Left		14	84	02	

Table 5: Comparison of various mandibular parameters related to Mental Foramen

Authors	Side	Distance between symphysis menti to anterio border of MF	Distance between alveolar crest and superior margin of MF
Yesilurt et al. [7] (Turkey)	Right	19.18	10.5
	Left	19.37	10.64
Singh et al. [3] (North India)	Either side	23.6	15.3
Balakrishnan et al. [8] (South India)	Right	26.28	11.93
	Left	25.45	12.26
Present study	Right	26.07	11.54
	Left	25.36	12.08

CONCLUSION

Variations in morphology and morphometry of mental foramen are well documented. This study reaffirms that variations do exist, and knowledge of these variations is important for an uneventful successful surgical procedure on mandible such as reconstructive facial surgery and for localising the neurovascular bundle during local anaesthesia. Larger sample size is needed for further evaluation of data.

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Ethical Approval: Approved

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