

Radiographic evaluation of the mental foramen in a selected Iranian population

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ABSTRACT

Background: Information on the position of the mental foramen is important for dental surgeons. Variations in its position can be a cause of complications during local anesthesia or surgical procedures. The usual position of the mental foramen in an Iranian population has not been previously reported.

Aims: The purpose of this study was to determine the most common location of the mental foramen in an Iranian population. We also analyzed gender differences and the symmetry of location within individuals.

Materials and Methods: 400 panoramic radiographs were evaluated with regard to the location and symmetry of the mental foramina in male and female subjects.

Results: We found that the mental foramen was located between the first and second premolars in 47.2% of patients and in line with the second premolar in 46%. In 49.2% of males, the mental foramen was in line with the second premolar. In 50.9% of females it was between the first and second premolars. It was symmetrical in 85.7%.

Conclusions: Based on this study it appears that the most common position of mental foramen is either between the two premolars or in line with the second premolar. This is in concordance with previous studies.

Key words: Mandible, mental foramen, mental nerve, panoramic, radiography

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The mental foramen on each side is located on the buccal cortex of the mandibular bone and lies near the apices of the premolars. It has been shown to be located at precisely the same level on most humans (13–15 mm superior to the inferior border of the mandible). The opening of the mental foramen is directed outward, upward, and posteriorly, viewed from inside out. It transmits the mental vessels and nerve.^[1] The mental nerve is a terminal branch of the inferior alveolar nerve; it supplies sensory innervation to the lower lip, the buccal vestibule, and the gingiva mesial to the first mandibular molar.^[2] The mental bundle can be traumatized during surgical procedures, resulting in paresthesia or anesthesia in the area innervated by the nerve. Additionally, local anesthesia of the terminal incisive branches of the inferior alveolar nerve and the mental nerve can be achieved if the mental canal is accurately located and anesthetic solution deposited within it. Thus, accurate information regarding the location and orientation of the mental canal and its foramen can be very important.^[3]

As the bone density increases, the mental foramen becomes more difficult to identify on radiographs.^[4] Such cases, in which the mental foramen cannot be identified on panoramic

radiographs under ordinary exposure and viewing conditions, were classified as 'unidentified type' by Yosue and Brooks.^[5,6]

The location of mental foramen has been studied in different populations.^[2-14] The purpose of this study was to report the usual position of the mental foramen in Iranians; it has not been reported in this population before.

MATERIALS AND METHODS

We evaluated 400 panoramic radiographs of patients who had been referred to our Dentomaxillofacial Radiology Center in Babol city (in Iran) during two years. All panoramic radiographs were taken by Planmeca 2002EC (tube potential: 60–80 KV, tube current: 4–12 mA, total filtration: 2.5 mmAl, focal spot: 0.3, and time: 18 s) and had high-quality processing. Exclusion criteria were:

1. Presence of a radiolucent lesion in the lower jaw anywhere in the area extending from the right first molar to the left first molar
2. Presence of a missing tooth in the lower jaw (between 36 and 46)
3. Nonvisualization of the mental foramen bilaterally

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4. Incomplete eruption of permanent teeth
5. Patient under 18 years
6. Presence of periodontal lesions
7. Patient with previous orthodontic treatment
8. Presence of crowding and spacing in the lower arch

The position of the image of the mental foramen was recorded as follows:

- Position 1: Situated anterior to the first premolar
- Position 2: In line with the first premolar
- Position 3: Between the first and second premolars
- Position 4: In line with the second premolar
- Position 5: Between the second premolar and first molar
- Position 6: In line with the first molar

We used the edge of a ruler to identify the longitudinal axis of the nearest tooth and the position of the mental foramen was recorded in relation to this. If the mental foramen was too large or was situated between two teeth, the position of the foramen was established after drawing an imaginary line parallel to the long axis of the teeth.^[4] After evaluation of each panoramic radiograph, the location of the mental foramen on each side was recorded in the form. The location of the mental foramen was reported on the basis of gender and symmetry or asymmetry.

RESULTS

Of the 400 panoramic radiographs analyzed, 178 were that of males and 222 that of females. The most common position for the mental foramen in this sample was position 3 (47.2%). There was no case found in position 1 (anterior to the first premolar). On the right side, the commonest position of the mental foramen was position 3 (24.7%) and on the left side it was position 4 (23.6%) [Table 1]. Position 4 was the most common one among males (49.2%) and position 3 was the most common one among females (50.9%) [Table 2].

In 343 cases (85.7%) the mental foramina were symmetrically located. For the symmetrically placed mental foramina, the most common location was position 3 (41.5%), followed by position 4 (39.8%). No case was found in position 1 and 6. No statistically significant differences were seen between males and females in symmetry and asymmetry location of mental foramen in both sides. $P < 0.05$ was taken to indicate

statistical significance [Table 3].

DISCUSSION

There is considerable debate regarding the normal position of the mental foramen in different populations. In our series of 400 panoramic radiographs the location of the mental foramen varied widely, being found at any position between the root of the first premolar and the roots of the first molar; this is in accordance with previous studies. According to this study, in 47.2% of the cases the mental foramen was located between the first and second premolars and in 46% it was in line with the second premolar; thus these two positions accounted for 93.2% of the cases.

Studies done by Moiseiwtsch^[2] in a North American white population and by Fishel *et al.*^[7] and Olasoji *et al.*^[8] in Northern Nigerian adults showed that the most common location of the mental foramen was between the two premolars. These findings are consistent with our results. But studies done in other populations such as Malays, Asian Indians, Kenyan Africans, and Saudis, as well as the studies done by Phillips *et al.*, have indicated that the mental foramen is most commonly positioned in line with the second premolar tooth.^[3,4,9-14]

In our review of literature we found that according to most authors the mental foramen is usually located between the lower premolars.^[15-17] However, there were some studies that reported that it most commonly lies near the apex of the second premolar.^[1,18-20] Other studies have found that both locations are common.^[21,22]

In this study we used panoramic radiographs because the mental foramen is seen more consistently on the wide field of mandible view in panoramic radiographs than on periapical radiographs.^[6]

We selected patients over the age of 18 because we needed patients with completed skeletal growth. The presence of periodontal lesions and also previous orthodontic treatment could cause tooth migration; we, therefore, omitted these cases from our study.

In conclusion, the most common locations of the mental foramen are between the two premolars and in line with

Table 1: Distribution of position of mental foramen on both sides by gender

Position	Male		Female		Total
	Right frequency (%)	Left frequency (%)	Right frequency (%)	Left frequency (%)	
1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2	3 (0.4)	4 (0.5)	2 (0.2)	4 (0.5)	13 (1.6)
3	79 (9.9)	72 (9)	118 (14.8)	108 (13.5)	377 (47.2)
4	87 (10.9)	88 (11)	92 (11.5)	101 (12.6)	368 (46)
5	9 (1.1)	13 (1.6)	10 (1.3)	9 (1.1)	41 (5.1)
6	0 (0)	1 (0.1)	0 (0)	0 (0)	1 (0.1)

Table 2: Frequency of the position of mental foramen (by gender) as seen in the present study

Position	Male freq (%)	Female freq (%)
1	0 (0)	0 (0)
2	7 (1.9)	6 (1.3)
3	151 (42.4)	226 (50.9)
4	175 (49.2)	193 (43.5)
5	22 (6.2)	19 (4.3)
6	1 (0.3)	0 (0)
Total	356 (100.00)	444 (100.00)

Table 3: Position of mental foramen in present study by gender and symmetry

	Symmetry	Asymmetry	P*
	Frequency (%)	Frequency (%)	
Male	0 (0)	0 (0)	
Female	0 (0)	0 (0)	
Male	2 (0.2)	5 (0.7)	0.286
Female	2 (0.2)	4 (0.5)	
Male	136 (17)	15 (1.9)	0.418
Female	30 (3.7)	196 (24.5)	
Male	156 (19.5)	19 (2.4)	0.171
Female	162 (20.3)	31 (3.8)	
Male	16 (2)	6 (0.8)	0.945
Female	14 (1.7)	5 (0.7)	
Male	0 (0)	1 (0.1)	
Female	0 (0)	0 (0)	
Total	686 (85.7)	114 (14.3)	

*Analysis between male and female based on symmetry and asymmetry parameters

the second premolar (below and/or mesial to the second premolar). This agrees with the results of previous studies in other populations. The mental foramina are usually symmetrically located on both sides.

REFERENCES

1. Woelfel JB, Scheid RC. Structures that form the foundation for tooth function. *Dental Anatomy: Its relevance to dentistry*. 6th ed. New York: Lippincott, Williams and Wilkins; 2002. p. 19.
2. Moiseiwtsch JR. Position of the mental foramen in a North American, white population. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;85:457-60.
3. Phillips JL, Weller RN, Kulild JC. The mental foramen: Part 1. Size, orientation and positional relationship to the mandibular second premolar. *J Endod* 1990;16:221-3.
4. Ngeow WC, Yuzawati Y. The location of the mental foramen in a selected Malay population. *J Oral Sci* 2003;45:171-5.
5. Yosue T, Brooks SL. The appearance of mental foramina on panoramic radiographs. I. Evaluation of patients. *Oral Surg Oral Med Oral Pathol* 1989;68:360-4.
6. Yosue T, Brooks SL. The appearance of mental foramina on panoramic and periapical radiographs. II. Experimental evaluation. *Oral Surg Oral Med Oral Pathol* 1989;68:488-92.
7. Fishel D, Buchner A, Hershkowitz A, Kaffe I. Roentgenologic study of the mental foramen. *Oral Surg Oral Med Oral Pathol* 1976;41:682-6.
8. Olasoji HO, Tahir A, Ekanem AU, Abubakar AA. Radiographic and anatomic locations of mental foramen in northern Nigerian adults. *Niger Postgrad Med J* 2004;11:230-3.
9. Shankland WE 2nd. The position of the mental foramen in Asian Indians. *J Oral Implantol* 1994;20:118-23.
10. Mwaniki DL, Hassanali J. The position of mandibular and mental foramina in Kenyan African mandibles. *East Afr Med J* 1992;69:210-3.
11. Al Jasser NM, Nwoku AL. Radiographic study of the mental foramen in Saudi females. *Saudi Med J* 1996;17:471-4.
12. Al Jasser NM, Nwoku AL. Radiographic study of the mental foramen in a selected Saudi population. *Dentomaxillofac Radiol* 1998;27:341-3.
13. Phillips JL, Weller RN, Kulild JC. The mental foramen: Part 2. Radiographic position in relation to the mandibular second premolar. *J Endod* 1992;18:271-4.
14. Phillips JL, Weller RN, Kulild JC. The mental foramen: Part 3. Size and position on panoramic radiographs. *J Endod* 1992;18:383-6.
15. Atkinson ME, White FH. The skeletal system. *Principles of Anatomy and Oral Anatomy for Dental Students*. 1st ed. Edinburgh: Churchill Livingstone; 1992. p. 120.
16. Robinson PD, Pitt ford TR, McDonald F. *Mandibular anaesthesia. Local anaesthesia in Dentistry*. 1st ed. Oxford: Wright; 2000. p. 52.
17. Hiatte JL, Gartner LP. *Anatomic basis for local anesthesia. Textbook of Head and Neck Anatomy*. 3rd ed. New York: Lippincott, Williams and Wilkins; 2001. p. 296.
18. White SC, Pharoah MJ. *Normal radiographic anatomy. Oral Radiology: Principles and interpretation*. 5th ed. St Louis: Mosby; 2004. p. 183.
19. Liebgott B. *The skull. The Anatomical Basis of Dentistry*. 2nd ed. St Louis: Mosby; 2001. p. 189.
20. Berkovitz BKB, Holland GR, Moxham BJ. *Dento-osseous structures. Oral Anatomy, Histology and Embryology*. 3rd ed. London: Mosby; 2002. p. 11.
21. Williams PL, Warwick R, Dyson M. *Osteology. Gray's Anatomy*. 37th ed. Edinburgh: Churchill Livingstone; 1989. p. 368.
22. Malamed SF. *Techniques of mandibular anesthesia. Handbook of local anesthesia*. 5th ed. St Louis: Mosby; 2004:246-8.

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