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Study of the antero-posterior position of the mental foramen in the Nepalese population using digital Panoramic Radiograph

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Abstract

Background: Mental foramen is an important landmark to be considered when operating in the anterior mandible. It is mandatory to identify the location of the foramen to prevent injury to mental nerve and subsequent paresthesia.
Objectives: The objective of this study was to identify the position of the mental foramen in relation to the mandibular premolars and first molar in patients visiting Kathmandu Medical College, Department of Oral Surgery, Duwakot using the Orthopantomogram.
Methodology: A total of 200 digital panoramic radiographs of 92 males and 108 females in the age range of 20-50 years were collected. Consequently, 184 mental foraminain males and 216 mental foraminain females were evaluated. The outline of the mandible along with canine, first premolar, second premolar, and first molar was traced. The mental foramen opening was also traced and the position wasevaluated in relation to the first, second premolars and first molar.
Results: Out of 400 foramina, 217 (54.2%) were located between the first and second premolar, i.e. position 3. The second most commonlocationof 152 (38%) foramina was in line with the second premolar, i.e. position 4. Position 2, i.e. in line with the first premolar was seen in 4% and position 5, i.e. between the second premolar and first molar was seen in 3.5%. The left side (29.2%) had a higher occurrence of position 3 as compared to the right side (25%).
Conclusion: The location of mental foramen should be identified in all surgeries involving the anterior mandible as this will help us prevent injury to the mental nerve.In our population, position 3 was the most common location of the mental foramen.

Key words: Mandible; Mental foramen; Mental nerve

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INTRODUCTION

The mental foramen is a small funnel-like opening situated bilaterally in the antero-lateral aspect of the body of the mandible[1]. It is an important anatomic structure because it is the terminal end of the mandibular canal and it is involved in various conditions, like parasymphysis fractures of the mandible, osteotomy procedures duringorthognathic surgery, implant placement in the premolar–molar region as well as when administering local anesthesia[2]. The mental nerve exits the foramento supply the sensory innervations to the soft tissues of the chin, lower lip, and gingiva on the ipsilateral side of the mandible[3]. Thus, any injury to the mental foramen and the nerve can result in paresthesia or anesthesia of the different areas supplied by the mental nerve[2]. Therefore,the importance of the mental foramen and mental nerve cannot be undermined when performing various surgical procedures in the mandible.

The purpose of this study was to identify the exact position of mental foramen and to evaluate the position of the foramen in relation to mandibular premolars and first molar in the Nepalese population using the orthopantomogram. The orthopantomogram is used as the preferred diagnostic modality as it allows a more

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accurate localization of the mental foramen in both the horizontal and vertical dimensions[2,4]. This is helpful for the planning and treatment of various surgical procedures without injuring the mental nerve.

METHODOLOGY

A total of 200 digital panoramic radiographs of different patients within the age group of 20-50 years were collected from the Department of Oral Medicine and Radiology, Kathmandu Medical college, Duwakot, during the period from 1st August 2017 to 31st July 2018. Patients who had come with some complaint in one or both the Temporomandibular joints, like pain, clicking were selected for the study. There were a total of 92 male and 108 female patients. Consequently, 184 mental foraminain males and 216 mental foraminain females were evaluated. The study was done and the data was analyzed using the IBM Statistical Package for Social Sciences software. Written consent was taken from each patient for the study and ethical clearance was obtained from the institutional review board. All the panoramic radiographs were collected in the printed version with the Planmecaromexis software. With a pencil, the outline of the mandible along with the canine, first premolar , second premolar, and first molar was traced. The mental foramen opening was also traced and the positions were evaluated as follows:

Position 1: anterior to first premolar
Position 2: in line with first premolar
Position 3: betweenfirst and second premolar
Position 4: in line withsecond premolar
Position 5: betweensecond premolar and first molar
Position 6: in line withfirst molar

Inclusion criteria

a. All mandibular teeth from the right second molar to the left second molar were present.
b. All teeth hadcompletely erupted.
c. There was no pathology present in the mandible.
d. There were no traumatic injuries present in the mandible.
e. The digital panoramic radiograph films were free from radiographic errors and artifacts.

Exclusion criteria

a. Panoramic radiographs where the mental foramen could not be identified were excluded
b. Any teeth having deep caries, root canal treated teeth or teeth with restorations were excluded because of the possibility of periapical pathology.

RESULTS

A total of 400 mental foramina were studied for the antero-posterior position of mental foramen. The age group selected was from 20 years to 50 years, with the mean age being 33 years, where all the permanent teeth were erupted and there were no missing teeth. There were 184 males (46%) and 216 female (54%) patients in thestudy group as shown in Figure 1.

According to Table 1, the most common position was position 3, (54.2%) where the mental foramen was in between the first and second premolar, followed by position 4 (38%) where the foramen was in line with the second premolar. The mental foramen at position 2 with the foramen in line with the first premolar (4%) and position 5 where the foramen was located between the second premolar and the first molar (3.5%) were less commonly seen. There was no mental foramen identified at position 1, situated anterior to the first premolar, in the male group, whereas 0.2% was identified in the female.

Considering the side according to Table 2, the right side had the position 3 (25%) as the most common position whereas theleft side was 29.2%.

According to Table 1, comparision of the position of the mental foramen between males and females as well as the sides appeared to be not significant.

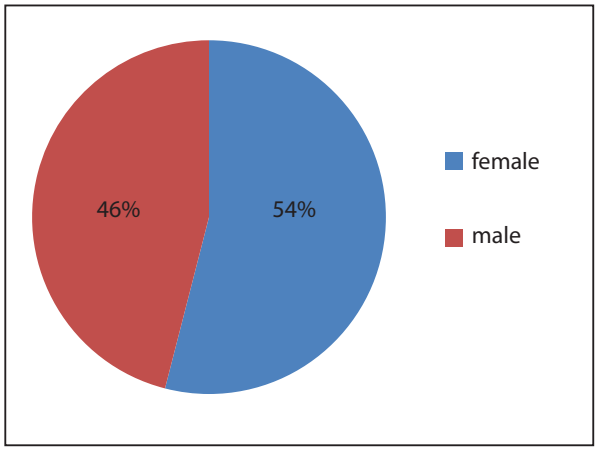

Figure 1: Sex distribution

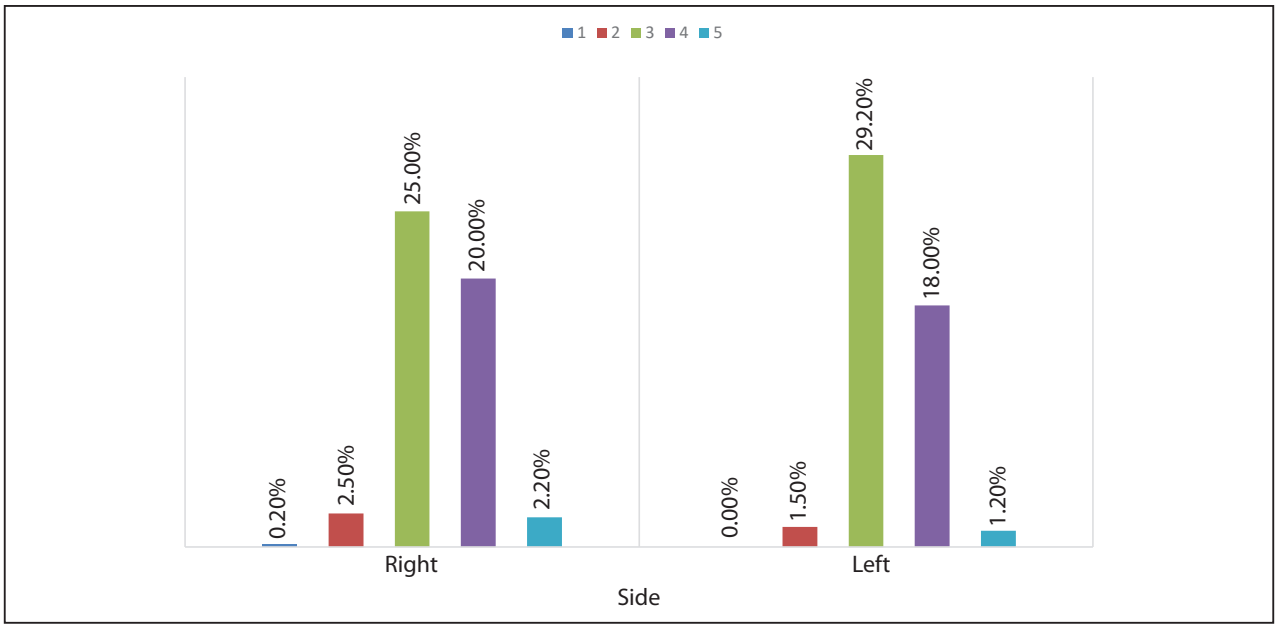

Figure 2: Position according to side

Table 1: Association between sex and position of mental foramen

Sex	Position					p- value
	1	2	3	4	5	
Male	0 (0.0%)	6 (1.5%)	101 (25.2%)	69 (17.2%)	8 (2.0%)	0.654
Female	1 (0.2%)	10 (2.5%)	116 (29.0%)	83 (20.8%)	6 (1.5%)	

Table 2: Association between side and position of mental foramen

Side	Position					p- value
	1	2	3	4	5	
Right	1 (0.2%)	10 (2.5%)	100 (25.0%)	80 (20.0%)	9 (2.2%)	0.257
Left	0 (0.0%)	6 (1.5%)	117(29.2%)	72 (18.0%)	5 (1.2%)	

DISCUSSION

The mental foramen is considered a very important anatomical structure in the mandible because of its location. The mental nerve exits from the mental foramen and gives sensory innervation to the lower lip, the soft tissues of the chin and gingiva on the ipsilateral side[2-5]. The nerve can be damaged due to fracture of the parasymphysis of mandible, during cyst enucleation involving the area and also during implant placement for fixed prosthesis. Although it is often possible to identify the mental foramen radiographically, knowing the normal range of possible locations is essentialto avoid any post-operative complications like paresthesia, anesthesia, and bleeding from the mental foramen region while performing surgical procedures[3]. The position of the mental foramen has been reported to vary in different ethnic groups[1,2,4-7]. This has led to the study of its anteroposterior position being important not only to avoid the surgical complications but also aids in the successful and accurate delivery of local anesthesia to the mental nerve and the terminal incisive branches of the inferior alveolar nerve. The study of the mental foramen also aids in interpreting anatomic landmarks in oral pathology and forensic odontology studies[3].

In our study, out of the 200 panoramic radiographs, all the 400 mental foraminawere located and studied. The most common position of the mental foramen was in

the line between the first and the second premolar in 54.2% of the patients, followed by the foramen located in line with the apex of the second premolar in 38.0%. These two positions accounted for 92.2% of the cases.

The results were different when compared to previous studies. The studies done by Agarwal and Gupta[8], Prabodha and Nanayakkara[9], and Choi and Bae et.al[10] published their findings with the most common position of the mental foramen being in line with the apex of the second premolar followed by the foramen being located between the first and second premolars. In our study, the most common position was the position of the mental foramen being between the first and the second premolar. Therefore, the mental foramen in most of the people is present either between the first and the second premolar or in line with the apex of the second premolar.

The study of the position of the mental foramen has led to a more effective way in the placement of dental implants to avoid the injury to the mental and incisive nerves[11]. The 35 degree angulation for the implant placement in the premolar region for an edentulous lower arch is an example of avoidance of injury to the nerves leading to a better outcome[12].

Although the panoramic radiographs are a better way of visualizing and locating the mental foramen than periapical radiographs, a more precise method like the use of anatomic measurements and the use of Cone Beam CT would have given us a more accurate location and position of the foramen.

CONCLUSION

This study allowed an evaluation of the anteroposterior position of the mental foramen of both sides using the panoramic radiograph which gives us the location of the foramen being mostly between the first and second premolar and below the second premolar region. The location of the mental foramen is helpful for the surgeries performed in the mandibular premolar region like trauma, cyst enucleation, and implant placement to avoid injury to the mental and incisive nerves. This study can further be substantiated using the CBCT and anatomic tracings using steriolithotripsic models.

REFERENCES

1. Ngeow WC, Yuzawati Y. The location of the mental foramen in a selected Malay population. J Oral Sci. 2003 Sep;45(3): 171-5[PubMed| DOI| FullText]
2. Gungor K, Ozturk M, Semiz M, Brooks SL. A radiographic study of the location of mental foramen in a selected Turkish population on panaromic radiograph. CollAntropol. 2006 Dec;30(4):801-5 [PubMed| FullText]
3. Neo J. Position of the mental foramen in Singaporean Malayas and Indians. AnesthProg 1989 Nov-Dec; 36(6):276-8. [Full Text]
4. HaghanifarS, Rokouei M. Radiographic evaluation of the mental foramen in a selected Iranian population. Indian J Dent Res 2009 June;20(2):150-2. [FullText]
5. Moiseiwitsch JR. Position of the mental foramen in a North American, white population. Oral Surg Oral Med Oral Pathol Oral Radiol. 1998 April;85(4):457-60. [FullText]
6. Al-Khateeb T, Al-HadiHamasha A, Ababneh KT. Position of mental foramen in a northern region Jordanian population. SurgRadiolAnat 2007 March;29(3):231-7. [FullText| DOI]
7. Rupesh S, Winnier JJ, John SA, Joy T, Rao AP, Reddy V. Radiographic study of the location of mental foramen in a randomly selected Asian Indian population on digital panoramic radiographs. J Med Sci. 2011 Aug;11(2):90-5. [FullText | DOI]
8. Agarwal DR, Gupta SB. Morphometric analysis of mental foramen in human mandibles of south Gujarat. People J Sci Res. 2011 Jan;4(1):15-8. [FullText]
9. Prabodha LBL, Nanayakkara BG. The position, dimensions and morphological variations of mental foramen in mandibles. Galle Med J. 2006 Sep;2(1):13-5. [FullText | DOI]
10. Paik DJ, Jeong HH, Jeon YM, Yoon YH. Anthropometric study on the location of the mental foramen. Korean J PhysAnthropol. 2007 March;20:1-10.[DOIFullText]
11. Greenstein G, Tarnow D. The Mental Foramen and Nerve: Clinical and Anatomical Factors Related to Dental Implant Placement: A Literature Review. J Periodontol. 2006Dec;77(12):1933-43.[FullText | DOI]
12. Roshanak BN, Nokar S, HastiBorghei H, MarziehAlikhasi M. Tilted or parallel implant placement in the completely edentulous Mandible? A Three-Dimensional Finite Element Analysis.Int J of Oral & Maxillofacial implants. 2011 July;26(4):776-81. [FullText]