

PANORAMIC RADIOGRAPHIC STUDY ON LOCATION OF MENTAL FORAMEN IN PATIENTS OF ORTHODONTIC TREATMENT

Dr Shardha Bai Rathod¹, Dr Anand V Nimbal², Dr Shreedevi K Chillalshetti³, Dr Vinutha Chiniwar⁴,
Dr Vikas Desai⁵, Dr G A Hadimani⁶, Dr. Ishwar Bagoji⁷, Dr Ambadasu Bharatha⁸.

¹Lecturer, ²Prof & Head, ³Senior Resident, ⁴Senior Resident, ^{5,6,7}Assistant Professor, Department of Dentistry and Anatomy, BLDE (Deemed to be University), Shri BM Patil Medical College, & Research Centre, Vijayapura, India.

⁸Lecturer in Faculty of Medical Sciences, The University of the West Indies, Cave Hill Campus, Barbados, WI.

Abstract

Background: Information on the location of the mental foramen is the need for various purposes in dental treatment. Change in Anatomy and morphometry of foramen can be a cause of complications during local anaesthesia or surgical procedures. The usual position of the mental foramen in the Vijayapur population has not been previously reported. **Objectives:** To determine the most common type and position of the mental foramen in the Vijayapur population. **Materials and Methods:** 291 panoramic radiographs were evaluated with regard to only the position of mental foramen foramina in male and female subjects. **Results:** We found that the position of mental foramen was most common in line with second premolar (54.2%) and second common in between the first and second premolar (37.5%). **Conclusions:** This study revealed the most common position of mental foramen is either between the two premolars or in line with the second premolar. This knowledge is important to perform safer mental nerve blocks in surgical interventions.

Keywords: Mandible, mental foramen, mental nerve, panoramic, radiography.

Introduction

The accurate identification of the mental foramen (MF) is important both for the diagnoses and clinical procedures.

The mental foramen is a small foramen situated in the anterolateral aspect of the body of the mandible. The mental foramen is defined as the entire funnel-like opening in the lateral surface of the mandible at the terminus of the mental canal. This foramen is contained entirely within the buccal cortical plate of bone. The most common location of mental foramen is below the apex of the second premolar or between the apices of first and second premolars. The average size of the foramen measured was 4.6 mm horizontally and 3.4 mm vertically on the lateral surface of the mandible [1, 2].

The accurate knowledge of the position of the mental foramen is important both when administering regional anaesthesia, performing periapical surgery, dental implant surgery, and endodontic treatment. Panoramic radiographic study of Mental Foramen is the most preferred diagnostic modality as it allows more accurate localization of the mandibular foramen in both a horizontal and vertical dimension [3]. The position of the mental foramen varies among races and genders. There have been variations in the mental foramen ranging from the difference in the shape and position to the presence of accessory foramen or even complete absence in some cases [4]. The purpose of this study was to report the usual position of the mental foramen in Vijayapur; it has not been reported in this population before.

eISSN: 2522-7165
pISSN: 2520-7342

Materials and Methods

We had evaluated 291 all panoramic radiographs from the patients within the age group of 15-40 years who were advised for OPG for various purposes, most of them were referred for orthodontic treatment to the Dental Department, in Shri B. M. Patil Medical College Vijayapur. Informed consent was taken from all the patients and children's consent parents. The study was approved by the ethical committee. This study was conducted over a period of one year. Radiological evaluation of the patient was done using the OPG model Orthoralix digital panoramic system (Tube Potential: 70–80 kv, Tube Current: 2–15 mA, Total Filtration: >2.5 mm, time: 14.8 s). The magnification factor, as reported by the manufacturer, is 1.25.

Exclusion criteria included:

- 1) Non-visualization of the mental foramen bilaterally on OPG
- 2) Presence of impacted premolar
- 3) Patients with missing teeth and congenitally missing premolar.
- 4) Presence of a radiolucent lesion in the lower jaw anywhere around mental foramen of the mandible

All radiographs were analyzed by the principal investigator. Random sample of 10 radiographs that were re-examined by the corresponding investigator. The assessment of radiographs was made digitally.

The position of the image of the mental foramen in a panoramic radiograph was recorded according to criteria given by Wei Cheong Ngeow and Yusof Yuzawati [5,6].

Correspondence: Dr G A Hadimani, Lecturer, Department of Anatomy, BLDE (Deemed to be University),

Shri BM Patil Medical College, & Research Centre, Vijayapura, Karnataka, India. Email: gavish.hadimani@yahoo.com



Table 1. Distribution of cases according to age and gender

Age (Yrs)	Male		Female		p value
	Frequency	%	Frequency	%	
15-20	58	28.7	144	71.3	0.94
20-25	20	27.0	54	73.0	
25-30	3	37.5	5	62.5	
>40	2	28.6	5	71.4	
Mean age	19±9.3		19±6.7		
Total	83	28.5	208	71.5	

Table 2. Gender wise distribution of mental foramen

LOCATION	MALE				FEMALE				TOTAL			
	LEFT		RIGHT		LEFT		RIGHT		LEFT		RIGHT	
	N	%	N	%	N	%	N	%	N	%	N	%
1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2	1	1.2	1	0.7	7	3.4	8	2.5	8	2.8	9	2.0
3	40	48.8	39	28.9	100	48.1	103	31.6	140	48.3	142	30.8
4	29	35.4	83	61.5	87	41.8	208	63.8	116	40.0	291	63.1
5	12	14.6	12	8.9	14	6.7	7	2.1	26	9.0	19	4.1
6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL	82	100	135	100	208	100	326	100	290	100	461	100

Table 3. Association of asymmetry/symmetry and gender

ASYMMETRY/SYMMETRY	MALE		FEMALE		p-value
	N	%	N	%	
Asymmetry	33	39.8	56	26.9	0.032*
Symmetry	50	60.2	152	73.1	
Total	83	100	208	100	

Note: * significant at 5% level of significance (p<0.05)

They were:

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

We used the edge of a ruler for the identification of the longitudinal axis of the nearest tooth on both the side and the position of the mental foramen was recorded with respect to that. The position of the large mental foramen situated between two teeth was established after drawing an imaginary line in parallel to the long axis of the teeth.[6] The location of the mental foramen was reported on the basis of gender and symmetry or asymmetry.

Statistical analysis

For anticipated Proportion of common position of the mental foramen between first and the second premolar

71.5% the minimum sample size is 313 patients with a 5% level of significance and 5% absolute error. Data was represented by using Mean ±SD, percentages and diagrams. And a significant difference was found using the chi-square test. Study duration: 1 year

The formula used: $n = z^2 p * q / d^2$

Results

Of the 291 panoramic radiographs of patients was analyzed, 83 were that of males and 208 that of females. The female patients were more compared to male patients who had been referred for the aesthetic process of orthodontic treatment. [Table 1 & 2]

A total of 291 patient’s OPGs were examined in the study. Of that 208 were females (71.5%) and 83 were males (28.5%). The most common position for the mental foramen in the present study sample was position 4 (54.2%) followed by position 3 (37.5%). [Table 3]. A total of 116 On left (40%) and 291 on right (63.1%) were found in position 4 inline second premolar and a total of 140 on left (48.3%) and 142 on right (30.8%) were found in position 3, between first and second premolar.

Discussion

The mental foramen (MF) is a very important landmark during surgical procedures. To avoid mental nerve injury during surgical procedures and an elongated styloid process leads to inferior alveolar nerve irritation during mandibular movement. This results in a progressive loss of sensation in the mental nerve [7]. The knowledge of the site of the mental foramen in the patients allows for accurate delivery of local anaesthesia for dental procedures and avoids damage to the nerve in surgical procedures, such as periapical surgery, implantation, cyst enucleation, periodontal surgery, mandibular bony osteotomy [8].

Additionally, good interpretation of anatomical landmarks in oral pathology and forensics can be aided. For all of the above-mentioned reasons, the horizontal location and position of the mental foramen have been studied utilizing panoramic radiographs or dry skulls.

With respect to detecting the anatomical structure, the cadaveric dissection methods are more accurate than radiographic methods. It has been suggested that the most common position of MF examined on 525 dry mandibles was in 43.66% located in front of the apex of the root of the second premolar that was position 4 [9].

A different position of mental foramen has recently been reported to have existed between the population of different or even of the same geography [10]. In this study, the position of the mental foramen in a randomly selected patient in the Vijayapur population was studied using panoramic radiographs rather than other plane films. Consequently, a more accurate interpretation of the location of the mental foramen in both the horizontal and vertical dimensions was allowed by using panoramic radiographs [11,12].

In our series of 291 panoramic radiographs, the position of mental foramen was most commonly both in males and females in line with the second premolar and the second most commonly was between first and second premolar. No cases were found in positions 1 and 6. This present study result coincides with observations made by Ngeow et al. The previous study showed that 95% of mental foramen was reported the position of the 3 and 4. Studies done on North American and Caucasian populations reported the area between the two premolars as the most common location of the mental foramen [13-15]. Our study on the position of mental foramen was inconsistent with findings of Yosue and Brooks, & Gupta and Soni [12,1]. The Panoramic study of position of mental foramen was also observed in Tanzanian adult black male [16], Malay population [13] Brazilian, [17] Sankar et al., [18] Malawian mandible, [19] Ukoha [20] in southeastern Nigerian Singh et al. [21] and Kanta et al. Jasser and Nwoku observed most common position as in line with the longitudinal axis of second premolar followed with location between first and second premolar in radiographs study of Saudi Arabians [22].

We had selected patients with age group from 15 to 40, the present study is a cross-sectional, epidemiologic convenient study, and was done in BLDE Medical Hospital in Dental Department, a period of one year. The presence of premolar for the detection of the mental foramen is important, from the age of 11 years the lower

canine and premolar starts erupting, so we selected the patients from the age group of 15 years and above. The study excluded patients with impacted premolar, non erupted premolar, and congenitally missing premolar, fractured cases of mandibular in region and radiograph defects.

We used panoramic radiographs because, the wide area of both hard and soft tissues is visualized in continuity, thus allowing a more accurate location of the mental foramen in both horizontal and vertical dimensions. The research results show different variability and asymmetry in the position and shape of the mental foramen in different races, age, sexes and geographies.

Conclusion

Accurate knowledge is important for dental practitioners about variation in anatomical and morphological appearance and position of the Mental Foramen for the isolation of mental nerves and vessels is to perform safer mental nerve blocks in surgical interventions.

Acknowledgment: I would like to thank Dr. Anand V Nimbal corresponding investigator and HOD of the Dental Department of BLDE (Deemed to be University) hospital Vijayapur for helping me in the observation of the panoramic radiographs.

References

- [1] Gupta S, Soni JS. Study of anatomical variations and incidence of mental foramen and accessory mental foramen in dry human mandibles. *Natl J Med Res* 2012;2:28-30.
- [2] Muhammad DA. Anteroposterior position of the mental foramen on panoramic radiographs in Sulaimani population. *Kurdistan Acad J* 2009;8:9-16.
- [3] Gungor K, Ozgur M, Semiz M, Brooks SL. A radiographic study of location of mental foramen in a selected Turkish population on panoramic radiograph. *Coll Antropol* 2006;30(4):801.
- [4] Hasan T, Fauzi M, Hasan D. Bilateral absence of mental foramen – A rare variation. *Int J Anat Variations* 2010;3:167.
- [5] Haghaifar S, Rokouei M, Radiographic evaluation of the mental foramen in a north American, , population w. . 1998;85:457-460.
- [6] Ngeow WC, Yuzawati Y. The location of the mental foramen in a selected Malay population. *Journal of Oral Science* 2003;45(3):171-175.
- [7] Bagoji IB, Hadimani GA, Patil BG, Bannur BM, Ambadasu B. Bilateral elongated styloid process: Its anatomical embryological and clinical implications. *International Journal of Medical Research & Health Sciences* 2013;2(2):273-6.
- [8] Rowe AH. Damage to the inferior dental nerve during or following endodontic treatment. *Br Dent J* 1983 Nov;155(9):306-7.
- [9] Gershenson A, Nathan H, Luchansky E. Mental foramen and mental nerve: changes with age. *Acta Anat (Basel)* 1986;126(1):21-8.
- [10] Ari I, Kafa IM, Basar Z, Kurt MA. The localization and anthropometry of mental foramen on late Byzantine mandibles. *Coll Antropol* 2005;29(1):233-6.

- [11] Philips JL, Weller, R. Norman, , Kulild JC. The mental foramen: Part II. Radiographic position in relation to the mandibular second premolar. *Journal of Endodontics* 1992;18(6):271-274.
- [12] Yosue T, Brooks SL. The appearance of mental foramina on panoramic radiographs. I. Evaluation of patients. *Oral Surgery, Oral Medicine, Oral Pathology* 1989;68(3):360-364.
- [13] Ngeow WC, Yuzawati Y. The location of the mental foramen in a selected Malay population. *Journal of Oral Science* 2003;45(3):171-175.
- [14] Shankland WE. The position of mental foramen in Asian Indians. *J Oral Implantol* 1994;68:118-23.
- [15] Gangotri S, Patni VM, Sathwane RS. Radiographic determination of position and symmetry of mental foramen in Central Indian population. *J Indian Acad Oral Med Radiol* 2011;23:101-3.
- [16] Fabian FM. Position, shape and direction of opening of the mental foramen in dry mandibles of Tanzanian adult black males. *Ital J Anat Embryol* 2007;112:169-77.
- [17] Maise MA, Felipe BP. The mental foramen position in dentate and edentulous Brazilian's mandible. *Int J Morphol* 2008;26:981.
- [18] Sankar DK, Bhanu SP, Susan PJ. Morphometrical and morphological study of mental foramen in dry edentulous mandibles of South Andhra population of India. *Indian J Dent Res* 2011;22(4):542-6.
- [19] Igbigbi PS, Lebona S. The position and dimensions of the mental foramen in adult Malawian mandibles. *West Afr J Med* 2005;24:184-9.
- [20] Ukoha UU. Position, shape and direction of the mental foramen in mandibles South-Eastern Nigeria. *Int J Biomed Res* 2013;4(9):499-503.
- [21] Roy PP, Ambali MP, Doshi MA, Jadhav SD. Variation in the position shape and direction of mental foramen in dry mandible. *Int J Anat Res* 2014;2(2):418-20.
- [22] Jasser NM, Nwoku AL. Radiographic study of the mental foramen in a selected Saudi population. *Dentomaxillofac Radiol* 1998;27(6):341-3.