MedCrave
Step into the World of Research

Journal of Otolaryngology-ENT Research

Review Article

Open Access

CrossMark

Evaluation of mental foramen in U. P. population- A CBCT study

Abstract

Introduction: Mental foramen is variable in location & in type of emergence affecting the sufficiency of local anesthesia and safety during surgical procedure.

Aims and objective: To evaluate the location, type of emergence and accessory mental foramina by means of Cone Beam CT scan.

Material and method: A cross-sectional study of 150 CBCT images were retrieved from archive of Department of Oral Medicine and Radiology, KGMU, Lucknow and evaluated for location, emergence and presence of accessory foramina in the body of mandible.

Results and discussion: Most often mental foramen is antero-laterally placed to second premolar. In our study, 49.4% right and 50.6 % left mental foramen are located at apex of second premolar. Anterior and straight emergence is common in right and left side respectively (72% and 81%).

Conclusion: The position of mental foramen should not be confirmed until a good quality CBCT scan is evaluated.

Keywords: accessory mental foramen, anatomic landmarks, cbct, cone-beam computed tomography, mandible, mental foramen

Volume 8 Issue 4 - 2017

Shweta Srivastava,[1] Ranjeet Kumar Patil,[2] Anurag Tripathi,[3] Vikram Khanna,[4] Parikshit Sharna[5]

[1]Resident of oral medicine and radiology KGMU, India
[2]Head of department of oral medicine and radiology KGMU, India
[3]Associate professor of oral medicine and radiology KGMU, India
[4]Assistant professor of oral medicine and radiology KGMU, India
[5]MDS Consultant, India

Correspondence: Parikshit Sharna, MDS Consultant, King George's Medical University, University in Lucknow, India, Email prkshtshrm9@gmail.com

Received: June 22, 2017 | **Published:** September 06, 2017

Abbreviations: MF, mental foramen; ROI, region of interest; FOV, fields of view; AMF, accessory mf

Introduction

Mental foramen (MF) is one of, the common sites for any form of iatrogenic injury either during achieving anesthesia or during surgery. Extraction of root tips of premolars and molars and placement of Implants in mandibular premolar region are the most complicated surgical procedures due to potential inadvertent complications of neuro-sensory alterations in the chin and lower lip. Chances of injury rises further if mental foramen is not properly identified and protected.[1] Possibility of these insults further increases with variable anatomy of the mandible in position, course of neurovascular bundles passing through mandibular canal and type of emergence through mental foramen.[2] Variation in its location and accessory foramen sometimes leads to misdiagnosis of some pathology. Mental nerve and associated blood vessels pass through this foramen. Previously researchers also showed keen interest in finding the anatomical variation of mental foramen but this issue particularly gain importance due to advanced dental rehabilitation surgeries and also due to more accurate three dimensional diagnostic images (CBCT images)[2–4] Implant placement is one of those dental rehabilitation procedures whose prognosis needs precise knowledge of anatomical variations.[5] MF is located in antero-lateral aspect of mandible at an approximately equal distance (13-15mm) from the superior and inferior border of the mandible.[6] Racial differences between different nations play an important role in human anatomic variations of mental foramen in its number (AF) location (L) and emergence of mental nerve (ET).[7,8]

For Accessory MF (AMF) different authors have different descriptions in articles. Some authors described AMF as any additional foramina except the main MF[6,7] while the others considered only those foramina that are integrated with mandibular canal as AMF and rest are nutritional canals only.[9–12]

In some researches, any additional foramen except the MF has been named the buccal mandibular foramen.[11,13] Oliveira et al.,[14] reported accompaniment between AMF and bifid mandibular canal. To minimize the iatrogenic complications such as of hemorrhage, postoperative pain, paresthesia and paralysis could be reduced by detection of AMF prior to endodontic and surgical treatments including bone graft, implant insertion, osteotomy, bone plating and fracture reduction. Ethnic variations were reported to have a role in presence of AMF.[6,9,10,12,15,16]

After the invention and implication of cone beam in dentistry limitations of conventional radiography was overcome by producing three-dimensional (3D) images that allow a comprehensive evaluation of the anatomy of the region of interest (ROI).[17]

This cross sectional study was planned to assess the L and ET of MF and presence of AMF in U.P state population in India to evaluate the effect(s) of patient's age and gender on these variables, by means of CBCT.

Materials and methods

In this cross sectional study, 150 CBCT images that were acquired during a one-year period from archives of Department of Oral Medicine and Radiology, Faculty of Dental Sciences, King George's Medical University, Lucknow U.P.

Images were taken by New Tom VGi (QR SRL Co., Verona, Italy) with 110 kVp, 20 mA and voxel size of 0.3×0.3×0.3. The CBCT images were taken with different fields of view (FOV) (8×8, 12×8, 15×12 and 15×15) and were used only if they covered the ROI and matched with the inclusion and exclusion criteria.

Inclusion criteria were the Presence of first and second premolars in both sides of the mandible, and availability of precise information about patient's age and gender. Exclusion criteria presence of any

pathology, fracture, supernumerary or impacted teeth in ROI and images with poor resolution.

CBCT scans were evaluated in terms of L, TE and presence of AMF. The L was recorded based on reconstructed 3D images. Considering the description of Kieser et al.,[15] the ET of MF in the mandibular body was recorded based on axial cross-sections of CBCT images (Table 1).

The frequency of the L in relation to age and gender was first analyzed descriptively. The Pearson chi-square and Fisher's exact tests were used to assess the relation between patients' demographic variables with L, ET and occurrence of AMF. Data were analyzed with SPSS software (SPSS version 15.0, SPSS, Chicago, IL, USA) and the level of significance was set at 0.05.

Table 1 Classification of Variables (L & ET)

Variation in Location of Mental Foramen (L) was Categorized by Pyun et al. into Four Groups.
Type 1: Below the apex of second premolar
Type 2: Between the apices of second and first premolars
Type 3: Between the apices of second premolar and first molar
Type 4: Distal to apex of first molar.
Emergence Type (ET) of Mental Nerve was Classified by Kieser et al. [8]
Posterior
Anterior
Right-Angled
Multiple-Angled

Table 2 Presentation of Variables and their Distribution

Variables		**L**				**ET**			**AMF**	
		I	**II**	**III**	**IV**	**A**	**P**	**S**	**Number**	**Side**
Male	20-30	12	7	4	2	7	13	5	1	Right
-91	(Group-1)	13	6	5	1	7	12	6	0	Left
	31-40	16	9	5	3	8	18	7	2	Right
	(Group-2)	15	10	6	2	9	20	4	1	Left
	41-50	17	10	4	2	9	17	7	0	Right
	(Group-3)	18	9	5	1	8	21	4	0	Left
Female (59)	20-30	10	3	2	2	4	10	3	0	Right
	(Group-1)	11	3	3	0	3	10	4	1	Left
	31-40	11	4	3	1	6	9	4	2	Right
	(Group-2)	12	4	2	1	5	10	4	0	Left
	41-50	13	6	2	2	6	12	5	0	Right
	(Group-3)	12	8	2	1	7	14	2	2	Left

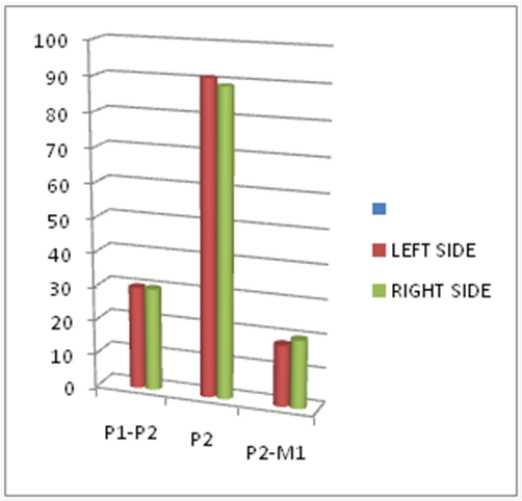

Figure 1 Location of Mental Foramen.

Results

The final evaluated images comprised of 150 CBCTs belonging to 91 males and 59 females. Mean age of study population was 41years.

Location of mental foramen varies greatly but apical area of the second premolar (type I) was the most common location for MF. 49.8% male population and 58% female population have type I location. Posterior ET was more common. As 52.8% male population and 52.5% of female population have posterior emergence. 5.2 % of mandible has accessory mental foramen while 1.75% has bilateral accessory foramen. Type I location was common in age group I (52%), group II (51.9%), and group III (53%) in both male and female on both sides. Posterior emergence was common in age group I (54.8%), group II (52%), and group III (51.8%) in both male and female (Figure 1 & 2), (Table 2).

Discussion

This study analysed location, number and emergence type of mental foramen in 150 CBCT images in Indian population. Mental foramen recently got more interest from different aspects of dental science to improve human health. Many studies were planned globally to determine normal anatomical structure of mental foramen and possible variations.[7,9,16,18] Apart from its clinical implication mental foramen can serve as forensic landmark. As it varies from person to person and remain stable throughout the life in an individual.

Most common location of mental was apical to second premolar antero-lateraly as established by present study in Indian population. Other studies also reported this position as most preferred position.[19]

Citation: Srivastava S, Patil RK, Tripathi A, et al. Evaluation of mental foramen in U. P. population- A CBCT study. *J Otolaryngol ENT Res.* 2017;8(4):478–481. DOI: 10.15406/joentr.2017.08.00253

Saintini & alayan in their anthropometric study described that racial characteristics are major deciding factor for position of mental foramen. Chinese have it in the long axis of second premolar but Indian and Caucasoid have it between first and second premolar.

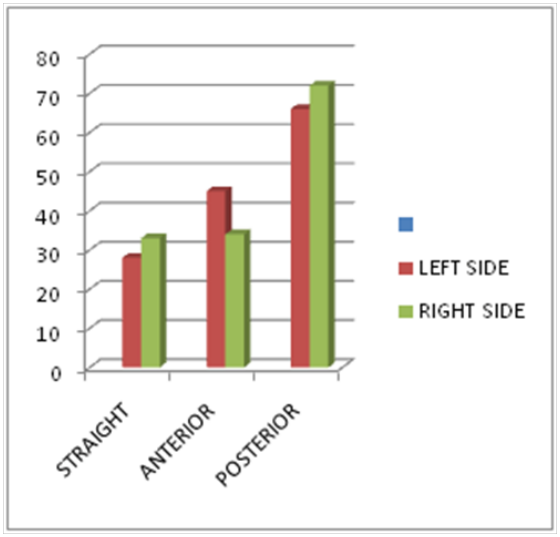

Figure 2 Type of Emergence.

As most of previous studies were done with OPG x-rays which represent flat image of a curved structure, so imaging technique could be a responsible factor for slight difference. CBCT produces exact angulated image of curved structures and can minimizes these differences.

In present study posterior emergence type was recorded as most common emergence type which is also supported by Kieser et al.,[8] An Iranian study on native population stated that posterior emergence was least common. This could be due to different examination pattern and different population.

12th week of embryonic is critical period for division of mental nerve. If mental foramen formed after this division there are high chances for accessory mental foramen formation. To avoid pain, parasthesia and loss of other sensation clinician should be well prepare for these variations.[20]

Some studies report accessory mental foramen as rare entity and its prevalence ranges 1.4-10%. Incidence of accessory foramina was much higher in Negros and Maori.[8] Some cadaveric studies even reported 5.33% double and 0.7% triple mental foramina also.

According to singh & srivastava[7] examination of dry extracted mandible is the most accurate method to find out any variation regarding mental foramen, but in clinical practice CBCT provide suffiecient and effective information regarding the anatomy and anatomical variations.

Conclusion

CBCT is an effective tool for three-dimensional assessment of MF. The possible presence of AMF should be borne in mind to avoid the occurrence of a neurosensory disturbance/hemorrhage following surgical procedures. It can be concluded that the most prevalent location for MF is below the apex of second premolar.

Acknowledgments

None.

Conflicts of interest

Author declares there are no conflicts of interest.

Funding

None.

References

1. Juodzbalys G, Wang H-L, Sabalys G. Anatomy of mandibular vital structures. Part II: mandibular incisive canal, mental foramen and associated neurovascular bundles in relation with dental implantology. *J Oral Maxillofac Res*. 2010;1(1):e3.
2. von Arx T, Friedli M, Sendi P, et al. Location and dimensions of the mental foramen: a radiographic analysis by using cone-beam computed tomography. *J Endod*. 2013;39(12):1522–1528.
3. Tebo HG, Telford IR. An analysis of the variations in position of the mental foramen. *The Anatomical Record*. 1950;107(1):61–6.
4. Montagu M. The direction and position of the mental foramen in the great apes and man. *Am J Phys Anthropo*. 1954;12(4):503–518.
5. Riesenfeld A. Multiple infraobaital, ethmoidal, and mental foramina in the races of man. *Am J Phys Anthropol.* 1956;14(1):85–100.
6. Balcioglu HA, Kocaelli H. Accessory mental foramen. *N Am J Med Sci*. 2009;1(6):314.
7. Singh R, Srivastav A. Study of position, shape, size and incidence of mental foramen and accessory mental foramen in Indian adult human skulls. *Int J Morphol*. 2010;28(4):1141–1146.
8. Kieser J, Kuzmanovic D, Payne A, et al. Patterns of emergence of the human mental nerve. *Arch Oral Biol.* 2002;47(10):743–747.
9. Sisman Y, Sahman H, Sekerci A, et al. Detection and characterization of the mandibular accessory buccal foramen using CT. *Dentomaxillofac Radiol*. 2012;41(7):558–563.
10. Naitoh M, Hiraiwa Y, Aimiya H, et al. Accessory mental foramen assessment using cone-beam computed tomography. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2009;107(2):289–294.
11. Katakami K, Mishima A, Shiozaki K, et al. Characteristics of accessory mental foramina observed on limited cone-beam computed tomography images. *J Endod*. 2008;34(12):1441–1445.
12. Naitoh M, Nakahara K, Hiraiwa Y, et al. Observation of buccal foramen in mandibular body using conebeam computed tomography. *Okajimas Folia Anat Jpn*. 2009;86(1):25–29.
13. Iyengar AR, Patil S, Nagesh KS, et al. Detection of anterior loop and other patterns of entry of mental nerve into the mental foramen: A radiographic study in panoramic images. *Journal of Dental Implants*. 2013;3(1):21–25.
14. de Oliveira-Santos C, Souza PHC, de Azambuja Berti-Couto S, et al. Assessment of variations of the mandibular canal through cone beam computed tomography. *Clin Oral Investig*. 2012;16(2):387–393.
15. N S M, N S K, Singh M, et al. Accessory mental nerve: a case report. *J Clin Diagn Re*. 2013;7(9):2078–2079.
16. Parnia F, Moslehifard E, Hafezeqoran A, et al. Characteristics of anatomical landmarks in the mandibular interforaminal region: a cone-beam computed tomography study. *Med Oral Patol Oral Cir Bucal* . 2012;(3):e420–e425.
17. Kiarudi AH, Eghbal MJ, Safi Y, et al. The Applications of Cone-Beam Computed Tomography in Endodontics: A Review of Literature. *Iran Endod J*. 2015;10(1):16–25.

18. Leite GMF, Lana JP, de Carvalho Machado V, et al. Anatomic variations and lesions of the mandibular canal detected by cone beam computed tomography. *Surg Radiol Anat* . 2014;36(8):36(8):795–804.

19. Haghanifar S, Rokouei M. Radiographic evaluation of the mental foramen in a selected Iranian population. *Indian J Dent Re*. 2009;20(2):150.

20. Olasoji H, Tahir A, Ekanem A, et al. Radiographic and anatomic locations of mental foramen in northern Nigerian adults. *Nigerian Postgraduate Medical Journal.* 2004;11(3):230–233.

Citation: Srivastava S, Patil RK, Tripathi A, et al. Evaluation of mental foramen in U. P. population- A CBCT study. *J Otolaryngol ENT Res.* 2017;8(4):478–481. DOI: 10.15406/joentr.2017.08.00253