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Morphologic and morphometric analysis of the mental foramen: A systematic review

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Abstract

Mandible is the only movable bone of the facial skeleton that forms almost the lower half of the face. In ontogeny, the mandible undergoes substantial morphological and dimensional changes. These changes are largely associated with development of primary and secondary dentition in the human. The present study was undertaken for morphologic and morphometric analysis of mental foramen (MF). The position of MF is very important as important neurovascular bundles passes through it. It is landmark to facilitate local anaesthetic, surgical and other invasive procedures or the dental surgeons performing periapical and periradicular surgeries in parasymphysis region. The findings of this study might be useful in providing important data to anatomists, archaeologists, forensic legal experts and maxillofacial surgeons.

Keywords: Mandible, mental foramen, morphology, morphometry.

Introduction

Mandible is the only movable bone of the facial skeleton that forms almost the lower half of the face. It is one of the functionally and cosmetically important structures of the face that contributes to the facial contour. It is largest and strongest bone of the face. Evolution of mandible, the lower jaw is of greatest interest in vertebrate history. It is one of the earliest innovations in the evolution of vertebrates.(1) It develops from the first pharyngeal arch. It has horseshoe shaped body which lodges teeth and a pair of rami which projects upwards.(2)

The Mental Foramina (MF) are a pair of openings present on the external surface of the body of the mandible, one on either side of the midline. The MF is described to be funnel shaped, with the mouth of the opening being round or oval. It lies at a variable distance away from the midline and between the upper alveolar border and the lower inferior border of the mandible.(3) The MF, from which the mental nerve and vessels emerge, lies in premolar-molar

teeth region. It gives passage to mental nerve, mental artery and vein. Mental nerve is a branch of inferior alveolar nerve which in turn is a branch of the mandibular nerve. It supplies chin, labial gingiva of lower teeth. The mental artery is a branch of inferior alveolar artery and a branch of maxillary artery. It supplies the chin lower teeth and gingiva. Mental vein, which drains into facial vein, is a part of pterygoid venous plexus.[4]

Importance of mental foramen

MF is an important landmark during local anesthesia (mental nerve block) and at the time of surgical intervention in the mental region of mandible. The knowledge of the position of MF is also important for endodontics (root canal treatment and apicectomy), periodontal surgery,[5] flap operation of lower teeth[5] implant placement, fracture reduction, bone harvesting from chin and orthognathic surgery. The mental nerve could be injured during surgical procedures, resulting in paraesthesia or anesthesia. Generally the MF is difficult to locate as it cannot be clinically visualized and palpated.[6]

Anatomical importance of MF is underscored. An atypical radiographic appearance of the MF may be mistaken for radiolucent lesion in the apical area of mandibular premolar teeth.[7] Also, instrumentation can produce inflammation of the apical tissue, so distance from the root apex to the MF must be taken into consideration to reduce post-operative symptoms.[8]

Developmentally, MF is an ideal model to study bone remodelling due to presence of neurological, vascular and primordial contents. It is the determinant of mandible maturity and symmetry pattern of the mental triangle.[9]

So, MF holds strategic importance not only in clinical dentistry but also in oral surgery. Its accurate identification determines the effectiveness of nerve blocks and prevention of post-operative neurovascular complications in the mental region like neuro-sensory disturbances, paralysis, hemorrhage, altered sensation, orofacial pain, a typical neuralgia etc.[9]

Age changes related to mental foramen

Each half of the mandible ossifies from only one centre which appears at about 6th week of intra-uterine life in the mesenchymal sheath of meckel's cartilage near the future MF. Meckel's cartilage is the skeletal element of first pharyngeal arch. At birth MF opens below the sockets of the two deciduous molar teeth near the lower border, this is because the bone is made up of only the alveolar part with sockets. The mandibular canal runs near the lower border. The foramen and canal gradually shift upwards. In adults, the MF opens midway between the upper and lower borders because the alveolar and sub alveolar parts of the bone are equally developed. The mandibular canal runs parallel with the mylohyoid line. In edentulous mandible the alveolar border is resorbed, so that the height of the body is markedly reduced. The MF and the mandibular canal are close to the alveolar border.[3] In extreme cases it may open directly at the alveolar crest.[9] MF is directed anteriorly before the fusion of mandible and directed posteriorly after 2-3 years of the age.[6]

The MF in the embryonic period is at the apical area of the canine and 1st deciduous molar. During the development of the mandible until the eruption of deciduous molars, the MF is displaced anteriorly but after eruption of the 2nd deciduous molar it redirects posteriorly. This displacement is a possible cause for development of an anterior loop of the inferior alveolar nerve before it emerges as the mental nerve.[6]

Methodology

An extensive review of published literature was done through use of general and meta search engines (Google Scholar, PubMed, Science Direct) to harvest prominent medical database (Medline, Embase, Conchrane). The search strategies used were 'Mesh' (key terms used were :

mandible, MF, mandibular canal, mental nerve, mental canal etc), 'text word' searching, 'reference list' harvesting and 'related articles' feature. Strict inclusion and exclusion criteria were applied to select 100 articles ranging from the year 1986 through 2018, based on context relevance.

Inclusion criteria

1. Dry skulls macroscopic investigations on MF, investigations with plain radiography, periapical radiography and computed tomography highlighting foramen gross morphology and morphometry, retrospective analysis of mandibular and mental regions.
2. Evaluative studies to detect the frequency, size, number and ideal position of MF, reviews dealing with age and race related variations of MF or post-operative complications of the sub mandibular region.

Exclusion criteria

1. Studies on child skulls, animal mandibles and dry mandible researches where race or sex were unidentified.
2. Studies with exclusive or excessive detailing on histology and development of the MF were excluded from the review.

Key journals from library were hand searched (British dental journal, Saudi dental journal, American journal of dentistry, Journal of anatomy, Journal of American dental association, American Journal of orthotics, Archives of oral biology etc.). Endnote reference management system was used.

Discussion

MF represents the termination of the mental canal. The inferior alveolar nerves and vessels, after traversing the mandibular canal, exit through the MF as the mental nerves and vessels. These form an important innervations for the lower jaw, cheek, teeth and lip. Developmentally, MF is an ideal model to study bone remodelling due to presence of neurological, vascular and primordial contents. It is the determinant of mandible maturity and symmetry pattern of the mental triangle. There are discrepancies in studies regarding the shape, size, modal position and number of MF in human mandibles. These discrepancies result from naturally occurring differences in facial structure, jaw skeleton size and feeding habit induced bone remodelling in mandibles of different human races. Another reason for diversification in observations is the difference in strategies used to record data about MF; ranging from direct measurements to digital imaging, conventional panoramic radiography, computerized tomographic scans etc.[9,10]

So the credibility of this analysis lies in the fact that accurate knowledge of various morphologic and morphometric parameters of MF can be of significant help in accurate localisation of important maxillofacial neurovascular structures in and around MF.

For that following points are very important to analyse.

Table 1: Parameters for the evaluation of the MF.

Sr. No.	Characteristics	Sr. No.	Characteristics
1.	Position of the MF in relation to tooth	7.	Distance of MF from standard landmark
2.	Size of the MF	8.	Distance between MF and AMF
3.	Type of the MF	9.	Absence of MF
4.	Shape of the MF	10.	Incidence of accessory MF (AMF)
5.	Direction of opening of the MF	11.	Position of AMF
6.	Symmetry of MF	12.	Size of the AMF

1. Position of the mental foramen in relation of tooth : Tebo and Telford classification is used to establish the horizontal relationship of the MF to mandibular teeth. It is classified into 6 groups.[11,12]

Position 1 :- Between canine and 1st premolar.

Position 2 :- At the level of 1st premolar.

Position 3 :- Between 1st and 2nd premolar.

Position 4 :- At the level of 2nd premolar.

Position 5 :- Between 2nd premolar and 1st molar.

Position 6 :- At the level of the 1st molar.

According to Yesilyurt, most common position in different populations are below[7,11,13] :-

Position 3 :- Negroid, British, Central Anatolian, North Americans white population, Jordania, Kosovarian.

Position 4 :- Indian, Chinese, Kenyan Africans, Nigerians, Mongoloid, Saudi, Kenyan,

Korean, Thailandian, Kurdish, Sri Lankan, Malaysian, Tanzanian.

Position 5 :- Caucasian, Zimbabweans, Blacks.

So, the most common position of the MF is position 4.[3,6,7,9,11,13,14] Position 1 and Position 6 are relatively rare.[9] Some authors have mentioned that the most common position of MF is between the apices of mandibular 1st and 2nd premolar, but this is found to be second common position. The position of the MF varies depending on various factors like symmetry of mental triangle, morphology and maturity of the human mandible, bone remodelling activity and anthropologic features of the facial skeleton in different populations.[6,11,13]

Sankar et al. had observed positions of the MF in relation to apex of mandibular premolar sockets. MF was situated in 42% below the level of premolar apex, 36% above the premolar apex and in the remaining 22% situated at the level of apex of socket. So, in most of the cases MF is below the apex of the premolars. If MF is above the apex of the premolar then distance is shown in negative value (from -2.7 to -2.8 mm) and if it is below the apex of premolar than it is shown in positive value (+2.8 to +3.7 mm). Owing to this small distance between the apex of tooth socket and MF, there is possibility of damaging the mental nerve or inferior dental nerve during endodontic treatment like root canal filling.[5]

2. Size of the mental foramen : Studies have reported MF diameter ranging from 2.38 mm to 2.64 mm. Morphometric studies reveal the height of MF to range from 2.5 mm to 5.5 mm (average 3.5 mm) and the width ranging from 2 to 5 mm (average 3.6 mm).[9] Gumusok et al. have reported 3.11 ± 0.89 and 2.80 ± 0.99 mm in vertical and horizontal dimensions respectively. No significant difference was observed between male and female subjects. Results are similar with the results of Kalender et al.[15]

Table 2: Size of MF in different populations according to different studies.

Author	Year	Population	Horizontal diameter		Vertical diameter	
			Right side	Left side	Right side	Left side
Oguz and Bozkir	2002	Turkey	2.93 mm	3.14 mm	2.38 mm	2.64 mm
Oliveira Junior et al.	2009	Japanese	3.32 mm	3.25 mm	2.38 mm	2.39 mm
Ilayperuma et al.	2009	Sri Lanka	3.26 mm	3.41 mm	2.45 mm	2.60 mm
Agrawal and Gupta	2011	South Gujarat	3.33 mm	3.25 mm	2.15 mm	2.13 mm
Budhiraja et al.	2013	North Indian	5.19 mm	5.12 mm	2.61 mm	2.53 mm
Udhaya et al.	2013	South Indian	2.28 mm	2.95 mm	2.86 mm	2.52 mm

Rai et al.	2014	Indian	2.63 mm	2.61 mm	2.33 mm	2.29 mm
Nimje et al.	2014	Indian	3.11 mm	3.18 mm	2.53 mm	2.56 mm
Voljevica et al.	2015	Bosnia	2.56 mm	2.41 mm	1.71 mm	1.69 mm
Kadel et al.	2016	Nepalese	3.01 mm	2.88 mm	2.29 mm	2.29 mm
Lalitha and Rao	2016	South Indian	3/04 mm	2.86 mm	2.31 mm	2.19 mm

So. differences in the dimensions can be basically due to change in the proportion of the size of the MF from oval to round. Overall, no significant difference between right and left side dimensions.[15] Also, no significant difference in the dimensions in different age groups.[11] (Table 2)

3. **Type of mental foramen :** According to Yosue and Brooks classification[14] :-

a. Type I :- Continuous type, the mental canal is continuous with the mandibular canal.

b. Type II :- Separate type, the foramen is distinctly separated from the mandibular canal and appears as a well-defined radiolucency with a distinct border.

c. Type III :- Diffuse type, the foramen has an indistinct border.

d. Type IV :- Unidentified type, the foramen cannot be seen.

According to Suragimath A et al., the most frequent type of MF is separate type (61.8%) followed by continuous type (38.2%), which is in accordance with the study conducted by Shah et al. in Gujarat population. In both the males and females and on both sides, the separate type was the most common.[14]

4. Shape of the mental foramen : There are no significant relationships between age and gender of the patients and type of MF on right and left sides.[7,11,16] Overall, there can be three shapes of the MF.

5. Type 1 :- Oval horizontal.

Type 2 :- Oval vertical.

Type 3 :- Round.

Out of which type 2 is the most rarely reported.[11] (Table 3)

Table 3 : Types of MF in different populations according to different studies.

Author	Year	Oval shape	Round shape	Race / Region	Type of study
Gershenson et al.	1986	65.52 %	34.48%	Israel	Dry mandible
Mbarjiorgu et al.	1998	56 %	44 %	Zimbabwean	Dry mandible
Oguz and Boskir	2002	92 %	8 %	Turkish	Dry mandible
Igbigbi et al.	2005	70 %	30 %	Malawian	Dry mandible
Prabodha and Nanayakkara	2006	66.67 %	33.33 %	Sri Lanka	Dry mandible
Fabian et al.	2007	54 %	46 %	Tanzania	Dry mandible
Oliveira Junior et al.	2009	72 %	27 %	Japanese	Dry mandible
Ilayperuma et al.	2009	59 %	41 %	Sri Lanka	Dry mandible
Singh and Srivastav	2010	6 %	94 %	Indian	Dry mandible
Siddiqui et al.	2011	70 %	30 %	Western India	Dry mandible

Singh et al.	2011	10 %	90 %	West India	Dry mandible
Agrawal et al.	2011	92 %	8 %	South Gujarat	Dry mandible
Sankar et al.	2011	21 %	79 %	South Andhra	Dry mandible
Shaik et al.	2012	65 %	35 %	South Indian	Dry mandible
Adejuwon et al.	2012	65.5 %	32.5 %	Yoruba ethnic group of Nigeria	Dry mandible
Sekerci et al.	2013	Less frequent	Most frequent	Turkish	CT
Parmar et al.	2013	69 %	31 %	Gujarat	Dry mandible
Budhiraja et al.	2013	74.3 %	25.7 %	North India	Dry mandible
Kishwor Bhandari et al.	2013	More frequent	Less frequent	Maharashtra	Dry mandible
Moogala et al.	2014	Less frequent	More frequent	Coastal Andhra	Dry mandible
Zhang et al.	2015	Most frequent	Less frequent	Chinese	CBCT
Voljewica et al.	2015	83.3%	16.7 %	Bosnian	Dry mandible
Kadel et al.	2016	55.5 %	45.5 %	Nepalese	Dry mandible
Lalitha and Rao	2016	70 %	30 %	South India	Dry Mandible
Bala et al.	2017	58.54 %	41.46 %	Indian	Dry Mandible
Dipak et al.	2018	64	36	Random	Dry mandible
Alam et al.	2018	Less frequent	Most frequent	Arabic	CBCT
Zmyslowska-Polakowska et al.	2019	Most frequent	Less frequent	Polish	CBCT

6. Direction of opening of the mental foramen : According to Lalitha and Rao, the direction of opening of the MF is posterior superior (most commonly) in 88.57%, superior in 5.71%, anterior superior 4.2% and anterior inferior in 1.42% of the foramina.[4] Mwaniki had also observed postero-superior direction of opening of MF, as most common one. (92%)[17] Udhaya et al. and Agarwal et al. observed the same in their study.[4] Kadel et al. had also observed direction of opening of the MF postero-superiorly in majority of the cases (65% of the cases). Other directions were posterior, superior, anterior and antero-superior.[6]

7. Symmetry of the mental foramen : According to Suragimath A et al., MF is symmetrically located in majority (54.9%) of cases. The higher percentage of symmetry is observed in other populations; for example, 90.4% in Turkish, 77% in North Jordanian, 82.7% in Kurdish, 85.7% in Iranians. Few studies have shown lower percentage of symmetry among Asian Indians. Not a single study has shown 100% of

symmetry of MF positioning on both sides. Thus it clearly indicates that MF is not always symmetrical in same individuals.[14]

8. **Distance of the mental foramen from the standard anatomical landmarks :** Knowledge of the average distance between the MF and the midline, mental symphysis, posterior border, inferior border and alveolar border is important in clinical practice, because this foramen cannot be palpated or visualized, but its location is determined using the teeth. However, in cases of toothless mandibles, these values are used to locate the MF. Many of the differences may be attributed to the nutrition habits of the population which affect the development of the mandible and the entire digestive system.[12] (Table 4)

Table 4 :Distance of MF from standard anatomical landmarks in different populations according to different studies.

Author	Year	Population	MF-AB	MF-IB	MF-SM	MF-PB
Singh et al.	1992	North India	15.3 mm	14.9 mm	23.6 mm	76.2 mm
Prabodha et al.	2006	Sri Lanka	-	12.25 mm	26.52 mm	65.38 mm
Apinhasmit et al.	2006	Thailand	-	14.88 mm	28.83 mm	68.85 mm
Yesilurt et al.	2008	Turkey	10.6 mm	9.45 mm	19.3 mm	48.4 mm
Sidduiqui et al.	2010	Western India	10.1 mm	10 mm	19.2 mm	47.4 mm
Sankar et al.	2011	South Andhra	15 mm	15.4 mm	27.4 mm	70.7 mm
Parmar et al.	2012	Eastern India	10.5 mm	10.7 mm	22.9 mm	61.9 mm
Budhiraja et al.	2013	North India	11.4 mm	15.34 mm	-	-
Voljevica et al.	2015	Bosnian	14.37 mm	12.7 mm	25.63 mm	59 mm
Balakrishnan et al.	2015	South India	12.10 mm	13.5 mm	25.9 mm	68.9 mm
Kadel et al.	2016	Nepalese	13.85 mm	12.25 mm	26.6 mm	65.5 mm
Bala et al.	2017	Indian	11.04 mm	11.1 mm	24.4 mm	-
Dipak et al.	2018	Indian	11.95 mm	12.43 mm	25.9 mm	61.4 mm

AB = Alveolar border, IB = Inferior border, SM = Symphysis menti, PB = Posterior border.

Anand Jagannath Reddy et al. and Moogala et al. had studied dimensional differences in dentulous and edentulous mandible. Significant difference had been observed in the distance between alveolar border and MF, posterior border and MF and symphysis menti and MF in dentulous and edentulous mandible. While no significant difference was observed in the distance between inferior border and MF in both types of mandible. Which probably shows the resorption pattern of the mandible between dentulous and edentulous mandible.[1,10] On general overview no significant difference is observed on the above dimensions in right and left side of mandible.[3,6]

So, the variability in MF position from the standard anatomical landmarks is related to different feeding habits which subsequently affecting mandibular development. Also the differences observed among the studies related to different methodology such as measurement on skull photographs or use of different skull marks like center versus anterior or inferior margin of MF or absence of skull marks information.[18]

9. **Mean distance between mental foramen and accessory mental foramen :** In the literature distance

between MF and AMF is reported between 2.5 mm to 6.3 mm. According to Gumusok et al. the mean distance between MF and AMF is 2.85 mm. (2.84 ± 2.14 mm) No significant difference are found between male and female.[15]

10. **Absence of the mental foramen :** Absence of MF is an extremely rare occurrence and reports of the same are quite infrequent. The key underlying reasons for absence may include congenital agenesis, hyperplasic bony lesion, post traumatic fibrosis or age related bone resorption induced positional ascent and loss of MF at the alveolar crest. Occasionally, false reporting of apparent MF absence may arise from poor quality imaging or patient position induced misalignment and superimposition of the foramen with other bony structures. The absence of MF is not related with the perviousnes of inferior alveolar canal; in fact in all the above reported cases of absence, authors have described the inferior alveolar canal to be partially or completely pervious. MF absence may cause sensory alterations in the lower jaw because of absence of any exit portal for mental nerves. Hasan et al. had reported one case with bilateral absence of MF.[9] The absence of the MF was investigated in 1,435 dry human mandibles (2,870 sides) by De Freitas et al. The foramen was absent twice in the right side (0.06%) and once in the left side (0.03%).[7]

11. **Incidence of accessory mental foramen :-** Though existence of a single MF, is the most common presentation, variations like supernumerary (AMF) or absent foramen are also encountered. In fact, presence of AMF (double>triple>quadruple) is a much more common phenomenon than absence. This phenomenon occurs due to splitting of the mental nerve into several fasciculi before the development of MF during the 12th week of intrauterine life. Such variations are often accidently discovered during routine diagnostic or therapeutic oral procedures. The incidence of AMF differs among races : being more frequent in Caucasians than non-Caucasians. The presence of supplementary blood vessels or nerves in AMF hold clinical significance as portals of anesthetic and post-operative neurovascular - hemorrhagic / paralytic complications during implant procedures. Rarely, they may play an unexplained role in the spread of tumors of the mental region.[9] (Table 5,6)

Senyurek reported that multiple MF were characteristic of prehistoric man and that evolution has tended to reduce this number to one in modern man. Olivier felt that an AMF may be nothing more than a bony septum dividing the foramen into two openings or the persistence of the anterior orifice of the canal of Serres or the mandibular canal of primary dentition.[15]

Table 5: Incidence of AMF in different populations.

Population	Incidence of AMF	Population	Incidence of AMF
French	2.6%	Melanese	9.7%
American Whites	1.6%	Egyptians	3.6%
American Blacks	5.4%	Japanese	12%
Greeks	3.3%	Asian Indians	1.5%
Russians	1.5%	African Americans	5.7%
Hungarians	3%	Pre-columbian and Nazca Indian	9.0%

Table 6 : Incidence of AMF in different populations according to different studies.

Author	Year	Incidence of AMF	Population	Type of study
Riesenfeld et al.	1956	12.5%	Polonaise race	Dry mandible
Gershenson et al.	1986	4.3%	Indian and Israel	Dry mandible
Serman et al.	1989	2.7%	South Africa	Dry mandible
Zografos and Mutzuri	1989	6.68%	Greek	Dry mandible
Suresh et al.	1992	11.48%	North India	Dry mandible
Sawyer et al.	1998	1.4%	White Americans	Dry mandible
		1.5%	Asian Indians	
		5.7%	Africans-Americans	
		9%	Nazca natives	
Al-Khateeb et al.	2007	10%	Jordan	OPG
Naitoh M. et al.	2009	7%	Japan	CBCT
Singh and Srivastav	2010	13%	India	Dry mandible
Sankar et al.	2011	8.7%	South Andhra, India	Dry mandible
Budhiraja et al.	2013	6.6%	North India	Dry mandible
Voljevica et al.	2015	2.7%	Bosnia	Dry mandible
Kadel et al.	2016	6 %	Nepalese	Dry mandible
Bala et al.	2017	4.87%	India	Dry mandible

Budhiraja et al. had observed possibility of presence of triple MF (two AMF) is 0.7%.[18] Whereas Gumusok et al., in his study on CBCT image had observed triple MF in 10% cases and quadruple MF in 1.2% of population. Bifid mandibular canal is commonly associated with AMF in majority of the cases.[15]

Different results were obtained about whether there is a relation between AMF and gender. Naitoh et al., Goregen et al. and Kalendar et al. suggested that the prevalence of AMF did not vary depending on gender, but Sawyer et al. reported that AMF was more frequent in African and American male patients.[15]

The most appropriate method for the diagnosis of AMF is the inspection conducted during the dissection process of dried mandibles. However, this method is not used in clinical practice. Instead, radiographic examination is used for diagnosis. In the past, panoramic radiographs were employed for the diagnosis of AMF. However, the prevalence of these formations was found to be lower compared to the anatomical studies because of reasons such as superimposition and inadequate image resolution. In the following years, CT was reported to be effective in the detection of AMF. On the other hand, the need for high dose radiation to obtain an image on CT and its cost restricted the use of this technique in dentistry. In parallel with the technological advances, the technology of CBCT has been developed to view the hard tissues in the maxillofacial region. Images with high diagnostic quality can be obtained through this technique and a smaller dose of radiation is used in single rotation compared to conventional CT. Considering the widespread use of dental implants, many complications can be avoided

particularly in the region of the MF, using appropriate imaging methods before implant procedures and other surgical operations. It has been reported that CBCT is an effective imaging method for monitoring neurovascular structures such as the MF and its variations. Its usage should be limited only to the cases in which the radiological data would contribute to the efficiency of the treatment.[15]

12. Position of accessory mental foramen : According to Gumusok et al, the location of the AMF in relation to MF is posterior-inferior > posterior-superior > posterior > Anterio-suerior > anterio-inferior = inferior. Also, location of AMF in relation to dental roots in dentulous mandible is 1st molar > 2nd pre-molar > 2nd molar = 1st pre-molar > canine. No significant difference was found between male and female patient regarding location according to dental roots.[15]

Kalender et al. reported that the AMF was frequently located in the anterio‑inferior of the MF. Balcıoğlu et al. presented an AMF case located in the anterior region of the MF and at the root line of a deciduous canine tooth on the 3D CT image of a 6 years old boy. Similar to our findings, Naitoh et al. suggested that the AMF mostly occurred in the posterio‑inferior region of the MF.[15]

13. Size of the accessory mental foramen : Studies have reported that AMF diameters varies from 0.74 mm to 0.89 mm. The mean vertical and horizontal diameters of AMF were 1.50 ± 0.63 mm and 1.27 ± 0.40 mm, respectively. There was no statistically significant difference between the female and male patients regarding the diameters of MF and AMF.[15]

Conclusion

The restoration of form and function without violating important anatomic structures are the fundamental goal in the surgical management of any patient. One of these is the MF. Its identification and preservation in different surgical procedures is of utmost importance. Moreover, it also aids in interpreting landmarks in oral pathology and forensics. To avoid nerve injury during surgery, guidelines should be developed based on the literature with respect to verification of the position of the MF. Dental anthropologic studies of the origin and the variation of the human dentitions, is a useful tool because the physical anthropologist relies upon the MF in the identification of species, races and determining age.

The review of the available literature shows that the MF shows racial and ethnic variations. Moreover the variations in the values indicate towards the variable mandibular dynamics of the population under consideration. Many of the differences can also be attributed to the variability in the chewing habits of different populations, leading to differential development of the mandible. It seems that there is no single and universal pattern of MF location in different populations. This makes a precise assessment of the MF location characteristic for every population as very helpful in clinical dental practice. It is suggested that pre-operative radiographs and additional radiographs from different angles should be taken in ascertaining the accurate location of MF because of its great variability and thus to avoid any foreseen injury. Thus, above analysis could be very useful for many clinicians.

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