Case Report

Accessory mental foramina, incisive nerve plexus and lingual canals with unusual emergence paths: Report of two rare cases

Sina Haghanifar, Arash Poorsattar Bejeh Mir[1]

Department of Maxillofacial Radiology, Dental School, [1]Dental Materials Research Center, Dental School, Babol University of Medical Sciences, Ganj Afrooz Ave, Babol, Iran

Abstract

Being knowledgeable of neurovascularization of anterior mandible is crucial for successful local anesthesia and for safe minor and major oral surgeries of this part. The first case was 62 years old and was found to have two accessory mental foramina with buccal emergence on the left side and two accessory mental foramina with buccal and lingual emergence paths on the right side (overall five mental foramina). Incisive nerve plexus with multiple cephalic branching was obvious on both sides. The second case was 60 years of age and had two lingual foramina on the lingual side with two accessory foramina on the buccal side of the symphysis. Considering our findings, a pre-operation limited cone beam computed tomography is suggested to avoid inadvertent damage, especially when planning a surgery in the mandibular inter-mental region.

Key words: Anatomy, case report, mandible

INTRODUCTION

The first report of accessory foramina dates back to 1956 and an anthropologic study in which multiple mental, ethmoidal and infraorbital foramina were described in the human race.[1]

Inferior alveolar nerve (IAN) traverses the mandible within the inferior alveolar nerve canal (IANC) and has three distinct anatomical patterns as it ends: Mental nerve (MN), anterior loop (AL) and mandibular incisive nerve (MIN).[2]

The MN may branch to smaller trunks before exiting from the mental foramen (MF), and may give rise to an accessory mental nerve (AMN). Intraosseous anterior short extension of MN beyond the MF is called anterior loop (AL).[2] Mandibular incisive canal (MIC) is the intraosseous extension of the mandibular canal that almost terminates in the apical region of the mandibular incisors emerging from a lingual foramen (LF).[2]

The MF may vary widely in incidence, size, number (i.e. presence of an accessory canal), location (i.e. with regard to teeth apices), shape (i.e. round vs. ovoid) and direction of opening.[2] A single mental foramen is mainly found between the first and second premolar roots or inferior to the apex of the second premolar.[3]

Different incidences of accessory mental canals are reported to range from 1.5% to 12.5%. No clear role for mandibular side, age and gender is documented, aside from race.[2,4,5] It may be absent on 0.2% of the occasions reported by de Freitas, who studied 1435 dry skulls.[6] Double and triple MFs are found in 1.8–10.6% and 0.6–1.2% of population.[4,7] Of interest, 1.1% may have bilateral accessory mental foramen (AMF).[5]

The reported frequency of midline lingual foramen is 12.8–99.04% of cases.[8,9] More than 80% of the lingual foramen or foramina could be found between

Access this article online

Quick Response Code:

Website: www.ijdentistry.com

DOI: 10.4103/0975-962X.151710

Address for correspondence:
Dr. Arash Poorsattar Bejeh Mir,
Dental Materials Research Center, Dental School, Babol University of Medical Sciences, Ganj Afrooz Ave, Babol, Iran.
E-mail: arashpoorsattar@gmail.com

the two lateral incisors. The majority of cases are single in number and are located above the genial tubercle (72%), followed by double (22%) and triple (4%) lingual foramina, which appear on the lingual surface of the mandible in the interforaminal area.[8] The reported absence rates are 0.96–4.5%. The lingual foramen is visible in 28–49% of the periapical radiographies.[9,10]

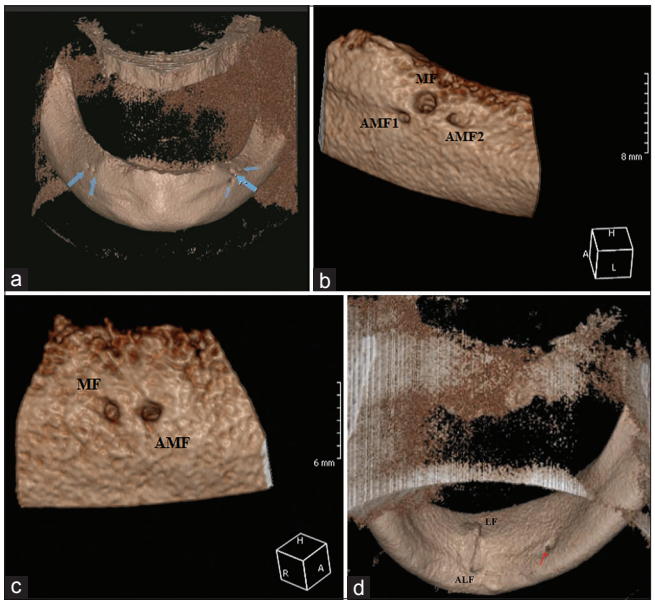

Figure 1: (a). 3D view of the patients' mandible (arrows indicate mental foramina), (b) main (distal) and accessory (mesial) mental foramina on the right side, (c) main (middle) and accessory foramina (most medial and most distal) of the left side and (d) lingual accessory mental foramen on the ride side (arrow). MF: Mental foramen, AMF: Accessory mental foramen

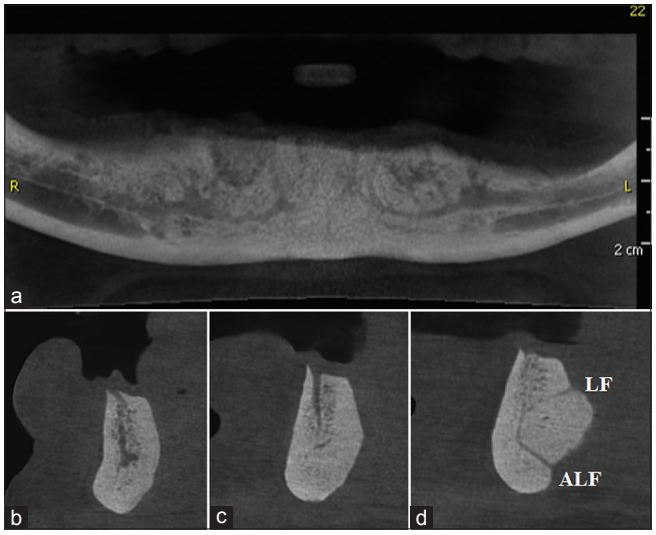

Figure 3: (a) Panoramic view of patient's mandible. Note multiple branching incisive nerve on both sides with crestal extension. (b–d) Communications of the upper and lower lingual foramina and a crestal opening. Reconstruction of three continuous cross-sectional images. LF: Lingual foramen, ALF: Accessory lingual foramen

Different emergence paths for MF with regard to its exiting point from IANC are as follows: Posterior, right angled, posterior superior, labial, mesial (anterior) and superior directions.[2] The MN is an afferent sensory nerve that supplies the sensation of chin, lip corner

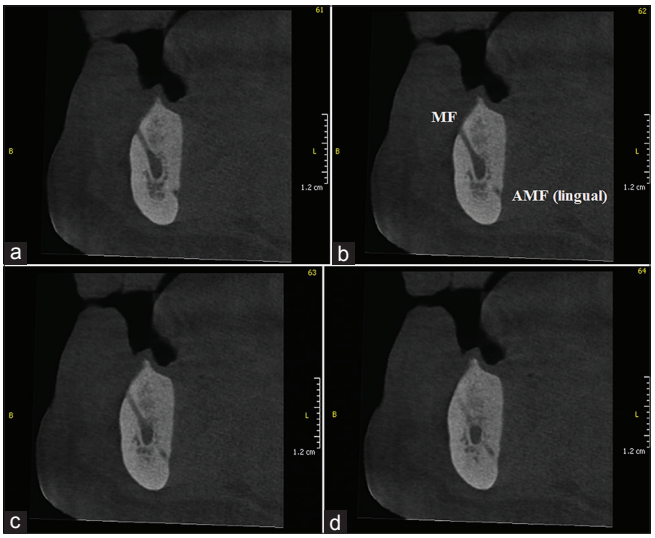

Figure 2: (a–d) Communication of lingual AMF with IANC and buccal MF. Reconstruction of four continuous cross-sectional images. MF: Mental foramen, AMF: Accessory mental foramen, IANC: Inferior alveolar nerve canal

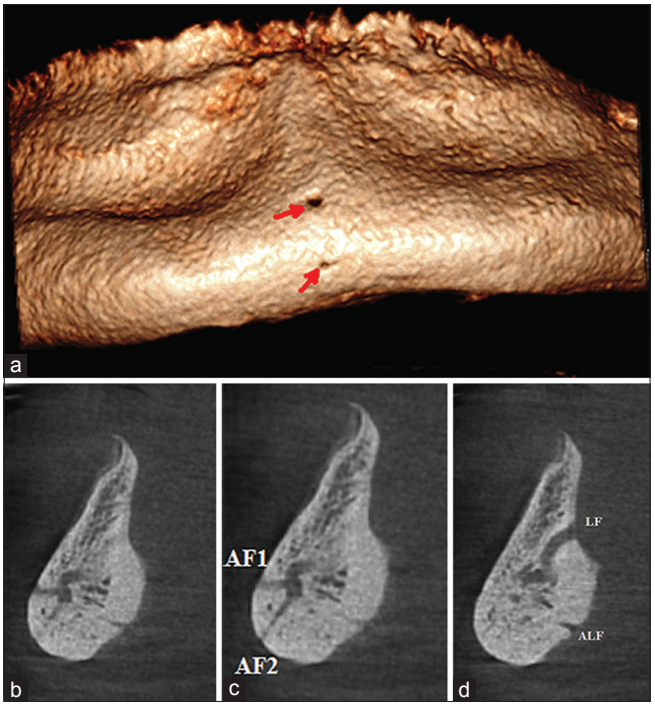

Figure 4: (a) Frontal view of the buccal emergence of the incisive nerve at the midline mandible (arrows), (b–d) communications of buccal and lingual (lingual foramen) exit paths of the incisive nerve and reconstruction of three continuous cross-sectional images. Lingual foramina and a crestal opening. Reconstruction of three continuous cross-sectional images. LF: Lingual foramen, ALF: Accessory lingual foramen. AF: Accessory foramen with buccal emergence paths

and its adjacent mucosa with its four major branches: Angular, medial inferior, lateral inferior and mental branches.[2]

At LF, MIN may communicate with an accessory branch from the mylohyoid nerve. In addition, the incisive artery may have anastomosis with right and left lingual arteries.[9] Reports considering the contents of this foramen, however, are not consistent addressing within nervous and vascular plexus.[9]

The anterior mandibular anatomical and neurovascular apparatus may be documented by intraoperative surgical findings, conventional radiographies (e.g. periapical and panoramic views), magnetic resonance imaging (MRI), computed tomography (CT) and cone beam CT (CBCT). More recently, Doppler ultrasound study is suggested to assess the vascular content of the main and also to evaluate unusual accessory foramina.[10-12]

The presence of a accessory canal is influential on differential diagnoses with other radiolucent pathologic lesions, effectiveness of local anesthesia, intraoperative iatrogenic damages and increased chance of metastasis.[7,10] Hence, being aware of these canals is of paramount importance in all diagnoses, treatment plan and prognosis aspects.

CASE REPORTS

Case 1

A 62-year-old patient referred was found to have one main MF and two AMF with buccal emergence on the left side [Figure 1a and b]. Examination of the right side revealed two mental foramina with buccal opening and one with lingual emergence [Figure 1c and d]. This lingual mental foramen was in communication with the main IANC and MF and a crestal extension of IANC [Figure 2]. Topographic details are displayed in Table 1. He had two buccal MF and two LFs. As evident in the panorama view, a communicating neural bundle existed between mental foramina, incisive canals and crestal opening of their vertical extension [Figure 3].

Case 2

Investigating a 60-year-old patient in symphysis mentalis from the lingual side revealed two LF with two additional openings [Table 1 and Figure 4]. One of them was located at the buccal side and another was on the inferior border of the symphysis.

Past medical history of both patients who were male and Iranian was significant for hypertension and osteoporosis. Dental history was significant for advanced periodontitis and severe bone loss and both wore complete denture for several years.

Table 1: Topographic data of the main and accessory foramina (mm)

Foramen	Transverse dimension	Vertical dimension	Vertical distance†	Transverse distance††
$AMF_{L1‡}$	1.0	1.2	12.8	21.8
$MF_{L‡}$	1.7	2.2	14	23.4
$AMF_{L2‡}$	0.6	0.9	13	26.8
$AMF_{R1‡}$	1.1	1.6	15.4	22.6
$MF_{R‡}$	1.2	1.6	15.4	26
$AMF_{R2‡}$	1	1.2	4.6	23
LF‡	0.3	0.5	14.0	0
$ALF_{1‡l}$	0.4	0.5	3.4	0
LF‡‡	1	1.6	12.9	0
$ALF_{1‡‡l}$	1	0.6	3.3	0
$AF_{2‡‡*}$	0.5	1	7.1	0
$AF_{3‡‡*}$	0.5	0.5	2	0

L: Left, R: Right, A: Accessory, MF: Mental foramen, LF: Lingual foramen, AF: Accessory foramen, †: Distance from the inferior border of the mandible, †: Distance from the midline mandible, ‡: Fist patient data , ‡‡: Second patient data, l: Lower lingual foramen, *: Buccal emergence of incisive nerve

Both image acquisitions were performed with a CBCT device (Cranex 3D, Soredex, Finland) in a high-resolution mode with further multiplanar reconstruction using the "Ondemand3D" software.

DISCUSSION

A case with six mental foamina and a case with two additional exiting paths aside two lingual foramina at the midline are reported. The mandible possessed many accessory foramina that nearly all appear in the lingual side. Their contents are diverse.[2,7,10] Considering the neurovascular contents and possible significant communications and anastomoses with other important adjacent neural and vascular plexus should not be neglected just for their size.[10]

Among two cases, one had multiple bilateral mental foramina and a rare lingual mental foramen with unusual neural plexus. A lingually located MF is very uncommon and a few reports do exist in the literature.[12] The other case was noticed to have multiple LF with bicortical opening from the symphysis. Dissimilar to the existing documented anatomical descriptions of LF, this situation is also rare. All were accidental findings of CBCT images.

The AMN, which is commonly less than 1 mm in diameter, could not be feasibly found in the periapical and panoramic views with 14% and 23.5% distortion rates, respectively (4). A helical CT, nevertheless, may also miss these anatomic variations due to its inherent

low resolution.[7] Cone beam CT, however, is reliable to detect such small foramina with a precision of less than 0.06 mm discrepancy.[2]

As a misbelief, it is generally accepted that accessory foramina are located posterior and inferior to the main canal and are smaller in size. Singh postulated that AMF could be found beneath the apex of the first molar; nevertheless, there are documented reports that clearly show that the accessory foramina may be found anterior (mesial) or superior to the main foramen and are even larger in size.[5,13] We named the main canals with regard to the diameter of the branching trunk from IAN. Actually, all mental foramina extended directly from the IAN.

The first case exhibited multiple bilateral communicating incisive nerves. A MIC is usually single on each side and is seen in 11% of the panoramic images.[2] A cadaver study and CBCT investigations reported that is does exist in 26–100% of the cases. Of interest, just one-third of the edentulous cadavers revealed this anatomic structure; meanwhile, more than 90% of the dentulous cadavers had one.[2] It is difficult to localize the MIC in conventional radiographies due to the corresponding adjacent bony structures.[8]

Besides the importance of successful local anesthesia, maxillofacial surgeons should be aware of the risk of damage during vestibuloplasty of anterior mandible with extensive bone resroption and during osteotomy, orthognatic surgery and genioplasty.[10,11,13]

Accessory mental foramina should be differentiated from the buccal foramina or vascular foramina (nutritional foramina).[10,11] They are more frequent on the external and internal surfaces of the mandible. Moreover, they are smaller in size and do not communicate with the mandibular inferior alveolar nerve. As defined by Ichikawa in 1961, a nutritional foramen is formed in the prenatal era and is a passage for communications of the lower lip, submental and facial arteries deep into the cancellous bone.[11]

The Iranian population is aging. Approaching this unique class of patients needs special medical, dental and psychiatric knowledge.[14] Edentulism occupies a considerable share of disability-adjusted life year score for mouth conditions in the + 60 year old population reported by the World Health Organization (WHO) for Iranian people.[15]

When the presence of such accessory foramina is doubted or assured in an aged patient, a sophisticated dentist or team should take the responsibility of dental care of the patient for many reasons. First, polypharmacy is not uncommon in an elderly patient, including consumption of anticoagulant agents.[14] There could be progressive bleeding through the limited space of a non-expandable osseous chamber and subsequent compressive neuropathy of within neural bundles. Second, a profound and successful local anesthesia may guarantee the cooperation of an aged patient with labile emotion, which is substantially affected by the presence of accessory foramina. Third, accessory foramina of the lingual side of the mandible, if neglected, may lead to paresthesia, ischemic necrosis and ulceration of the lingual side, which depends on their neurovascular content. From the prosthodontic aspect and flange extension limits, one should note the senile changes cephalic migration of MF and presence of MF or AMF even beneath the crestal gingiva.[2]

In conclusion, accessory foramina are not uncommon, and a pre-operation limited CBCT is suggested to avoid inadvertent damage, especially when planning a surgery in the mandibular inter-mental region.

REFERENCES

1. Riesenfeld A. Multiple infraorbital, ethmoidal and mental foramina in the Races of man. Am J Phys Anthropol 1956;14:85-100.
2. Juodzbalys G, Wang HL, 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:e3.
3. Haghanifar S, Rokouei M. Radiographic evaluation of the mental foramen in a selected Iranian population. Indian J Dent Res 2009;20:150-2.
4. Ramadhan A, Messo E, Hirsch JM. Anatomical variation of mental foramen. A case report. Stomatologija 2010;12:93-6.
5. Udhaya K, Saraladevi KV, Sridhar J. The morphometric analysis of the mental foramen in adult dry human mandibles: A study on the south Indian population. J Clin Diagnos Res 2013;7:1547-51.
6. de Freitas V, Madeira MC, Toledo Filho JL, Chagas CF. Absence of the mental foramen in dry human mandibles. Acta Anat (Basel) 1979;104:353-5.
7. Katakami K, Mishima A, Shiozaki K, Shimoda S, Hamada Y, Kobayashi K. Characteristics of accessory mental foramina observed on limited cone-beam computed tomography images. J Endod 2008;34:1441-5.
8. Yoshida S, Kawai T, Okutsu K, Yosue T, Takamori H, Sunohara M, *et al*. The appearance of foramen in internal aspect of mental region of mandible form Japanese cadavers and dry skull under macroscopic observation and three-dimnetional CT images. Okajimas Folia Anat Jpn 2005;82:83-8.
9. Mcdonnell D, Nouri MR, Todd ME. The mandibular lingual foramen: A consistent arterial foramen in the middle of the mandible. J Anat 1994;184:363-9.
10. Murlimanju BV, Prakash KJ, Samiullah D, Prabhu LV, Pai MM, Vadgaonkar R, *et al*. Accessory neurovascular foramina on the lingual surface of mandible: Incidence, topography, and clinical implications. Indian J Dent Res 2012;23:433-5.
11. Naitoh M, Hiraiwa Y, Aimiya H, Gotoh K, Ariji E. Accessory

mental foramen assessment usingcone-beam computed tomography. Oral Surg Oral Med Oral Pathol Oral Radiol Oral Endod 2009;107:289-94.
12. Neves FS, Torres MG, Oliveira C, Campos PS, Crusoé-Rebello I. Lingual accessory mental foramen: A report of an extremely rare anatomical variation. J Oral Sci 2010;52:501-3.
13. Balcioglu HA, Kocaelli H. Accessory mental foramen. N Am J Med Sci 2009;1:314-5.
14. Mir ABP. Need for Geriatric Dentistry Training Programs in Iran. J Dent Educ 2013;7:113-8.
15. Poorsattar Bejeh Mir K, Poorsattar Bejeh Mir A. Should medical clinicians be involved in orodental screening of diabetic patients? East Mediterr Health J 2012;18:1262.

How to cite this article: Haghanifar S, Poorsattar Bejeh Mir A. Accessory mental foramina, incisive nerve plexus and lingual canals with unusual emergence paths: Report of two rare cases. Indian J Dent 2015;6:44-8.

Source of Support: Nil. **Conflict of Interest:** None declared.