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ACCESSORY NERVE AND MENTAL FORAMEN.

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ABSTRACT

The presence of accessory mental foramen to vary in relations with sex, ethnicity. Its location and prevalence is important for nerve block and surgical procedures. The present study was conducted using 13 cadavers of both sex, with different age groups, right and left mental foramen region of the cadavers were dissected as per the standard dissection procedure in the Morphology Laboratory of the University of Pamplona. Digital Vernier Callipers was used to measure the dimensions of mental foramen and accessory mental foramen. Mental foramens were present in all observed mandibles and it was bilateral in position. Accessory mental foramen was present in 1 mandible and was unilateral in position. Accessory mental nerve communicated with a branch of the facial and buccal nerve. The knowledge about of mental foramen and presence of accessory mental foramen may be helpful for planning the operative procedures to avoid injury to neurovascular bundle.

KEYWORDS: Accessory mental foramen, accessory mental nerve, anatomical variations, mandibles, facial nerve, buccal nerve.

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INTRODUCTION

Mental foramen is a small foramen situated anterolateral aspect of the body of the mandible at an equal distance from the superior and inferior border [1,2]. Normally, mental foramen are located below the interval between the premolars. It may lie between the apices of lower premolars, below the apex of second premolar. It transmits mental nerve, artery and vein. Mental nerve is a branch of inferior alveolar nerve which supplies sensation to lower lip and the labial mucosa and lower canines and premolars. The most useful injection for anaeathetising the mandibular teeth is the inferior alveolar nerve block. To anaesthetise the anterior teeth, including the premolars and canines, it is possible to avoid giving inferior alveolar nerve block by injecting anaesthetic solution adjacent to the mental foramen. So the study of position and morphological variation of mental foramen is very important because it will be helpful to localise the important neurovascular bundle passing through the mental foramen[3]. Identification of mental foramen is important for dental surgeons in nerve block and surgical procedures like apical curettage of mandibular premolars, amalgam filling, peridental surgery etc. to avoid injury to neurovascular bundle. Any foramen in addition to mental foramen in the body of mandible is known as accessory mental foramen. Accessory mental foramen transmits the accessory branch of mental nerve. So the knowledge of its position and incidence is helpful to dental surgeons to achieve complete anaesthesia because if this nerve is not blocked, anaesthesia will be incomplete. Accessory mental foramen tends to exist in the apical area of the first molar and posterior or inferior area of the mental foramen. It is situated below the first molar tooth. Thus, the knowledge of location, incidence, size, and shape of mental foramen and accessory mental foramen will facilitate the dental surgeons to apply nerve block in different surgical procedures involving lower jaw. As accessory mental foramen is due to branching of mental nerve before passing through mental foramen, hence its shape, size and verification of its existence will prevent accessory nerve injury during periapical surgery. In addition to this, if this nerve is not blocked, paresthesia will be less[3,4]. The present study was undertaken to document the incidence, size, shape, position of foramen and mental nerve accessory.

MATERIALS AND METHODS

A total of 13 cadavers of both sex (12 men and 1 woman) with different age groups were used for the study after obtaining ethical clearance from ethics committee of the University of Pamplona. The history of the individual and the cause of death are not known. Right and left mental foramen region (26 in total) of the cadavers were dissected as per the standard dissection procedure in the Morphology Laboratory of the University of Pamplona. Digital Vernier Callipers was used to measure the dimensions of mental foramen and accessory mental foramen to analyse and examine the size, shape and position of mental foramen and accessory mental foramen. The incidences of mental foramen and accessory mental foramen were also observed and the topographic details were examined and photographed.

RESULTS

Of the 26 mandibular body dissections performed in only one revealed the presence of accessory nerve and mental foramen, in the left side of a male cadaver of 65 years of age, edentulous jaw. Figure 1. The direction of the opening of the mental foramen and accessory mental foramen was outward and upward in a posterior orientation. Mental foramen located on the anterolateral aspect of the mandible 15 mm superior to the inferior border of the mandibular body. Accessory mental foramen located on the anterolateral aspect of the mandible 8.5 mm superior to the inferior border of the mandibular body the distance between the mental foramen and accessory mental foramen was 5 mm posterior and inferior to mental foramen. The size of the mental foramen was 2.38 mm in vertical dimension, 2.93 mm in horizontal dimension. Accessory mental foramen were 1 mm in vertical dimension and 1.5 mm in horizontal dimension, the shape of both foramens was

oval. In the observations under this study the mental foramen was present in all the 13 mandibles and it was bilateral, mean distance of mental foramen from lower border of body mandible was 14.45 mm, respect to the shape on right side it is oval in 6% of mandibles and round in 94% of mandibles. On left side it is oval in 13% of mandibles while it is round in 87% of mandibles. The size of mental foramen On right side: Average size was 2.79 mm. Minimum size is 1mm and Maximum size is 5 mm. On left side: Average size is 2.57mm. Minimum size is 1mm and Maximum size is 6 mm. Accessory mental foramen were present in one mandible (7.69%) out of 13 mandible were found on left side. None of the mandibles presented with bilateral accessory mental foramen. The accessory mental nerve was found to exit from the accessory mental foramen lying around 5 mm above the distal aspect of the mental foramen. The distribution of the accessory mental nerve was extending to the mucous membrane and the skin of the corner of the mouth, and the mucous membrane of the median labial region. The different distribution of the accessory mental nerve may be related to the position of the accessory mental foramen. The accessory mental nerve communicated with a branch of the facial and buccal nerve.

View of the mandibular body - left side. Showing Details of the mental foramen region

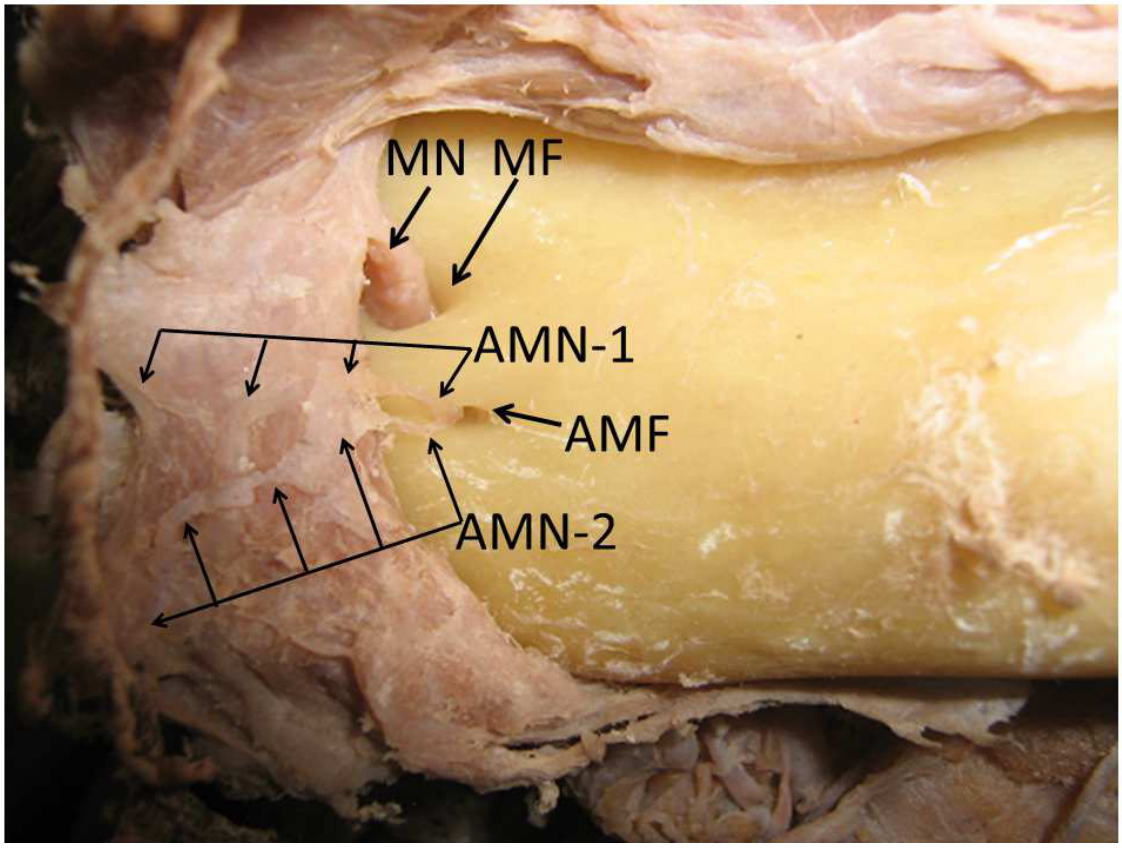

Figure 1

Mandible. Left side. MN: mental nerve; MF: mental foramen; AMF: accessory mental foramen; AMN-1: accessory mental nerve- upper branch communicating with buccal nerve; AMN-2: accessory mental nerve- lower branch communicating with facial nerve.

DISCUSSION

The mental foramen is incomplete until the 12th gestational week, when the mental nerve separates into several fasciculi at that site. It has been suggested that separation of the mental nerve earlier than the formation of the mental foramen could be a reason for the

formation of the accessory mental foramen[5].The direction of the opening of the mental foramen is outward and upward in a posterior orientation. The incidence of accessory mental foramen varies between ethnic groups, and is reported as follows: 2.6% in French; 1.4% in American Whites; 5.7% in American Blacks; 3.3% in Greeks; 1.5% in Russians; 3.0% in Hungarians; 9.7% in Melanesians; and 3.6% in Egyptians[6]. Studies performed in a Japanese population showed that accessory mental foramen is less rare, with a prevalence ranging from 6.7 to 12.5% in Japan[7]. In previous study found a unilateral accessory mental foramen among 45 dry mandibles (2.22%) [8]. These reports reveal that non-Caucasians may have a higher incidence of accessory mental foramen than Caucasians. In the present study the incidence was 7.69%. Previous studies reported no gender differences[7, 9]. The case in the present study is a male. Koktenet al. (2004) reported the highest percentage (42.3%) of mental foramen was found under the second premolar[8].Absence of mental foramen has also been reported. De Freitas found no mental foramen in 3 cases out of 2870 sides of 1435 dry skulls[10]. Instead of 2 cases cited by Freitas et al, No other published reports of the absence of mental foramen have been found. Accessory mental foramen have been reported to be detected by macroscopic investigations on dry skulls, investigations with plane radiography, periapical radiography, and computed tomography. As far as we are concerned, unbiased radiological interpretation of an accessory mental foramen is possible only on computed tomography images since the disadvantages of low image quality, low magnification, and distortion on the panoramic and periapical radiographs is a concern. If the mental foramen cannot be clearly identified on panoramic radiographs under ordinary exposure and viewing conditions, a 3-dimensional computed tomography (3D-CT) should be utilized to determine the extent and location of the mental foramen prior to surgical procedures. However, if only a panoramic radiograph instead of a CT scan can be obtained, in order to improve visualization of the mandibular canal, the patient's head should be tilted 5° downward with reference to the Frankfort horizontal reference bar of the machine, as suggested by Dharmar[11]. The mental nerve emerges at the mental foramen and divides into four branches: angular (innervations of the angle of the mouth region), medial and lateral inferior labial (skin of the lower lip, oral mucosa and gingiva as far posterior as the second premolar) and mental branch (skin of the mental region)[12]. Is primarily a sensory nerve and innervates after leaving the foramen, lower canines and premolars and therefore plays an important role in procedures in this area[13]. The mental nerve exits from the mental foramen, which is located on the antero lateral aspect of the mandible, 13–15 mm superior to the inferior border of the mandibular body[14]. Accessory mental nerve is a branch of the inferior alveolar nerve and bifurcates in the same region as the mental nerve, the only difference being that it exits the mandibular canal from a different foramen called the accessory mental foramen as was found in this study. The accessory mental nerve supplies the same area as the mental nerve. Whenever the patients of trigeminal neuralgia have the trigger points in the region of distribution of the mental nerve, the accessory mental nerve if present will automatically get involved. The high rate of recurrence of trigeminal neuralgia following peripheral neurectomy is always attributed to regrowth of the excised mental nerve. Accessory mental nerve due to its miniature size and unusual occurrence may be left out without being excised leading to persistence of the neuralgic pain in the distribution of the accessory mental nerve Most of the times owing to the small size of the accessory mental nerve and unusual location of the accessory mental foramen, the nerve gets hidden within the mucoperiosteal flaps. Excessive bleeding during a surgical procedure may also make it impossible to trace the accessory mental nerve[15]. Cag irankaya and Kansu (2008) reported an accessory mental foramen below the first molar[16]. In the present study as the patient was edentulousin the left side, the relationship of the accessory mental foramen with the teeth could not be ascertained. According to Toh et al. (1992) the distance between the mental foramen and accessory mental foramen in three cadavers was 0.67, 2.1 and 5.74 mm[17]. Singh et al.(2010) in their study observed the position of accessory mental

foramen from mental foramen to be 0.67 mm[18]. In the present study the distance between the mental foramen and accessory mental foramen was 5 mm. Singh et al.(2010) reported that the average dimension of accessory mental foramen was 1 mm[18]. Hardly any published literature related to the size of accessory mental foramen for common scholars is available. In the present study, the size of the accessory mental foramen was 1.5 mm. In the present study the distribution of the mental nerves was almost the same as that reported previously. However, the distribution of the accessory mental nerve was different, extending to the mucous membrane and the skin of the corner of the mouth, and the mucous membrane of the median labial region. The different distribution of the accessory mental nerve may be related to the position of the accessory mental foramen. The accessory mental nerve communicated with a branch of the facial and buccal nerve. This suggests that some regions under the control of the mental nerve can be completely anesthetized by local infiltration of the mental foramen, and an injection may give pain to the patient due to injury of the nerves from an accessory mental nerve when the injection needle is inserted through the mucous membrane. Reports of neurosensory disturbances during surgical procedures involving the mandible are not rare; for instance, neurosensory disturbances are reported to range up to 12% in genioplasty[19]. Surgeons should always dissect carefully in order to avoid neurovascular complications during implant placement, regional anesthesia, surgical correction of jaw deformities and periapical surgery. The probability of the existence of an accessory mental foramen should be kept in mind[20,21]. Gerhenson et al.(1986), reported that 4.3% of the mandibles had double mental foramens, 0.7% had triple mental foramina and that one mandible had 4 mental foramina on one side[22]. Injuries to any of the nerves during surgical procedures in this area can cause anaesthesia or paraesthaesia[23].

CONCLUSION

Accessory mental nerve and accessory mental foramen are very rare anatomical variations. To achieve a profound local anaesthesia and avoid neurovascular complications during various surgical procedures which are done in this area, the probability of the existence of an accessory mental nerve and the probability of the existence of accessory mental foramen should be kept in mind and should not be ruled out. Careful surgical dissection should be performed in the region so that the presence of accessory mental nerve can be detected and the occurrence of a neurosensory disturbance or hemorrhage can be avoided. Since mental nerve supplies the skin of the chin, mucous membrane of the lower lip and gingiva, a careful identification, dissection and preservation is of paramount importance, to avoid post-operative paraesthaesia. Knowledge on anatomic variations influences the diagnosis, treatment planning and eventually the management.

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REFERENCES

1. Zarei R, Ebrahimi RS, Dashti G, Pourentezari M, Karizbodagh MP. Anatomical Variations of Mental Foramen and Accessory Mental Foramen. *Global Journal of Medicine Researches and Studies*, *1*(1): 17-19, (2013).
2. Udhaya K, Saraladevy KV, Sridhar J. The morphometric analysis of the mental foramen in adult dry human mandibles: A study on the south indian population. J Clin Diagn Res, august, 7(8):1547-1551, (2013).
3. Sumit G, Jagdish SS. Study of anatomicalvariations and incidence of mental foramen and accessory mental

foramen in dry human mandibles.Nat. J. Health Res, (2): 28-30,(2012)
4. Singh R, Srivastav AK. Evaluation of position, shape, size and incidence of mental foramen and accessory mental foramen in Indian adult human skulls. International Journal of Exp & clinical Anat, April, p.1-7, (2011).
5. Naitoh M, Hiraiwa Y, Aimiya H, Gotoh K, Ariji E. Accessory mental foramen assessment using cone-beam computed tomography. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, (107): 289-294, (2009).
6. Sawyer DR, Kiely ML, Pyle MA. The frequency of accessory mental foramina in four ethnic groups. Archives of Oral Biology, 43(5): 417-420, (1998).
7. Toh H, Kodama J, Yanagisako M, Ohmori T. Anatomical study of the accessory mental foramen and the distribution of its nerve. Okajimas Folia Anat Jpn,(69): 85-87, (1992).
8. Kokten G, Buyukanten M, Balcioglu HA. Foramen mentalenin cap ve lokalizasyonunun kuru kemik ve panoramik radyografilerde. Istanbul Universitesi Dishekimligi Fakultesi Dergisi, 38(10): 65-71, (2004).
9. 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 Endod, 107(2):289-294, (2009).
10. de Freitas V, Madeira MC, Toledo Filho JL, Chagas CF. Absence of the mental foramen in dry humanmandibles. Acta Anat (Basel), 104 (3): 353-355, (1979).
11. Dharmar S. Locating the mandibular canal in panoramic radiographs. Int J Oral Maxillofac Implants, (12): 113-117, (1997).
12. Kieser J, Kuzmanovic D, Payne A, Dennison J, Herbison P. Patterns of emergence of the human mental nerve. Arch Oral Biol, (47):743–774, (2002).
13. Agthong S, Huanmanop T, Chentanez V. Anatomical variation of the supraorbital, infraorbital and mental foramina related to gender and side. J Oral Maxillofac Surg, (63):800–804, (2005).
14. Haghanifar S, Rokouei M. Radiographic evaluation of the mental foramen in a selected Iranian population. Indian J Dent Res, (20):150–152, (2009).
15. Jha AK, Kumar NG. Accessory mental nerve: case report, review and its role in trigeminal neuralgia. Surg Radiol Anat, Jul; 34(5):469-73, (2012).
16. Cag irankaya LB, Kansu H. An accessory mental foramen: a case report. J Contemp Dent Prac,(9):98–104, (2008).
17. Toh H, Kodama J, Yanagisako M, Ohmori T. Anatomical study of the accessory mental foramen and the distribution of its nerve. Okajimas Folia Anat Jpn,(69):85–87, (1992).
18. Singh R, Srivastav AK. Study of position, shape, size and incidence of mental foramen and accessory mental foramen in Indian adult human skulls. Int J Morphol, 28(4):1141–1146, (2010).
19. Hwang K, Lee WJ, Song YB, Chung IH. Vulnerability of the inferior alveolar nerve and mental nerve during genioplasty: an anatomic study. J Craniofac Surg, 16(1): 10-14, (2005).
20. Balcioglu HA, Kocaelli H. Accessory mental foramen. North Am J Med Sci, (1): 314 – 15, (2009).
21. Thakur G, Thomas S, Thayil SC, Nair PP. Accessory mental foramen: a rare anatomical finding. BMJ Case Reports, BMJ Case Rep, 2011: bcr0920103326.
22. Published online 2011 March 1. Doi: 10.1136/bcr. 09.2010.3326, (2011).
23. Gershenson A, Nathan H, Luchansky E. Mental foramen and mental nerve: changes with age. Acta Anat (Basel), 126 (1):21-8, (1986).
24. Kulkarni et al. Accessory mental nerve and foramen during implant surgery. Journal of Indian Society of Periodontology,Jan-Mar:15, (2011).