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Original Research Article.

Morphological Study of Accessory Foramina in Dry Mandible and Its Clinical Significance

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ABSTRACT

Background: To provide anatomical information on the position and incidence of accessory foramina in mandible as they are important for dental surgeons and anesthetists in achieving complete nerve blocks and for avoiding injury to neurovascular structures passing through them.

Objective: To study the incidence of accessory foramina in dry mandible in population of Bihar & compare it with incidence among various races of the world.

Materials & Methods: Present study is a cross sectional study which has been carried out on 56 dried fully ossified adult human mandibles, which were examined in the Department of Anatomy and Forensic Medicine of Indira Gandhi Institute of Medical Sciences, Patna, Bihar. The age of the bones used in the study was not predetermined. Only fully ossified dried, macerated and thoroughly cleaned mandibles which were complete in all respects, in order to give the correct observations, were included in the study while the mandibles having any deformity or pathology were excluded. The accessory foramina and their positions were observed.

Results: Accessory mandibular foramina were found in 55.36 %, accessory mental in 23.22 %, and retromolar in 17.85% of the cases. The accessory foramen observed most commonly in right side (39.28%) followed by bilateral (37.5%) then left side (19.65%).

Conclusion: The anatomical variability of incidence and position of accessory foramina should be considered as they may be used to give additional locoregional anesthesia in case of failed mandibular blocks. Knowledge of the commonest positions will be beneficial for oncologists and oromaxillofacial surgeons in planning graft implants.

Key words: Accessory Foramina, Mandible, Neurovascular Bundle, Retromolar Foramen, Mandibular Foramen.

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INTRODUCTION

The accessory foramina are unnamed openings in the mandible.[1] They may contain blood vessels or nerve fibres. When the nerve fibres transmit through these foramina, the local anaesthesia given during dental extractions may become unsuccessful as branches of nerve passing through them escape the drug. The accessory vessels contained in them, may result in difficulty in controlling intraosseous haemorrhage. Most commonly the accessory foramina are present on the internal aspect of the bone. They are named as lingual foramina if the foramina are present in the midline, superior, or within the genial tubercle.[1] Madeira et al.[2] and McDonell et al.[3] describe these foramina as midline foramina or superior retromental or supraspinous foramina. Foramina that were present inferior to the genial tubercle were referred to as inferior retromental or infraspinous foramina and that present lateral to the genial tubercle were referred to as lateral retromental foramina. Any foramen that present in the body of mandible apart from the mental foramen is named as accessory mental foramen. Accessory mental foramen transmits accessory branches of mental nerve. The local anaesthesia is given near the mental foramen to anesthetize the anterior teeth including premolars and canines. The precise knowledge of the accessory mental foramina, their position as well as incidence, will be very helpful to

dental surgeons for achieving complete anaesthesia. This knowledge will also help to prevent injury to accessory mental nerve during periapical surgery. The mandibular foramen is a prominent foramen and its knowledge is of paramount importance during dental procedures of lower jaw. Sometimes accessory mandibular foramen (AMF) is found in the vicinity of the main foramen. This AMF transmits branches of inferior alveolar nerve. The accessory mandibular foramen is known to provide the route for tumour spread even after radiotherapy. Extraction of third molar or wisdom tooth is a common dental procedure. A complete knowledge of the region around third molar is a must to minimize possible risks and complications during this extraction. Posterior to the lower third molar is a cribose triangle, the retromolar triangle, and, laterally, the retromolar fossa. The retromolar foramen is present on the surface of retromolar fossa.[4]

From the clinical point of view, this area forms an open corridor for the passage of infections arising in connection with the third molar. In view of lack of consistency in position and number, a detailed study was undertaken of these accessory foramina.

OBJECTIVE

To study the incidence of accessory foramina in dry mandible in population of Bihar & compare it with incidence among various races of the world.

MATERIALS AND METHODS

Present study is a cross sectional study which has been carried out on 56 dried fully ossified adult human mandibles, which were examined in the Department of Anatomy and Forensic Medicine of Indira Gandhi Institute of Medical Sciences, Patna, Bihar**.** The age of the bones used in the study was not predetermined**.** Only fully ossified dried, macerated and thoroughly cleaned mandibles which were complete in all respects, in order to give the correct observations, were included in the study while the mandibles having any deformity or pathology were excluded**.** All surfaces of mandible were observed carefully in a regular manner to locate the accessory foramina with the help of a magnifying glass**.** When there is confusion in the presence of the foramen, we put a probe in the foramen to ascertain its extend**.** The number and position of foramina were observed.

Table 1: Incidence of different types of accessory foramina of mandible and its percentage

	Right Side	Left Side	Bilateral	Absent	Total
Accessory mandibular foramen	14	6	11	25	56
	(25%)	(10.72%)	(19.64%)	(44.64%)	(100%)
Accessory mental foramen	4	3	6	43	56
	(7.14%)	(5.36%)	(10.72%)	(76.78%)	(100%)
Retromolar foramen	4	2	4	46	56
	(7.14%)	(3.57%)	(7.14%)	(82.15%)	(100%)

Fig 1: Photograph showing accessory mandibular foramen

Fig 2: Photograph showing accessory mental foramen

Fig 3: Photograph showing retromolar foramen

RESULTS

In the present study, we observed three types of accessory foramen: accessory mandibular foramen, accessory mental foramen and retromolar foramen (Figure 1-3). Accessory mandibular foramina were found in 55.36%, accessory mental in 23.22% and retromolar in 17.85% of the cases. Accessory mandibular foramina were found in 25% in right side, 10.72% in left side and 44.64% bilateral while accessory mental foramina were found in 7.14% in right side, 5.36% in left side and 10.72% bilateral (Table 1). The retromolar foramen found in 7.14% in right side, 3.57% in left side and 7.14% bilateral too. So, the accessory foramen observed most commonly in right side (39.28%) followed by bilateral (37.5%) then left side (19.65%).

DISCUSSION

The incidence of accessory mandibular foramina was 55.36%, accessory mental in 23.22% and retromolar in 17.85% of the cases in our study.

While Gupta S et al.[5] reported accessory mental foramen in 22% of mandibles & Gupta S, Jagdish SS[6] reported 6.6% of mandibles which were less than our observations. Gupta S, Jagdish SS[6] observed that the commonest position was near the main mental foramen opposite the 2nd premolar and 1st molar. This knowledge will be very helpful in preventing damage to the accessory mental nerve. Gershenson et al. reported accessory mental foramen in 2.8% Israeli mandibles.[7] Highest incidences of accessory mental foramen were reported in Negros and Maori mandibles. Mamatha N.S. et al.[8] reported a case of two accessory mental nerve at the periapex of second premolar, one above the other, coming out of a separate foramina's in a 22 years old patient. The accessory mental nerve is a branch of inferior alveolar nerve, which exit from the mandibular canal from different foramina's. It is thought that mental nerve separates even earlier than the formation of mental foramina and this could lead to formation of accessory mental foramina.[9] This presence of accessory nerves is an added challenge to the surgeon. Their retraction and protection during surgery is vital for preventing post-operative paraesthaesia. Parveen S et al.[10] observed that the most common shape of mental foramen was round shape in their study (59.29%). The commonest way of exit of mental foramen was in the postero superior direction (93.21%) in both the sides. Mean transverse diameter were 3.34 mm on right side & 3.56 mm on left side whereas mean vertical diameter were 2.94 mm and 3.24 mm for right and left side respectively. The most frequent position of mental foramen in relation to the lower teeth were below the apex of 2nd premolar on both the right (36.79%) and the left (37.5%) side. The second commonest position were in line between first & second premolar (right :7.14% & left: 6.79%); closely followed by position in the line between 2nd premolar & 1st molar teeth (right: 6.07% & left: 5.71%). The distance between the mental foramen & symphysis menti were 29.01±1.24 mm on the right side & 28.84±1.12 mm on the left side. The distance between the mental foramen & posterior border of ramus were 72.23±1.28 mm on the right side & 79.61±1.76 mm on the left side. The distance between the mental foramen & alveolar crest were 17.54±1.83 mm on the right side & 17.74±1.36 mm on the left side and between the mental foramen & inferior border of body of the mandible were 17.1±1.43 mm & 17.51±1.25 mm on the right & the left side respectively. Sankar D K et al.[11] observed double mental foramina were found to be 5.6% on the right & 3.3% on the left side. Singh S K et al.[12] and Zografos & Mutzuri[13] found the incidence of double foramina in 11.48% of North Indians & 6.68% of Greek population, respectively. Rajkohila J et al.[14] reported these accessory mental foramina in 8.85% cases in South Indian population. They observed accessory mental foramina were located more on the left side than on the right side. Similar results were also reported by Singh and Srivastav[15] who found 8% accessory mental foramina on the left side and 5% on the right side; Udhaya et al.[16] reported 3.33% accessory mental foramina on the left side and 2.22% on right side. Voljevica et al.[17] reported the presence of four accessory mental foramina, all of which were present on the right side of the mandible. However, in 2.17% of North Indian mandibles triple mental foramen was also reported by Singh S K et al.[12] Absence of mental foramen is a very rare observation was also reported by de Frietas et al.[18]

The incidence of retromolar triangle, in our study is 17.85%, which is lesser than incidence of Park MK et al.[19] (93.5%), followed by incidence of Schejtman et al.[20] (72%), Kawai et al.[21] (52%), Rossi et al.[22] (26.6%), Von Arx et al.[23] (25.6%), Bilecenoglu and Tuncer[24] (25%), Kodera and Hashimoto[25] (20%) followed by Lagrana et al.[26] (18%). The highest incidence of retromolar foramen is found in Korean population.[19] Our incidence (17.85%) is greater than incidence of Sawyer and Kiely[27] (7.7%), Pyle et al.[28] (7.8%), Ossenberg[29] (8.2%) followed by Suazo et al.[30] (12.9%). Sutton[31] first of all explained additional sensory nerve fibres in retromolar foramen. He explained the relationship between the presence of retromolar foramen and the failure of obtaining analgesia using classical anesthetic techniques. The bone surrounding the retromolar triangle is heavier as compared to cortical plate over triangle & cortical plate is more cancellous.[32] The knowledge about its cancellous nature prevent damage of neurovascular bundles in retromolar foramen during routine anesthetic, surgical and implantation procedure of mandible.

Very few cases of accessory mandibular foramina are reported. The accessory mandibular foramina were present in 16.4 % mandible in a study conducted on south Indian population. A single accessory mandibular foramina was found in 9 cases and double in 2 cases.[33] The embryological basis of the occurrence of the accessory mandibular foramina can be explained by the fact that during the development, initially there will be three inferior alveolar nerves which innervate each of the three groups of the mandibular teeth. Later, there will be fusion of these nerves and a single inferior alveolar nerve is formed. The incomplete fusion of these three nerves leads to the development of double mandibular canals.[34] Narayana and Prashanthi observed the incidence of large accessory mandibular foramina in human mandibles to be 0.3%.[35] In a Brazilian population 27.93% and 43.24% of the mandibles presented at least one mandibular accessory foramina located on the medial surface, located either below or above the mandibular foramen respectively.[36]

CONCLUSION

The anatomical variability of incidence and position of accessory foramina should be considered as they may be used to give additional locoregional anesthesia in case of failed mandibular blocks. Knowledge of the commonest positions will be beneficial for oncologists and oromaxillofacial surgeons in planning graft implants.

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