

A study of accessory mandibular foramina in north Indian mandibles

Archana Singh^{1*}, Syed Hasan Hyder Zaidi², Rakesh Gupta³

¹P. G. Student 1st year, ²Professor and HOD, ³Professor, Department of Anatomy, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, INDIA.

Email: drarchana279@gmail.com

Abstract

Introduction: The surgeon who is going to perform a surgery in oral cavity e.g. a dental surgeon performing tooth extraction should be aware of accessory mandibular foramina for planning anaesthesia at an appropriate anatomical site as the branches of the facial nerve, mylohyoid nerve, buccal nerve and transverse cervical cutaneous nerve are known to pass through these foramina. Another applied use of morphological situation of accessory mandibular foramina may be utilized by the oncologist in planning radiation therapy as these foramina also provide an easy route for the spread of infection and tumor cells following radiotherapy. Since the positions of these foramina in the mandibular bones are highly variable with the races, region, and ethnicity and if this information of position of foramina can be made available freely for particular region with the help of such types of studies like the present one. Thus we can increase utilization to enhance accuracy especially in the above mentioned areas of medical field. **Aims and Objectives:** To evaluate the incidence of variations regarding the position and number of accessory mandibular foramina in human dry mandibles of north Indian population irrespective of gender and specific age in the light of similar studies in other global region and to draw significant conclusions. **Material and Methods:** Twenty eight dry human mandibles of Rohilkhand Medical College and Institutes of Dental College, Bareilly, UP, were studied to find out the incidence of accessory mandibular foramina, a mandibular variant. **Results:** Out of total 28 mandibles this variant (accessory mandibular foramina) was present in 39.28% of mandibles. The commonest pattern of this variant was bilateral in 21.43% of mandibles. Out of these in 14.29% mandibles the variant was single and in 3.57% mandible it was double while in remaining 3.57% of mandibles it was triple. In 17.86% mandibles the pattern was found to be unilateral.

Keywords: Accessory mandibular foramina, North Indian mandibles.

*Address for Correspondence:

Dr. Archana Singh, Post Graduate Student 1st year, Department of Anatomy, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, INDIA.

Email: drarchana279@gmail.com

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INTRODUCTION

The determination of location of mandibular canal and the identification of any anatomical variations that relate to it that is, accessory mandibular foramina and canals, is important to clinician prior to any surgical interventions. Accessory mandibular foramina referred to any opening

in the mandibular bone other than the sockets of teeth, the mandibular foramina, the mental foramina and the lingual foramen.¹ Many unnamed accessory foramina are present on the lingual side of the mandible which are very variable in their distribution but they are observed more often on the internal surface of the mandible in position above or below the mandibular foramen.^{2,3} These foramina may permit the branches of nerve and vessels related with the mandible e.g. the mandibular nerve and inferior alveolar branch of maxillary artery. The branches of the facial nerve, mylohyoid nerve, buccal nerve and transverse cervical cutaneous nerve are also known to pass through these accessory foramina.⁴ And the usual course may be of configurationally, surgical, dental and other clinical significance. Accessory mandibular foramina also provide an easy route for the spread of infection and tumor cells following radiotherapy.^{5,6} Accessory mandibular foramina are mandibular variant

which may permit the unusual passage of nerves and vessels of lower jaw and neighbouring region. They are therefore clinically significant in dentistry, surgical, anaesthesiological and clinical procedures. Therefore the present study has been carried out with the following aims and objectives.

AIMS AND OBJECTIVES

Since the positions of these foramina in the mandibular bones are variable with the races, region, and ethnicity. Therefore the present study has been carried out

- To evaluate the incidence of variations regarding the position and number of accessory mandibular foramina in human dry mandibles of north Indian population irrespective of gender and specific age in the light of similar studies in other global region and to draw significant conclusions.

MATERIAL AND METHODS

The morphological study of the non- metric mandibular variants was carried out in the Department of Anatomy, Rohilkhand Medical College and Hospital (RMC and H), Bareilly. Twenty eight adult north Indian human mandibles using purposive sampling were selected irrespective of age and sex from museum of the RMC and

H and Institute of Dental Sciences (IDS) Bareilly U.P. The incidence of morphological variants and presence and absence of the accessory mandibular foramina on the internal surface of the body of mandible were noted and calculated after naked eye examination. If accessory mandibular foramina were present, then the numbers of these were categorized as following in accordance with the side of the mandible. All the data were noted and compiled on a standardized table followed by calculation of percentage of all the variants unilaterally as well as bilaterally. Results of the study were also compared with the reported prevalence in previous studies of other ethnic and geographical areas.

OBSERVATIONS

Out of total 28 mandibles this variant present in 11 mandibles (39.28%). The commonest pattern was bilateral detection of this anomaly in 6 mandibles (21.43%). Out of these in 4 mandibles the variant was single (14.29%) and in one mandible it was double (3.57%), while in remaining one mandible, on right side it was triple and on left side it was single (3.57%). In 5 mandibles it was unilateral (one each) (17.86%). [Table1, Figure1]

Table 1: Incidence (%) of accessory mandibular foramina

Unilateral	Bilateral	Right Side				Left Side				Total
		No. of foramina				No. of foramina				
17.86	21.43	28.57				32.14				39.28
		1	2	3	4	1	2	3	4	
		21.43	3.57	3.57	-	28.57	3.57	-	-	

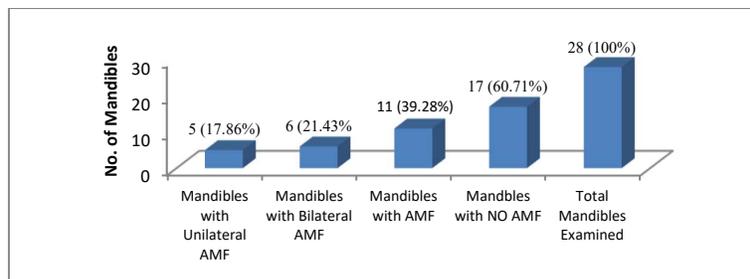


Figure 1: Distribution of Mandibles with Accessory Mandibular Foramina



Figure 2:



Figure 3:

DISCUSSIONS

Mandibular variant like any other variant may be considerable clinical, racial and regional significance. As a variation from normal especially in foramina may result, in to the unusual course of nerves and vessels of that region and clinical procedure adopted by clinicians should be accordingly adjusted and modified. Several workers have studied the significance of mandibular accessory foramina, a variant studied by present study. Reported cases of accessory mandibular foramina are very few. In a study conducted on south Indian population, the AMF were observed in 11 mandibles (16.4%). They were present unilaterally in 6 (8.9%) mandibles (3 on right side and 3 on left sides) and bilaterally in 5 (7.5%). Accessory foramen was single in 9 cases and it was found to be double in 2 cases. (Muralimanju *et al*, 2011).⁷ In a Brazilian population 27.3% mandible had AMF located on medial side, below the mandibular foramina and 43.24% had AMF above the mandibular foramina (Freire *et al* 2012).⁸ P P Samanta *et al*, 2013, a study carried out at Noida north India, the AMF was present in 16.66% of mandibles. A single AMF was present in 10% mandibles and in 6.66% mandibles, double AMFs were observed.⁹ Seema Gupta and Anshu studied fifty mandibles and observed AMF in 48% of mandibles in Punjab region (Gupta *s et al* 2013).¹⁰ Sutton 1974, studied 300 human mandibles and demonstrated the presence on both internal and external aspects of the bone, of a number of accessory foramina containing nerve fibres.¹ Padmavati G *et al* (2014) studied 65 adult human mandibles of south Indian origin and incidence of accessory foramina was noted in 41.5% of the mandibles and in 29.2% mandibles it was unilateral and bilateral in 12.3% cases.¹¹ The passage of blood vessels and nerves makes the accessory mandibular foramina clinically important. The embryological basis of the occurrence of the accessory mandibular foramina has been described in the literatures. During development, initially, there are three inferior alveolar nerves, which innervate each of the three groups of the mandibular teeth. Later there is a fusion of these nerves and single inferior alveolar is formed. The incomplete fusion of these three nerves leads to the development of double mandibular canals.¹² The differences in size and number may be explained by different criteria for size and different methods of evaluation. Studies that utilized dissection and examination of dry mandibles would produce a higher and more accurate number of foramina than studies which are based on radiographic evaluation, where many foramina will not be visible.¹³ Most studies agree that the majority of accessory mandibular foramina are present in posterior arc of mandible and lesser degree in the symphysis and more frequently on medial aspect of

mandible.^{1,14,15} Racial differences may affect the prevalence of accessory foramina. For example native population of North America may have more foramina than others. However no gender difference was found.^{16,17,18} Apparently prevalence of accessory mandibular foramina is affected by age with a marked peak in adolescent which may reflect adolescent growth spurt leading to increased neurovascular requirements.¹⁸ Contents of accessory foramina and canals, find out only by dissection. Myelinated nerves, neurovascular bundles have been found to occupy these foramina and canals.^{1,14,19} The presence of AMF makes it more vulnerable to perinural spread of tumor cells from cortical to cancellous part of the bone.²⁰ thus the knowledge of AMF is important for radiotherapist. Dissection and visual inspection of dry mandibles are the most accurate way to diagnose these accessory mandibular foramina. In the present study, AMF were present in 39.3% of mandibles, bilateral in 21.43% mandibles and unilateral in 17.86% mandibles. The single variant was 14.29%, double variant was 3.57% and triple variant was (3.57%).

CONCLUSION

Present study in the light of other global studies therefore shows marked variation in this mandibular variant of accessory mandibular foramina. The findings are of great clinical (especially in surgical, dental and anaesthetic field), regional and racial significances. The results of the present study may be utilized by dentists and oncologists for determining accurate site of local anaesthesia and to prevent unwanted spread of infections and tumour cells during radiotherapy via these variants respectively.

REFERENCES

1. Sutton RN. The practical significance of mandibular accessory foramina. *Aust Dental J* 1973; 19:167-173.
2. Das S, Suri RK: An anatomical-radiological study of an accessory mandibular foramen on the medial surface of mandible. *Folia Morphol.* 2004; 63:511-513.
3. Fanibunda K, Matthews JNS. Relationship between accessory foramina and tumor spread in the lateral mandibular surface. *J Anat*, 1999; 195:185-190.
4. Gray H, Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Ferguson MWJ (eds.0(1995) Gray's anatomy. 38th ed. Churchill Livingstone, London, pp.576-577.
5. Brown JS, Brown RM. Factors influencing the pattern of invasion of the mandible by oral squamous cell carcinoma. *Intern J oral Maxillofacial Surg*, 1995; 24:417-428.

6. Mc Gregor DA, Mac Donald DG. Routes of entry of squamous cell carcinoma in to the mandible. *Head Neck Surg*, 1987; 10: 294-301.
7. Murlimanju B V, Latha V, Prameela M D, Mohammed C, Ashraf *et al.* Accessory mandibular foramina: Prevalence, Embryological basis and surgical implications. *Journal of clinical and diagnostic research*.2011; 5(6):1137-1139.
8. Freire AR, Rossi AC, Prado FB, Caria PHF and BotacinPR. Incidence of the mandibular foramina in Brazilian population. *J Morphol.Sci*, 2012; 29(3): 171-173.
9. PP Samanta, Poonam Kharb. Morphometric analysis of mandibular foramen and incidence of accessory mandibular foramina in adult human mandibles of an Indian population. *Rev Arg de Anat Clin*; 2013; 5(2):60-66.
10. Gupta S, Soni A, Singh P. Morphological study of accessory foramina and its clinical implication. *Indian J of oral Sciences*, 2013; 4(1): 12-16.
11. Padmavathi G, Tiwari S, Varalakshmi KL, Roopashree R. An Anatomical Study of Mandibular and Accessory Mandibular Foramen in Dry Adult Human Mandibles of South Indian Origin. *IOSR-JDMS*, 2014; 13(4):83-88.
12. Chavez Lomeli ME, MansillaLoryJ, PompaJA, Kjaer I. The Human Mandibular Canal Arises from Three separate Canals, Innervating Different Tooth Groups. *J Dent Res*, 1996; 75:1540-4.
13. Kaufman E, Serman NJ, Wang PD. Bilateral Mandibular Accessory Foramina and Canals: A case Report and Review of the Literature. *Dentomaxillofacial Radiology*, 2000; 29:170-175
14. Carter RB, Keen EN. The Intramandibular Course of the Inferior Alveolar Nerve. *J Anat* 1971; 108:433-440.
15. Haveman CW, Tebo HG. Posterior Accessory Foramina of the Human Mandible. *J Prosthet Dent* 1976; 35:462-468.
16. Nortje CJ, Farman AG, Grotepass FW. Variations in the Normal Anatomy of the Inferior Dental (Mandibular) Canal: A Retrospective Study of Panoramic Radiographs from 3612 Routine Dental Patients. *Br J Oral Surg* 1977; 15:55-63.
17. Langlais RP, Broadus R, Glass BJ. Bifid Mandibular canals in Radiographs. *J Am Dent Assoc* 1985; 110:923-926.
18. Ossenberg NS. Retromolar Foramen of the Human Mandible. *Am J PhysAnthropol* 1987; 73:119-128.
19. Sicher H, Dubrul EL. *Oral Anatomy*, 7thed, St. Louis. The C.V. Mosby Company.1980:468.
20. Funibunda K, Matthews JNS. Relationship Between Accessory Foramina and Tumor Spread in the Lateral mandibular Surface. *J Anat* 1999; 195:185-90.

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