International Journal of Research in Medical Sciences
Tiwari S et al. Int J Res Med Sci. 2015 Jun;3(6):1383-1387
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: 10.18203/2320-6012.ijrms20150152

Research Article

A study on the incidence of retromolar foramen in South Indian adult dried human mandibles and its clinical relevance

Suman Tiwari*, Roopashree Ramakrishna, M. Sangeeta

Department of Anatomy, MVJ Medical College & Research Hospital, Bangalore, Karnataka, India

Received: 02 April 2015
Accepted: 06 May 2015

***Correspondence:**
Dr. Suman Tiwari,
E-mail: sumanravi80@gmail.com

ABSTRACT

Background: The retromolar foramen is one of the most important non-metrical anatomical variants in the mandible. The present study describes the incidence of retromolar foramen in South Indian adult dried mandibles and its clinical relevance.
Methods: One hundred South Indian adult dried mandibles of unknown sex were studied at the Department of Anatomy, MVJ Medical College, Bangalore for the presence of retromolar foramen. Its location, size, shape, distance of the foramen if present from the posterior border of socket for 3rd molar tooth, anterior border of ramus of the mandible were measured.
Results: Retromolar foramen was present in 16 (16%) of the mandibles. Out of the 16 mandibles, it was present bilaterally in 3 (3%) mandibles and unilaterally in 13 (13%) mandibles (In 3 (3%) on the right side and in 10 (10%) on the left side). The mean diameter of the foramen was 1.33mm (range - 1.10-1.92 mm). It was oval in shape in 9 (9%) and rounded in shape in 7 (7%) mandibles. The mean distance of retromolar foramen from the posterior border of socket for 3rd molar tooth and anterior border of ramus were 6.15 mm (2.23-12.10) and 8.02 mm (3.24-13.12) respectively.
Conclusions: The knowledge about the incidence of the retromolar foramen is important for dental surgeons during various anaesthetic, implantation and surgical procedures of the mandible, especially during extraction of the lower last molar tooth.

Keywords: Mandible, Ramus of mandible, Retromolar fossa, Retromolar foramen, Retromolar canal, Third molar tooth

INTRODUCTION

The retromolar foramen is an accessory foramen of the mandible situated in the retromolar fossa. The triangular depression between the temporal crest and the anterior border of the ramus of mandible is called the retromolar fossa. Nerves may pass from the substance of temporalis to enter the mandible through the retromolar fossa, where they communicate with branches of the inferior alveolar nerve. Foramina occur in 10% of retromolar fossa and infiltration in this region can abolish sensation which occasionally remains after an inferior alveolar nerve block.[1]

The retromolar foramen, which is located in the retromolar fossa receives the retromolar canal which normally arises from the mandibular canal behind the third molar.[2] This foramen transmits a neurovascular bundle consisting of an artery, vein and nerve that contribute to the nutrition and innervations of the pulp and periodontium of the lower teeth. This area forms an open corridor for the passage of infections arising in

connection with the third molar, this is the so-called Chompret-L' Hirondel abscess.[3]

Ossenberg[4] analysed 2500 mandibles for the retromolar foramina and stated that these foramina are more common in native populations of North America than in other part of the world namely India, Europe, Africa, & Northeast Asia. They occur more commonly unilaterally than bilaterally. He also reported peak incidence of the retromolar foramen in the adolescent cohort which might reflect increased neurovascular requirements related to the adolescent growth spurt and eruption of the wisdom teeth.

Bilecenoglu and Tuncer[5] evaluated 40 mandibles from population of turkey and found retromolar foramen in 10 (25%) (Bilateral retromolar foramen in 5% and a unilateral foramen in 20%).

The variations of human mandible are important because several dental procedures are carried out like dental extraction of third molar tooth, orthognathic surgey, mandibular reconstructions, and in implantation surgery.[6]

The present study is undertaken to analyze the incidence of retromolar foramen in South Indian adult dried human mandibles.

METHODS

The present study has been carried out on 100 South Indian adult dried & complete mandibles of unknown sex which were collected from medical students in the Department of Anatomy, MVJ Medical College & Research Hospital, Bangalore. The mandibles with marked deformities or asymmetries and fractured mandibles were excluded from the study. The area behind the 3rd molar tooth in all the mandibles was carefully inspected for the presence of retromolar foramen. Retromolar foramen if present was noted. Wherever the foramen was present, its location, size, shape, distance of the foramen from the posterior border of the socket for the 3rd molar tooth and from the anterior border of ramus of the mandible was noted with the help of vernier caliper to the nearest millimetre. The mean, range and standard deviation of all the measurements are statistically analyzed. The data obtained was recorded, analyzed and compared with the previous studies.

RESULTS

Out of the 100 mandibles studied, retromolar foramen was present in 16 (16%) of the mandibles. The remaining 84 (84%) mandibles did not show the presence of retromolar foramen. It was observed that out of the 16 (16%) mandibles, retromolar foramen were found to be bilateral (Figure 1) in 3 mandibles (3%) and unilateral in 13(13%) [Left: 10 (10%) (Figure 2); Right: 3 (3%) (Figure 3)] mandibles. (Table 1) It was oval in shape in 9 (9%) and rounded in shape in 7 (7%) mandibles.

The mean diameter of the foramen was 1.38 mm (range-1.10- 1.92 mm). The mean distance of retromolar foramen from the posterior border of socket for 3rd molar tooth and anterior border of ramus of mandible were 6.15 mm (2.23-12.10) and 8.02 mm (3.24-13.12) mm respectively (Table 2).

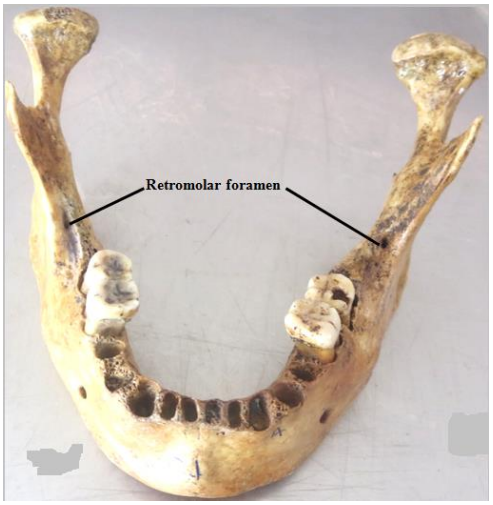

Figure 1: Showing retromolar foramen bilaterally.

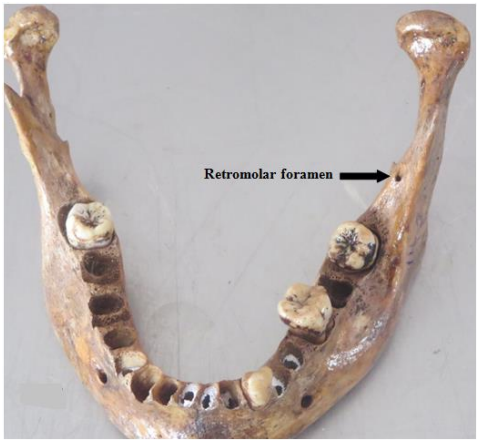

Figure 2: Showing retromolar foramen on left side.

Figure 3: Showing retromolar foramen on right side.

Table 1: Showing the distribution of retromolar foramen.

Retromolar foramen	Number	Percentage
Rt. sided	3	3%
Left sided	10	10%
Bilateral	3	3%
Absent	84	84%

Table 2: Distance of retromolar foramen from the posterior border of socket for 3rd molar tooth and anterior border of ramus of mandible.

Mandible number	Side	Distance between the retromolar foramen and	
		3rd molar tooth (mm)	Anterior border of ramus (mm)
4	L	2.23	10.32
6	L	7.81	10.14
10	L	5.83	9.32
13	L	4.82	7.91
21	B	3.94	9.82
25	L	3.94	13.12
35	R	5.68	8.46
48	L	2.92	6.91
52	B	8.91	4.82
58	R	7.92	9.84
64	R	4.63	9.41
68	L	3.96	9.32
72	L	5.24	3.24
74	L	12.1	6.42
88	B	9.23	3.72
92	L	9.32	5.64
Mean ± SD		6.15 ± 2.76	8.02 ± 2.69
Min-Max		2.23-12.10	3.24-13.12

DISCUSSION

The incidence of retromolar foramen reported by different authors varies from 4.35% - 21.9%.[7-14] and is summarized in Table 3. The highest incidence was reported by Narayana (21%) and the lowest by Shantaram (4.35%). In the present study, its incidence is 16% which is within the range.

The mean diameter and distance of retromolar foramen from posterior border of socket for 3rd molar, anterior border of ramus of the mandible of the present study is compared with earlier studies[10-12,14] and represented in Table 4.

In the present study, the distance of retromolar foramen from the posterior border of 3rd molar is 6.15 mm which is comparable with the reports published in the literature (4.3 mm - 9.71 mm). The close relation of retromolar foramen with 3rd molar tooth may damage the structures passing through it during extraction of 3rd molar tooth and causes postoperative hematomas due to rupturing of the blood vessels.

The retromolar foramen extends as a retromolar canal into the body of the mandible. Narayana[7] have described three morphological types of the retromolar canals in their study using injection of radiopaque dye Angiograffin into the retromolar foramen and followed the course of the canal: Type - I was a simple canal descending vertically to the mandibular canal whereas type-II canal first descended and then coursed posteriorly and joined the mandibular canal. Type-III canal descended vertically, but another canal traversed anteriorly from the anterior aspect. They have reported a varying diameter among the three types - type-I - 1.5 mm; type-II - 3 mm; type-III - 4.35 mm.

Table 3: Showing the comparison of incidence of retromolar foramen of the present study with other studies.

Author	Number of specimens	Total	Right sided	Left sided	Bilateral
Narayana (2002)	242	53 (21.9%)	26 (10.7%)	17 (7.1%)	10 (4.1%)
Priya Manjunath (2005)	157	28 (17.8%)	9 (5.7%)	11 (7%)	8 (5.1%)
Ivan (2008)	294	38 (12.9%)	14 (4.8%)	13 (4.4%)	11 (3.7%)
Senthil Kumar (2010)	150	26 (17.3%)	8 (5.3%)	6 (4%)	12 (8%)
Shantaram (2013)	115	5 (4.35%)	2 (1.74%)	2 (1.74%)	1 (0.87%)
Athavale (2013)	71	10 (14.08%)	4 (5.63%)	4 (5.63%)	2 (2.81%)
Seema Gupta (2014)	50	9 (18%)	3 (6%)	2 (4%)	4 (8%)
Bhagath (2014)	94	11 (11.7%)	5 (5.3%)	3 (3.2%)	3 (3.2%)
Present study	100	16 (16%)	3 (3%)	10 (10%)	3 (3%)

Table 4: Showing the comparison of mean diameter and distance of retromolar foramen from 3rd molar, anterior border of ramus of the present study with other studies.

Author	Number of specimens	Mean diameter (mm)	Distance of foramen from 3rd molar (mm)	Distance from anterior border of ramus (mm)
Shantaram	115	2.97	9.71	-
Athavale	71	-	8.5	-
Bhagath	94	-	6.21	6.57
Senthil Kumar	150	1.3	4.3	8.4
Present study	100	1.4	6.15	8.02

The predominant components of the retromolar foramen are the neurovascular bundle which originates from the mandibular canal. The artery in the canal is a branch from inferior alveolar artery which joined with the branches of buccal and facial artery. The nerve in the retromolar canal was a branch from the trunk of inferior alveolar nerve and supplied the third mandibular molar, the mucosa of retromolar triangle, the buccal mucosa, and the buccal gingiva in the mandibular premolar and molar region.

The nerve fibres which pass through retromolar foramen and canal also provide innervations to temporalis and buccinators. Hence, damage of these nerve fibres in retromolar canal leads to alteration in function of temporalis and buccinators.

Possible vascular excessive bleeding or postoperative hematomas can be caused by damage to the contents of the neurovascular package on this canal and foramen or the nerve injury resulting in post-anaesthesia of the area if the package was injured during a surgical procedure. Furthermore, any restoration of prostheses or implants located distally to the retromolar area can lead to pain and parasthesia.[9,10]

The appearance of a retromolar foramen, with or without the presence of bifid inferior alveolar nerve canals, also often predicts the presence of accessory innervation to the mandibular molars. This accessory innervation has been proposed to be responsible for failure of the traditional inferior alveolar nerve block. The nerve which is thought to provide accessory innervation in these situations is the long buccal nerve (a branch of the anterior division of the mandibular nerve) or perhaps even accessory branches of the Inferior alveolar nerve.[11]

The dental surgeon should also be aware of occasional presence of this neurovascular bundle in retromolar area while infiltrating local anesthetic agents in the surgical procedures carried out for impacted lower third molar tooth extraction. Carcinoma in the mucosa of the retromolar trigone may require resection and radical dissection. Such surgery can put important structures at risk.

The vascular components which pass through retromolar foramen may facilitate the spread of infection and metastases from the oropharynx to the blood circulation.[12,14]

The presence of a retromolar neurovascular bundle may provide alternative routes whereby impulses conveying pain can continue to be transmitted even after the main trunk of inferior alveolar nerve has been blocked at the mandibular foramen. In such individuals, complete anaesthesia is obtained by supplementary infiltration of local anaesthetic into the soft tissues overlying the retromolar fossa.[15]

Hence the knowledge of the location and contents of retromolar foramen should be carefully considered for choosing the best plan and consequently for optimizing anaesthetic and surgery procedure during oral and maxillofacial procedures.

CONCLUSION

The present study reports the incidence of retromolar foramen and its distance from posterior border of 3rd molar, anterior border of ramus in south Indian adult population. The high incidence of retromolar foramina should alert the dental surgeon to avoid the complications during surgical extraction of lower wisdom teeth. The knowledge of the presence of neurovascular structures in the retromolar foramen is important during surgical procedures performed in retromolar area such as dieresis procedures, flap lifting, bone tissue for autologous bonegrafts, osteotomy for the surgical extraction of lower third molars, placement of osseointegrated implants for orthodontic, or during the division of the mandibular ramus in the sagittal split osteotomy surgery.

ACKNOWLEDGEMENTS

I sincerely thank our principal of MVJ Medical College & Research Hospital, Bangalore, for giving me permission to carry out the research work.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, et al. The retromolar foramen. In: Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, et al., eds. Gray's anatomy 39th ed. London, UK: Churchill Livingstone: 2000: 481-483.

2. Von Arx T, Hanni A, Sendi P, Buser D, Bornstein MM. Radiographic study of the mandibular retromolar canal: an anatomic structure with clinical importance. J Endod. 2011;37:1630-5.
3. Rossi AC, Freire AR, Prado BG, Prado FB, Botacin PR, Caria PHF. Incidence of retromolar foramen in human mandibles: ethnic and clinical aspects. Int J Morphol. 2012;30(3):1074-8.
4. Ossenberg NS. Retromolar foramen of the human mandible. Am J Phys Anthropol. 1987;73(1):119-28.
5. Bilecenoglu B, Tuncer N. Clinical and anatomical study of retromolar foramen and canal. J Oral Maxillofac Surg. 2006;64(10):1493-7.
6. Bilodi AKS, Singh S, Ebenezer DA, Suman P, Kumar R. A Study on retromolar foramen and other accessory foramina in human mandibles of Tamil Nadu region. Int J Health Sci Res. 2013;3(10):61-5.
7. Narayana Nayak UA, Ahmed WN, Bhat JG, Devaiah BA. The retromolar foramen and canal in south Indian dry mandibles. Eur J Anat. 2002;6:141-6.
8. Priya Ranganathan, K. Y. Manjunath, V. Balasubramanyam. Retromolar foramen. Indian J Dent Res. 2005;16(1):15-6.
9. Suazo GI, Cantín LM, López FB, Valenzuela UV, Valenzuela RR. Morphometric study of the retromolar triangle. Int J Odontostomat. 2007;1(2):129-32.
10. Senthil Kumar S, Kesavi D. A study on the incidence of retromolar foramen and canal in Indian dried human mandibles and its clinical significance. Int J Anatom Sci. 2010;1:14-6.
11. Shantharam V, Manjunath KY, Aruna N, Shastri D. Retromolar foramen in South Indian mandibles. Anatomica Karnataka. 2013;7(1):34-7.
12. Athavale SA, Vijaywargiya M, Deopujari R, Kotgirwar S. Bony and cadaveric study of retromolar region. Peopl J Sci Res. 2013;6(2):14-8.
13. Gupta S, Soni A, Singh P. Morphological study of accessory foramina in mandible and its clinical implication. Indian J Oral Sci. 2013;4(1):12-6.
14. Potu BK, Kumar V, Salem AH, Abu-Hijleh M. Occurrence of the retromolar foramen in dry mandibles of South-Eastern part of India: a morphological study with review of the literature. Anat Res Int. 2014;2014:1-5.
15. Jaffar AA, Al-Zubaidee AF, Al-Salihi AR. Anatomical features of clinical significance in dry mandibles. Iraqi Dent J. 2002;29:99-118.

DOI: 10.18203/2320-6012.ijrms20150152
Cite this article as: Tiwari S, Ramakrishna R, Sangeeta M. A study on the incidence of retromolar foramen in South Indian adult dried human mandibles and its clinical relevance. Int J Res Med Sci 2015;3:1383-7.