Section: Anatomy

Original Research Article

THE CLINICAL SIGNIFICANCE OF A MORPHOMETRIC AND MORPHOLOGICAL INVESTIGATION OF THE MENTAL FORAMEN IN THE ADULT HUMAN MANDIBLE

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Received *: 05/11/2024*
Received in revised form *: 16/12/2024*
Accepted *: 31/12/2024*

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DOI: 10.70034/ijmedph.2025.1.11

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (1); 61-64

ABSTRACT

Background: It is important to know where the Mental Foramen is and how its shape changes because that helps doctors find the important oral neurovascular bundle that runs through it. The goal is to look at the mental foramen in dried human mandibles using morphometric and morphological methods.

Material and Methods: For this investigation, 60 dried adult human mandibles of an unknown sex with entire teeth and undamaged alveolar boundaries were acquired from the Department of Anatomy, Dr. VRK Women's Medical College and Research Centre, Aziznagar, Telangana, India. This study was conducted between September 2023 to August 2024. The MF that was witnessed had an oval or spherical shape.

Results: During our study, the skull foramen's position and shape mostly stayed the same. The average distance between a group's symphysis menti and skull foramen is very important for therapy. Because there aren't any clear physical clues, it's usually hard to find the mental foramen. In a professional setting, the skull foramen is located near the lower teeth because it can't be seen or felt. Clinically, there are times when patients don't have any reference teeth or their teeth are in the wrong place, which makes it impossible to find the skull foramen in its normal place.

Conclusion: This study gives us important new information about how the skull foramen looks in people of different races and demographics. This work will help dental surgeons a lot by giving them accurate measurements of anatomical landmarks that are useful for therapy.

Key Words: Human mandible, mental foramen, morphometric.

INTRODUCTION

Dental practitioners who perform peri-apical surgery in the mandibular skull region should pay close attention to the Skull Foramen (MF), which is an essential anatomical feature. Surgery, local anesthetic, and other invasive therapies are all made easier with its assistance. The foramen through which mental nerve and blood vessels traverse is known as mental foramen.[1-3] Either beneath the second premolar or in the space between the premolar teeth lies this structure. As it travels through the mandibular canal, the inferior alveolar nerve and its blood vessels eventually arrive to the skull foramen, which is located in the jaw.[2-4]

Two distinct canals, the incisive canal and the skull canal, are formed when the mandibular canal divides into two distinct canals at this point. The skull bundle is responsible for delivering nerves and blood to the soft tissues of the chin, lower lip, and gingiva on the same side of the mouth. This is accomplished through the skull foramen connection. An inferior alveolar block is not required in order to numb the front teeth, such as the canines and premolars, because a numbing solution can be injected near to the skull foramen. This allows for the front teeth to be numbed.[3-5]

Although it is referred to as a skull injection or a mental nerve block, the purpose of the shot is to have an effect on the nerves that are located in that region, specifically the inferior alveolar and incisive nerves. It is essential to locate the primary mandibular

neurovascular bundle that passes through the MF. This can be accomplished by examining the location of the MF as well as the manner in which it has altered its shape [4-6]. Using morphometric analysis to investigate how the MF interacts with the lower teeth, the mandibular body, and the back border of the ramus, the purpose of this study was to investigate how the MF changes shape and position during the course of the study. When it comes to highly invasive procedures in the oral and maxillofacial regions, such as surgical procedures, diagnostic procedures, and local anesthetic, the skull foramen is a very significant landmark.[5-7] If dental professionals are aware of the locations of the accessory foramen and the skull foramen, they will be better able to prevent accidents during periapical surgery and administer complete anesthesia. It is a significant instrument in the field of investigative odontology, despite the fact that the gonial angle (The gonial angle is a term used in anatomy and orthodontics to describe the angle formed by the intersection of the posterior border of the ramus of the mandible and the inferior border of the mandible). The normal range of the gonial angle is approximately 100° to 108° in the general population. Studies have observed that females tend to have a slightly smaller gonial angle, usually 3° to 5° less than males, owing to differences in craniofacial morphology and growth patterns. Does not receive a lot of attention. It is the purpose of this study to investigate the amount of MF that is present, as well as its size, shape, dimensions, and position in relation to body markers that surgeons observe.[6-8]

MATERIALS AND METHODS

For the purpose of this study, sixty dried adult human mandibles of an unspecified sex with entire teeth and undamaged alveolar boundaries were acquired from the Department of Anatomy, Dr. VRK Women's Medical College and Research Centre, Aziznagar, Telangana, India. This study was conducted between September 2023 to August 2024. Using a Vernier caliper on both sides, measurements were taken of the mandible's size, shape, location, number of skull foramina, and orientation of the aperture of the mental ass. The form of the observed MF was oval or spherical.

RESULTS

A morphometric study of 60 dehydrated human mandibles showed that each side had a single mandibular foramen; no cases of a second or secondary foramen were seen in this study. The average angle of the mandible that was measured was 128°. In 35.8% of cases, the foramina were round, and in 62.2% of cases, they were oval. The average width across the width was 2.2 to 5.8 mm, with 4.62 mm on the right and 2.35 mm on the left. The average height across the width was 3.10 mm on the right and 2.20 mm on the left, with a range of 2.1 to 3.2 mm. The linear measures of MF in relation to anatomical features are shown in Table 1. [Table 1]

In Table 2, you can see where the skull foramen is in reference to both sets of mandibular teeth. The main foramen was placed next to the teeth on both the right and left sides, and it lined up with the second premolar's lengthwise axis. The least common position was lined up with the first molar. This was followed by lining up with the first premolar. The next least common position was between the second premolar and the first molar, and the third least common position was between the first and second premolar. [Table 2]

Table 1: Morphometric skull foramen measures between sides

Sr. No.	Characteristic	Right Side (in mm)	Left Side (in mm)
1	Symphysis menti distance from MF	24.26	25.78
2	Distance from MF to alveolar margin	15.14	15.63
3	Distance between MF and mandible's lower border	12.33	13.69
4	Mandible ramus posterior boundary distance from MF	66.48	65.88

Table 2: Periodic skull foramen placement on mandibular teeth between sides

Sr. No.	Location	Right Side	Left Side
1	In line with the second premolar.	85.37%	83.24%
2	Second premolar to first molar	4.16%	2.68%
3	From first to second premolar	5.53%	4.74%
4	In line with the first molar	2.21%	2.61%
5	Like the first premolar	5.10%	5.27%

Table 3: Compare skull foramen placement to anatomical markers

Sr. No.	Location	Side	Current study
1	Next to the second premolar	Right	85.23%
		Left	83.64%
2	Second premolar to first molar	Right	4.34%
		Left	3.54%
3	First-to-second premolar	Right	6.38%
		Left	4.76%
4	Like the first molar	Right	2.36%
		Left	2.25%

5	Like the first premolar	Right	5.36%
		Left	4.44%

DISCUSSION

It is essential to determine the precise position of the skull foramen in order to properly diagnose and treat issues that are associated with the mandible. Operative operations have the potential to cause damage to the mental nerve bundle, which originates in the skull foramen. This might result in alterations in the distribution of feelings, as well as paresthesia or numbness within the affected area. When the mental canal opens up, the opening is referred to as the skull foramen in clinical anatomy.[8-10]

The skull foramen is often located between the tips of the first and second lower premolars, where it is described in the majority of the available literature. People in Europe who fall into this category are the only ones who are impacted by it; other groups are not affected.[10-12] A variety of racial groupings have skull foramen located in a variety of various locations. In British people, the skull foramen was located between the first and second premolars, however in Chinese people, it was aligned with the second premolar during the dental examination. In addition, it was fascinating to observe that the skull foramen of persons of African descent was situated further back than that of people of white descent.[13-15]

In this investigation, the distance between the left side of the skull and the skull foramen was measured to be 25.43 ± 4.31 millimeters, whereas the right side measured 26.34 ± 4.32 millimeters respectively. The foramen of the skull remained largely unchanged throughout the course of this research project, both in terms of its location and its appearance.[16-18] The typical distance that separates the symphysis menti and the skull foramen of a group is of critical significance for therapeutic purposes. The skull foramen is typically difficult to locate because there are no obvious anatomical clues to guide one in the right direction. Due to the fact that it cannot be seen or felt, the skull foramen is situated in close proximity to the lower teeth in a situation that is professional.[17-19]

If the patient does not have any reference teeth or if their teeth are positioned incorrectly, it is possible that the skull foramen will not be seen in its usual location while the patient is in a clinical setting. If you are aware of the distance that separates the skull foramen from the symphysis menti, it will be much simpler to locate the appropriate location for it.[18-20]

It was found that the aperture of the brain canal was located behind and above the ear in the majority of people. All of this was consistent with the findings of earlier investigations. During the course of this investigation, the average horizontal widths on the right side and the left side were found to be 4.35 mm and 3.34 mm, respectively.[19-21]

Not only are these numbers lower than the 5.58 mm that was discovered in Nigerians, but they are also roughly equivalent to the 2.88 mm that was discovered in South Africans. In this particular investigation, the skull foramen was discovered on the long axis of the second lower premolar and the line of the first molar the majority of the time. According to the findings of other studies, this was consistent with what was discovered concerning Thai, Malay, and Asian Indian communities.[20-23] During the time leading up to delivery, the skull foramen is located in the alveolar bone, specifically at the middle of the first molar and the primary canine. It has been hypothesized that a delay in the development of the fetus is the reason of placements that are not typical of the majority of cases.[24-26]

CONCLUSION

Dentists need to be aware of how the position, form, and orientation of the skull foramen alter, as well as the presence of other skull foramina, in order to prevent the mental nerve from being injured during operations involving periodontal disease, dental implants, and endodontics. When a mental nerve block is being performed, the most crucial item to take into consideration is the distance that separates the skull foramen from the bottom edge of the jaw and the alveolar margin.

Sources of funding: None
Conflicts of interest: None.

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