

## Original Article

# Assessment of Position of Mandibular and Genial Foramen in North Indian Human Mandibles

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### ABSTRACT:

**Introduction:** The mandibular foramen is a prominent foramen and its knowledge is of paramount importance during dental procedures of lower jaw. Most common of the accessory foramina are the foramina 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. The present study was undertaken to examine the incidence of the Mandibular Foramen and lingual (genial) foramen and their morphological variants by examining adult north Indian human mandibles from anthropology museum. **Material and Methods:** The present study was carried on 500 adult north Indian human mandibles from anthropology museum. They were carefully examined and the incidence of the Mandibular Foramen and lingual (genial) foramen and their morphological variants was observed and noted after visual examination. Data obtained was studied and tabulated. **Results:** The position of mandibular foramen was more common below the midpoint, 451 cases (90.2%) while it was less common at the midpoint, 49 (9.8%) cases. In none of the mandibles examined, the position of the mandibular foramen was found above the midpoint. In the 500 mandibles examined, lingual foramen was present in 468(93.6%) cases, single foramen in 190 (38%), and multiple in 278 (55.6%). Multiple lingual foramens were more common (55.6%) than single foramen. **Conclusion:** The most common position of the mandibular foramen is below the midpoint of the height of ramus, from angle of mandible to the tip of condyloid process, in 90.2% of the cases. Multiple lingual foramina were more commonly found (55.6%) than a single lingual foramen (38.0%). Thus, it is concluded that morphological variants are extremely important to estimate the clinical, racial and anthropological significance of a particular population and should be kept in mind while doing a population study.

**Keywords:** Accessory foramen; Lingual foramen; Mandible; North India.

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### INTRODUCTION

The mandibular foramen is a prominent foramen and its knowledge is of paramount importance during dental procedures of lower jaw.<sup>1</sup> Its location has been deliberated in relation to the anterior-posterior dimensions of the ramus of the mandible, the height of the ramus and changes of these dimensions with age, and also the foramen's position in relation to the occlusal plane.<sup>2</sup> Thangavelu et al,<sup>3</sup> studied the position of the mandibular foramen and reported that the MF is positioned at a mean distance of 19 mm (with SD 2.34) from coronoid notch of the anterior border of the ramus. Superio-inferiorly from the condyle to the inferior border MF is situated 5 mm inferior to the midpoint of

condyle to the inferior border distance (ramus height). Hayward J et al<sup>4</sup> conducted study on forty-five Asiatic skulls and sixty-two mixed skulls of black and white Americans to determine the anteroposterior relationship of the mandibular foramen. The mandibular foramen was found to be located in the third quadrant anteroposteriorly. The lingula was located just anterior to the mandibular foramen. There was no right or left side dominance in the ramus size and position of the mandibular foramen. Most common of the accessory foramina are the foramina 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.<sup>1</sup> McDonnell

et al,<sup>5</sup> Shiller et al<sup>6</sup> found the accessory foramen lying in the midline, either superior or within the genial tubercle, and named it therefore the lingual foramen. Sutton<sup>7</sup> referred to this as the midline foramen whereas Madeira et al<sup>8</sup> referred as the superior retromental foramen, while Eriguchi<sup>9</sup> and Shirai<sup>10</sup> as the supraspinous foramen.<sup>11</sup> The present study was undertaken to examine the incidence of the Mandibular Foramen and lingual (genial) foramen and their morphological variants by examining adult north Indian human mandibles from anthropology museum.

**MATERIAL AND METHODS**

The present morphological study of the non metric morphological mandibular variants was carried out in the Department of Anatomy, G.S.V.M. Medical College, Kanpur. 500 adult north Indian human mandibles from anthropology museum, were randomly selected belonging to both the sexes. They were carefully examined and the incidence of the Mandibular Foramen and lingual (genial) foramen and their morphological variants was observed and noted after visual examination.

For studying mandibular foramen (MF): In all specimens both the third molar teeth had erupted into occlusion. Observations were done with the help of a flexible tape and the height was measured from the angle of the mandible to the highest point of the condyloid process. The midpoint of the line joining these two points was decided and the position of the MF was observed on both the sides:

- Above the midpoint.
- At the midpoint.
- Below the midpoint.

Data obtained was studied and tabulated

**For studying lingual (genial) foramen:** The mandibles studied were noted for the presence of the lingual foramen on the lingual surface of the body of the mandible. The location of the foramen was determined in relation to the mental spines (previously called genial tubercles) and the following positions were noted:

- Foramen present superior to the mental spines and referred as supraspinous
- Foramen present in between the mental spines and referred as interspinous
- Foramen present inferior to the mental spines and referred as infraspinous.

The lingual foramen was also noted if it was present in more than any one of the above described positions just as it was also noted for its absence.

Data obtained was studied and tabulated.

**RESULTS**

The position of the mandibular foramen (figure 1 and 2) was studied in relation to the midpoint of the height of ramus from the angle to the tip of the condyloid process. The three positions studied were categorized as to be above the midpoint, at the midpoint and below the midpoint (table 1).

**Table 1:** Mandibular foramen according to position

S.No.	Position	Right Side		Left side	
		Number	%	Number	%
1	Above the midpoint	0	0%	0	0%
2	At the midpoint	49	9.8%	49	9.8%
3	Below the midpoint	451	90.2%	451	90.2%
Total		500	100%	500	100%

The position of the mandibular foramen, and its incidence was similar on both the sides of the mandible. Mandibular foramen was present in all the 500 mandibles examined. The position of mandibular foramen was more common below the midpoint, 451 cases (90.2%) while it was less common at the midpoint, 49 (9.8%) cases. In none of the mandibles examined, the position of the mandibular foramen was found above the midpoint.

**Table 2:** Position of Lingual foramen in relation to the mental spines (for singular foramen)

S.No.	Position of Lingual foramen	Number	%
1	Supraspinous	131	26.2%
2	Interspinous	24	4.8%
3	Infraspinous	35	7%
Total		190	38%

**Table 3:** Position of Lingual foramen in relation to the mental spines (in case of multiple or absent foramen)

S.No.	Position of Lingual foramen	Number	%
1	Supraspinous with infraspinous	166	33.2%
2	Supraspinous with interspinous	50	10%
3	Interspinous with infraspinous	18	3.6%
4	All present	44	8.8%
5	All absent	32	6.4%
Total		310	62%

The position of the lingual foramen (figure 3 and4) was studied in relation to the mental spines and the three primary position were categorized as: supraspinous (above the spines) interspinous (in between the spines) infraspinous (below the spines)

In the 500 mandibles examined, lingual foramen was present in 468(93.6%) cases, single foramen in 190 (38%) (table 2), and multiple in 278 (55.6%) (table 3). Multiple lingual foramens were more common (55.6%) than single foramen. In case of a singular lingual foramen, the supraspinous position was the maximum 131 (26.2%) while the interspinous position was encountered in minimum number of case 24 (4.8%). In case of multiple lingual foramens, the supraspinous with infraspinous position was most common, 166 (33.2%) while the interspinous with infraspinous position was least common 18 (3.6%). In the 500 mandibles examined, 32 (6.4%) mandibles had absent

lingual foramen while 44 (8.8%) mandibles had multiple lingual foramina present in all the three positions studied. In the 500 mandibles studied, the most common case was of a multiple mental foramen present in suprapericardial with infrapericardial position 166 (33.2%) while the least common case was of a multiple mental foramen present in interpericardial with infrapericardial position 18 (3.6%).

## DISCUSSION

The topography of the mandibular foramen is important clinically for anesthetic block of the inferior alveolar nerve entering the mandibular foramen after being given off by the mandibular division of the trigeminal nerve.<sup>2</sup>

Generally the position of the mental foramen is described at about the middle one third of the width of the mandibular ramus or slightly above to the midpoint of the height of the mandible. This is consistent with some previous studies commenced by Hetson et al.,<sup>12</sup> Hayward et al.<sup>13</sup> and Mwaniki et al.<sup>14</sup> Moreover these studies are in contrary with those studies that placed the mandibular foramen at the midpoint of ramus and halfway between the mandibular notch and the lower surface of the mandible.

There was no side dominance with respect to the position of the foramen in the present study as previously reported in some earlier studies. This may be expected since the right and left halves of the mandible would be subjected to the same genetic factors and magnitude of functional activity during the early stages of development. This fact is essential for the development of normal facial configuration. From the above, it could be expected that the size of the mandibles, if at all, would not vary appreciably between the gender and therefore the position of the mandibular foramen.

The present study is highly individualistic for the determination of the position of the mandibular foramen since the height of the mandible as a measurement criterion, was from the angle of the mandible to the tip of the condyloid process as compared to other studies which have described the height from the lower surface of the mandible to its notch,<sup>15-19</sup> other studies described the position in relation to the anterior or posterior border of ramus.<sup>20</sup> This is so because for the local anesthetic procedures the identification of the mandibular foramen is commonly done by palpation, and discrepancies of its position would result in a failed inferior alveolar nerve block. For a dentist, it is easier to palpate the mandibular foramen, using the landmarks such as angle & tip of the condyloid process rather than searching for the mandibular notch or borders of ramus. If we can get a correct knowledge about the position of mandibular foramen based on the above two landmarks, it would be far easier than to ascertain the position using multiple landmarks which are difficult to locate practically. Another point in favor of present study is that locating the position of mandibular foramen would not be based on occlusal surface of teeth as in some studies<sup>21</sup> since in old

age patients with loss of teeth and alveolar margin reabsorption, it cannot be done teeth and correctly or in cases of failure to account for the curvature of plane (space of Spee) present in some individual.

The results of the present study showed that the position of the mandibular foramen was most commonly seen below the midpoint of the height of ramus in 451 (90.2%) cases while it was less commonly present at the midpoint, 49 (9.8%). This is not in agreement with Williams et al.<sup>22</sup> who described it to be a little above the centre of ramus. This may serve as a guide for the placement of a hypodermic needle and local anaesthesia can be successfully carried out applying the results of the parameters studied.

The present study suggests that the lingual foramen is a consistent finding on the lingual surface of the mandible in midline, being present in 93.6% of specimens examined. This is a higher incidence than that previously reported by Shiller and Wiswell,<sup>6</sup> Sutton<sup>7</sup> who reported 88.9% 88.5% respectively.

The observations by Novitsky,<sup>23</sup> Phillips<sup>24</sup> and Sicher<sup>25</sup> of incomplete anesthesia in the incisive and bicuspid regions after mandibular blocks present the possibility of collateral innervation to these areas. It has been suggested Phillips<sup>24</sup> that branches of the nerves cutaneous colli may send sensory fibers to the bicuspid region and it has been demonstrated by Novitsky<sup>23</sup> that sensory fibers in the mylohyoid nerve may supply collateral innervation to the incisive regions of the mandible.

From the data obtained in this study, it would seem that the above suppositions are anatomically possible. If sensory nerves can be demonstrated passing through these foramina, then one could explain the incomplete anesthesia following conventional mandibular blocks. The frequency with which these foramina occur would seem to indicate some important role in either the vascular or nervous system. A study of dissected specimens is required to elucidate this problem.

## CONCLUSION

The most common position of the mandibular foramen is below the midpoint of the height of ramus, from angle of mandible to the tip of condyloid process, in 90.2% of the cases. Mandibular foramen was never found to be present above the midpoint of the height of ramus. Multiple lingual foramina were more commonly found (55.6%) than a single lingual foramen (38.0%). Single lingual foramen was most commonly present at suprapericardial position (26.2%) while multiple lingual foramen were most common at supra with infrapericardial positions (33.2%).

Thus, it is concluded that morphological variants are extremely important to estimate the clinical, racial and anthropological significance of a particular population and should be kept in mind while doing a population study.

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