



Original Research Article

A Morphological and Morphometric Study of the Lingula in Dry Adult Human Mandibles of South Indian Origin and Its Clinical Significance

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ABSTRACT

Background: Lingula is a bony projection on the medial surface of the mandibular ramus. It is closely related to the mandibular foramen and inferior alveolar nerve and it serves as a very important bony landmark in oral, maxillofacial surgeries and inferior alveolar nerve blocks and for excision of nerve in facial neuralgia.

Aim: To study the shape, height & position of the lingula in relation to the mandible.

Materials and methods: 65 human dry mandibles of South Indian origin were used for the study. Variations in the shape of the lingula were noted and classified. Vernier caliper was used to obtain the measurements of the lingula and the data collected was analysed statistically.

Results: Lingula was truncated in shape in 33.84%, triangular in 29.23%, nodular 19.23% and assimilated in 17.70% of the mandibles. The mean height of the lingula was 7.41 ± 2.23 mm. The lingula was located at a mean distance of 21.3 ± 4.12 mm and 19.6 ± 3.30 mm from the anterior and posterior borders of the mandibular ramus. The mean distance between the mandibular notch and the tip of the lingula was 18.6 ± 3.71 mm. The mean distance from lingula to the second molar and the base of the mandible were 34.6 ± 5.14 mm and 36.1 ± 4.12 mm respectively. The bilingual distance (It is the distance between the tips of both the lingula) was 77.7 ± 4.75 mm.

Conclusions: Lingula is a reliable landmark to locate the mandibular foramen in osteotomies; hence the knowledge of the anatomy of the lingula is important for the maxillo-facial surgeons to perform the surgeries safely and to avoid complications.

Key words: lingula, dry adult mandibles, south Indian population, morphometry and morphology.

INTRODUCTION

Lingula is a bony projection present on the medial surface of the mandibular ramus. It is closely related to the mandibular foramen through which the inferior alveolar nerve and artery pass and enter the mandibular canal. [1] In more than 50% of adults, the lingula takes part in the formation of half to

two thirds of the wall of the mandibular foramen, and the mylohyoid line starts from the posterior border of the lingula. [2] Lingula gives attachment to the sphenomandibular ligament. [3]

Sagittal split ramus osteotomy and intra oral vertical-sagittal ramus osteotomy are the most widely used techniques for the correction of dentofacial deformities

like prognathism, retrognathia and laterognathia. The lingula is an important anatomic reference point for these procedures. The bone cuts must be made in reference to the tip of the lingula to prevent complications like sectioning of the inferior alveolar nerve. [4, 5]

Lingula is used as an important anatomical guide to inject local anaesthetics during dental surgical procedures. The different locations of the lingula could be one of the reasons for failure of an inferior alveolar nerve block. Nearly 10-15% failure rates of conventional nerve blocks are attributed to the structural variations of the lingula. [6]

Various studies have shown regional morphological differences in the shape and position of the lingula among various human races. [7-9]

Jansisanont et al [7] have studied the shape and position of the lingula in adult mandibles of Thai origin.

Kanno CM et al. [8] have studied the position of the lingula in children. Tuli et al. [9] has classified the shapes of the lingula among Indian population.

The present study mainly aims at analysing the shapes, height and position of the lingula in the dry adult mandibles of south Indian origin and to compare the data with previous studies.

MATERIALS AND METHODS

Sixty-five (130 sides) dry human mandibles of south Indian origin were obtained from the anatomy department of MVJ medical college and research hospital for the study. Mandibles with second molar and canine tooth on the same side were chosen and edentulous, damaged mandibles were excluded from the study. To avoid error, the measurements were taken on three different occasions and the average values were noted. Vernier caliper calibrated to

measure upto 0.1mm was used in the study.

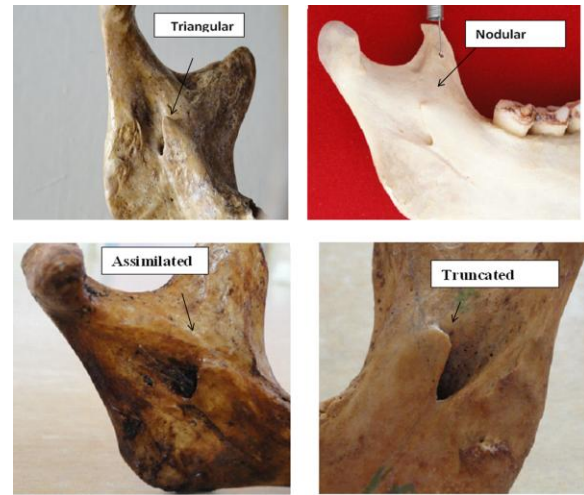


Figure: 1. Various shapes of the lingula.

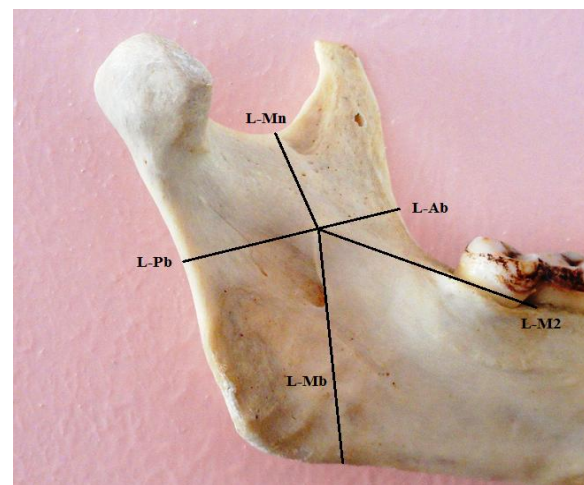


Figure: 2. Measurements of the lingula upto the mandibular notch (L-Mn), upto the anterior border (L-Ab), upto the posterior border (L-Pb), to the mandibular base (L-Mb), upto the alveolar socket of the second molar teeth (L-M2).

The shapes of the lingula was macroscopically studied and classified into four types. Triangular (lingula with broad base and a pointed apex). Nodular (when lingula is almost completely incorporated into the mandibular ramus, except by its apex), Assimilated (when lingual is fully incorporated into the mandibular ramus) and Truncated type (lingula with a quadrangular apex). Figure: 1

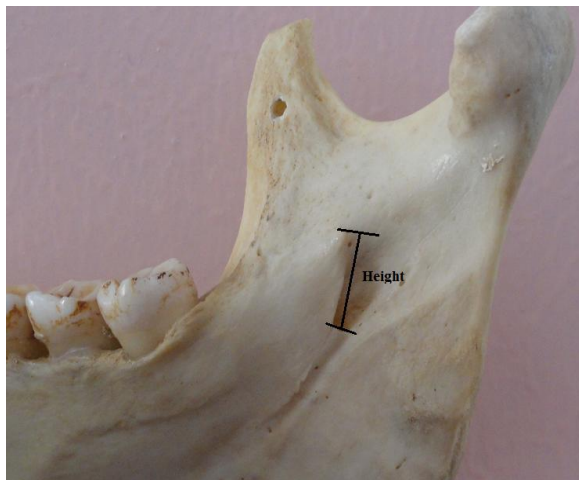


Figure: 3. Picture showing the measurement of the height of the lingula.

The location of the lingula was determined by the distance from the tip of the lingula to: the base of the mandible, the anterior and posterior borders of the ramus, the mandibular notch and the distal side of alveolar socket of second mandibular molar. The height of the lingula was measured from the tip of the lingula to the inferior border of the mandibular foramen. Bilingual distance measured from the tips of the lingula on both the sides of the mandibular ramus was noted.

Descriptive statistics was used. The mean and standard deviation (SD) of each measurement was computed. Figure: 2 and figure: 3

RESULTS

Morphology

Truncated lingulae was found in 33.84%, triangular in 29.23%, nodular type in 19.23% and assimilated type in 17.69% of the mandibles. The distribution is recorded in Table: 1.

Morphometry

The mean height of the lingula, measured from its tip to the lower border of the mandibular foramen was 7.12 ± 2.10 mm on the left side and 7.69 ± 2.34 mm on right side. The mean distance from the lingular tip to the anterior border and posterior border of the mandibular ramus was 21.32 ± 4.12 mm and 19.61 ± 3.30 mm respectively. The lingula was at a mean distance of 34.57 ± 5.14 mm from the posterior side of the mandibular second molar teeth. The mean distance from the lingula to the base of the mandible measured 36.05 ± 4.12 mm. The bilingual distance was 77.74 ± 4.75 mm. Table:2.

Table: 1. Variations in the shape of lingula in 65 Mandibles (130 Lingula).

| Shapes | Bilateral | Unilateral | Percentage (%) |
|-------------|-----------|------------|----------------|
| Truncated | 14 | 16 | 33.84 |
| Triangular | 09 | 20 | 29.23 |
| Nodular | 07 | 11 | 19.23 |
| Assimilated | 07 | 09 | 17.70 |

Table: 2. Measurements from various landmarks to locate the position of the lingula on th mandible.

| Variables (mm) | Left side | Right side | Average |
|---|------------------|------------------|------------------|
| Height of the lingula | 7.12 ± 2.1 | 7.69 ± 2.34 | 7.41 ± 2.23 |
| Lingula to anterior border of the ramus | 21.15 ± 3.79 | 21.48 ± 4.46 | 21.32 ± 4.12 |
| Lingula to posterior border of the ramus | 19.62 ± 3.72 | 19.60 ± 2.84 | 19.61 ± 3.30 |
| Lingula to mandibular notch | 18.82 ± 4.00 | 18.43 ± 3.41 | 18.62 ± 3.71 |
| Lingula to the base of the mandible | 35.66 ± 4.84 | 36.15 ± 4.00 | 36.05 ± 4.12 |
| Lingula to the alveolar socket of second mandibular molar | 33.48 ± 5.24 | 35.66 ± 4.84 | 34.57 ± 5.14 |
| Bilingual distance | | | 77.74 ± 4.75 |

Table:3. Comparison of the measurements to locate the lingula with various studies.

| Parameters | North Indians Samanta PP | Thai population (Jansisyant et al. | Present study |
|--|--------------------------|------------------------------------|------------------|
| Lingula to anterior border of the ramus | 20.0 ± 2.4 | 20.6 ± 3.5 | 21.32 ± 4.12 |
| Lingula to posterior border of the ramus | 15.0 ± 2.7 | 18.0 ± 2.6 | 19.61 ± 3.30 |
| Lingula to mandibular notch | 15.4 ± 2.7 | 16.6 ± 2.9 | 18.62 ± 3.71 |

DISCUSSION

The medial surface of the ramus of mandible is characterized by the lingula, a small tongue of bone at the anterior margin of mandibular foramen^[10] to which the sphenomandibular ligament is attached. Another end of sphenomandibular ligament is attached to the spine of sphenoid.^[11] The spine of sphenoid, the sphenomandibular ligament and the part of the mandible bearing the lingula have a common origin from the Meckels cartilage of first branchial arch.^[12]

The exact reason for the variations in the lingular shapes is not understood. The role of the sphenomandibular ligament in altering the shape is negligible.^[9]

Shapes of the lingula were first described by Tuli et al.^[9] as triangular, truncated, nodular and assimilated types in adult human mandibles of Indian origin. Fabian FM^[2] classified lingula into five major types based on shape and size in the Tanzanian population. Hossain SM et al^[13] reported three types of lingula namely triangular, truncated and assimilated types in Bangladeshi population.

Devi, Arna et al.^[14] reported bilateral truncated type and nodular type as the most frequent ones in Indians. Kositbowornchai et al.^[15] showed truncated (47%) to be most common followed by nodular, triangular and assimilated in 23%, 17% and 13% respectively in a study on 144 dry mandibles of Thai population. Jansisyanont et al.^[7] studied 92 Thai cadavers and found truncated lingula in 46.2% cases, triangular, nodular and assimilated shape in 29.9 %, 19.9 % and 4.3 % respectively. Lopes, Pereira et al.^[15] found triangular shape of lingula in 41.3%, truncated in 36.3%, nodular in 10.5% and assimilated in 11.9 % in a study on 80 dry mandibles of south

Brazil. In the present study truncated type of lingula (33.84 %) was most common and assimilated type (17.69 %) was least.

Morphometric studies to locate the position of the lingula are few and regional variations among races are noted. The location of the lingula in reference to the mandibular landmarks were compared with other studies and tabulated in Table 3.

The lingula ratio gives us an idea of the position of lingula and lingual nerve on the mandibular ramus.^[16-18] If the lingula ratio is less, the lingula and the anteriorly related lingual nerve will be positioned more closely to the anterior border of the mandibular ramus there by increasing the risk of nerve injury.^[18, 19] Along with other nonmetric variants of the skull, the bilingular diameter of the lingula could be used as anthropological marker to assess different populations and races.^[19]

CONCLUSION

In conclusion, the shape and osteometric measurements of the lingula in relation to the mandibular landmarks in south Indians varied from other races and region.

The data obtained in this study can be of help to the maxillo-facial surgeons while performing procedures like bilateral sagittal split ramus osteotomy (BSSRO), intraoral ventral ramus osteotomy (IVRO) and inferior alveolar nerve block. The knowledge of the morphology and morphometry of the lingula can benefit the dental surgeons in preventing iatrogenic injuries to the nerves and vessels leading to nerve paresis and haemorrhages.

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