



# MORPHOMETRIC ANALYSIS OF ANTILINGULA AND ITS RELATION TO LINGULA OF MANDIBLE

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**Abstract: Introduction:** Morphometric analysis of mandibles is clinically important due to the close relationship of lingula with neurovascular structures. Lingula is considered a bony landmark during the maxillofacial surgical approaches. The antilingula is a bony prominence present on the lateral surface of the mandibular ramus, helpful to identify the position of mandibular foramen during oral surgery. **Aim:** The study aimed to determine the morphometric analysis of the antilingula and its relation to the lingula of the mandible. **Materials and methods:** In 30 dried mandibles distance from lingula and antilingula to the anterior, posterior, superior, and inferior borders of mandibular ramus was measured using a digital vernier caliper. **Results:** Average distance between superior border to Lingula  $17.57 \pm 2.86$  mm and Antilingula  $15.06 \pm 3.22$  mm; Inferior border to Lingula  $27.42 \pm 2.58$  mm and Antilingula  $26.93 \pm 3.53$  mm; Anterior border to Lingula  $16.36 \pm 1.73$  mm and Antilingula  $15.31 \pm 2.97$  mm and posterior border to Lingula  $16.15 \pm 2.32$  mm and Antilingula  $14.86 \pm 2.29$  mm. Friedman's two-way analysis of variance by ranks test was done and the p-value: 0.00 ( $p < 0.05$ ), it was statistically significant. **Conclusion:** The morphometric analysis of the antilingula and its relation to the lingula of the mandible was correlated and it was referred to as an important reference point for surgeons in the surgical field to localise the mandibular foramen for the variation in the position of the lingula.

**Keywords:** Lingula, Antilingula, ramus of mandible, mandibular foramen, novel method

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## INTRODUCTION

Morphometric analysis of mandibles is important due to the close relationship of lingula with the structure of neurovascular, lingula is considered as a bony landmark during maxillofacial and oral surgical approach (1). Johannes- Baptist in 1815 first described the lingula (2). There was no description but the shape and height of lingula were examined in adult mandibles of East Indian by Nicholson(1,3). The different morphological shapes of lingula such as truncated, triangular, nodular, and assimilated types were first described by Tuli et al in adult mandibles of Indian origin(4). In previous study positions of Lingula were identified by using antilingula which is also known as the external surface of the ramus of the mandible. The antilingula will not always be present(5). To assess different populations the variant shape of lingula is used as an anthropological marker(6).

The inaccurate localization of Lingula and mandibular foramen leads to complications in the intra operation like fracture, hemorrhage, and damage to the inferior alveolar nerve(7),(8). The variation in the localization of lingula

results in unsuccessful inferior alveolar nerve block anesthesia. 45% of inferior alveolar nerve block anesthesia failures were described. Nearly 10 to 15% of failure is due to variation in lingula localization (3)(3,9). The anti-lingula is a prominence found on the superior lateral aspect of the ramus of the mandible which may correlate with the lingula position. Studies described that there is a reduction in risk potential of injury to the bundle of neurovascular when the antilingula were used as a guide in the surgery of mandibular ramus (3,9–11)(12).

Antilingula corresponds on the medial side of the underlying mandibular foramen and to the true lingula position and Antilingula is a bony tubercle on the lateral surface of the mandibular ramus (12),(11),(13). However, studies show when doing inverted L osteotomy or vertical ramus osteotomy from either an extraoral or intraoral approach along with antilingula, there will be no guarantee of nerve damage absence. 30% of studies show an incidence of damage in the inferior alveolar nerve(13,14)(12),(13,14)(12).

Hence the antilingula is considered as an anatomical landmark with a high variable in localization. It is mostly situated in the superior and anterior to the inferior foramen. In most cases, the cut was made between 5 and 10 mm. Distal to antilingula is considered a safe area to avoid damage in the inferior alveolar foramen(12,15). Our team has extensive knowledge and research experience that has translated into high quality publications (16–23),(24),(25),(26),(27,28),(29),(30),(16,19,31–38).

Therefore, the study aimed to find the morphometric analysis of the antilingula and its relation to the Lingula of the mandible.

## MATERIALS AND METHODS

This study was carried out in the Department of anatomy. 30 dried mandibles of unknown age and gender were used. All

the measurements were taken by using a digital vernier caliper. For accuracy, three measurements were taken and the average was used for the study. Various parameters were measured on both the right and left sides to determine the position of the antilingula (figure1) and lingula (figure2). All the measurements were collected and tabulated and the statistical analysis was done by SPSS software version 23 and correlation of the data obtained was done using related - samples Friedman's two-way analysis of variance by ranks.

### 1. ANTILINGULA :

- To anterior border of ramus of mandible (C)
- To posterior border of ramus of mandible (D)
- To superior border of ramus of mandible (A)
- To inferior border of ramus of mandible (B).

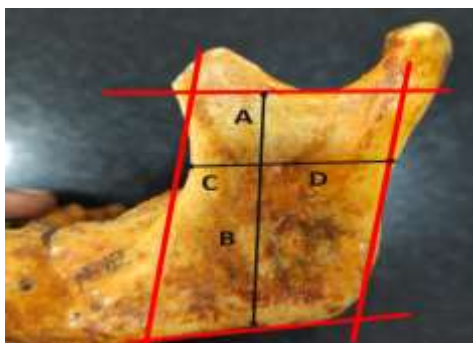


Figure 1. Measurements of Antilingula.

### 2. LINGULA :

- To anterior border of ramus of mandible (C)
- To posterior border of ramus of mandible(D)
- To superior border of ramus of mandible (A)
- To inferior border of ramus of mandible (B)

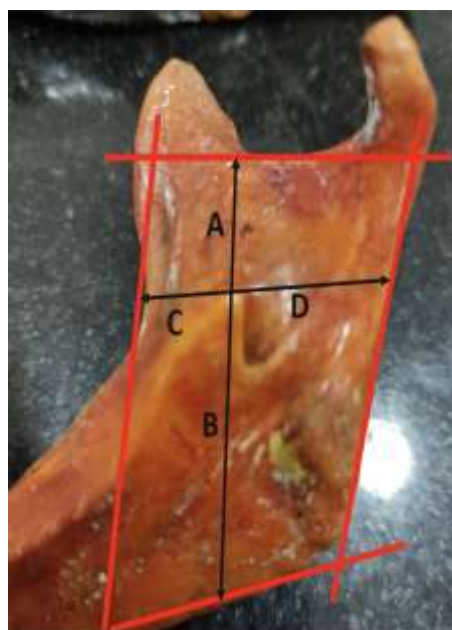


Figure 2. Measurements of Lingula.

## RESULTS

**Table 1.** shows all the staitical values of the position of the lingula and antilingula to the different borders of the ramus of the mandible. Related-samples Friedman's two-way analysis of variance by ranks was done, P-value: 0.00 (  $p < 0.05$ ). So, it is statistically significant.

N= 60	Minimum (mm)	Maximum (mm)	Mean (mm)	Std. Error	Std. Deviation
LINGULA SUPERIOR	11.23	22.78	17.57	0.389	2.86
LINGULA INFERIOR	19.80	32.68	27.42	0.333	2.58
LINGULA ANTERIOR	12.20	21.08	16.36	0.223	1.73
LINGULA POSTERIOR	12.45	25.11	16.15	0.299	2.32
ANTILINGULA SUPERIOR	8.72	24.19	15.06	0.416	3.22
ANTILINGULA INFERIOR	17.89	33.48	26.93	0.456	3.53
ANTILINGULA ANTERIOR	9.15	21.97	15.31	0.383	2.97
ANTILINGULA POSTERIOR	10.96	19.26	14.86	0.295	2.29

\* Related-samples Friedman's two-way analysis of variance by ranks was done, P-value: 0.00 (  $p < 0.05$ )

## DISCUSSION

Some studies have been done previously to learn the various changes in the mandible related to age and estimation of stature (39),(40). According to Tuli A et al and Kilankaje et al, alteration in the shape of the lingula leads to variation in the shape of the mandibular foramen (4) Lopes PT et al observed triangular-shaped lingula as a frequent type in the Indian population (41), whereas truncated type was considered as the most prevalent one in the Thai population by Kositbonruchai S et al(42). Similarly in other study reports(43) nodular and truncated types of lingula were considered to be the most frequent types in South Indian mandibles(44). In another study, based on lingula shape and size it was categorized into five major types(45). whereas in Hossain SM et al study only three types of lingula were observed in the Bangladesh population. The actual reason for

such variation was not understood properly. Using lingula for localization of mandibular foramen was considered to be an important landmark in different oral and maxillofacial surgeries(45). Evaluation of the morphology of the mandibular with proper localization of the antilingula with Lingula was important for surgery. The first part of the study explains antilingula as a definite landmark that is examined in less than half of the mandibles.

In our study, Lingula Superior  $17.57 \pm 2.86$  mm and Antilingula Superior  $15.06 \pm 3.22$  mm which was similar to findings where Antilingula Superior  $14.61 \pm 3.74$  (46). The opposing findings where the Lingula Superior was  $14.06 \pm 3.05$ mm (46) and Antilingula Superior was 11mm (46,47). Lingula Inferior  $27.42 \pm 2.58$ mm and Antilingula Inferior  $26.93 \pm 3.53$ mm. The opposing finding where  $32.36 \pm 3.49$ mm for Lingula Inferior and Antilingula Inferior was  $32.12 \pm 3.38$ mm(46). Lingula Anterior  $16.36 \pm 1.73$ mm and

Antilingula Anterior  $15.31 \pm 2.97$ mm which was similar to Antilingula Anterior  $14.71 \pm 1.63$ mm (46). Lingula Posterior  $16.15 \pm 2.32$ mm and Antilingula Posterior  $14.86 \pm 2.29$ mm which was similar to Lingula Posterior  $16.39 \pm 1.20$ mm. The opposing finding was Lingula Posterior  $18.89 \pm 1.91$ mm and Antilingula Posterior  $18.59 \pm 1.82$ mm(46).

According to Aziz et al study, in the Anterior-Posterior dimension 11.1 % of the specimens, the position of the lingula was completely correlated with the position of the antilingula(47). In the superior-inferior dimension, the 2.8% position of the lingula was correlated with the antilingula(15). In Pogrel's study, the lingula was only identified in 44% of specimens, and the antilingula was not identified in 15% of the specimens (48). In Martone et al study, the antilingula was only identified in 42% of specimens (49).

**Limitation:** The limitation of our study was sample size limited.

**Future scope:** Further studies considering gender, ethnic group, and age. Studies involving uncomplicated maxillofacial surgery and a successful inferior alveolar nerve block anesthesia.

## CONCLUSION

The morphometric analysis of the antilingula and its relation to the lingula of the mandible was correlated and it was referred to as an important reference point for surgeons in the surgical field to localize the mandibular foramen for the variation in the position of the lingula.

### Author Contributions

**Rakshitha V S:** Study Design, Data collection, Data Analysis, Manuscript writing

**Yuvaraj Babu:** Study Concept, Data verification, Data Analysis, Manuscript drafting, and correction.

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**Conflict of interest:** The authors reported the conflict of interest while performing this study to be nil.

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