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Original Research Article

A STUDY OF THE SHAPE, HEIGHT AND LOCATION OF THE LINGULA IN DRY HUMAN MANDIBLES

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ABSTRACT

Aim: The present study aims to analyze the shapes of the lingula, its height and relationship with the mandibular ramal landmarks.

Material and Methods: Dried mandibles were included in the study without sex differentiation. The shape of the lingula was studied in 60 mandibles. In each mandible, the lingula was scored using the classification proposed by Tuli et al (2000) i.e., triangular, truncated, nodular and assimilated. 120 sides of mandibles were studied for various measurements, using sliding caliper.

Results: The most common shape of the lingula was found to be 'triangular' and the least common was 'assimilated'. The mean height of the lingula was 7.77 ±1.8 mm. The mean distance of the lingula from anterior border, posterior border and notch of the mandibular ramus was 17.38 ±2.52 mm, 15.96 ±1.91 mm and 16.26 ±2.36 mm respectively.

Conclusion: This study provides information regarding shape, height, and location of the lingula. Thus, the study will assist surgeons to locate the lingula and avoid intraoperative complications.

KEY WORDS: Mandible, lingula, osteotomy.

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INTRODUCTION

The lingula of the mandible is a salient feature and is described in textbooks as a sharp tongue-shaped bony projection on the medial aspect of ramus. It is an important landmark as it lies in close proximity to the mandibular foramen [1]. Since the inferior alveolar nerve enters the mandibular foramen to supply the structures of the lower jaw, the relationship of lingula to the inferior alveolar nerve is of clinical significance to dental surgeons. It becomes a necessity to know the morphology of lingula so as to preserve the important structures during surgical interference of mandible around the lingula region [2]. Lingula is an important landmark for injection of local anaesthetics or for excision of the nerve in facial neuralgias of lower jaw [3]. Tuli et al. classified lingula into four different types based on its shape, namely, triangular, truncated, nodular, and assimilated types[1]. Such structural variability could account for failure to block the inferior alveolar nerve [4,5].

The variant shape of lingula can also be used as anthropological marker to assess different population along with other non-metric variants of skull [6]. Due to its connection to nerve and vascular structures the study of the lingula provides important information related to oral and maxillofacial surgical procedures, such as the sagittal split ramus osteotomy and the intraoral vertico-sagittal ramus osteotomy carried out to correct dental facial deformities as prognathism [7], orthognathic surgery, mandibular trauma management, eradication of benign and malignant lesions, preprosthetic surgery and nerve injury [8]. If oral and maxillofacial surgeons are unable to identify the lingula correctly, intraoperative complications such as hemorrhage, unfavorable fracture nerve injury may occur [1, 9].

MATERIALS AND METHODS

Dried mandibles were included in the study without sex differentiation. Mandibles were taken from the Department of Anatomy, Seth G. S. Medical College, Mumbai. Shape of the lingula was studied in 60 mandibles and classified into four types i.e., triangular (wide base & a narrow rounded or pointed apex), truncated (with quadrangular top), nodular and assimilated (completely incorporated into the ramus). 120 sides of the mandibles with at least a premolar and a molar were studied for various measurements. Measurements were made using sliding calipers. Horizontal distances were measured parallel to the occlusal plane of the molars, whereas the vertical distances were measured perpendicular to the occlusal plane. Parameters studied were height of the lingula, distance of the lingula from anterior border, posterior border and notch of the ramus of mandible. The mean, standard deviation (SD) and range for each measurement were assessed.

Fig. 1: Different shapes of lingulae (a) Triangular (b) Truncated.

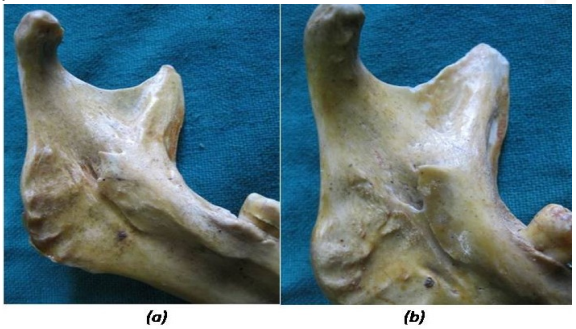


Fig. 2: Different shapes of lingulae (c) Nodular (d) Assimilated.

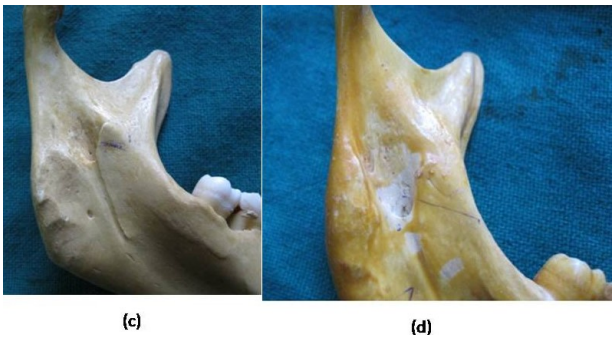
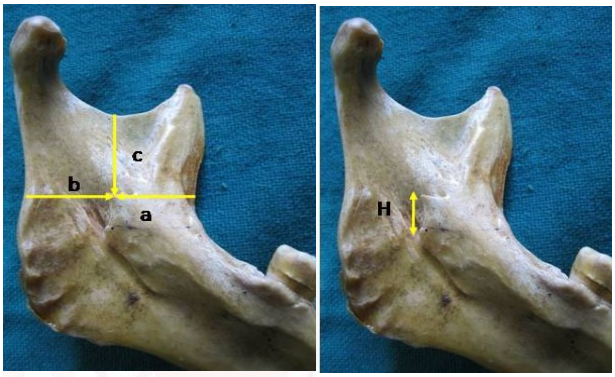


Fig. 3: Different shapes of lingula (a) Lingula to anterior border of mandibular ramus (b) Lingula to posterior border of mandibular ramus (c) Lingula to mandibular notch (H) Height of Lingula.



RESULTS

The most common shape was 'triangular' (57.5%) and the least common was 'assimilated' (1.7%). The mean height of the lingula was 7.76 mm. The mean distance of the lingula from anterior border, posterior border and notch of the mandibular ramus was 17.38 ±2.52 mm, 15.96 ±1.91 mm and 16.26 ±2.36 mm respectively.

Table 1: Distribution of the shapes of the lingula (in Total 60 mandibles = Total 120 sides).

Shape	Frequency (No. of sides)	Percent (%)
Triangular	69	57.5
Truncated	42	35
Nodular	7	5.8
Assimilated	2	1.7
Total	120	100

Table 2: Distribution of the shapes of the lingula (in 60 Right sides & 60 Left sides).

Shape	Right sides	Left sides
	Frequency (%)	Frequency (%)
Triangular	31 (51.7)	38 (63.3)
Truncated	24 (40.0)	18 (30)
Nodular	05 (08.3)	02 (3.3)
Assimilated	00 (00)	02 (3.3)
Total	60 (100)	60 (100)

Table 3: Height of the lingula (H), Location of the lingula in relation to mandibular ramal landmarks (Total 120 sides).

	H	a	b	c
No. of sides	**120**	**120**	**120**	**120**
Mean	7.77	17.38	15.96	16.26
Std. Deviation	1.8	2.52	1.91	2.36
Minimum	2.5	11.18	11.38	10.6
Maximum	12.64	24.32	23.3	21.34

(L) Tip of the lingula

(H) Height of the lingula - from tip of the lingula (L) to the lower border of the mandibular foramen

(a) The distance from (L) to the anterior border of the mandibular ramus

(b) The distance from (L) to the posterior border of the mandibular ramus

(c) The perpendicualar distance from (L) to the lowest point on the mandibular notch

Table 4: Height of the lingula (H), Location of the lingula in relation to mandiular ramal landmarks (in 60 Right sides).

	H	a	b	c
No. of sides	**60**	**60**	**60**	**60**
Mean	7.32	17.3	16.16	16.32
Std. Deviation	1.56	2.42	2.12	2.36
Minimum	4	11.18	11.38	10.6
Maximum	11	22.54	23.3	21.2

Table 5: Height of the lingula (H), Location of the lingula in relation to mandiular ramal landmarks (in 60 Left sides).

	H	a	b	c
No. of sides	**60**	**60**	**60**	**60**
Mean	8.21	17.45	15.77	16.2
Std. Deviation	1.91	2.63	1.67	2.37
Minimum	2.5	11.3	11.96	10.72
Maximum	12.64	24.32	19.6	21.34

DISCUSSION

Table 6: The most prevalent shape of lingula in reported studies.

Authors	Year	Population
Tuli et al.[1]	2000	Triangular
Hossain et al.[10]	2001	Triangular
Devi et al.[2]	2003	Truncated
Kositbowornchai et al.[11]	2007	Truncated
Jansisyanont et al.[12]	2009	Truncated
Lopes et al.[7]	2010	Triangular
Murlimanju et al.[13]	2012	Triangular
Pesent study	2012	Triangular

Different morphological shapes of the lingula were first classified by Tuli et al. [1] into triangular, truncated, nodular and assimilated types in adult human mandibles of Indian origin. The frequency of different morphological types of lingula studied by different authors varied among different population and races.

The incidence of different forms of lingula can be used as an anthropological marker to assess the different group of population and races, with other non-metric variants of the skull. The morphology of this subject is important to the maxillofacial and orodental surgeons as the inferior alveolar nerve is close to the lingula and may assist in the inferior alveolar block [13].

Tuli A et al. [1] in the study on Indian mandibles reported triangular shape in (68.5%) to be most common while the remaining were truncated (15.8%), nodular (10.9%) and assimilated (4.8%). They found triangular lingulae bilaterally in 110, truncated in 23, nodular in 17 and assimilated in 7 mandibles. In study by Murlimanju BV et al. [13] in adult human dried mandibles of South Indian population described 29.9% (40) of the lingula had triangular shape, 27.6% (37) were truncated, 29.9% (40) were found nodular and 12.6% (17) were assimilated. In 61.2% (41) of the mandibles, the shape of the lingula was symmetrical on both the sides. Devi R et al. [2] more frequently observed the Truncated and Nodular types unilaterally as well as bilaterally. In Thai population, P. Jansisyanont et al. [12] found truncated shape to be most common (46.2%). They observed most truncated shaped lingula appeared to be bilateral (71.7%).

In another study in Thai adults by Kositbowornchai S et al. [11] truncated lingula were most commonly found (68 sides or 47%). Lopes et al. [7] reported the triangular shape as the most common and assimilated type the least common variety of shape of lingula in the Southern Brazil population. In present study, the most prevalent shape of lingual was triangular and the least prevalent shape was assimilated type, which is in accordance with the results of studies on populations of Indian origin [1] and Southern Brazil [7]. Height of lingula varies in different population. Nicholson [4] studied eighty dry adult human mandibles of East Indian ethnic origin and reported a height of the lingula

on the right side to be 8.6 ±4.7mm and left side to be 9.1 ±5.7mm. A study in the Thai population by Jansisyanont et al. [12] reported the height of the lingula to be 8.2 ±2.3mm. Another study on Thai mandibles [14] showed that the lingular heights on the right and left sides were 8.7 ±2.0mm and 8.2 ± 2.1mm, respectively. In a study on a Korean population, Woo et al. [15] reported that height of lingula was found to be higher, that is, 10.51 ± 3.84 mm. Monnazzi et al. [16] in a study in Brazilian population reported the height of lingula to be 5.82 ± 0.43 mm. In present study the mean height of the lingula was 7.77 ±1.8 mm, which is less than that reported in East Indian ethnic, Thai, Korean population groups and more as compared to Brazilian population.

Location of lingula varies among the various ethnic and racial groups. In a study done on Thai population by Kositbowornchai et al. [11], lingula was observed to be located as 20.7 ± 2.8 mm and 15.4 ± 1.9 mm respectively from anterior and posterior border of mandibular ramus. Other study done on Thai population by Jansisyanont P et al. [12] reported that the lingula was located at 20.6±3.5 mm, 18.0±2.6 mm and 16.6± 2.9 mm from the anterior border, posterior border and notch of the mandibular ramus respectively. In Korean population Woo SS *et al*. [15] found that the lingula was located at 18.6±2.5 mm, 16.1± 3.5 mm and 19.82±5.11 mm from the anterior border, posterior border and notch of the mandibular ramus respectively. In present study the mean distance of the lingula was 17.38± 2.52 mm, 15.96± 1.91 mm and 16.26± 2.36 mm from anterior border, posterior border and notch of the mandibular ramus respectively. The results from the present study suggest that clinicians or oral surgeons can insert a needle approximately 17.38 mm from the anterior border of the ramus.

Nishioka GJ, Aragon SB [17] observed that if lingula is situated very high on the mandibular ramus, there is increase in the risk of an unfavorable fracture. Even in a normal sized mandibular ramus, a high lingula places the medial cut in a thin region where there is little or no cancellous bone.

Measurements are also useful for surgical procedures on mandible. Most surgical techniques for bilateral sagittal split ramus osteotomy (BSSRO) use the lingula and the mandibular foramen as the landmarks for horizontal osteotomy. In most surgical techniques for BSSRO horizontal osteotomy has to be made just above the lingula and extend posteriorly to it in order to make a safe split with less potential for nerve injury. In cases where there is not enough cancellous bone in the area above the lingula to make a safe split, the surgeon can retract or push the inferior alveolar nerve down at least 7 mm to 9 mm (lingular height:7.8 ± 1.8 mm).

CONCLUSION

This study provides information regarding shape, height, and location of the lingula. Thus the study will assist surgeons to localize the lingula and avoid intraoperative complications**.**

Conflicts of Interests: None

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