

## A Morphometric Study of Mandibular Lingula in Population of Udaipur, Rajasthan

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### Abstract

**Background:** Lingula is a sharp bony projection located on the medial aspect of ramus of mandible. It is very closely related to the mandibular foramen and inferior alveolar nerve and vessels. Lingula directs oral and maxillofacial surgeons to locate inferior alveolar nerve to provide anesthetic block during dental procedures.

**Objectives:** Lack of precise knowledge on varying shapes of lingula in different population might be a cause for surgical failures. The aim of this study was to determine the morphology of mandibular lingula in relation to the surrounding structures in adult mandibles to provide an image that can be used during dental, mandible reconstructive surgeries and in neurosurgery treating trigeminal neuralgia.

**Materials and Methods:** The study was conducted on 50 adult dry human mandibles (100 sides) in the department of anatomy, Geetanjali Medical College & Hospital, Udaipur, Rajasthan. The different shapes of lingula were observed by the classification given by Tuli et al.

**Results:** Different shapes of lingula noted were truncated, triangular, assimilated and nodular type. The triangular, truncated, nodular and assimilated shape of the lingula was noticed in 51%,21%,18%and 10%.respectively.

**Conclusion:** The lingula is a very important landmark where mandibular foramen has to be identified in procedures, such as inferior alveolar nerve block, bilateral sagittal split ramus osteotomy and for excision of nerves in facial neuralgia, and in mandible reconstruction surgeries. Variations occur in the anatomical structure of lingula , a surgeon should have keen understanding of such morphological changes to avoid any damage to the associated blood vessels & nerves of this region while anaesthetizing the area or performing mandibular arch surgeries. Different types of lingula can serve as important & useful anthropological marker.

**Keywords:** inferior alveolar nerve, lingula, mandibular foramen, ramus of mandible.

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### Introduction

Lingula of the mandible is a prominent, sharp bony projection located on the medial aspect of the ramus of the mandible to which the speno-mandibular ligament is

attached. [1] Lingula was first described by Johannes – Baptist as ‘spix ossicle’ in 1815. Lingula can be palpated through oral mucosa. In edentulous subjects, lingula is

situated in higher position as compared to subjects having teeth.[2]The lingula forms the orifice of mandibular foramen from where the inferior alveolar nerve and vessels traverse the mandibular canal. The inferior alveolar nerve provides the sensory innervation to the pulp of mandibular teeth, the lower lip.[3] In about 50% of adults, lingula forms half to two-thirds of the wall of mandibular foramen and mylohyoid line begins from the posterior border of the lingula and its provides attachment to sphenomandibular ligament.[4,5]

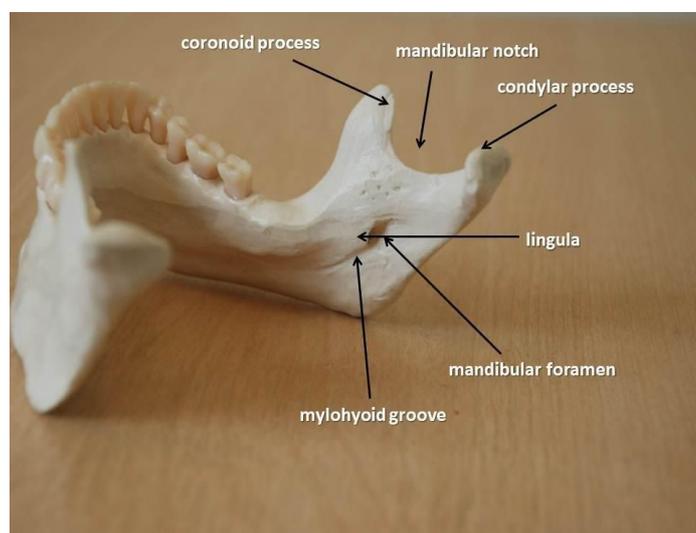
Lingula acts as an important landmark for identifying the site for injection of local anaesthetics during oral and maxilla-facial surgical procedures or for excision of nerve for facial neuralgia.[6-7] .

Nearly 10-15 % of failure rates of inferior alveolar nerve block may be due to structural variations of the lingual Considering the fact that metric characteristics of mandible are among ethnic groups, several studies have been

performed to better understand the morphology and anthropometric location of lingual on different population.[8-10] Nicholson reported variations of height and shape of lingula upon examination of adult mandible of East Indian ethnic origin.[9] Hollinshead in 1962 [11] illustrated the truncated shape of lingula, Berkovitz et al. in1978 [12] illustrated the nodular shape and Morgan et al in 1982[13] illustrated the assimilated shape

Tuli et al studied adult mandibles of Indian origin and first described different morphological shapes of lingula as triangular, truncated, nodular and assimilated types [14].

The aim of this research was to identify and determine the morphology of mandibular lingula in relation to surrounding structures in dry adult mandibles of population of South West Rajasthan in the region of Udaipur to provide data which can be used during mandible reconstructive and oro-facial surgeries.



**Figure 1: The medial surface of mandible showing lingula**

#### **Material and Method:**

The study was an institution based observational study carried out in the department of anatomy in Geetanjali Medical College and Hospital, Udaipur, Rajasthan to determine the different shapes of the lingula. The study materials were done on 50 dry adult human mandibles with

full ossification. The age and gender of the same could not be ascertained. The mandibles showing any gross deformity was rejected as unsuitable for morphological evaluation. Ethical approval was not obtained as study involved dry bones only. The shapes of the lingual were observed meticulously by naked eye

examination. Digital photographs were taken using optimal transmitted light for all morphological analysis. The shapes of lingula were noted as per the classification given by Tuli et al.[14]

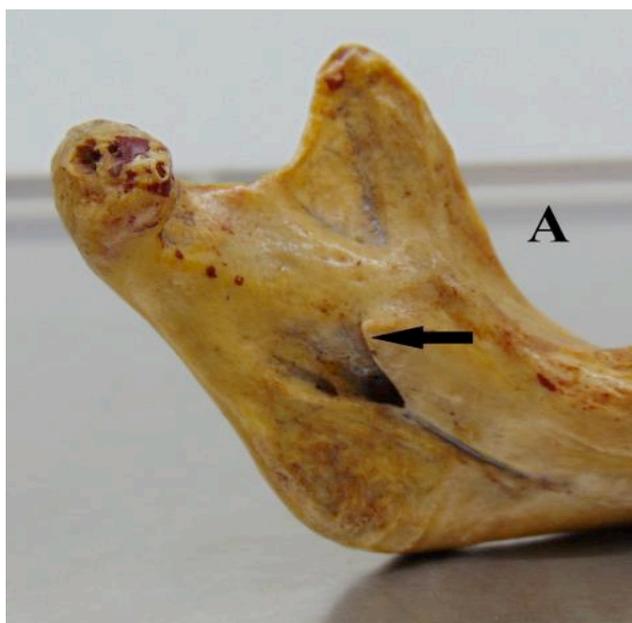
A. Triangular – The lingula has a wide base and narrow rounded or pointed apex and apex being directed postero- superiorly i.e., towards condyle or towards posterior

border of ramus of mandible was classified as triangular. (Fig 2)

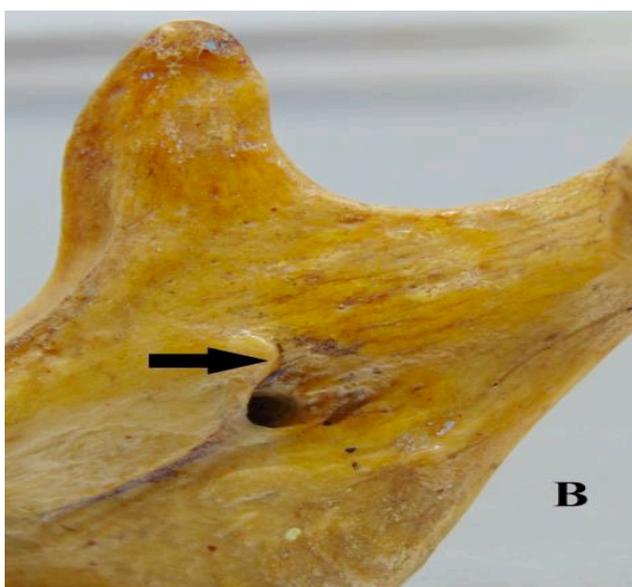
B. Nodular: The whole lingula is merged into the ramus of mandible except the apex (Fig 3)

C. Truncated: The lingula with quadrangular apex with superior, inferior and posterior borders. (Fig 4)

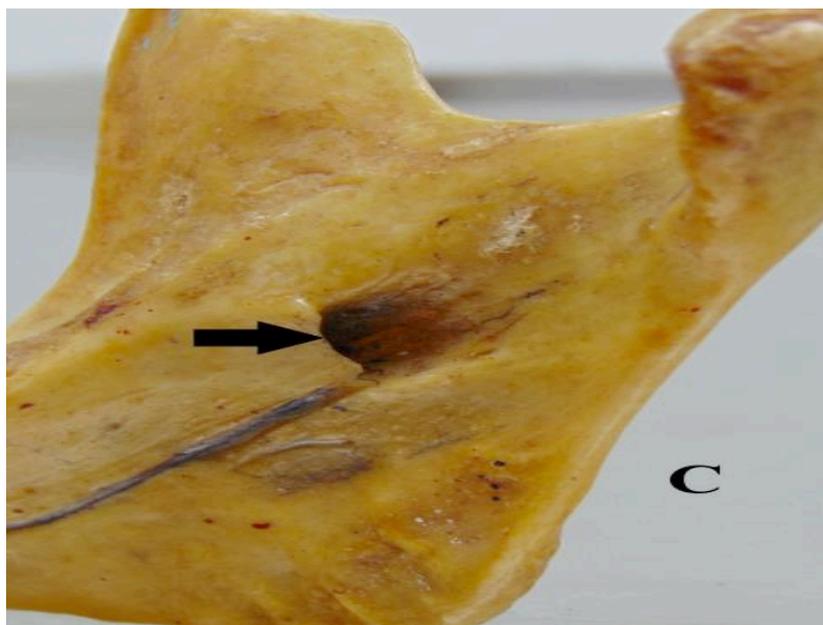
D. Assimilated: Lingula is completely merged with ramus of mandible. (Fig 5)



**Figure 2: Triangular lingual**



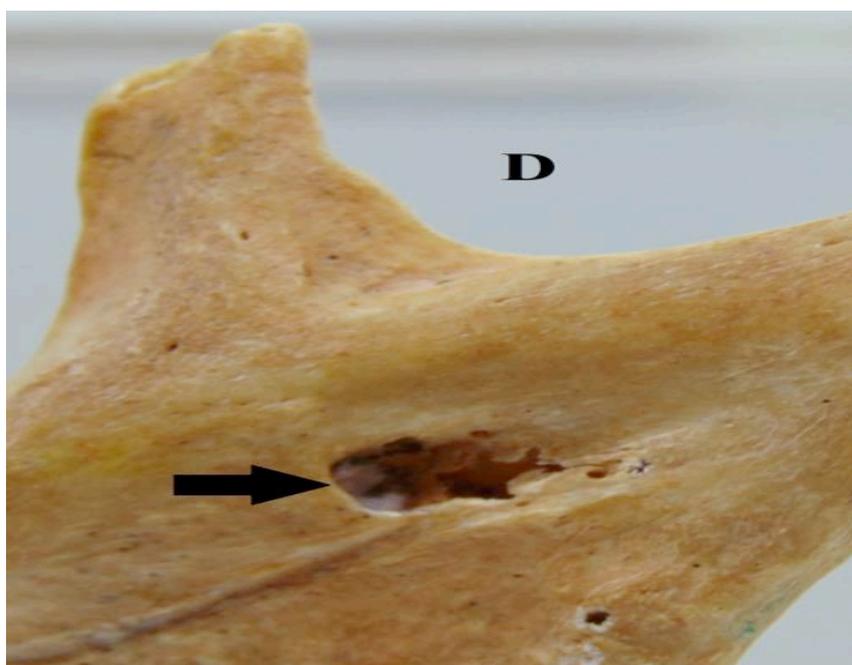
**Figure 3: Nodular lingual**



**Figure 4: Truncated lingula**

The different shapes of lingula observed in this study has been summarised in table 1. The most common type of lingula observed in present study was triangular (51%), 45% observed bilaterally and 6% unilaterally. The second most common type of lingula is nodular in about 21% of cases, showing bilateral and unilateral nodular shape in 19% and 2% respectively.

Among this population 18% of lingual were truncated in shape and showed 12% bilateral and 6% unilateral presentation. Remaining lingula were of assimilated pattern 10%, showing bilateral and unilateral patterns in 8% and 2% respectively.



**Figure 5: Assimilated type**

**Table 1: Variations in shape of lingula observed on *dry mandibles***

S.No	Shape of lingula	Bilateral presentation	Unilateral presentation		Total	Percentage %
			Right	Left		
1	Triangular	45	4	2	51	51%
2	Nodular	19	1	1	21	21%
3	Truncated	14	3	1	18	18%
4	Assimilated	06	2	2	10	10%
	Total	84	8	8	100	

## Discussion

The lingula is a small tongue shaped bony projection attached at the anterior margin of mandibular foramen present on the medial surface of the ramus of mandible. [1] The speno-mandibular ligament is attached at one end to the lingula & another end to the spine of sphenoid.[2] The sphenomandibular ligament, spine of sphenoid, the and the part of the mandible having the lingula have a common origin from the Meckel's cartilage of first branchial arch[3-4].

Lingula serves as an important clinical landmark for identification of mandibular foramen from where inferior alveolar nerves & vessels enter into the mandibular canal. It serves as an important reference point for determining the entry point of needle in various dental and mandible reconstructive surgeries and in neurosurgeries related to trigeminal neuralgia to preserve the inferior alveolar nerve. [5-6].

A clinical expertise and accurate knowledge of bony anatomy on the lingula morphology is for delivering of regional anesthesia & fruitful mandibular surgeries.[7-9].

Although a vast amount of studies have been conducted on morphometry of lingula.

Need of such studies are still required to be done on different races, due to the variation of morphological and morphometric properties of lingula among different ethnic

and racial groups as our country is full with ethnic as well as geographical diversity.

Previous studies reported the anatomical variations in lingula. Some literature describes the shape of the lingula to be triangular [10], truncated type was described by Hollinshead [11], nodular by Berkovitz et al.[12] & assimilated type by Morgan et al.[13].

Tuli et al in 2000 [14] done a study on 165 dry adult mandibles of Indian origin reported triangular lingula, truncated, nodular and assimilated shape in 68.5%,15.8%, 10.9% and 4.8% of mandibles respectively.

According to Devi R et al[15] the most commonly found types of lingula were truncated and nodular.

Kositbowornchai et al study 2007 [16] on 144 dry mandibles of Thai population reported truncated (47%) to be the commonest lingula type followed by nodular, triangular and assimilated in 23%, 17% and 13% respectively. Similarly, Jansisyanont et al 2009 [17] evaluated 92 Thai cadavers and revealed truncated lingula in 46.2% cases. The incidence of triangular, nodular and assimilated lingula shapes were 29.9%, 19.9% and 4.3% respectively.

Lopes et al 2010 [18] conducted a study on 80 dry mandibles of Brazilian adults concluding triangular shape of lingula to be 41.3%, truncated in 36.3%, nodular in 10.5% and assimilated in 11.9% of the cases.

Samanta et al [19] reported the most prevalent shape of lingula was triangular and the least prevalent shape of lingula was assimilated type. Varma et al [20] their study shows nodular lingula in 42%, truncated in 29 %, triangular in 13 %, assimilated in 6 % and M shaped in 4%.[20].

According to the Khan [21] Triangular shape lingula is more common in males (59.25%).

The least common type in males is nodular (4.5%) and in females is assimilated (0%).

The truncated type is almost twice as common in males (6%) than females (3.5%).

Nirmale et al[22] reported the most common shape of lingula was triangular and the least prevalent shape of lingula was truncated type.

Gite et al[23] studied location and the distance of lingula on radiograph.

The present study also noted that triangular shape of lingula to be the prevalent one & nodular to be the least found one (Table 1) which is in accordance with the study of Lopes et al in southern brazil[18], but contradictory to the findings of Varma et al [20], where nodular shape of lingula is most prevalent.

### Conclusion

In this present study, four different shapes of lingula have been noticed on dried mandibles: triangular, truncated, assimilated and nodular type. The most common type among them is triangular shape & least common being nodular.

Taking consideration the lingula morphology fully is a necessity in preservation of important neurovascular bundles during surgical interventions involving mandible around the lingula region.

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