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A Study of Gender Related Various Morphological Appearances of Lingula in Adult Dry Mandibles in Odisha

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KEYWORDS
Lingula; Mandible; Morphology; Tongue-shaped; Ramus of the jaw.

Abstract:
Introduction: The lingula is a bony protrusion with a tongue-like form located on the inner surface of the ramus of the jaw. The classification of it has been categorized into four distinct shapes. The objects in question exhibit a triangular shape, truncated appearance, nodular characteristics, and a state of assimilation. The current report was conducted in order to determine the distribution, percentage, plus gender distribution of the lingula. This study, the subjects and methods employed were carefully selected and implemented to provide accurate and reliable results. A total of 70 adult dry human mandibles, comprising 140 sides, were included in this study. These specimens were obtained from the museum of the Anatomy Department and were maintained for research purposes. The several forms of the lingula were documented in a spreadsheet, taking into account their lateral orientation and sexual dimorphism. The proportions were computed manually. The findings indicate that the most prevalent form of lingula observed was triangular, accounting for 31% of the sample. This was followed by truncated at 27%, nodular at 23%, and assimilated at 19%. The truncated form was observed to be the most prevalent among males, accounting for 20.71% of cases. The most often observed form among females was triangular, accounting for 11.42% of the sample. In conclusion, it can be inferred that Lingula serves as a valuable anatomical landmark for professionals in the fields of anthropology, maxillofacial surgery, and forensic science.

Introduction

The lingula is a bony bulge that is formed like a tongue and is located in close vicinity to the mandibular foramen. The location being referred to is the point of attachment for the spheno-mandibular ligament. Numerous scholarly investigations have delineated the geographic distribution, orientation, and morphology of the lingual feature across diverse racial groups, encompassing both paediatric and adult populations. The inferior alveolar nerve exhibits a close association with it. The lack of efficacy in anaesthetic blockade of the nerve can be attributed to anatomical variances in the lingual nerve across individuals. This anatomical structure is commonly referred to as Spix's ossicle, a designation derived from the name of Johannes Baptist Spix [1,2].

There exist four primary classifications of lingula based on their respective shapes. The triangular shape is characterised by a wide base and a sharp apex. The truncated shape exhibits a quadrangular top portion. The lingula has undergone fusion with the ramus, resulting in a nodular configuration, with the exception of the apical portion. The assimilated shape is fully incorporated into the ramus [3].

The Lingula serves as a skeletal landmark for many surgical interventions, including sagittal tore ramus osteotomy and intra-oral vertical-sagittal ramus osteotomy. Oral and maxillofacial surgeons employ these techniques to provide treatment for patients

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diagnosed with prognathia, retrognathia, and laterognathia [4,5]. There has been a limited amount of research conducted in our location. Therefore, we have devised a research project focused on the examination of the lingula. The current report was conducted in order to determine the distribution, percentage, plus gender distribution of the lingula.

Materials and Methods:

The current investigation was performed within the confines of the Department of Anatomy throughout the period spanning from December 2022 to February 2023. Our study utilised a sample size of 70 adult dried human mandibles, which corresponds to a total of 140 sides, acquired from the gallery of the Anatomy Department. The concept of gender was recognised, however, specific markers or indicators were not accessible. The study excluded mandibles that were edentulous, damaged, or belonged to children. The medial surface of each side's ramus was investigated. The many morphologies of the lingula were documented in a spreadsheet, which included information regarding lateral orientation and gender. The morphology of the lingula has been characterised by four distinct shapes: three-sided, shortened, nodular, and embraced. The three-sided form has a widespread base and a pointed tip, while the shortened shape features a rectangular tip. The nodular shape is characterised by a rounded and smooth tip. Lastly, the assimilated shape refers to the absence of any discernible elevation. The lingulae were captured by photography and subsequently stored in a digital format known as .JPG, which is compatible with computers.

The aforementioned parameters were computed. a) The lateral dispersion and relative abundance of various lingula species. b) The present study examines the gender distribution among several forms of lingula.

Results

A total of 70 mandibles, corresponding to 140 sides, were subjected to examination. Out of a total of 140 sides, 96 sides (68.57%) corresponded to the mandibles of male individuals, while the remaining 44 sides (31.43%) corresponded to the mandibles of female individuals. The subsequent varieties of lingulae were observed: Figure 1 depicts a triangular shape characterised by a broad base and a sharp tip. The truncated shape depicted in Figure 2 exhibits a quadrangular top. The shape of the object seen in Figure 3 is nodular, characterised by a smooth and rounded apex. The geometry that has been assimilated does not exhibit any discernible or tangible elevation, as depicted in Figure 4. The predominant lingula form identified in the sample was Triangular, accounting for 31% of the observations. This was followed by truncated at 27%, Nodular at 23%, and Assimilated at 19% (see Table 1 and Figure 5). Among the male population, the prevailing form seen was Truncated, accounting for 20.71% of the cases, followed by Triangular at 20%, Assimilated at 15%, and Nodular at 12.85%. In contrast, the prevalent types detected in females were Triangular (11.42%), Nodular (10%), Truncated (6.42%), and Assimilated (3.57%) as shown in Table 2 and Figure 6.

Discussion:

On the medial aspect of the ramus of the jaw, there is an anatomical structure called the lingula. It is characterised by its tongue-like form. The component in question is derived from the early pharyngeal arch and serves as an attachment site for the sphenomandibular ligament. The mandibular foramen, through which the inferior alveolar nerve passes, is strongly associated with this anatomical feature. The Lingula serves as a reference point for the administration of anaesthetic blockade targeting the inferior alveolar nerve. Several authors have described morphological variants of the lingula, including reduced, triangle-shaped, nodular, and assimilation types. Limited research has been conducted to demonstrate disparities between genders.

An overall of 70 fully developed dry hominid mandibles were chose for this study based on their availability in the Anatomy museum and adherence to specific inclusion and exclusion criteria. There were 48 mandibles that belonged to males and 22 mandibles that belonged to females. A total of 140 mandibles were examined in our study, with 96 of them belonging to males and 44 belonging to females. The goal of our analysis was to investigate the lateral distribution, percentage, and gender distribution of several forms of lingula.

The most frequently seen form in our study was triangular, accounting for 31% of the sample. This was followed by the truncated shape, which accounted for 27% of the sample. The nodular shape accounted for 23% of the sample, while the assimilated type accounted for 19%. This discovery aligns with the findings of

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previous studies conducted by Lopes et al [1], Tapas [2], Gupta [3], Sanmugam [6], and Assis [10], which likewise reported that the triangular variety was the most prevalent among the four varieties examined. Table 3 presents the relevant data.

Among men, the most prevalent shape seen was the truncated type, accounting for 20.71% of cases, while the least common shape was the nodular type, accounting for 12.85% of cases. The most frequently observed kind among females was the triangular type, accounting for 11.42% of the sample, while the least commonly observed type was the assimilated type, representing just 3.57% of the sample. The study conducted by Rikhotso [7] revealed that the shortened type was the most prevalent among males and females, while the assimilated form was shown to be the least common in both genders. According to Assis FP's findings, the triangular form was identified as the most prevalent type among both sexes, while the least common type was observed to be the M-shaped configuration [10]. The observed variations could perhaps be attributed to variances in race and ethnicity.

The research conducted in this study possesses certain limitations. The limited sample size may restrict the generalizability of the findings to the entire population, although they may still hold relevance for the people of Odisha. The utilisation of mandibles from foetuses and children was not employed, thus precluding any definitive conclusions on potential age-related alterations in the structural characteristics of the lingula.

Conclusion

The Lingula serves as a valuable anthropological anatomical landmark, facilitating the acquisition of many mandibular measures. Furthermore, it can also serve as a tool for race identification within the field of forensic medicine. The link with the inferior alveolar nerve makes it surgically significant for oral and maxillofacial surgeons. The examination of the lingula in mandibles of foetuses and children will contribute to the comprehension of its evolutionary importance. Cone Beam Imaging Computerised tomography (CT) can be employed in resource-rich environments to investigate anatomical structures and physiological processes in living individuals.

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Figure 1- Triangular type of lingula

Figure 2- Truncated type of lingula

Figure 3- Nodular type of lingula

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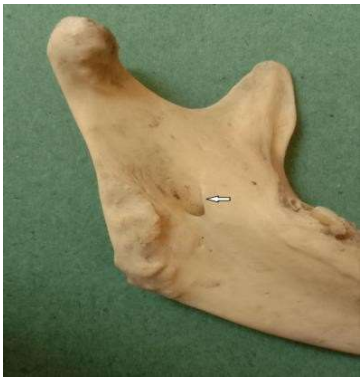

Figure 4- Assimilated type of lingula

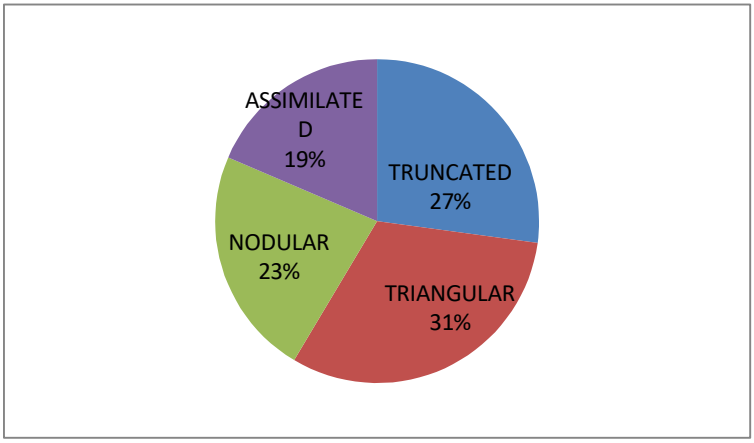

Figure 5- Pie diagram showing proportion of different types of Lingula

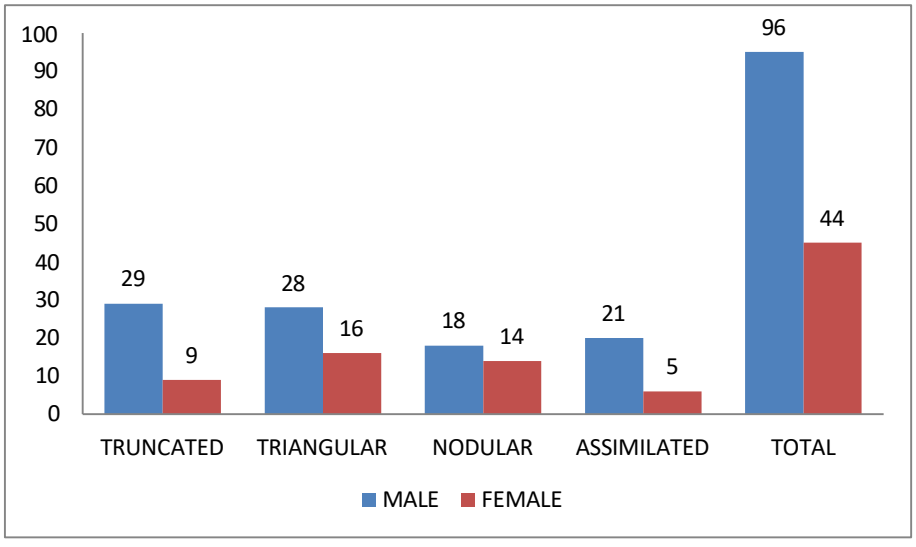

Figure 6- Bar Diagram showing gender distribution of different types of Lingula

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Table 1: Side distribution and Proportion of different types of Lingula found in the study sample

TYPE	BOTH SIDES	ONLY ON RIGHT SIDE	ONLY ON LEFT SIDE	TOTAL	PERCENTAGE
TRUNCATED	20	10	8	38	27%
TRIANGULAR	22	12	10	44	31%
NODULAR	24	2	6	32	23%
ASSIMILATED	16	4	6	26	19%
TOTAL				140	100%

Table 2: Gender distribution of different types of Lingula

	MALE	FEMALE	TOTAL
TRUNCATED	29 (20.71%)	9 (6.42%)	38 (27%)
TRIANGULAR	28 (20%)	16 (11.42%)	44 (31%)
NODULAR	18 (12.85%)	14 (10%)	32 (23%)
ASSIMILATED	21 (15%)	5 (3.57%)	26 (19%)
TOTAL	96 (68.57%)	44 (31.43%)	140 (100%)

Table 3: Comparison of our study with previous studies

Author	Year	Place	Sample size	Truncated (%)	Triangular (%)	Nodular (%)	Assimilated (%)
Lopes PTC [1]	2010	Southern Brazil	160 sides	36.3	41.3	10.5	11.9
Tapas S [2]	2013	New Delhi	100 sides	36	42	10	12
Gupta S [3]	2014	North India	204 sides	33.82	50	11.76	2.9
Padmavathi G [4]	2014	South India	180 sides	33.84	29.23	19.23	17.7
Sophia MM [5]	2015	South India	100 sides	18	49	23	10
Sanmugam K [6]	2015	Chennai	200 sides	26	48	7	19
Rikhotso RE [7]	2017	South Africa	201 sides	38.8 (Male=Female)	30.8 (Male<Female)	21.4 (Male> Female)	8.9 (Male < Female)
Modasiya UP [8]	2018	Gujarat	180 sides	42.22	15.55	21.67	20.56
Covantev S [9]	2018	Republic of Moldova	100 sides	36	16	36	12
Assis FP [10]	2019	Kerala	100 sides	18	47	26	7

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				(Male > Female)	(Male > Female)	(Male < Female)	(Male < Female)
Ibeachu PC [11]	2022	Nigeria	84 sides	41.6	39.27	9.52	9.52
Present Study	2023	Odisha	140 sides	27 (Male>Female)	31 (Male>Female)	23 (Male>Female)	19 (Male>Female)