

ORIGINAL ARTICLE

**VARIATIONS IN MORPHOLOGICAL APPEARANCE OF THE
CORONOID PROCESS OF THE MANDIBLE IN EASTERN
ODISHA POPULATION.**

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Abstract :

Background

The Coronoid process is a thin bony triangular projection which arise from the ramus of the mandible. Two main muscles of mastication attached are temporalis and masseter. It varies in both shape and size. Its anterior border is convex and continuous with the anterior border ramus of the mandible. The variations in the shapes of coronoid process are of mostly three types they are triangular, hook, and rounded. Different morphological variations of the coronoid process have been documented in literature as indispensable aids in anthropological and forensic studies.

Materials and Methods: In the present study, a total of 84 human mandibles of unknown sex and age was taken from the department of anatomy and forensic medicine, for morphometrical analysis and evaluated. Shapes of the coronoid process on both sides of the mandible (168 sides) were analyzed. The various shapes of the coronoid process were observed and recorded.

Results:We observed that The triangular shaped coronoid process was most prevalent in 104(61.90%) sides, the hook shaped was reported in 40(23.80%) sides & the round shaped was found only in 24 (14.30%) sides. So, triangular shaped coronoid process was most prominent in our study followed by hook and round shaped was least. The bilateral occurrences of all the three types were more common. All values were compared with series of other workers to draw the conclusions.

Conclusion:

The knowledge of the morphological shapes of the coronoid process is useful for the oral and maxillofacial surgeons. It makes an excellent donor graft site for reconstructive surgeries of the face like orbital floor repair, alveolar defects repair maxillary augmentation and repair of non-union fracture of mandible. In this regard, the present study was undertaken to depict various morphological disparities of the coronoid process in our ethnic group so as to aid in personal identification. It also helps in determining buccal vestibule during denture fabrication.

Keywords: mandible, coronoid, maxillofacial , triangular, hook, round

Introduction

Mandible is the strongest and largest bone of skull, having various morphological features which can be useful in identifying race, sex and age. Morphological variations are produced by the corresponding developmental variations through hereditary determinants and functional changes, this takes place during the growth process. The muscle and bone may dynamically affect the function of each other and lead to the changes in the morphology of the bone involved.¹ It has a curved body which is convex forward and two rami that ascends posteriorly. The rami bear the coronoid and condyloid process. The coronoid process projects upwards and slightly forward as a triangular plate of bone. Its posterior border bounds the mandibular incisor and its anterior border continues into that of ramus.². there may be Presence of double or second coronoid process. The temporalis muscle is attached to the apex of the coronoid process, the whole of the medial surface and anterior part of lateral surface of the coronoid process. The lateral surface provides attachment to anterior fibers of masseter. These two are the important muscles which show morpho-functional dependence. The word coronoid process is derived from Greek word “korone” means “like a crown”. In humans, there is another “coronoid fossa” in humerus and a "coronoid process" present in ulna.³

Literature shows the variations in the shapes of coronoid process is classified into three types as hooked, triangular and rounded⁴. Triangle-shaped process has a tip pointing upwards, hook-shaped process has the tip points backward whereas the tip is rounded in rounded coronoid process. The cause for the variation in the shape of coronoid process may be due to the hereditary or functional changes and has correlation with the way of attachment of temporalis muscle and chewing habits⁵ It also acts as an anthropological marker for detection of races⁶ Elongation of the coronoid process either unilaterally or bilaterally can cause impingement resulting in the restriction of mouth opening and mandibular hypomobility.⁷

Coronoid process of mandible can be used as a local bone graft as it can be harvested easily, with minimal morbidity and no cutaneous scarring⁸. A Coronoid process graft can be used for maxillary augmentation, repair of alveolar defects, repair of non-union fracture of mandible and orbital floor repair⁹. Though fracture of mandible is common, but fracture of the coronoid is very uncommon (2%) and requires no treatment unless impingement is present on the zygomatic arch. After removing the coronoid process no functional limitations are apparent. The anatomical variations in coronoid process can result in narrowing the vestibular space due to the close proximity of the medial aspect of the coronoid process to the distal molar. and it is suitable for paranasal augmentation¹⁰. The size and shape of coronoid process is influenced by genetic constitution, dietary habit, hormonal activity and by temporalis muscle activity. Coronoid process enlargement can be seen in some pathological conditions like osteochondroma, exostosis, osteoma and other developmental anomalies.^{11,12}

Knowledge about the shape of coronoid process is also essential for the oral and maxillofacial surgeons during coronoidectomy.¹³ The morphological variations in the coronoid process help the dentist and maxillofacial surgeons, to plan graft surgeries and coronoidectomy in case of ankylosis of the TMJ, trauma, deformities, tumors and Facial nerve paralysis. Hence, this study aims to analyze the variations in the morphological appearance of the coronoid process of the mandible and compare it with authors of previous studies.

MATERIALS AND METHODS

The present study was conducted on 84 mandibles of unknown age and sex, so total 168 sides were observed. The bones were obtained from the museum of Department of Anatomy and Forensic Medicine, Institute of Medical Sciences and Sum Hospital, Bhubaneswar. The bones are cleaned, dried and numbered. The deformed bones are discarded. The various morphological forms of coronoid process were observed, documented and classified as follows.

Triangular: apex is pointed

Rounded: apex is rounded,

Hook shaped: apex was pointing backwards

Shapes of the coronoid process on both sides of the mandibles were observed carefully & compared for difference on either side. Digital photographs were taken using a digital mobile camera.

Results

In present study it was found that the Triangular shape of coronoid process was present in 52 mandibles(104 sides) out of which, in 76.92%(80 sides) cases it was bilateral while in 23.08 %(24sides) cases it was unilateral, in which 14 belongs to right side & 10 belongs to left.Hence, we conclude that bilaterally the common shape is triangular. The hook shaped coronoid process was found in 40 mandibles (80 sides) out of which, in 60%(48 sides) cases it was bilateral and 40%(32 cases) it was unilateral in which 24 belongs to right side & 8 belongs to left. The round shaped coronoid process was reported in 12 mandibles (24 sides) out of which.in 25%(6 sides) cases it was bilateral and 75%(18 cases) it was unilateral in which 8 belongs to right side & 10 belongs to left.[Table 1]. So, triangular shaped coronoid process was most commonly reported in our study followed by hooked shaped and round shaped was least. The bilateral occurrences of all the three types were more common.

On analyzing above data using Microsoft excel software “P” value is .0131 and hence, results are significant. The test is used between unilateral and bilateral shapes of the bone. It was found that higher percentage (76%) of bilateral is triangular in shape and about 60% in Hooked shaped. And 25 % in round shaped. In rounded shape, percentage of unilateral is higher than bilateral. Hence the results are significance.

Table-1: Frequency of various shape of coronoid process in total side with percentage.

shape	total	Percentage%	bilateral		unilateral			
			Sides	percentage	Right	Left	Total	percentage
Triangular	52	61.90	40	76.92	7	5	12	23.10
Hooked	20	23.80	12	60	6	2	8	40
Round	12	14.30	3	25	4	5	9	75
Total	84	100	55	65.47	17	9	29	34.53

Discussion

The word , coronoid means ‘crow’, which has been described as one of the bony projection of the ramus of the mandible.The knowledge of the morphological shapes of the coronoid process is useful for the oral and maxillofacial surgeons. It makes an excellent donor graft site for

reconstructive surgeries of the face like orbital floor repair, alveolar defects repair maxillary augmentation and repair of non-union fracture of mandible⁹.

Many authors have been done studies globally on different races and groups of population about the coronoid process and their findings are compared by our results and observations After comparing and evaluating findings of the present study with that obtained by the various authors, we found several similarities and dissimilarities.(Table.2)

We observed that most common shape of coronoid process is triangular while round shape is least common, which is very much similar to findings of Issac B et al¹⁴, Khan TA et al¹⁵ Prajapati VP et al¹⁶, Nirmale et al^{18,9} Sanmugam K.²¹ Kadam SD et al²², A Quadri²³ Dhanaji S Jadhav,²⁴Sufia Parveen²⁵,&.We recorded that triangular shaped coronoid process seen in 61.90% cases which is very much near to findings of Dhanaji S Jadhav²⁴,which is seen in 60.76% cases. Hooked shaped coronoid process was the second commonest type found in 23.80% cases which is similar to the study done by Dhanaji S Jadhav,et al²⁴and Desai VC et al¹⁹,they reported in 23.84% and 24% respectively. While Kasat P.A. Hossain SMA¹⁷ & Mouna S et al²⁰ observed that hook shaped coronoid process was most commonly found. They reported triangular shaped coronoid process as 2nd most common type.

Round shaped coronoid process was found in 14.30 % cases which is least common,and the finding is very much nearer to the findings of Kadam SD et al²² and Mouna S et al²⁰,they reported round shaped coronoid process in 14.05% cases and 12% respectively.

temporalis myofascial flap can be used both as a single and as composite flap with the cranial bone,as the arteries supplying the coronoid process commonly arise from vessels which supply the muscles attached to the coronoid processes. It is not generally derived from the inferior alveolar artery which mainly supplies the mandibular body and teeth.

Conclusion :

The detail knowledge about the different morphological shapes of the coronoid process of mandible is useful for preoperative planning during reconstructive surgeries, by the dental surgeons in oral& maxillofacial surgeries. The coronoid process can be easily harvested as a donor bone and also suitable for paranasal augmentation. This Study may be used by anthropologists to assess different populations & races and by forensic experts for determination of gender.It is suitable for graft because of its availability, biocompatibility & reduced operation time for harvesting. It is also helpful in determining the buccal vestibule during denture fabrication In the present study, out of 82 mandibles triangular shaped coronoid process was found to be most common followed by hook shaped then by rounded shaped.The variations in the shape of coronoid process may be due to unilateral chewing habits, hormonal factors and muscular pull on the process

No study was done previously at shape of coronoid process at population of eastern odisha population ; hence, present study may be very useful for maxillofacial surgeons, anthropologists and forensic experts especially of eastern odisha region.

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Table 2.Comparison of Incidences of different shapes of coronoid process in various studies

Author (year of study)	Types of Coronoid Process		
	Triangular Shaped	Hook shaped	Round shaped
Issac B et al [14] (2001)	49%	27.4% %	23.6%
Khan TA et al [15] (2011)	67%	30%	3%
Prajapati VP et al [16] (2011)	54.17%	21.25%	24.58%
Hossain SMA [17] (2011)	29%	45%	25.35%
Nirmale et al [18] (2012)	65%	28%	7%
Desai VC et al [19] (2014)	68%	24%	8%
Mouna S et al [20] (2015)	14%	61.25%	12%
Sanmugam K. [21] (2015)	49%	27%	24%
Kadam SD et al [22] (2015)	64.97%	21.02%	14.01%
A Quadri (2016)[23]	67%	30%	3%

Dhanaji S Jadhav,(2017)[24]	60.76	23.84	15.38
Sufia Parveen[25](2018)	66.10%	21.97%	11.93%
Present study 2020	61.90%	23.80%	14.30%

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FIGURE 1-HOOKED



FIGURE 2-ROUNDED



FIGURE 3-TRIANGULAR.