

# Morphological study of variation in shape of coronoid process of mandible in dry human bone in Mahakaushal region

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## Abstract

**Introduction:** The coronoid process is present at the ramus of mandible bone. The coronoid process projects upwards and slightly forwards as a triangular plate of bone. The variations in shape of coronoid process may acts as anthropological markers, to assess different populations & races. It may also be useful in forensic studies for determination of gender. With keeping above facts in mind, present study was planned. **Material methods:** The shape of the coronoid processes of both sides of 52 dry adult human mandibles (29 male and 23 female) were studied to classify the variations. The study was conducted in NSCB Medical College, Jabalpur. Three types of shapes were observed which are hooked, triangular and round shaped. **Results:** Triangular shape of coronoid process was present in 48.08% mandibles. It was of rounded shape in 19.23% mandibles. In 32.69% mandibles found hooked shaped. out of total 52 mandibles, in 29 belonging to male, triangular shape was found in 36.21%, rounded shape in 22.41% and hooked shape was found in 41.37% mandibles. Out of remaining 23 mandibles which were of females, triangular shape was found in 63.04%, rounded shape in 15.22% and hooked shape in 21.74% mandibles. **Conclusion:** In present study, it is found that hooked shape coronoid is more common in male mandibles and in females, most common shape is triangular. As, no study was done previously at shapes of coronoid process at Mahakaushal area, hence, present study may be useful for maxillofacial surgeons and forensic experts especially of Mahakaushal region.

**Keywords:** Coronoid process, Mandible bone, Hooked Shaped

## Introduction

The coronoid process of the mandible projects upward and slightly forward as a triangular plate of bone. Its margins and medial surface give attachment to temporalis muscle [1]. Literature shows the variations in the shapes of coronoid process is classified into three types as hooked, triangular, and rounded [2].

The morphological variation in the shape of coronoid process may be due to the hereditary or functional changes and has a correlation with the way of attachment of temporalis muscle. Various scholars in their studies have noted different sequences of prevalence of shapes. Tanveer A et al [3], Nirmale et al [4] observed that triangular shape of coronoid process were most prevalent which were followed by hooked and rounded shapes respectively in their respective

studies. Vipul et al [5], Sahithiet al [6], Shakya et al [7], Sudha et al. [2] and Pradhan et al. [8] have concluded that most common shape of coronoid process was triangular only in their studies also, but, it was followed by rounded and hooked shapes respectively. It is very useful for anthropological and forensic studies to know about the prevalence of shapes of coronoid process [7]. Although various studies are already done on the topic but, it is noticeable that different scholars came out with different pattern of shapes according to prevalence of the shapes of coronoid process. As study on the topic was never done before in the Mahakaushal region, there was a serious need of study to enable maxillofacial surgeons, anthropologists and forensic experts of Mahakaushal region with knowledge of variation of shapes of coronoid process of mandibles in human. Accordingly, the study was planned and published in a scientific journal for a better circulation among the targeted readers.

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**Material & Methods**

**Place of Study:** Study was carried out in the Department of Anatomy, Netaji Subhash Chandra Bose Medical College, Jabalpur (M.P.), India.

**Sampling:** Shape of the coronoid processes of 52(104 sides) dry adult human mandibles were studied out of which 29 (58 sides) were of males and 23(46 sides) were of females.

**Inclusion Criteria:** Only adult’s mandibles were included in this study.

**Exclusion Criteria:** Mandibles with damages were excluded from the study to come out with exact results.

**Method**

Male and Female bones were differentiated by noting standard morphological features. Different shapes of coronoid process observed are triangular, rounded, and hooked.

The different shapes of coronoid process were compared for sexual dimorphism and difference on either side.

**Statistical Method:** Statistical analysis was also done through Chi-square test using IBM SPSS software on personal computer.

**Results**

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

Type	Shape	Total	%	Bi lateral		Unilateral			
				Sides	%	Right	Left	Total	%
1	Triangular	50	48.08	38	76.00	8	4	12	24.00
2	Rounded	20	19.23	8	40.00	3	9	12	60.00
3	Hook	34	32.69	24	70.59	6	4	10	29.41
<b>Total</b>		104	100	70	67.31	17	17	34	32.69

In present study it is observed that Triangular shape of coronoid process was present in 50 mandibles out of which, in 76% cases it was bilateral while in 24% cases it was unilateral. Hence, observation leads to the interpretation that triangular shape of is more commonly bilateral. In case of unilateral, eight coronoid process of right side were triangular (corresponding side have five rounded shaped & three hook shaped coronoid process). It was left side in four mandibles (corresponding side have two rounded and two hook shaped process). It was of round shaped in 20 mandibles, out of which, in 40% cases it was bilateral mandibles and unilateral in 60% mandibles. In cases of unilateral side, it is present at three right and nine left side of mandible, The corresponding side of mandibles were two triangular shaped and one hooked shape in case of right side, while in cases of left side, five were triangular and four were hooked shape coronoid process.

Remaining 34 mandibles were found hooked shaped, out of which, 70.59% mandibles were bilateral and in 29.41% mandibles it was unilateral (six were right & four were on left side mandible). In case of unilateral corresponding sides were four rounded & two triangular in right sides and three triangular & one rounded in left sides. On analyzing above data using Chi Square Test on IBM SPSS software it is observed that  $X^2$  is 8.66, “P” value is .0132 and hence, results are significant. The test is used between Bilateral and unilateral among the shapes of the bone. It was found that higher percentage (76%) of bilateral is triangular shape and about 71% in Hooked shaped. In rounded shape, percentage of unilateral is higher than bilateral. Overall results are significant.

**Table-2: Gender wise distribution of various shape of coronoid process in total sides of mandibles and its percentage.**

Type	Male (58)				Female (46)			
	Bilateral		unilateral		Bilateral		Unilateral	
	Sides	%	Sides	%	Sides	%	Sides	%
Triangular	14	24.14	7	12.07	24	52.17	5	10.87
Rounded	6	10.34	7	12.07	2	4.35	5	10.87
Hook	18	31.03	6	10.34	6	13.04	4	8.70
Total	38	65.52	20	34.48	32	69.57	14	30.43

Out of total 52 (104 side) mandibles, 29 (58 sides) were of male. On analysis of male mandibles it was found triangular shaped in 36.20%, rounded shape in 22.41% and hook shaped in 41.37% mandibles. On the other hand, while analyzing 23 (46 sides) female mandibles, triangular shape was found in 63.04%, rounded shape in 15.22% and hook shaped in 21.74% mandibles.

Above table also revealed that percentage of Triangular Shape are higher in female than male and percentage are higher in male in Hooked & Rounded shape compared to female.



**Photo-1: Hooked Shaped Mandible**



**Photo-2: Triangular Shaped Mandible**



**Photo-3: Rounded Shaped Mandible**

## Discussion

The knowledge of the morphological shapes of the coronoid process is useful for the maxillofacial surgeons. It makes an excellent donor graft site for reconstruction of orbital floor deformities. A Coronoid process graft can be used for alveolar defects repair, orbital floor repair, maxillary augmentation, repair of non-union fracture of mandible [9].

The present study exhibited overall triangular shape of coronoid process were most prevalent followed by hook shaped and rounded. As discussed earlier, it is observed that the patterns of prevalence of shapes in coronoid process of mandible in human were different in different studies. Some studies have shown triangular shape prevalence which is followed by rounded and hooked shape coronoid process respectively, while, some other studies have concluded triangular shape as most common shape of coronoid process, but, followed by hooked and rounded shapes respectively.

In the study of Tanveer A et al [3] and Nirmale et al [4] similar observations were found as in this study where triangular shape was followed by hooked and rounded shape respectively. In the study of Vipul et al [5] it was observed that triangular shaped are the most common shape but, Round & Hook shapes are the next shapes respectively. According to Isaac B et al [10] in 79.6% mandibles the type of coronoid process was the same bilaterally and only 20.4% mandibles

did the presentation differ between sides. Triangular and rounded types were the most and the least prevalent in males (46.5% & 23.5% respectively) while in female the triangular and hooked shape type were the most & least prevalent (53.5% & 22.8% respectively)

According to the studies conducted by Sahithi et al [6], Shakya et al [7], Sudha et al [2] and Pradhan et al [8] among the South Indian populations, in case of male and female, the most common shape of the coronoid process detected was triangular followed by round with male pre-dominancy. In their study Sheela D. Kadam et al [11] observed that most common shape of coronoid process was triangular in both sex (62.5% in male and 67.08% in female). 87.26% mandible showing same shape coronoid process bilaterally and in 12.74% of mandible shape differs on both sides.

In present study it is found that triangular shape was more common in female (63.04%) while hook shape of coronoid process is more common in male mandibles (41.37%). However, the total share of these two shapes in total mandibles was 48.08% & 32.69% in triangular and hooked shape respectively.

**Table-3: Shapes of coronoid process in mandibles.**

Study	Shapes observed		
	Triangular	Hook Shaped	Rounded
Issac B et al [10]	49%	27.4%	23.6%
Vipul et al [5]	54.17%	21.25%	24.58%
Nirmale et al [4]	65%	28%	7%
Tanveer A et al [3]	67%	30%	3%
Present Study	48.08%	32.69%	19.23%

## Conclusion

In present study it is found that hook shape of coronoid is most common in male mandibles followed by triangular and rounded shape. In case of female mandibles triangular shape is most common followed by hook and rounded shape.

For preoperative planning during reconstructive surgeries, knowledge of the morphological shapes of the coronoid process may be of great help for maxillofacial surgeons.

**What Study add to existing knowledge:** Study may be used by anthropologists to assess different populations & races and may also be useful for determination of gender by forensic expert. As shape of coronoid process depends on its functional use, it shows variation in different population groups. No study was done previously at shape of coronoid process at population of Mahakaushal area; hence, present study may be very useful for maxillofacial surgeons, anthropologists and forensic experts especially of Mahakaushal region. However, there is need of further study on larger group in this region.

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**Permission of IRB:** Yes

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## Original Research Article

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