



## A Morphological Study of Coronoid Process of Adult Human Dry Mandibles

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### Abstract

**Background:** *The coronoid process of mandible is a thin & triangular eminence which is flattened from side to side and varies in shape & size. The different variation in the shape of the coronoid process are like rounded, triangular & hook shaped. These variations occurs may be due to the functional or hereditary changes and has a strong correlation with the mode of attachment of the temporalis muscle. These shapes of the coronoid process acts as an evolutionary marker & is very useful in the anthropological studies as well as in the forensic studies. The coronoid process has also great clinical significance to the maxillofacial surgeons for the reconstructive surgeries. This coronoid process can be easily harvested as a donor bone. Therefore, we study about the incidence of different shapes of coronoid process in the mandible in population of Bihar & compare it with findings of different studies.*

**Materials & Methods:** *The present study is a cross sectional study which has been carried out on 264 dried fully ossified adult human mandibles (528 Sides) which were segregated as 144 male (288 sides) and 120 female (240 sides) mandibles. The age of the bones used in the study was not predetermined.*

**Result:** *We observed three different shapes of coronoid process i.e. triangular, hook & rounded Shaped. The triangular shaped coronoid process was reported in 349 (66.10%) sides, the hook shaped was reported in 116 (21.97%) sides & the round shaped was reported only in 63 (11.93%) sides. So, triangular shaped coronoid process was most commonly reported in our study while round shaped was least commonly. The bilateral occurrences of all the three types were more common. The incidence of all the three types of shape were more common in male mandible as compared to female. The bilateral occurrences of all these three types were also more common in male mandibles as compared to female.*

**Conclusion:** *The detail knowledge about the different morphological shapes of the coronoid process of mandible is useful for the dental surgeons in oral & maxillofacial surgeries.*

**Key Words:** *Coronoid Process, Mandible, Maxillofacial Surgeries.*

## Introduction

There are two structures in the human body which are known by a common name the coronoid process. The first one is present in the jaw bone i.e. mandible while other one present in a long bone of forearm named ulna. In both the location it has a triangular shape. The coronoid process of mandible is a thin & triangular eminence which is flattened from side to side and varies in the shape as well as size. The different variation in the shape of the coronoid process are like rounded, triangular & hook shaped<sup>[1]</sup>. This process projects upwards & slightly forwards. It has a superior border which is convex in shape, while its lower part is concave in shape. The temporalis muscle has attachment on its margins as well on the medial surface. These variations in the shape of coronoid process of mandible may be due to the functional or hereditary changes and has a strong correlation with the mode of attachment of the temporalis muscle. These different shapes of the coronoid process acts as an evolutionary marker & is very useful in the anthropological & the forensic studies. The coronoid process has also great clinical significance to the maxillofacial surgeons for the reconstructive surgeries<sup>[2]</sup>. Autogenous bone grafts can be taken from the ilium, rib or the calvarias but these sites has its own associated morbidity. So, we can obtained a local bone graft from the coronoid process of mandible which is easily harvested with low morbidity as well as shorter surgical and hospitalization time. In this process there is no cutaneous scarring as the bone is harvested intra orally. A coronoid process graft can be used for various procedures like repair of non-union fracture of mandible, orbital floor repair, alveolar defects repair & also in case of maxillary augmentation<sup>[3]</sup>. This coronoid process is also used as a donor site for sinus augmentation<sup>[4]</sup>. Therefore, we study about the incidence of different shapes of coronoid process in the mandible in the population of Bihar & compare it with the findings of the different studies.

## Materials and Methods

The present study is a cross sectional study which has been carried out on 264 dried fully ossified adult human mandibles (528 sides), which were collected from the students of the 1st year MBBS & BDS and Department of Anatomy & Forensic Medicine of different medical & dental colleges of Bihar state of India. These 264 mandibles were segregated into male and female mandibles on the basis of following criteria<sup>[1]</sup>:--

1. In males: the angle of mandible is everted.
2. In females: the angle of mandible is inverted.

Finally, these were segregated as 144 male (288 sides) and 120 female (240 sides) mandibles. The age of the bones used in the study was not predetermined. Only fully ossified dried, macerated and thoroughly cleaned mandibles which were complete in all respects, in order to give the correct observations, were included in the study while the mandibles having any deformity or pathology were excluded. Shapes of the coronoid process on both sides of the mandibles were observed carefully & compared for difference on either side. Representative photographs were taken using a digital mobile camera.

## Results

In the present study three different shapes of coronoid process were reported based on the description by Isaac B & Holla S J.<sup>[5]</sup>:-

1. Triangular, 2. Hook & 3. Rounded Shaped.

The triangular shaped coronoid process was reported in 349 (66.10%) sides in which 153 mandibles had bilateral while 43 had unilateral in which 11 belongs to right side & 32 belongs to left.

The hook shaped coronoid process was reported in 116 (21.97%) sides in which 50 mandibles had bilateral while 16 had unilateral in which 6 belongs to right side & 10 belongs to left.

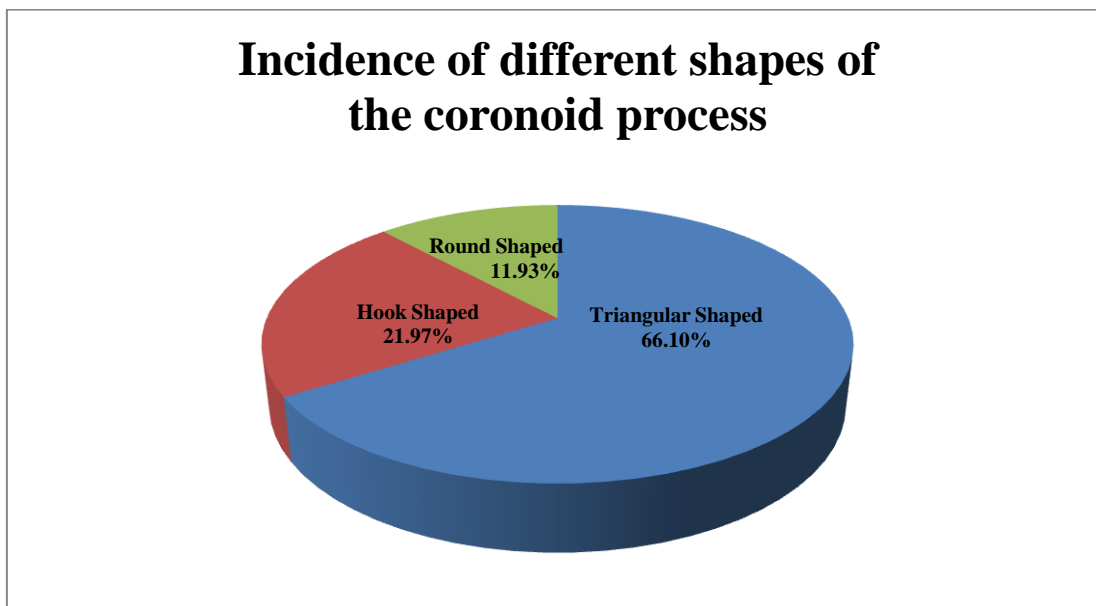
The round shaped coronoid process was reported only in 63 (11.93%) sides in which 44 mandibles had bilateral while 19 had unilateral in which 8 belongs to right side & 11 belongs to left [Table 1

& Figure 1,2, 3 & 4]. So, triangular shaped coronoid process was most commonly reported in our study while round shaped was least commonly. The bilateral occurrences of all the three types were more common. The incidence of

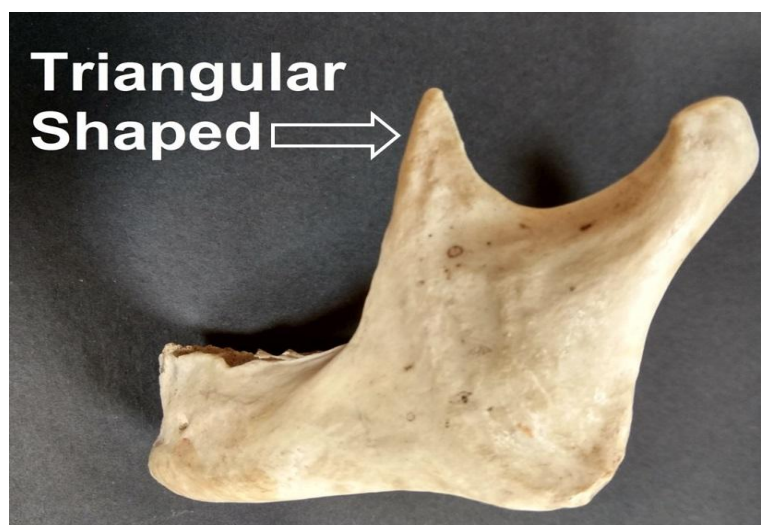
all the three types of shape were more common in male mandible as compared to female [Table 2]. The bilateral occurrences of all these three types were also more common in male mandibles as compared to female.

**Table 1:** Incidence of various shapes of Coronoid process and its percentage

Sr. No.	Type	Bilateral	Unilateral		Total (n) (%)
			Right	Left	
1.	Triangular Shaped	306 (57.96%)	11 (2.08%)	32 (6.06%)	349 (66.10%)
2.	Hook Shaped	100 (18.94%)	6 (1.14%)	10 (1.89%)	116 (21.97%)
3.	Round Shaped	44 (8.33%)	8 (1.52%)	11 (2.08%)	63 (11.93%)
Total (%)		450 (85.23%)	25 (4.74%)	53 (10.03%)	528 (100%)



**Figure 1:** Distribution of different shapes of coronoid process



**Figure 2:** Triangular shaped coronoid process



Figure 3: Hook shaped coronoid process

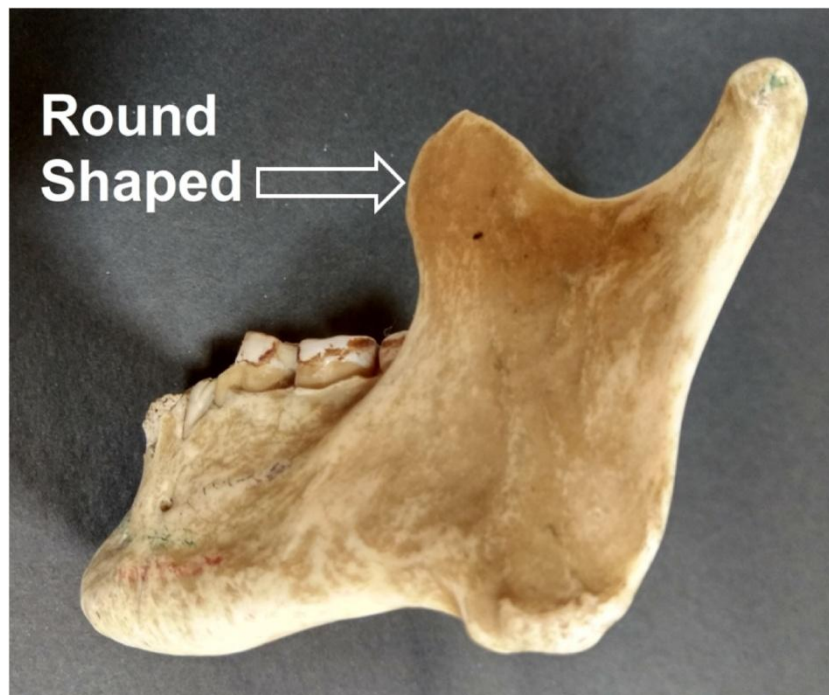


Figure 4: Round shaped coronoid process

Table 2: Gender wise distribution of different shapes of coronoid process

Sr. No.	Type	Male			Female			Total
		B/L	U/L	Total	B/L	U/L	Total	
1.	Triangular Shaped	164 (31.06%)	18 (3.41%)	182 (34.47%)	138 (26.14%)	29 (5.49%)	167 (31.63%)	349 (66.10%)
2.	Hook Shaped	58 (10.99%)	4 (0.76%)	62 (11.75%)	44 (8.33%)	10 (1.89%)	54 (10.22%)	116 (21.97%)
3.	Round Shaped	40 (7.57%)	4 (0.76%)	44 (8.33%)	16 (3.03%)	3 (0.57%)	19 (3.60%)	63 (11.93%)
Total		262 (49.62%)	26 (4.93%)	288 (54.55%)	198 (37.5%)	42 (7.95%)	240 (45.45%)	528 (100%)

## Discussion

Many studies have been done globally by different workers on other races and groups of population

**Table 3:** Comparison of Incidences of different shapes of coronoid process in various studies

Sr. No.	Author (year of study)	Types of Coronoid Process		
		Triangular Shaped	Hook Shaped	Round Shaped
1.	Issac B et al <sup>[5]</sup> (2001)	49%	27.4%	23.6%
2.	Khan TA et al <sup>[6]</sup> (2011)	67%	30%	3%
3.	Prajapati VP et al <sup>[3]</sup> (2011)	54.17%	21.25%	24.58%
4.	Hossain SMA <sup>[7]</sup> (2011)	29.65%	45%	25.35%
5.	Nirmale et al <sup>[8]</sup> (2012)	65%	28%	7%
6.	Desai VC et al <sup>[9]</sup> (2014)	68%	24%	8%
7.	Mouna S et al <sup>[10]</sup> (2015)	14%	61.5%	12.5%
8.	Sanmugam K. <sup>[11]</sup> (2015)	49%	27%	24%
9.	Kadam SD et al <sup>[12]</sup> (2015)	64.97%	21.02%	14.01%
10.	Present Study (2018)	66.10%	21.97%	11.93%

After comparing and evaluating findings of the present study with that obtained by the various workers, several differences as well as similarities found. We reported 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 al<sup>[5]</sup>, Khan TA et al<sup>[6]</sup>, Prajapati VP et al<sup>[3]</sup>, Nirmale et al<sup>[8]</sup>, Desai VC et al<sup>[9]</sup>, Sanmugam K.<sup>[11]</sup> & Kadam SD et al<sup>[12]</sup>. While Hossain SMA<sup>[7]</sup> & Mouna S et al<sup>[10]</sup> observed that hook shaped coronoid process was most commonly found. They reported triangular shaped coronoid process was second commonest type. We reported triangular shaped coronoid process in 66.10% cases which is very much near to findings of Khan TA et al<sup>[6]</sup>, they reported triangular shaped coronoid process in 67% cases. We reported round shaped coronoid process in 11.93% cases which is least common, is very much nearer to the findings of Mouna S et al<sup>[10]</sup>, they reported round shaped coronoid process in 12.5% cases.

about the coronoid process their findings are compared by our results and observations.

We found 34.47% triangular shaped coronoid process in male & 31.63% cases in females. Triangular shape was also more common in both male & female. Similar findings were reported by Kadam SD et al<sup>[12]</sup>. They found 105 cases in male & 99 cases in females among 204 cases of triangular coronoid process. They found almost equal incidence of hook type in both male & female mandibles i.e. 34 cases in male & 32 cases in females among 66 total cases of hook shaped. They also measured intercoronoid distance in mandibles & found the results were not statistically significant in male & females mandibles. They found mean intercoronoid distance was 9.3 cm. in male and 9.2 cm in female mandibles.

The different anatomical variations in the shape of coronoid process may results in the narrowing of the vestibular space because of the close proximity of the medial aspect of the coronoid process to the distal molar teeth. This may cause impingement, which may results in the restriction of the mouth opening as well as mandibular

hypomobility<sup>[11]</sup>. In reconstruction of orbital floor deformities, the coronoid process makes an excellent donor graft site<sup>[13]</sup>. Clauser et al<sup>[14]</sup> described the use of a temporalis myofascial flap both as a single and as composite flap with the cranial bone. Because the arteries supplying the coronoid process commonly arise from vessels that supply the muscles attached to these processes. It generally not derived from the inferior alveolar artery which primarily supplies the mandibular body and teeth. The coronoid process with the skin island are commonly used in the different types of reconstructive craniomaxillofacial surgery including temporo mandibular joint ankylosis, tumors, trauma, deformities & facial paralysis. There are no any functional limitations are apparent after removing the coronoid process.

### Conclusion

The detail knowledge about the different morphological shapes of the coronoid process of mandible is useful for the dental surgeons in oral & maxillofacial surgeries. This coronoid process can be easily harvested as a donor bone. This part of the mandible is also suitable for paranasal augmentation. Its clinical application is also favorable due to its size & its morphology fits into the paranasal region. It has additional advantages of availability, biocompatibility & reduced operation time for harvesting. It may also helps in determining the buccal vestibule during denture fabrication. It's knowledge is also helpful in different anthropological studies as well as in forensic dentistry.

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