

Original article

Morphological Variations of Coronoid Process in Dry Adult Human Mandibles

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Abstract:

Introduction: The coronoid process has been described as one of the bony processes of the ramus of the mandible.

Materials and Methods: The morphological analysis of shapes of coronoid process of both side of fifty dry adult human mandibles of Indian origin (100 sides) were done in order to classify the variations.

Observation and results: Three types of variations in the shape were evident. Triangular, hook shaped and rounded. Triangular shaped coronoid process was found in 60 (60%) sides, hook shaped process in 22 (22%) and round shaped in 18 (18%) sides.

Conclusion: Knowledge of the morphological shapes of the coronoid process is useful for the maxillofacial surgeon during reconstructive surgeries. The mandibular coronoid process has been used as a donor site for sinus augmentation. The shape of coronoid process is also useful in anthropological studies and in forensic dentistry.

Key Words: Mandible, coronoid process

Introduction

Morphological variations are produced by the corresponding developmental variations through hereditary determinants and the functional changes that take 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 involved¹. The term coronoid process is given to the two entirely different structures that are found inside the human body. The first structure is seen in jawbone, mandible and another one is seen in ulna, a long bone which is found in forearm². The mandible is the largest strongest bone in the face. It has horizontally curved body that is convex forwards and two broad rami that ascend posteriorly. The rami bear the coronoid and condyloid processes³. The coronoid process projects upwards and slightly forwards as a triangular plate of bone. Its posterior border bounds the mandibular incisurae, and its anterior border continues into that of ramus³. Its

margins and medial surface give attachments to temporalis muscle². The morphological variation in the shape of coronoid process may be due to the hereditary or functional changes and has a correlation with the mode and attachment of temporalis muscle. The shape of coronoid process acts as an evolutionary marker and is useful in anthropological studies and in forensic studies¹.

The Coronoid process is of clinical significance to the maxillofacial surgeons for reconstructive purposes¹. Autogenous bone grafts can be obtained from ilium, rib and calvarias; but each site has its own associated morbidity. A local bone graft from Coronoid process of mandible can be used as it can be harvested easily, minimal morbidity, shorter surgical and hospitalisation time, no cutaneous scarring as bone is harvested intraorally. A Coronoid process graft can be used for alveolar defects repair, orbital floor repair, maxillary augmentation, repair of non-union

fracture of mandible². Coronoid process also has been used as a donor site for sinus augmentation⁴.

Materials and Methods

The present study was undertaken in fifty dry adult human mandibles (100 sides) of Indian origin to determine the variations in the shape of coronoid process. The shape of coronoid process were analysed in 50 mandibles. The different shapes of coronoid process were compared for difference on either side.

Observation and results

According to the shape of coronoid process, they were classified into 3 types. Triangular, hook shaped and rounded (Table-1). The triangular coronoid process (type1) with tip pointing upwards (fig.1) was seen in 60 (60%) sides. In 23 mandibles (46 sides) it was seen bilaterally while in 14 mandibles it was found unilaterally. The 7 mandibles, which had a triangular coronoid process on the right side, the corresponding sides had 5 hook shaped and 2 round shaped coronoid processes. The 7 mandibles which had a triangular coronoid process on the left side, the corresponding

sides had 3 hook shaped and 4 round shaped coronoid processes.

The hook shaped coronoid process (type 2), had a tip which was pointing backwards (fig: 2) was present in 22 (22%) sides. In 7 Mandibles (14 Sides) it was present bilaterally, while in 8 mandibles it was present unilaterally. Of the 3 mandibles which had a hook like coronoid process on the right side, corresponding sides showed 2 triangular shaped and 1 rounded coronoid process. Out of the 5 mandibles which had a hook like coronoid process on the left side, the corresponding sides showed 4 triangular and 1 rounded coronoid process.

The (type 3) coronoid process had a rounded tip (fig: 3) and was present in 18 (18%) sides. In 10 mandibles (5 sides) the rounded coronoid process was present bilaterally and in 8 mandibles it was present unilaterally. Of the 5 mandibles which had a rounded coronoid process on the right side, all the corresponding sides had triangular shaped coronoid process on the left side. The same was observed for the 3 mandibles which had a rounded coronoid process on the left side.

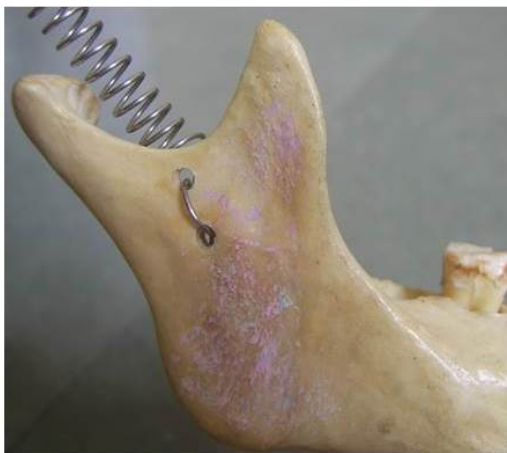


Fig 1: Triangular Coronoid process



Fig 2: Hook shaped coronoid process



Fig 3: Rounded coronoid process

Table1: Morphological analysis of various shapes of coronoid process

Types	Shapes	%	Bilateral	Unilateral	
				Right	Left
1	Triangular (n=60)	60	46	7	7
2	Hook (n=22)	22	14	3	5
3	Rounded (n=18)	18	10	5	3

Table 2:- Comparison of various studies of coronoid process of mandible

Authors	Types of Coronoid Process		
	Triangular	Hook Shaped	Rounded
Issac B et al(2001) ⁸	49%	27.4%	23.6%
Tanveer A et al (2011) ⁹	67%	30%	3%
Vipul et al (2011) ²	54.17%	21.25%	24.58%
Nirmale et al (2012) ¹⁰	65%	28%	7%
Present Study (2013)	60%	22%	18%

Discussion

The coronoid process, coronoid meaning 'crow', has been described as one of the bony processes of the ramus of the mandible⁵. Triangular coronoid processes have been illustrated by Hamilton (1976)⁶, Romanes (1986)⁷. Standring et al. (2008) described the coronoid process as a flat triangular process³. The present study (2013) showed triangular shape of coronoid process were most prevalent followed by hook shaped and rounded which was in accordance with findings of Isaac B et al (2001)⁸, Tanveer A et al (2011)⁹ and Nirmale et al (2012)¹⁰, But according to the Vipul et al (2011) triangular and hook shaped are the most and least prevalent shape of coronoid process.² (Table 2) The difference in the shape of coronoid process had been attributed to the various factors like attachment and action of temporalis muscle, unilateral chewing habit and hormonal factors.¹

The coronoid process is favourable donor site that possesses the advantage of biocompatibility, availability and less operative time for harvesting. Autogenous bone is still the gold standard for the augmentation of oral and maxillofacial defects⁴. The Coronoid process grafts are widely used in

reconstruction of osseous defects in oral and facio-maxillary region. The Coronoid process makes an excellent donor graft site for reconstruction of orbital floor deformities. Mintz et al.,1998 and Clauser et al.,1995 as quoted by Vipul et al(2011), reported the use of a temporalis myofascial flap both as a single and as composite flap with cranial bone, as the arteries supplying the coronoid process, arise from vessels that supply the muscles attaching to these processes, and generally not from the inferior alveolar artery which primarily supplies the mandibular body and teeth. Coronoid process skin island can be used in all aspects of reconstructive craniomaxillofacial surgery including trauma, deformities, tumors, temporomandibular joint ankylosis and facial paralysis. No functional limitations were apparent after removing the coronoid process².

Conclusion: Knowledge of the variant morphological shapes of the coronoid process is useful for the maxillofacial surgeon during reconstructive surgeries and used as a donor site for sinus augmentation. It is also useful in anthropological studies and in forensic dentistry.

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