

Evaluation of coronoid process by orthopantomogram

L. Saicharan, M. S. Thenmozhi, Ganesh Lakshmanan*

ABSTRACT

Aim: The aim is to study and find that is there any difference in coronoid process for males and females during these cases, mandible structures play a key role in forensic dentist. We want to find, is there any difference in coronoid process in between males and females. **Materials and Methods:** The study was carried out using 900 orthopantomogram comprised both genders. The different shapes of the coronoid process were traced on both the right and left sides. The data obtained had put in statistical analysis. **Results and Discussion:** The triangular square area including the lengths of coronoid process to angle of mandible, angle of mandible to condylar process, and from condylar process to angle of mandible. Is numerically there is a difference between males and females, but statistically there is no significant difference. There are different shapes of coronoid process in males and females. In males, triangular coronoid process was more on the right side about 57.8% than the left side about 54% followed by beak shape and round shape. In females, triangular coronoid process was more common followed by beak, round, and flat shape. In our study, flat-shaped coronoid process was present only in female.

KEY WORDS: Orthopantomogram, Coronoid process, Mandible, Sex determination

INTRODUCTION

From decades, DNA matching and fingerprint analysis have a key role in the identification of person. Identification of person actually becomes challenging and difficult when remnants are available. Gender determination in human bones is most commonly done by skull and pelvic bones. When skull remnants are remaining, the identification of person becomes much more challenging; during these cases, mandibular structures play a key role in forensic dentist. The morphological features of mental foramen, height of alveolar bone, position of mandibular foramen, coronoid process, condylar process, and size of dentition help in gender and age determination.^[1]

In the human body, there are two different structures named coronoid process. The first coronoid process is in the mandible and the other coronoid processes are seen in ulna, a long bone which is found in forearm. Coronoid

process in both the areas has an appearance of triangular shape. The mandibular coronoid process projects upward and slightly forward. The margins and medial surface of coronoid process give attachment to temporalis muscle.^[2] The shape of coronoid process acts as evolutionary marker and is helpful in forensic identification.

In forensic identification, radiographs play an essential role to uncover the hidden facts. Maxillofacial radiographs including orthopantomograms (OPGs) paranasal sinus views, computed tomography (CT), and cone-beam CT (CBCT) help in gender determination. Out of all, OPG was found to be less expensive when compared to other advanced imaging modalities such as CT and CBCT. In OPG, different shapes of the coronoid process can often be appreciated bilaterally.

Various *in vivo* and *in vitro* studies have done previously to evaluate the morphological variations of coronoid process in different population of the world.^[2,3] In this regard, the present study was undertaken to depict variations in morphology of coronoid process in South Indian population.

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Department of Anatomy, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

*Corresponding author: Dr. Ganesh Lakshmanan, Department of Anatomy, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600 077, Tamil Nadu, India. Phone: +91-9894999243. E-mail: drganeshbhms@gmail.com

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MATERIALS AND METHODS

The study was conducted in Saveetha Dental College during December 2018. The patients were explained about the objectives of the study, and informed consent was obtained before enrolling them in the study. Patients undergoing conventional OPG for diagnostic, periodontal, surgical (for impacted teeth), or orthodontic purposes were recruited for the study. A total of 328 radiographs were taken, of which only 300 OPGs were included in the study since 28 radiographs did not meet selection criteria.

Inclusion Criteria

The following criteria were included in the study:

- Patients aged 20 years and above
- High-quality OPGs with respect to angulation and contrast.

Exclusion Criteria

The following criteria were excluded from the study:

- Patients who have undergone surgical intervention in coronoid region
- Patients with disorders affecting bone such as Paget's disease, fibrous dysplasia, and hyperparathyroidism
- Patients with hemifacial malformations
- Patients with previous history trauma in orofacial region.

All OPGs were captured using Xtropan 2000 system (tube potential: 50–85 KV, tube current: 12 mA, and time: 14 s) using Carestream (T Mat GIRA) films. The magnification factor reported by the manufacturer was 1.2. A total of 600 sides were evaluated and compared for both sides and in both the genders.

RESULTS

We had tried to evaluate the triangular area from the lengths measured from coronoid process to angle of mandible, angle of mandible to condylar process, and from condylar process to coronoid process. By analyzing this in both males and females [Tables 1-3], we found that there is a little bit change in numerical significance, but there is no statistical significance in both males and females.

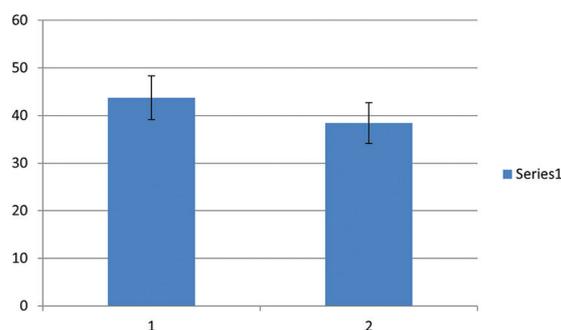


Table 1: Sidewise distribution of coronoid process shapes

Shapes	Right (%)	Left (%)	Total (%)
Triangular	180 (60)	160 (53.3)	340 (56.6)
Beak	64 (21.3)	72 (24)	136 (22.6)
Round	51 (17)	64 (21.3)	115 (19.1)
Flat	5 (1.6)	4 (1.3)	9 (1.5)
Total	300	300	600

Table 2: Shapes of coronoid process in males (178)

Shapes	Right (%)	Left (%)	Total (%)
Triangular	103 (57.8)	96 (54)	199 (55.8)
Beak	39 (22)	44 (24.7)	83 (23.3)
Round	36 (20.2)	38 (21.3)	74 (20.7)
Flat	0	0	0
Total	178	178	356

Table 3: Shapes of coronoid process in females (122)

Shapes	Right (%)	Left (%)	Total (%)
Triangular	77 (63.1)	64 (52.4)	144 (57.8)
Beak	25 (20.4)	28 (23)	53 (21.7)
Round	15 (12.3)	26 (21.3)	41 (15.7)
Flat	5 (4.1)	4 (3.2)	9 (3.6)
Total	122	122	244

However, we found that there is a difference in the shapes of the coronoid process. Out of 300 OPGs, 178 were male and 122 were female. The most common shape of coronoid process among 600 sides was triangular (340) which was distributed as 180 (60%) on the right side and 160 (53.3%) on the left side. The second common shape was beak shape (136), of which 64 (21.3%) were on the right side and 72 (24%) on the left side and then followed by the round shape (115), of which 51 (17%) were on the right side and 64 (21.3%) on the left side. Flat-shaped coronoid process was the least common accounting for 9, which was slightly more on the right side (1.6%).

In males, triangular coronoid process was more on the right side about 57.8% than the left side about 54% followed by beak shape and round shape. In females, triangular coronoid process was more common followed by beak, round, and flat shape. In our study, flat-shaped coronoid process was present only in female.

DISCUSSION

The coronoid process derived from a Greek word korone (meaning crow's beak) is a flat piece of triangular bone projecting upward from the anterior margin of the mandibular ramus.^[4] In the early stage of mandibular development, coronoid or condylar process cannot be distinguished. At 24 mm stage (55th day), these processes begin to be mapped out in membrane, and by 43 mm stage (70th day), it will take the form as bony processes. At around 13th week of

Table 4: Comparison of various studies of coronoid process with the present study

Authors	Triangular shape (%)	Hook shape (%)	Rounded shape (%)	Flat shape (%)
Issac and Holla ^[2]	49	27.4	23.6	-
Khan and Sharieff ^[9]	67	30	3	-
Prajapati <i>et al.</i> ^[10]	54.1	21.2	24.5	-
Nirmale <i>et al.</i> ^[11]	65	28	7	-
Tapas (2014) ^[8]	60	22	18	-
Subbaramaiah <i>et al.</i> ^[12]	14	61.5	12.5	12
Sahithi <i>et al.</i> ^[13]	53.7	8.5	35.7	2
Present study	56.6	22.6	19.1	1.5

intrauterine life, a strip of cartilage appears along the anterior border of coronoid process which is invaded and displaced by the membrane bone. This cartilage usually disappears before birth but can persist as subcoronoid sutures.^[5]

In reconstructive craniomaxillofacial surgeries such as orbital floor reconstruction, paranasal augmentation, and temporomandibular joint ankylosis, the coronoid process of the mandible is gaining vital importance as a graft material.^[6,7] Coronoid process is also being used as a non-metric skull variant in the assessment of age, gender, race, and species. The clinical and other applications of coronoid morphology are in the field of reconstructive surgery, and anthropology has been well documented in literature [Table 4].^[7]

In the present study, the most common shape of coronoid process was triangular (56.6%) followed by beak shape (22.6%) and round shape (19.1%) with least common as flat-shaped process (1.5%). The results of the present study were similar to studies done by Tapas and Isaac and Holla studies in different parts of the world.^[2,8]

Kadam *et al.*^[14] conducted an *in vitro* study to evaluate the variations in the shape of coronoid process in Maharashtra population and found that triangular has the most common type followed by hook shape and round type which was in accordance with our study.

Shakya *et al.*^[3] and Sahithi *et al.*^[13] conducted a retrospective study using OPGs radiographs to analyze the morphological variations of coronoid process and found triangular shape as the most common type followed by round shape, beak shape, and flat shape. The results of their studies were contradictory to our results. Prajapati *et al.*^[10] conducted a study on dry mandible to study the variations of coronoid process; the results were also in contradictory to our results. Flat-shaped coronoid process was present only in females which accounted for less percentage in our study which was in accordance with the previous study.^[13]

Morphological variations of anatomic structures occur either corresponding to the developmental discrepancies through hereditary determinants or

due to the functional variations that arise during the growth process. Various factors such as attachment and action of temporalis muscle,^[15] unilateral chewing habit,^[16] and hormonal factors lead to differences in the shape of coronoid process.

CONCLUSION

Within the limitations, the present study showed more common shape of coronoid process as triangular followed by beak shape and round shape. Future studies with larger sample size and different age group patients should be conducted.

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