

Morphology of Coronoid Process and Sigmoid Notch in Orthopantomograms of South Indian Population

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ABSTRACT

Introduction: The shape of the coronoid process and sigmoid notch is useful in anthropological studies and forensic dentistry. Literature review shows that the morphological variation in the shape of coronoid process and sigmoid notch may be due to hereditary or functional changes and have a correlation with the mode and degree of the attachment of temporalis muscle.

Materials and methods: In this study the shape of the coronoid process and sigmoid notch were analyzed in 200 orthopantomographs. The coronoid process and sigmoid notch were classified as beak shaped, flat round, triangular and sloping, round and wide respectively. In this study, we have attempted to analyze the prevalence of different shapes of coronoid process and sigmoid notch in the residents of South India. The different shapes of coronoid process and sigmoid notch were compared for sexual dimorphism and difference on either side.

Results: The mean age \pm SD of the study population was found to be 35.03 ± 18.37 . No significant changes were observed among right and left coronoid process and sigmoid notch, neither was there any changes observed among males and females. Triangular shape coronoid process and the sloping form for sigmoid notch appears to be more common. Variation in the shape according to age was found to be statistically insignificant.

Conclusion: A multicentric study involving various ethnic groups of larger sample size may be undertaken to analyze variations in the morphology of coronoid process and sigmoid notch.

Keywords: Coronoid process, Sigmoid notch, Orthopantomogram, Mandible.

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INTRODUCTION

Coronoid process of the mandible is a flat triangular process projecting upward and slightly forward.^{1,2} Sigmoid notch is the deficiency between the coronoid and the condylar process. The shape of the notch depends on the shape of these processes.² The margins and medial surface of coronoid process give attachment to temporalis muscle.¹ Secondary accessory cartilage appears in the region of the coronoid process by about 10 to 14 weeks of intrauterine life. This secondary cartilage of coronoid process is believed to grow as a response to the developing temporalis muscle.

The coronoid accessory cartilage becomes incorporated into the expanding intramembranous bone of the ramus and disappears after birth.³

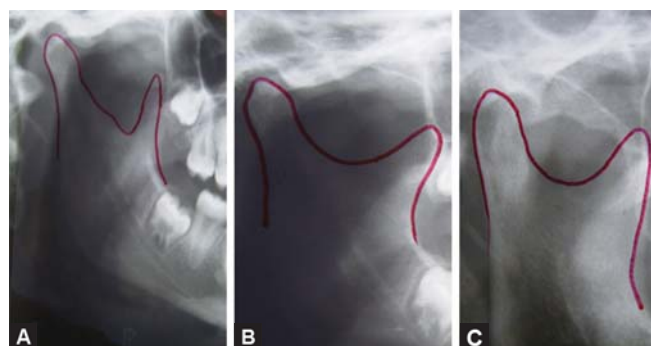
Morphologic variations are produced by corresponding developmental variations through hereditary determinants and functional changes that take place during the growth process. Muscle and bone may dynamically affect the function of each other and lead to change in the morphology of the bone involved.^{4,5} The variation in shape of the sigmoid notch depends upon the shape of the coronoid and condylar process.²

The present study was undertaken to assess the shape of coronoid process and sigmoid notch as the shape of the coronoid process and contour of the sigmoid notch acts as an evolutionary marker and can be used in anthropological studies and in forensic studies.² Besides, coronoid process can also be used by maxillofacial surgeons for reconstructive purposes.

MATERIALS AND METHODS

The study was conducted on 200 orthopantomograms (OPG) obtained from the archive of Department of Oral Medicine and Radiology, Manipal College of Dental Science, Mangalore. All OPGs were taken by using Planmeca Promax machine. The OPGs were then traced on over head projection sheets by using viewer-box. The shape of coronoid process and sigmoid notch were interpreted by using the criteria given by Narayan et al.²

Shapes of sigmoid notch and coronoid process (Figs 1 and 2) were recorded for either side for both sexes. The different shapes of coronoid process and sigmoid notch were compared for sexual dimorphism and for both sides.



Figs 1A to C: Various shapes of sigmoid notch: (A) Sloping, (B) wide, (C) round

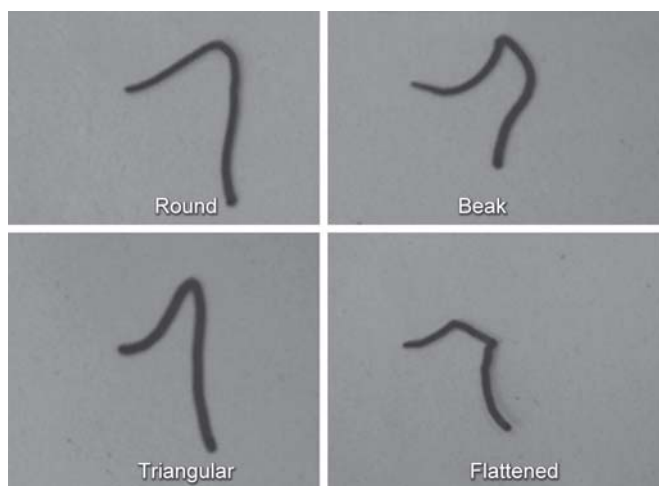


Fig. 2: Various shapes of coronoid process

RESULTS

Of the 200 OPGs, 102 were of males and 98 females. The age range of the study consisted of 4 to 89. The mean age of the males is 34.49 ± 17.63 and for females is 35.58 ± 19.59 . The distribution of the coronoid process and sigmoid notch, their correlation in right and left side, frequency of occurrence in right and left side, and distribution in males and females are shown in Tables 1 to 6 respectively.

Table 1: Correlation of right and left coronoid process

Left	Beak	Round	Triangular	Flat
Right beak	1	2	4	0
Round	0	46	20	0
Triangular	4	25	97	1
Flat	0	0	0	0

Table 2: Correlation of right and left sigmoid notch

Left	Round	Sloping	Wide
Right round	33	23	11
Sloping	17	60	16
Wide	6	6	28

Table 3: Distribution of coronoid process in right and left side

	Right	Left	Total
Round	66	73	139
Triangular	127	121	248
Beak	7	5	12
Flattened	0	1	1

Chi-square: 1.831; p = 0.60

Table 4: Distribution of sigmoid notch in right and left side

	Right	Left	Total
Round	67	56	123
Sloping	93	89	182
Wide	40	55	95

Chi-square: 3.440; p = 1.7

Table 5: Distribution of various shapes of coronoid process in males and females

Shapes	Male		Female	
	Right	Left	Right	Left
Beak	1	2	6	3
Rounded	33	7	33	36
Triangular	68	62	59	59
Flattened	0	1	0	0

Male Chi-square: 1.83, p = 0.60; Female Chi-square: 1.130, p = 0.56; Male/female: Chi-square: 4.43, p = 0.21

Table 6: Distribution of various shapes of sigmoid notch

Shapes	Male		Female	
	Right	Left	Right	Left
Round	31	33	36	23
Sloping	50	40	43	49
Wide	21	29	19	26

Male Chi-square: 2.45, p = 0.293; Female Chi-square: 4.34, p = 0.114; Male/female: Chi-square: 0.32, p = 0.84

DISCUSSION

Various authors have described coronoid process as a bony process with different shapes like triangular, beak and flat. Attempts had been made by various authors to classify coronoid process according to their shapes. We followed the classification given by Narayana;² the shape of the coronoid process was observed in the OPG. The comparison was done for variation in shape in either side of same subject and among males and females.

Our study showed that triangular shape was more common, followed by rounded, beak and flat shape and rectangular coronoid process were rare. This is similar to those reported by Romanes (1986),⁷ Snell (1986),⁸ Prajapati (2011)⁹ and different than those reported by Issac and Holla (2001)¹ as being beak shaped. The bilateral occurrence of triangular coronoid process was common followed by rounded. The occurrence of rounded and triangular coronoid process on either side was common than other combinations. However, the variation in the shape of coronoid process in either side was not statistically significant (p > 0.05). Variation in the shape among males and females were not found.

Out of 12 beak-shaped coronoid process around six were present in subjects above 30 and the flat shaped which was rare was found in 30 years old male. This is in contradiction to that reported by Narayan et al (2004)² in which he stated that beak and flattened form increases as the age advances. The differences in the shape even in the same population had been attributed to various factors like attachment and action of temporalis,^{2,5} unilateral chewing habits⁶ and hormonal factors.² Our study shows that there is no variation

in the shape in males and females which opposes hormonal concept. Most probably the differences observed may be due to small samples studied so far.

The sigmoid notch, which is the deficiency between the condylar and the coronoid process had been described as having sloping, wide and rounded contour.² This study showed the prevalence of sloping and rounded shape which is similar to the finding reported by Narayanan (2004)² where he has described these as basic types of contours.

Our study did not show any significant change in the shape of the sigmoid notch on either side. However, we observed the combination of various shapes on either side which did not reach statistically significance. Out of 95 wide types of sigmoid notch 42 of them were present in subjects above the age of 30 which means even these can be considered as basic shapes other than rounded and sloping. It may be that the age may not be the only factor that controls its shape. The role of hormonal influence² is also controversial because there was no significant difference observed between males and females. The shape of the notch is said to be species specific, through the human lineage of evolution and each predecessors is said to have a unique pattern in *Homo sapiens*.⁶ This requires further evaluation of shapes in different ethnic races.

CONCLUSION

Our study showed that the most common shapes of coronoid process and sigmoid notch are triangular and sloping forms. There is no significant change in the shape of coronoid process and sigmoid notch in either side. Males and females have similar type of coronoid process and sigmoid notch. Since this study has small sample size, future studies should include OPGs of various population groups to see the variation in ethnic groups and larger number of sample including different ethnic groups.

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