



IJCRR

Vol 05 issue 10

Section: Healthcare

Category: Research

Received on: 18/04/13

Revised on: 03/05/13

Accepted on: 21/05/13

## STUDY OF MORPHOLOGICAL VARIATIONS IN THE SHAPE OF CORONOID PROCESS OF MANDIBLE IN SOUTH INDIAN POPULATION

R. Sudha<sup>1</sup>, Shanta chandrasekaran<sup>2</sup>, N. Aruna<sup>1</sup><sup>1</sup>Department of Anatomy, Annapooranna Medical College and Hospital, Salem, TN, India<sup>2</sup>Department of Anatomy, Vinayaka Mission's Kirupananda Variyar Medical College and Hospital, Salem, TN, India

E-mail of Corresponding Author: : drsudha @rediffmail.com

### ABSTRACT

**Background of the study:** Coronoid process of mandible is a flat, triangular process, with variation in shapes like hooked, rounded and triangular. Anatomical variations in shape can result in narrowing of the vestibular space due to the close proximity of the medial aspect of the coronoid process to the distal molar tooth and cause impingement, resulting in restriction of mouth opening and mandibular hypomobility. This study was done to evaluate the presentation of different shapes of coronoid process of mandible in south indian population. As far as our knowledge goes this is frontier study in this region. **Aim of the study:** To determine the shape of coronoid process of mandible in south indian population. **Material and methods:** The present study was done in 125 dry human adult mandibles from the bone bank of Anatomy departments of Annapoorana medical College, Vinayaka Mission's Kirupananda Variyar Medical College, Vinayaka Homeopathy Medical College, Salem. Variations in the shape of the coronoid processes like triangular, hook, rounded among right and left sides of the coronoid process in both the sex were observed and recorded.

**Results:** Shapes of coronoid process observed were Triangular 60.8%, Rounded 14% and Hook in 25.6% in the present study. Hook shape was found Bilaterally in 28.8%. In Edentulous bone Hook type of coronoid process was found in 53.3% and there was no incidence of rounded type bilaterally.

**Conclusion:** Triangular shape of coronoid process is the most common presentation unilaterally and bilaterally. Incidence of Triangular, Rounded, Hook shape were found more in the in male mandibles compared to female mandibles. Unilateral Incidence of triangular and rounded coronoid shapes were more than bilateral incidence. Hook shape incidence (28.8%) was found more bilaterally.

**Keywords:** Hook type, Triangular type, Rounded type,

### INTRODUCTION

The coronoid process of the mandible is a flat, triangular process<sup>1</sup> pointing upwards. Its base is fused with the upper anterior part of the ramus of the mandible. Its anterior border is continuous with the anterior border of the ramus and the posterior border forms the anterior boundary of mandibular notch. Temporalis muscle is attached to its apex, margins, whole of medial surface and a part

of lateral surface close to the apex. The lateral surface is covered by anterior fibres of masseter muscle. Schafer<sup>2</sup> described the coronoid process as beak-shaped. Triangular coronoid processes have been illustrated by Romanes<sup>3</sup> and Basmajian<sup>4</sup>.

Issac B<sup>5</sup>, Vipul<sup>6</sup> and Tanveer A<sup>7</sup> have studied and reported triangular, hook and rounded coronoid shapes and their prevalence in either sex. Issac B<sup>5</sup> found the incidence of the rounded type almost

equal in male and female mandibles, triangular type slightly more in the females, while hook type more in the male mandibles. Vipul<sup>6</sup> observed rounded shape incidence more in females compared to males while hook shape was similar in both sexes. Tanveer A<sup>7</sup> reported triangular process more commonly present in males while females presented with round type. V.K. Nirmale<sup>8</sup> reported that triangular shaped coronoid process were found more in males.

Pujachauhan<sup>9</sup> described the presence of unilateral and bilateral hyperplasia of coronoid process. Wenghoefer M<sup>10</sup> has reported hyperplasia of the coronoid process in patients with ankylosing spondylitis (Bechterew disease). Hernandez-Alfaro F<sup>11</sup> has observed a new joint formation between enlarged coronoid process and the zygoma (Jacob disease). Jaskolka MS<sup>12</sup> reported mandibular coronoid hyperplasia in pediatric patients. Conditions like Osteochondroma, exostosis, osteoma, hypertrophy, hyperplasia and developmental anomalies can cause coronoid process enlargement<sup>13</sup>.

Coronoid process is a membranous bone showing less resorption. A local bone graft from coronoid process of mandible can be harvested intraorally with minimal morbidity without any cutaneous scarring. The coronoid process is of clinical significance to the maxillofacial surgeon for reconstructive purposes<sup>14</sup> as it is used as grafts in reconstruction of osseous defects in oral and facio-maxillary region like alveolar defects, orbital floor<sup>15</sup> repair, maxillary augmentation, correction of non-union fracture of mandible. No functional limitations were apparent after removing the coronoid process.

Anatomical variations in coronoid process can result in extremely narrow vestibular space due to the close proximity of the medial aspect of the coronoid process to the distal molar. This study was undertaken to note the variations in shapes of coronoid process and their prevalence in south Indian population.

## MATERIAL AND METHODS

The present study was done in 125 (80 male, 45 female) dry human adult mandibles from the bone bank of Anatomy departments of Annapoorana medical College, Vinayaka Mission's Kirupananda Variyar Medical College and Vinayaka Homeopathy Medical College, Salem. Study was done after getting Ethical committee clearance from the Institutional ethical committee. Bones collected were mainly from (110) adult age with teeth sockets (dentulous) and old age (15) (**Table no:1**) with resorbed teeth sockets (edentulous). Variations in the shape of the coronoid process (125 bones with 250 sides) in right and left sides of adult bones with teeth (dentulous) and without teeth (Edentulous) of both sexes were noted and tabulated. Fractured, deformed, bony growths of coronoid process [osteochondroma] were excluded from the study.

## RESULTS

Observation of this study was tabulated in **Table no:2**. Out of 125 mandibles 80 bones were of male sex and 45 of female sex. 15 old age (edentulous) bones of which 10 were male and 5 were female were noted.

### **I) Triangular type shape of coronoid process: Table no: 2 & 3**

Triangular type shape of coronoid process had a tip pointing straight upwards.

Out of 125 bones triangular shape of coronoid process was observed in 76 mandibles (55 male + 21 female) (60.8%). Unilateral incidence of triangular shape was 33.3% (35.2 right side, 31.2 left side) which is more than bilateral incidence 21.6%. Right side unilateral triangular shape type were associated with left side (8) hook shape and (6) round shape of coronoid process in male bones. Left side triangular shape of coronoid process were associated with (7) hook and (1) rounded type of coronoid process. In male bones triangular coronoid shape was more frequent than female bones both unilaterally and bilaterally. In

female bones unilateral right side triangular shape was associated on the other side with (4)each of hook and rounded shape types.Unilateral left side triangular shape of coronoid process was associated with(4)hook and (1)rounded shape of coronoid process.In edentulous bones 15(10 male,5 female) triangular type of coronoid process was observed in 33.3%.(**Table no:3**)

### **II)Rounded type of coronoid process: Table no: 2 & 3**

Coronoid process with a rounded tip was described as rounded type shape of coronoid process.In the present study out of 125 bones rounded type was found in(17.5 bones) 14% more in males compared to females.Unilateral incidence of rounded shape was 12%(7.2% rightside,16% left side) more than bilateral incidence 4.8%.Unilateral right side rounded type of coronoid process was associated with(1) triangular process in males.Left side unilateral round process was associated on the other side with (6)triangular process and (3)hook shape in males.In edentulous bones rounded type was found in 13% more in males in unilateral left side.In female bones unilateral right side rounded shape was associated with(1)each hook and triangular shape.On the left side it was associated with (4)triangular shape and (1)hook shape.In edentulous bone bilateral rounded type incidence was not found.

### **III)Hook type of coronoid process: Table no: 2 & 3**

Coronoid process with the tip pointing backwards angulated like a hook was noted as hook type of coronoid process.Incidence of hook type was found as 25.6% in 32 bones out of 125.Bilateral incidence of hook type was found in 28.8 %.Unilateral right side hook shape was associated with (7)triangular shape and (3)rounded shape in males.Unilateral right and left side hook shape is associated (4)triangular and (1) rounded shape of coronoid process in females.In edentulous bones 53.3% of hook type was noted.

## **DISCUSSION**

### **Table no:4**

In the present study of the three types of shapes of coronoid process incidence of triangular shape(60.8%)was the most prevalent unilaterally and bilaterally.Hook type incidence was more common bilaterally(28.8%) than unilaterally(11.2%).In edentulous bones also hook shape(53.3%)was most observed and bilateral rounded type of incidence was not found.The present study findings were compared with previous studies and tabulated in **Table no:4**.

Issac B<sup>5</sup> reported in a study of 157 mandibles incidence of hook shaped was 27.4%,triangular 49% and rounded type 23.6%.He found the incidence of the rounded type almost equal in male and female mandibles,triangular type slightly more in the females,while hook type more in the male mandibles.Comparing with Issac B<sup>5</sup> the incidence of hook type was closely similar to the present study,but triangular and rounded shape incidence observed was more in males and so the findings did not coincide with the author.

Vipul<sup>6</sup> noted prevalence of rounded shape more in females compared to males while hook shape was similar in both sexes.The present study differed from it as the rounded and hook shape incidence was more in males.

Tanveer A<sup>7</sup> reported triangular process more commonly present in males while females presented with rounded type.Triangular and rounded shape in the present study was found more in males and it is partly in agreement with Tanveer A<sup>7</sup>.

Studying the **Table no:4**,Incidence of triangular and hook type coincides with the findings of V.K.Nirmale<sup>8</sup>, Tanveer A<sup>7</sup> and varies with Vipul<sup>6</sup>. The shapes of coronoid process differs among male and female bones,similarly in adult and edentulous bones.This difference could be due to direction of the pull of temporalis muscle<sup>16</sup> as it is attached to coronoid process.Temporalis a masticatory muscle,depressor and retractor of the mandible.The cause for the prevalence of hook

shape in edentulous bone could be due to age related changes in the coronoid process. Finnegan<sup>17</sup>, M 1974 and Berry<sup>18</sup> 1975 mentioned that these variants can be due to the role played by genes.

Unilateral, bilateral hyperplasia of coronoid process<sup>9,10</sup> formation of new joint between coronoid process and zygomatic arch<sup>11</sup> were reported. The causative factor<sup>19,20</sup> is unknown but is thought to be related to periosteal activity that forms abnormal foci of the metaplasia metaplastic cartilage. This study is limited by the sample size. In future studies these limitations will be considered and revised.

### CONCLUSION

The morphological variation of shapes of coronoid process in south Indian population suggest that Triangular shape of coronoid process is the most common presentation unilaterally and bilaterally. Incidence of Triangular, Rounded and Hook shape were found more in the in male bones compared to female bones. Unilateral Incidence percentage of the triangular and rounded types of coronoid shapes were more than bilateral incidence. Hook shape incidence (28.8%) was found more bilaterally. In edentulous bones hook shape (53.3%) was most observed and bilateral rounded type of incidence was not found. The above findings are of substantial significance for the anatomist, anthropologist and forensic researchers. This study will be an aid to the oral and maxillofacial surgeons.

### ACKNOWLEDGEMENT

We thank our Head of the Institution and our Superiors for granting us the opportunity and permission to do the study. We appreciate immensely the valuable assistance of the technical staff. Authors acknowledge the great help received from the scholars whose articles cited and included in references of this manuscript. The authors are also grateful to authors / editors / publishers of all those articles, journals and books

from where the literature for this article has been reviewed and discussed. Authors are grateful to IJCRR editorial board members and IJCRR team of reviewers who have helped to bring quality to this manuscript.

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**Table:1 Data collection of bones based on sex and age:**

Age	Sex	Number of mandible bones
Adults / Dentulous	Male	70
	Female	40
Old age / Edentulous	Male	10
	Female	5
TOTAL		125

**Tables: 2 Incidence of shapes of coronoid process of mandible in south Indian population**

M :Male F :Female

Shape of coronoid process	Sex : Male / Female M/F	Total	%	Unilateral		Unilateral		Bilateral	
				Right side		Left side		Both sides	
				N= 125	%	N= 125	%	N=125 bones / 250 sides	%
Triangular	M	55	44	44	35.2	39	31.2	27	21.6
	F	21	16.8	21	16.8	18	14.4	13	10.4
	Total	76	60.8	65	52	57	45.6	40	32
Rounded	M	12	9.6	5	4	15	12	4	3.2
	F	5.5	4.4	4	3.2	5	4	2	1.6
	Total	17.5	14	9	7.2	20	16	6	4.8
Hook	M	19.5	15.6	10	8	8	6.4	21	16.8
	F	12.5	10	5	4	5	4	15	12
	Total	32	25.6	15	12	13	10.4	36	28.8

**Table no: 3 Incidence of coronoid shapes in edentulous bones**

Slno:	Shape of coronoid Process. N=15[10+5]	Bilateral		Unilateral		Unilateral		Total	%
		M	F	Right		Left			
				M	F	M	F		
1	Triangular	-	1(2)	4	-	-	3	10	33.3
2	Rounded	-	-	-	1	3	-	4	13.3
3	Hook	3(6)	1(2)	2	2	3	-	16	53.3

M :Male, F : Female

**Table no: 4 Comparison of Present study in South Indian population with Previous studies**

Sl no:	Author	No: of bones	Shape of Coronoid process	%
1	Vipul P <sup>6</sup> , 2011 Gujarat region	N=120	Triangular	54.7
			Rounded	24.58
			Hook	21.25
2	Tanveer <sup>7</sup> 2011 South india	N=200	Triangular	67
			Rounded	3
			Hook	30
3	V.K.Nirmale <sup>8</sup> 2012 Aurangabad	N=84	Triangular	65
			Rounded	7
			Hook	28
4	Present study 2013 South india	N=125	Triangular	60.8
			Rounded	14
			Hook	25.6



**Fig:1** Triangular shape of coronoid process



**Fig:2** Rounded shape of coronoid process



**Fig:3** Hook shaped coronoid process.