2025; Vol 13: Issue 5 Open Access

A Comparative Study of Size of the Coronoid Process of Dry Human Mandibles in Udaipur Zone

Ravina Sharma[1], Prakash K G[2], Saniya K[3*]

[1]PhD Scholar, Department of Anatomy, Geetanjali Medical College and Hospital, Geetanjali University, Udaipur, Rajasthan, India, Email id: ravinasharma0909@gmail.com
[2]Professor and Head, Department of Anatomy, Geetanjali Medical College and Hospital, Geetanjali University, Udaipur, Rajasthan, India, Email id: drprakashkg@gmail.com
[3*]Associate Professor, Department of Anatomy, Geetanjali Medical College and Hospital, Geetanjali University, Udaipur, Rajasthan, India, Email id: drsaniyakanatomy@gmail.com

***Corresponding author:** Saniya K
*Associate Professor, Department of Anatomy, Geetanjali Medical College and Hospital, Geetanjali University, Udaipur, Email Id: drsaniyakanatomy@gmail.com

Cite this paper as: Saniya K, A Comparative Study of Size of the Coronoid Process of Dry Human Mandibles in Udaipur Zone*, Frontiers in Health Informatics*, 13 (5), 332-343

INTRODUCTION

The mandible is the face's largest, strongest, and lowest bone. The mandible consists of two broad rami that ascend posteriorly and a curved body that is convex forwards. The coronoid and condylar processes are present in the ramus [1]. The coronoid process (CP) of the mandibular bone is derived from a Greek word, “korone” meaning “like a crown”[2]. It is a thin triangular eminence that continues anteriorly into the ramus and posteriorly bounded by mandibular incisurae. The lateral surface of CP provides attachment to temporalis and masseter muscles. Even though CP is rarely mentioned when discussing the functionality of the jaw, it plays a vital role in both mastication and mandibular stabilization [3].

The coronoid process is a membranous bone showing less resorption. A local bone graft from the coronoid process of the mandible can be harvested intraorally with minimal morbidity and without any cutaneous scarring. The coronoid process is of clinical significance to the maxillofacial surgeon for reconstructive purposes as it is used as grafts in the reconstruction of osseous defects in oral and faciomaxillary regions like alveolar defects, orbital floor repair, maxillary augmentation, correction of non-union fracture of the mandible. No functional limitations are apparent after removing the coronoid process. The anatomical variations in the 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. It seems to be suitable for paranasal augmentation. Its clinical application is also favourable because its size and morphology fit into the paranasal region, with the additional advantages of biocompatibility, availability, and reduced operation time for harvesting[4].Hernandez-Alfaro noticed a new joint between the enlarged coronoid process and zygomatic bone (Jacob’s disease) which causes restriction during mouth opening [5].Though fracture of the mandible is common, coronoid fracture incidence is rare (2%) and requires no treatment unless impingement on the zygomatic arch is present [6].

This work aimed to study the morphology, morphometry, and variations of the coronoid process in the dry adult human mandible.
The OBJECTIVES of the study were:
1. To measure the width of the coronoid process at its base.
2. To measure the height of the coronoid process from midbase to apex (tip).
3. To compare the results on the right and left sides.
4. To compare the results in males and females.

MATERIALS AND METHODS

The study included 60 dry human mandibles in 30 males and 30 females from the Department of Anatomy, GMCH, and RNT Medical College Udaipur from 2022 to 2023. They were kept free from any dust, moths, or insects. Each mandible was assigned a serial number. The Institutional Ethics Committee approved the study. The results obtained were recorded and tabulated. The different parameters recorded were:

1. The width of the coronoid process at its base. (**Fig. 2**)
2. The height of the coronoid process from its midbase to its apex. (**Fig. 3**)
3. Any other variations.

For measurement of its width and height, the base of the coronoid process was taken as the line tangential to the deepest part of the mandibular notch. The width and the height of the coronoid process were measured by using a digital vernier calliper (**Fig.1**).

Study Design: Descriptive & Comparative study.

Inclusion Criteria: All the mandibles available during the study period.

Exclusion Criteria: Abnormal human mandible as seen in congenital anomalies & damaged specimen was excluded from the study.

The data was statistically analyzed for comparison and correlation by calculating the mean, range, and standard deviation of the width and height of the coronoid process. P-value< 0.05 was considered as statistically significant.

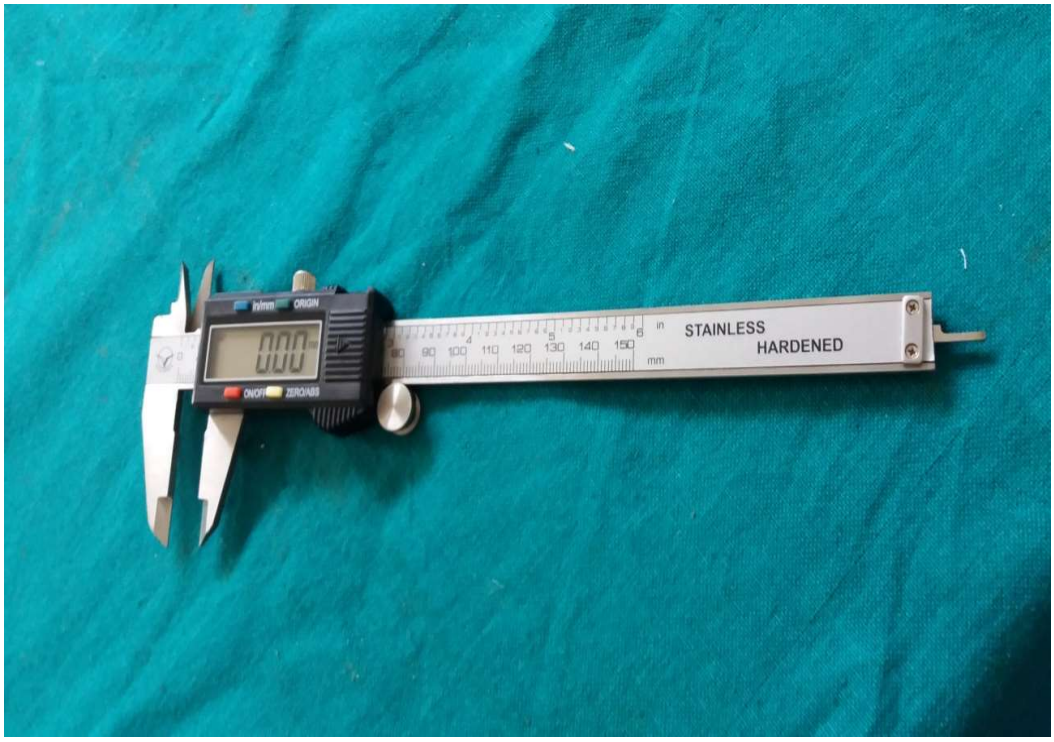

Fig.1: Digital vernier calliper.

Fig. 2: Measurement of the length of the coronoid process.

Fig. 3: Measurement of the width of the coronoid process.

RESULTS

The height of the coronoid process on the right side (male) ranged from 12.32 mm to20.59 mm with a mean of 16.30±2.30. The height of the coronoid process on the left side (male) ranged from 12.02 mm to 20.75 mm with a mean of 15.68±2.20. There was statistically no significant difference between the right and left values of the width of the coronoid process. (P-value>0.10).

Table 1. Comparison means and SD of height of male (right & left) coronoid process.

Sex	Side	No.	Range		Height of coronoid process		P value	Remark
			Minimum	Maximum	Mean	Std. Deviation		
Male	Right	30	12.320 mm	20.590 mm	16.307 m	2.308 mm	>0.10	Insignificant
	Left	30	12.020 mm	20.750 mm	15.688 m	2.206 mm	>0.10	

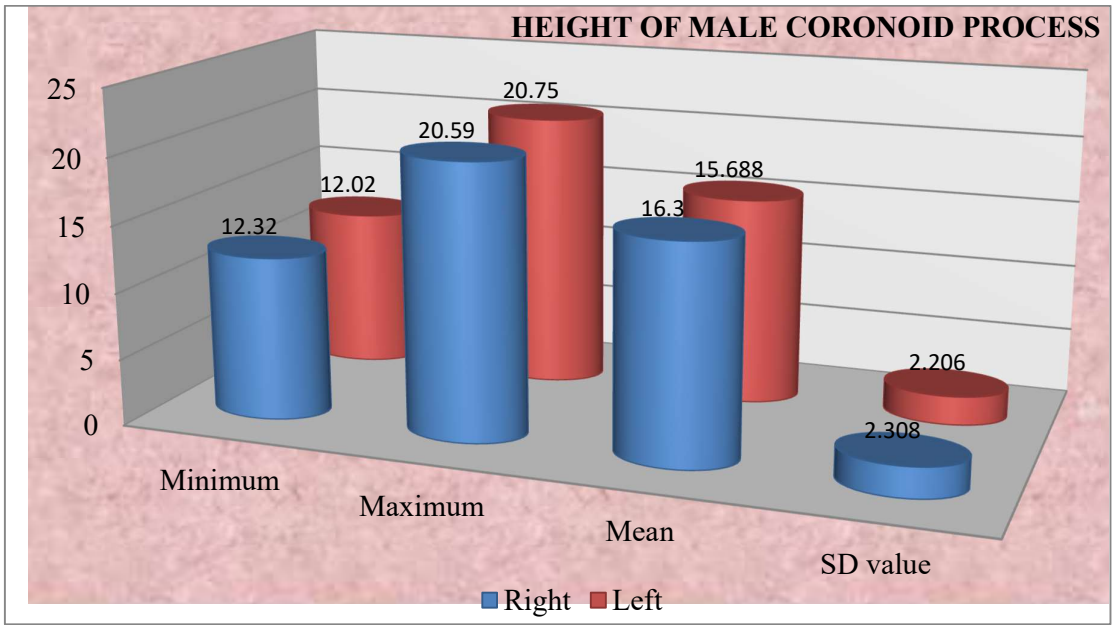

Fig. 4: Comparison of mean and SD of height of male (right & left) coronoid process.

The height of the coronoid process on the right side (female) ranged from 10.56 mm to 20.23 mm with a mean of 14.40±2.07. The height of the coronoid process on the left side (female) ranged from 10.65 mm to 16.85 mm with a mean of 13.53±1.54. There was statistically no significant difference between right and left values of height of the coronoid process. (P-value>0.10).

Table 2. Comparison of mean and SD of height of female (right & left) coronoid process.

Sex	Side	No.	Range		Height of coronoid process		P value	Remark
			Minimum	Maximum	Mean	Std. Deviation		
Female	Right	30	10.560 mm	20.230 mm	14.405mm	2.071 mm	>0.10	Insignificant
	Left	30	10.650 mm	16.850 mm	13.532mm	1.546 mm	>0.10	

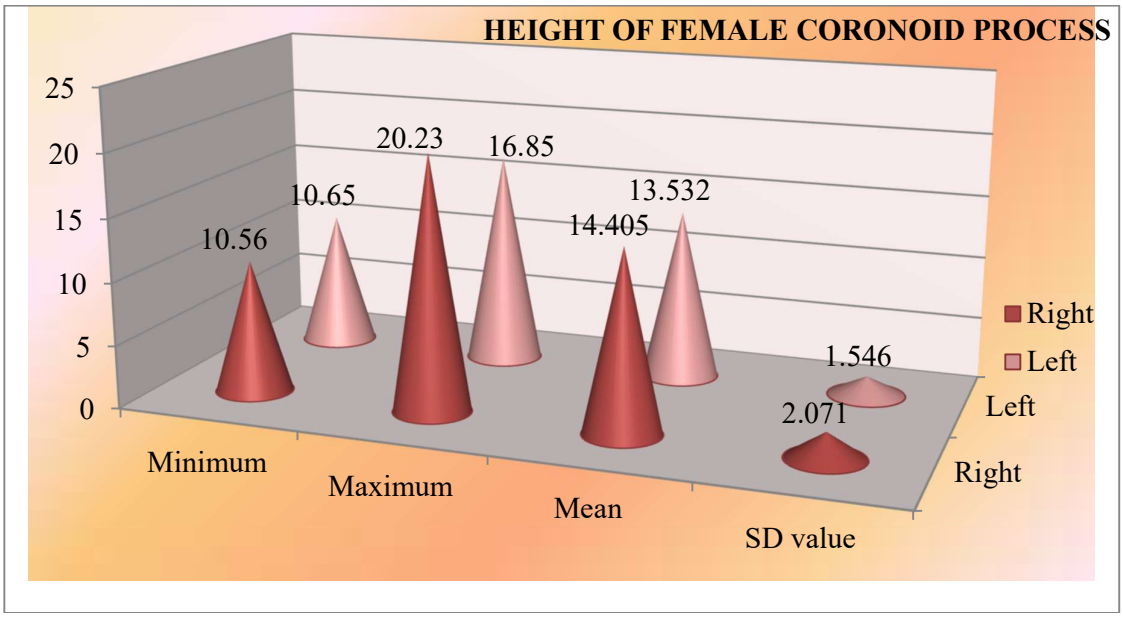

Fig. 5: Comparison of mean and SD of height of female (right & left) coronoid process.

The height of the coronoid process on the right side (male) ranged from 12.32 mm to 20.39 mm with a mean of 16.30±2.30.The height of the coronoid process on the right side (female) ranged from 10.56 mm to 20.23 mm with a mean of 14.40±2.07. There was statistically no significant difference between the right coronoid process of both males and females. (P-value>0.10).

Table 3. Comparison of mean and SD of height of coronoid process male & female (right side).

Sex	Side	No.	Range		Height of coronoid process		P value	Remark
			Minimum	Maximum	Mean	Std. Deviation		
Male	**Right**	**30**	12.320 mm	20.590 mm	16.307mm	2.308 mm	>0.10	Insignificant
Female	**Right**	**30**	10.560 mm	20.230 mm	14.405mm	2.071 mm	>0.10	

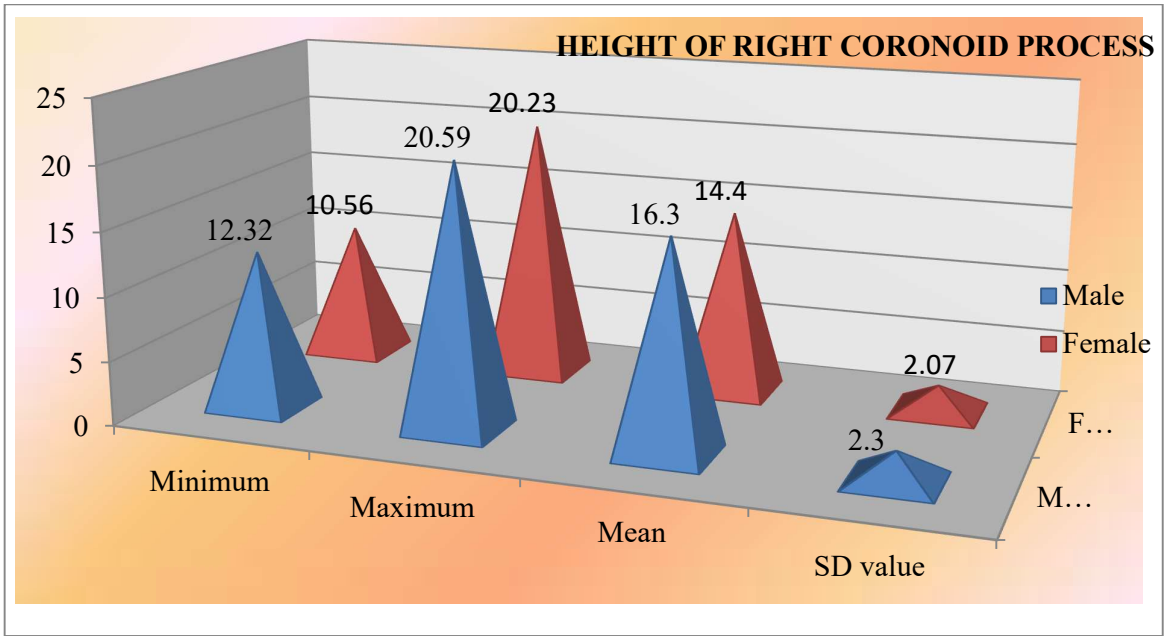

Fig. 6: Comparison of mean and SD of height of coronoid process male & female (right side).

The height of coronoid process on the left side (male) ranged from 12.02 mm to 20.75 mm with a mean of 15.68±2.20.The height of coronoid process on the left side (female) ranged from 10.56 mm to 16.85 mm with a mean of 13.53±1.54. There was statistically no significant difference between right coronoid process of both males and females. (p-value >0.10).

Table 4. Comparison of mean and SD of height of coronoid process male & female (left side).

Sex	Side	No.	Range		Height of coronoid process		P value	Remark
			Minimum	Maximum	Mean	Std. Deviation		
Male	**Left**	30	12.020 mm	20.750 mm	15.688mm	2.206 mm	>0.10	Insignificant
Female	**Left**	30	10.560 mm	16.850 mm	13.532mm	1.546 mm	>0.10	

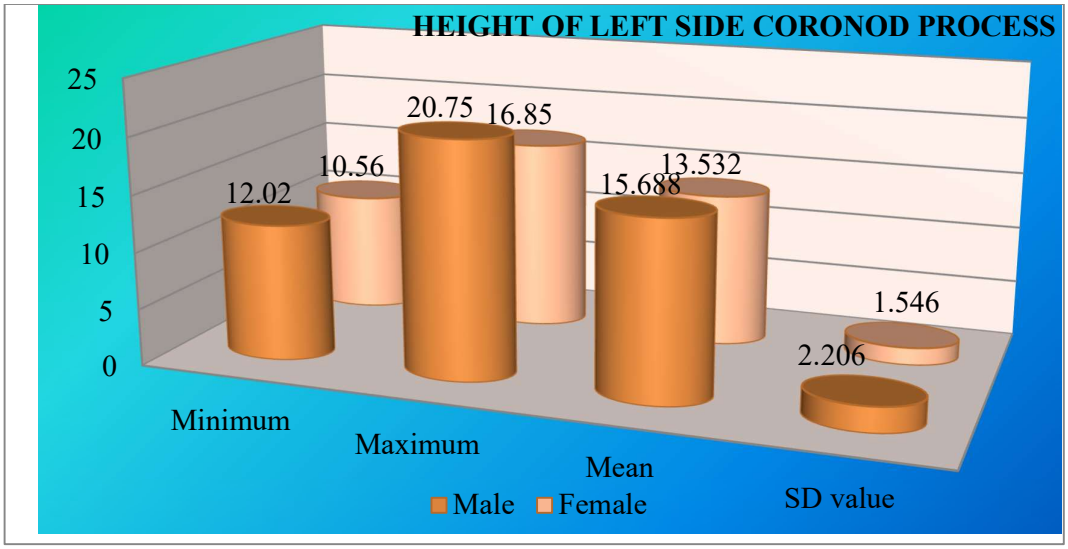

Fig. 7: comparison of mean and SD of height of coronoid process male & female (left side).

5: COMPARISON OF MEAN AND SD OF WIDTH OF MALE (RIGHT & LEFT)

The width of coronoid process on the right side (male) ranged from 13.25 mm to 20.41 mm with a mean of 16.75±1.96. The height of coronoid process on the left side (male) ranged from 12.42 mm to 19.93 mm with a mean of 16.23±1.90. There was statistically no significant difference between right and left values of width of coronoid process. (p-value >0.10).

Sex	Side	No.	Range		Width of coronoid process		P value	Remark
			Minimum	Maximum	Mean	Std. Deviation		
Male	**Right**	**30**	13.250 mm	20.410 mm	16.751 mm	1.965mm	>0.10	Insignificant
	Left	**30**	12.420 mm	19.930 mm	16.232 mm	1.901mm	>0.10	

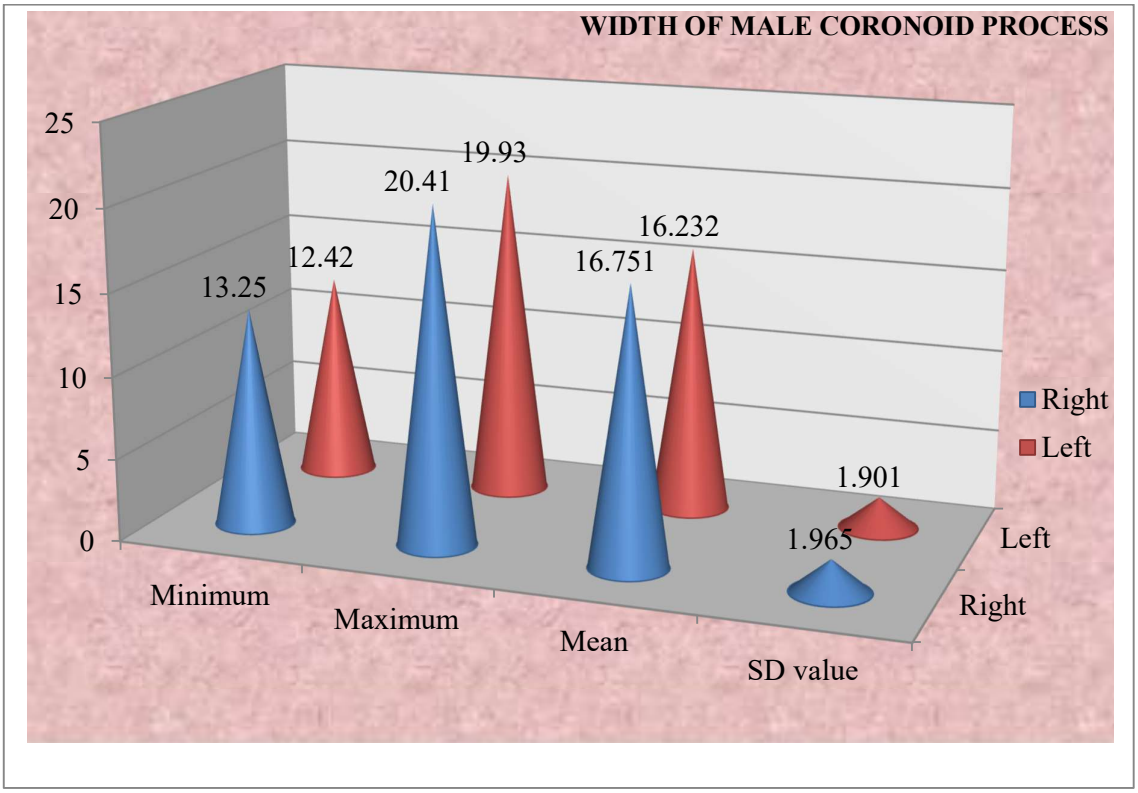

Fig. 8: Comparison of mean and SD of width of male (right & left) coronoid process.

6: COMPARISON OF MEAN AND SD OF WIDTH OF FEMALE (RIGHT & LEFT) CORONOID PROCESS.

The width of coronoid process on the right side (female) ranged from 10.49 mm to 17.96 mm with a mean of 14.26±1.65. The width of coronoid process on the left side (female) ranged from 10.35 mm to 16.83 mm with a mean of 13.76±1.48. There was statistically no significant difference between right and left values of width of coronoid process. (p-value >0.10).

Sex	Side	No.	Range		Width of coronoid process		P value	Remark
			Minimum	Maximum	Mean	Std. Deviation		
Female	Right	30	10.490 mm	17.960 mm	14.261 mm	1.657mm	>0.10	Insignificant
	Left	30	10.350 mm	16.830 mm	13.765 mm	1.481mm	>0.10	

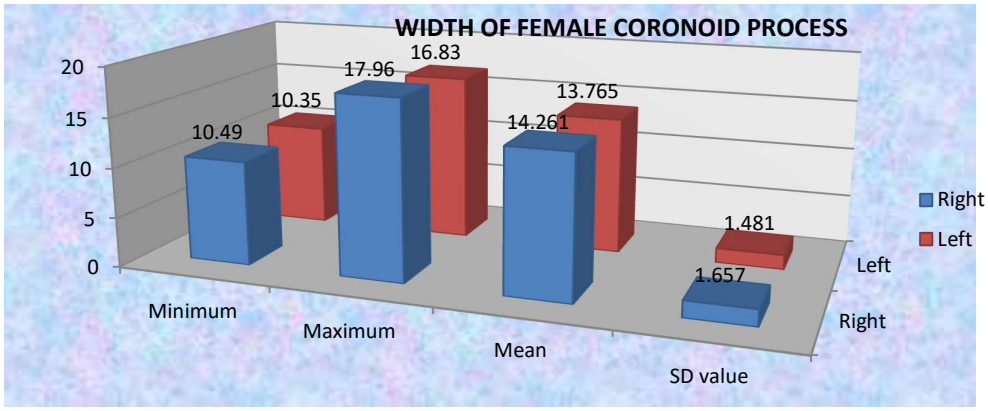

Fig. 9: Comparison of mean and SD of width of female (right & left) coronoid process

7: COMPARISON OF MEAN AND SD OF WIDTH OF CORONOID PROCESS MALE & FEMALE (RIGHT SIDE)

The width of coronoid process on the right side (male) ranged from 13.25 mm to 20.41 mm with a mean of 16.75±1.96.The width of coronoid process on the right side (female) ranged from 10.49 mm to 17.96 mm with a mean of 14.26±1.65. There was statistically no significant difference between right coronoid process of both males and females. (p-value >0.10).

Sex	Side	No.	Range		Width of coronoid process		P value	Remark
			Minimum	Maximum	Mean	Std. Deviation		
Male	**Right**	30	13.250 mm	20.410 mm	16.751mm	1.965 mm	>0.10	Insignificant
Female	**Right**	30	10.490 mm	17.960 mm	14.26mm	1.657 mm	>0.10	

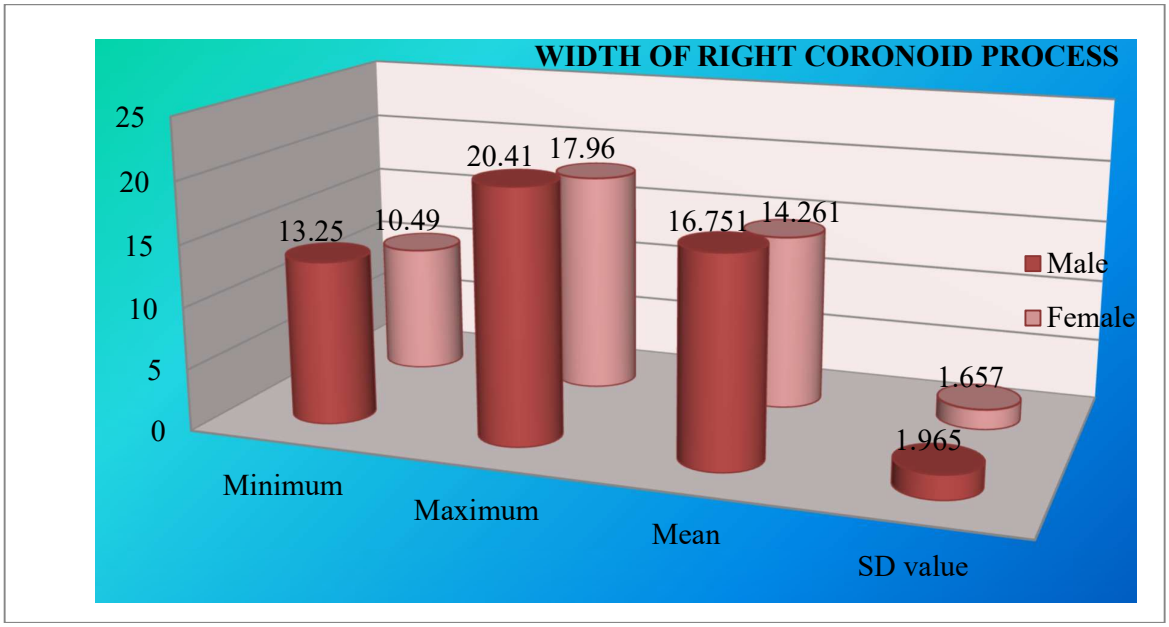

Fig. 10: Comparison of mean and SD of width of coronoid process male & female (right side)

8.COMPARISON OF MEAN AND SD OF WIDTH OF CORONOID PROCESS MALE & FEMALE (LEFT SIDE)

The width of coronoid process on the left side (male) ranged from 12.42 mm to 19.93 mm with a mean of 16.23±1.90.The width of coronoid process on the left side (female) ranged from 10.35 mm to 16.83 mm with a mean of 13.76±1.48. There was statistically no significant difference between left coronoid process of both males and females. (p-value >0.10).

Sex	Side	No.	Range		Width of coronoid process		P value	Remark
			Minimum	Maximum	Mean	Std. Deviation		
Male	**Left**	30	12.420 mm	19.930 mm	16.232mm	1.901 mm	>0.10	Insignificant
Female	**Left**	30	10.350 mm	16.830 mm	13.765mm	1.481 mm	>0.10	

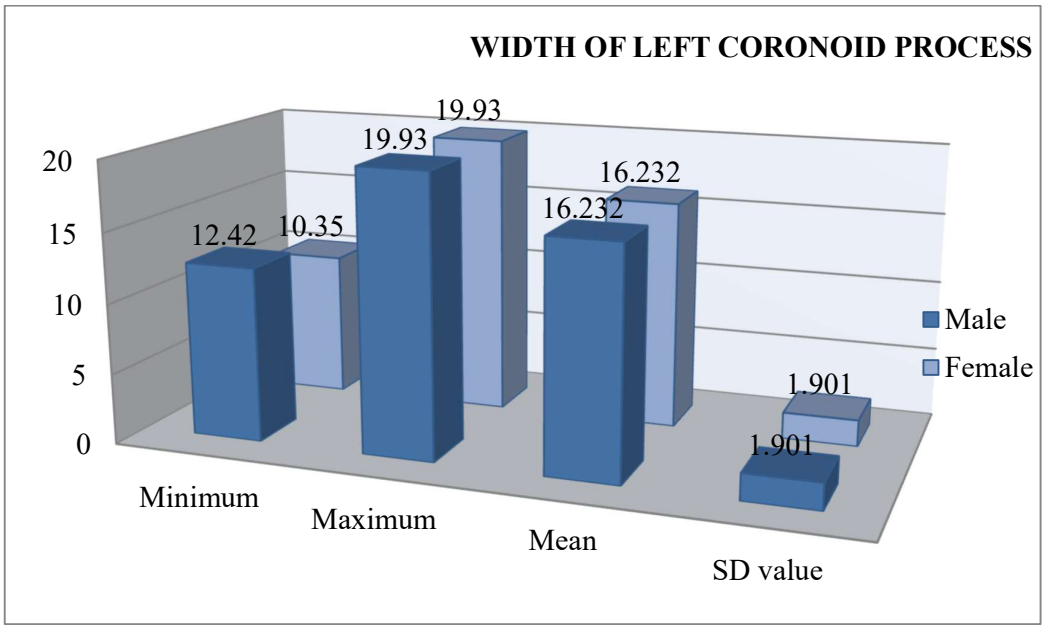

Fig. 11: Comparison of mean and SD of width of coronoid process male & female (left side).

DISCUSSION

In the present study, the mean height of the coronoid process on the right side in males is 16.3 mm & in females is 14.4mm and on the left side in males is 15.6 mm& in females is 13.5mm. Chauhan & Dixit(2011)founded that the mean height of the coronoid process on the right side was 20.0 mm and on the left side was 26.0 mm [7]. P.A. Kasat et al., founded that the mean height of the coronoid process on the right side was 18.2 mm and on the left side was 18.0 mm (Table 9) [8].

Comparison of Mean Values of Height of Coronoid Process Between Present Study With Other Studies.

Study	Year	Country	Materials for study	Mean Height of coronoid process (in mm)
Chauhan & Dixit	2011	India	Dry bones	R: 24.0 L: 26.0
P.A. Kasat et al.	2016	India	Dry bones	R : 18.2 L : 18.0
Present study Male		India	Dry bones	R : 16.3 L : 15.6
Present study Female		India	Dry bones	R : 14.4 L : 13.5

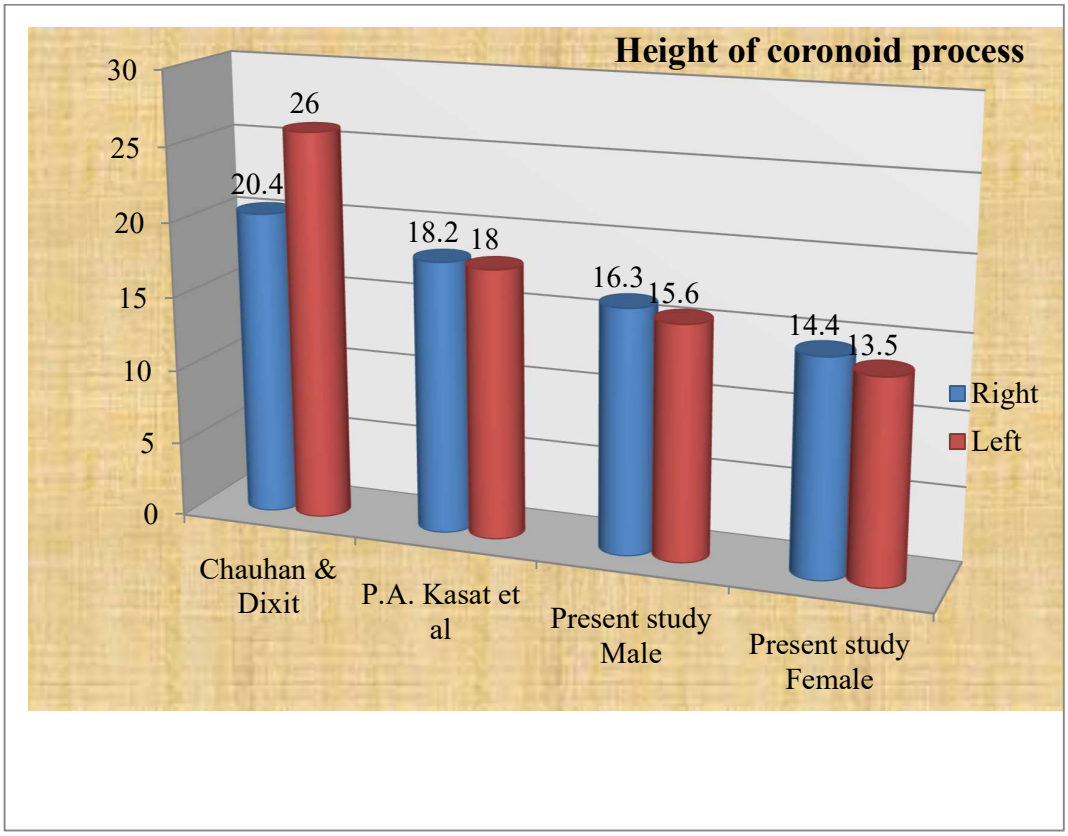

Fig 8: Comparison of mean values height of coronoid process between present study with other studies.

In the present study, the mean width of the coronoid process on the right side in males is 16.7 mm & in females is 14.2mm, and on the left side in males is 16.2 mm & in females is 13.7 mm. Langet al., (1984) founded that the mean width of the coronoid process on the right side was 20.4 mm and on the left side was 20.3 mm [9]. P.A. Kasat et al., founded that the mean width of the coronoid process on the right side was 19.3 mm and on the left side was 19.1 mm (Table 9) [8].

9: Comparison of Mean Values of Width of Coronoid Process Between Present Study With Other Studies.

Study	Year	Country	Materials for study	Mean Width of the coronoid process (in mm)
Lang	1984	New York	Dry bones	R: 20.4 (range 14.5-25.5) L: 20.3 (range 14.0-26.6)
P.A. Kasat et al.	2016	India	Dry bones	R :19.3 (range 13.0-28.0) L :19.1 (range 10.0-28.0)
Present study Male		India	Dry bones	R :16.7 (range 13.2-20.4) L :16.2 (range 12.4-19.9)
Present study Female		India	Dry bones	R :14.2 (range 10.4-17.9) L :13.7 (range 10.3-16.8)

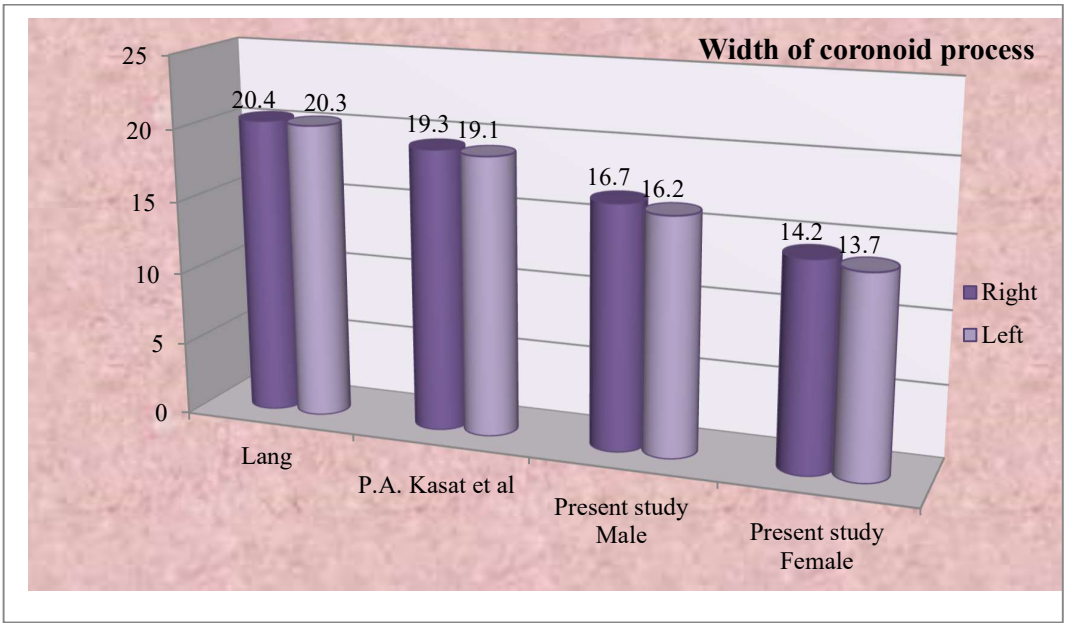

Fig. 12: Comparison of mean values of width of coronoid process between present study with other studies.

At the time of birth, coronoid process projects above the level of condylar process. With growth, it comes to lie at lower level in adults. Bilateral hyperplasia of the coronoid processes of the mandible is less frequent mostly affecting males between the ages of 14 and 16 with male and female ratio of 5:1. Craniofacial development is a complex process. This requires the integration of multiple specialized tissues, such as the surface ectoderm, neural crest, mesoderm, and pharyngeal endoderm from the paired mandibular prominences, the lower jaw develops primarily between weeks fourth to eighth of pregnancy. The proliferation of neural crest cells, which migrate from the neural crest into the arches during the fourth week of pregnancy, is responsible for all of these prominences. The mandibular primordia's neural crest cells originate primarily in the anterior rhombencephalon region and give rise to the connective tissue found in the facial and oral regions, such as cartilage, bone, and ligaments. [7].

Mandibular hypomobility is caused by the zygomatic processes being impinged upon by the excessive growth of the coronoid processes. Surgery using an intraoral technique to remove the coronoid process on both sides is the treatment. This prevents unsightly scarring, lowers morbidity to the facial nerve, and provides access to the coronoid process. When zygomatic-coronoid ankylosis occurs, the submandibular method is recommended. Very elongated coronoid processes or related lesions, like osteochondroma, have also been reported to respond to the coronal approach. The best surgical strategy should be chosen for each situation. Physiotherapy methods must be used for early postoperative rehabilitation. [10].

Autologous, allograft, or synthetic bone grafts can be obtained by different approaches. An autologous bone graft is taken from a part of the patient's body and can be used in another part of the same person. In this way, complications such as infection, bleeding, and tissue damage are lower than allografts and so this method is preferred by surgeons. Graft bone is usually harvested from the iliac crest, rib, or calvarium [11]. If the injured area is small, the coronoid process can be used as a graft material. The coronoid process graft has some advantages as discussed earlier. It is valuable to know that the available dimensions of the issued bone are adequate before the grafting operations [12, 13].

CONCLUSION: Coronoid process hyperplasia as the cause of mandibular hypomobility is largely under diagnosed as it is a very rare entity, but a thorough clinical and radiological examination can help to rationalize the line of management and the ultimate clinical outcome. Knowledge of the morphological shapes of the coronoid process is useful for the maxillofacial surgeon. It makes an excellent donor graft site for reconstruction of orbital floor deformities.

REFERENCES

1. Standring S. Barry Mm et al: "The anatomical basis of medicine and surgery" Grays anatomy 40th ed. New York, churchilllivingstone. Newyork, 2008:.527-560.
2. Cascarini,L.Mandibularetymologies.*Br.Dent.J.***203**(4),209–210(2007).
3. Mezey,S.E.,MüllerGerbl,M.,Toranelli,M.&Türp,J.C.Thehumanmassetermusclerevisited:Firstdescription ofitscoronoidpart.*Ann.Anat.Anat.Anz.*240,151879(2022).
4. Desai VC, Desai SD, Shaik HS. Morphological Study of Mandible. J Pharm Sci Res. 2014;6(4):175–177.
5. Herna´ndez-Alfaro F, Escuder O, Marco V. Joint formation between an osteochondroma of the coronoid process and the zygomatic arch (Jacob disease): report of case and review of literature. J Oral Maxillofac Surg. 2000;58(February (2)):227– 232.
6. Nayak S, Patra S, Singh G. Study of the size of the coronoid process of mandible. IOSR J Dent Med Sci. 2015;14(6):66–69.
7. Chouhan P,Dixit SG . Bilateral elongated coronoid processes of mandible: A case report. Intj Anat Var. 2011; 4:25-27.
8. PA Kasat , PS Bhuiy. A study on coronoid process of the dry adult human mandibles. Journal of the Anatomical Society of india 65 (2016)9-14.
9. Lang J. Clinical Anatomy of the Masticatory Apparatus and Peripharyngeal Spaces. New York: Thieme Medical Publishers, Inc.; 1995:19-39.
10. Fernandez FM, Fernandez SJ, Sandoval GJ, Costas LA, Lopez de SA, Etayo PA. Treatment of Bilateral Hyperplasia of the Coronoid Process. Med Oral Patol Oral Cir Bucal. 2008;13:595–598.
11. Bakirci S, Ari I, Kafa IM. Morphometric characteristics and typology of the coronoid process of the mandible. Acta Med Mediter. 2013;29:683–686.
12. Mintz SM, Ettinger A, Schmakel T, Gleason MJ. Contralateral coronoid process bone grafts for orbital floor reconstruction: an anatomic and clinical study. J Oral Maxillofac Surg. 1998;56(10):1140–1145.
13. Clauser L, Curioni C, Spanio S. The use of the temporalis muscle flap in facial and craniofacial reconstructive surgery. A review of 182 cases. J Craniomaxillofac Surg. 1995;23(4):203–214.