



SEX DETERMINATION USING CONDYLAR PROCESS WIDTH ON RIGHT SIDE WITH OPG IN INDIAN POPULATION- A RETROSPECTIVE STUDY

Hooriyah¹, Dr.Abirami Arthanari^{2*}

Article History: Received: 12.12.2022

Revised: 29.01.2023

Accepted: 15.03.2023

Abstract

Introduction: One of the important aspects of Forensic dentistry is the determination of the gender from remained jaws and dentition. Mandibles are used for measurements, as these bones remain largely intact bone with high degree of sexual dimorphic characteristics. Since time immemorial, Condyles has been the area of interest for anthropologists, Which have been explored in our study.

Materials and Methods: Study setting- department of Forensic Odontology, Saveetha Dental College
Sample collection- department of oral medicine and radiology, Saveetha dental college and hospitals. n=60; 30 males, 30 females age groups: 31-60yrs

Results and Discussion: There is a significant difference between the condylar process width for males and females as t-test was performed. P value=0.0492 (<0.05)

Conclusion: According to this study the width of the condylar process of the right side was significantly more for males when compared to females. The study could be performed using different parameters in larger sample groups and different age groups on the condylar process. Although the measurements are distinct between males and females in each population, there is also a difference between measurements among societies.

Keywords: condylar process, dimorphism, orthopantomogram

¹Undergraduate Saveetha Dental College and Hospitals Saveetha Institute of Medical and Technical Sciences, Chennai- 77

^{2*}Department of Forensic Odontology, Saveetha Dental college and Hospitals Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai.

DOI: 10.31838/ecb/2023.12.s2.180

1. Introduction

The mandible, the strongest and largest bone of the face, serves for the reception of the lower teeth. The mandibular condyle's articular surface is curved slightly and tilted slightly forward at c.25° to the occlusal plane¹.

The mandibular condyle considerably varies in both shape and size. When viewed superiorly, the condyle is roughly ovoid in the perimeter. The anteroposterior dimensions of the condyle (c.1 cm) are approximately half of the mediolateral dimension². The medial aspect of the condyle is quite wider than the lateral. But, the long axis of the condyle is not perpendicular to the ramus of the mandible, but posteriorly diverges from a strictly coronal plane³. Thus, the lateral pole of the condyle lies slightly anterior to the medial, and in case the long axes of the two condyles are extended, they meet at an obtuse angle (c.145°) at the Foramen magnum's anterior border. The articular head of the condyle joins the ramus through a thin bony projection, the neck of the condyle. A tiny depression on the anterior surface of the neck of the mandible, below the articular surface, called the pterygoid fovea, gets a part of the attachment of the lateral pterygoid⁴.

The mandibular condyle is roll-shaped. And apart from just functioning as a joint, the mandibular condyle is an area of growth though it is still in the cartilage. Under normal circumstances, the head of the condyle would be convex and symmetrical concerning the contralateral. The condylar process is one of the most active parts of the human body that can move more than 150 times a day⁵. The condyle undergoes complex movements when the mandible opens and closes. The anterosuperior part of the mandibular condyle is assumed to bear the greatest burden during mandibular function. Functional and parafunctional loads can cause adaptive and degenerative changes in the recipient load which includes the condyle bone^{6,7}.

The articular eminence is a part of the temporal bone through which the condylar process glides during mandible movement. The tendency for articular eminence movement varies between individuals and this determines the path of movement of the condyle and the rate of rotation of the disk above the condyle. The depth of the fossa might vary, and the articular development depends on the functional stimulus of the condyle.

Results:

Excessive pressure on the movement of the tmj might cause wear on the surface of the articular eminence⁸.

The temporomandibular joint (TMJ) is a paired diarthrodial joint that contributes to the articulation of the mandible and the skull. The condyle of the joint is overlaid with fibrocartilage and is underlaid with the subchondral bone⁹. The cartilage acts as a cushion while loading of joint, whereas the subchondral bone provides structural support to the overlying articular cartilage¹⁰. Our team has extensive knowledge and research experience that has translate into high quality publications¹¹⁻²⁰.

The knowledge of the width of the condylar process in the present study will provide valuable information to dental surgeons that will facilitate effective anatomical knowledge of the TMJ, Hence avoiding complications otherwise from local surgical and other invasive procedures.

2. Materials and Methods:

Data Collection:

Study setting- Department of Forensic Odontology, Saveetha Dental College

Sample collection- department of oral medicine and radiology, Saveetha dental college and hospitals.

Sample size =60, in that each group have segregated to 30 males, 30 females
age groups: 31-60yrs

Inclusion criteria :Ideal orthopantomography of patients with complete dentition were considered. Measurement of condylar process: press the line and draw a parallel line extending from the outermost point of the mesial condyle to the distal outermost point of the condyle. Press measurement (length) and draw straight lines from the two parallel lines.

Exclusion criteria were: pathological changes in mandible, fractures, bone tumors, systemic diseases affecting bone metabolism; growth disorders; severe osteoporosis, missing teeth, cleft lip or palate.

Statistical analysis: The data was transferred to SPSS software for statistical analysis. Planmaker software was used to measure the condylar process width from OPGs.

Table1

DESCRIPTIVE STATISTICS					
	N	MINIMUM	MAXIMUM	MEAN	STANDARD DEVIATION
FEMALES	30	32.9	77.6	54.34	15.119
MALES	30	33.5	86.2	61.35	17.749

Table1 shows a significant difference between the condylar process width for males and females as t-test was performed. P value=0.0492 (<0.05)

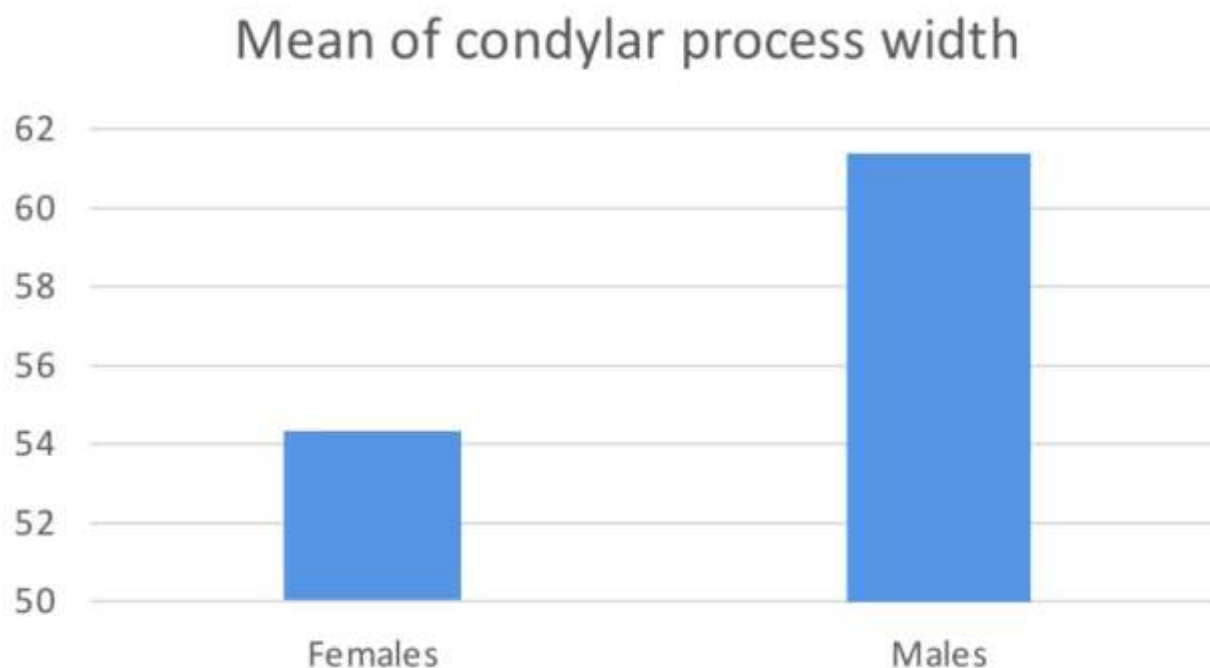
Table 2: Paired sample statistics

Gender	MEAN	N	STD.DEVIATION	STD. ERROR MEAN
Male	61.4	30	17.74	3.24
Female	54.2	30	15.11	2.76

Correlation= -1.51092 to 15.53092

P value=0.0492

Figure:1



From the graph(fig1),The mean value was found to be 54.34 with a standard deviation of 15.119 for females and 61.35 with a standard deviation of 17.749 for males.

3. Discussion

Identification of sex based on measurements and morphometry is accurate and can be used in the determination of gender from the skeletal remains. Mandibular bone's condylar process width was used for the analysis because this bone is often recovered and it is largely intact²¹. One of the important aspects of Forensic dentistry is the determination of the gender from remaining jaws

and dentition ²².Mandible is made up of dense cortical bone and shows sexual dimorphism which occurs mostly due to the genetic predisposition of males and females during the development period. The size, strength and angulation of the mandible are affected by the muscles of mastication and the masticatory forces ²³. Muscles of mastication and the masticatory forces.9 Males have a greater muscular mass applying more mechanical forces on the mandible than in females. Young adult males

have greater bite forces when compared to females thus responsible for greater muscle mass in males. This differentiation in the muscle mass contributes to sexual dimorphism. In a few instances, greater muscle mass in temporalis muscle may be due to elongated coronoid process of the mandible in males²⁴. Mandibles are used for measurements, as these bones remain largely intact bone with high degree of sexual dimorphic characteristics. Since time immemorial, Condyles has been the area of interest for anthropologists, Which have been explored in our study²⁵.

According to Samantha et al, 14 similar results were seen in correspondence to the present study where the condylar height was found to be significant and the mean values for males is 65.34mm and in females it was 61.69mm like our study²⁶.

According to a study, The mean value was found to be 54.34 with a standard deviation of 15.119 for females and 61.35 with a standard deviation of 17.749 for males, thereby showing higher values for males²⁷.

In another study, it was observed that the Japanese condylar process parameter values for males were significantly more than that of the females; in agreement with our study.²⁸

Population-specific standards need always to be developed for precise gender determination based on ethnicity. In many studies for various populations worldwide measurement standards were therefore developed. Skeletal remains have differential characteristics from one population to another because osteometric standards have been developed for the determination of gender²⁹.

Future scope:

The study could be performed using different parameters in larger sample groups and different age groups on the condylar process. Although the measurements are distinct between males and females in each population, there is also a difference between measurements among societies.

4. Conclusion

According to this study the width of the condylar process of the right side was significantly more for males when compared to females. Therefore, the width of the condylar process of the right side can be used as an aid in forensic anthropology for gender determination.

Author contributions:

Ms. Hooriyah Laiq Ahmed Khan 1: Literature search, data collection, manuscript writing.

Dr. Abirami Arthanari: Study design, data verification, manuscript drafting.

Acknowledgement: We express our sincere gratitude to Saveetha Institute of Technical and Medical Sciences for their constant support and encouragement.

Source of funding: NIL

Conflicts of interest: There are no conflicts of interest.

5. References

- Michalski CD, Pollizzi A, Dhar D, et al. Bifid Mandibular Condyle With Associated Temporomandibular Joint Ankylosis: A Rare Skeletal Abnormality. *Cureus* 2022; 14: e29624.
- Mahmood Hashemi H, Amirzargar R. Can electrocautery of the mandibular condyle effectively treat condylar hyperplasia? *J Craniomaxillofac Surg*. Epub ahead of print 17 August 2022. DOI: 10.1016/j.jcms.2022.06.003.
- Hennig TB. *Maxillomandibular Growth Following Replacement of the Mandibular Condyle with the Autologous Sternal End of the Clavicle: An Experimental Investigation in Macaca Mulatta : a Thesis Submitted in Partial Fulfillment ... Master of Science in Oral and Maxillofacial Surgery ..* 1991.
- Igarashi C, Kobayashi K, Ito H, et al. Clinical and magnetic resonance imaging findings in patients with and without improvement after mandibular manipulation and conservative physical therapy for temporomandibular joint disorders. *Oral Surg Oral Med Oral Pathol Oral Radiol*. Epub ahead of print 16 September 2022. DOI: 10.1016/j.oooo.2022.09.008.
- He Z, Liu M, Zhang Q, et al. Wnt/ β -catenin signaling pathway is activated in the progress of mandibular condylar cartilage degeneration and subchondral bone loss induced by overloaded functional orthopedic force (OFOF). *Heliyon* 2022; 8: e10847.
- Kim PJ, Skabelund Z, Kalim S, et al. Sex dependent differences of temporomandibular condylar bone mineral density distribution. *Cranio* 2022; 1–8.
- Bradford JS. *TMJ No More: The Complete Guide to TMJ Causes, Symptoms, & Treatments, Plus a Holistic System to Relieve TMJ Pain Naturally & Permanently*. 2013.
- Sabbagh H, Nikolova T, Kakoschke SC, et al. Functional Orthodontic Treatment of Mandibular Condyle Fractures in Children and Adolescent Patients: An MRI Follow-Up. *Life*; 12. Epub ahead of print 13 October 2022. DOI: 10.3390/life12101596.

- Feng Y, Teng H, Shu J, et al. Biomechanical comparison of the effect of bilateral sagittal split ramus osteotomy with or without Le Fort I osteotomy on the temporomandibular joints of the patients with maxillofacial deformities under centric occlusion. *Comput Methods Biomech Biomed Engin* 2022; 1–10.
- Šedý J, Rocabado M, Olate LE, et al. Neural Basis of Etiopathogenesis and Treatment of Cervicogenic Orofacial Pain. *Medicina* ; 58. Epub ahead of print 21 September 2022. DOI: 10.3390/medicina58101324.
- Ramesh A, Varghese S, Jayakumar ND, et al. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. *J Periodontol* 2018; 89: 1241–1248.
- Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol* 2019; 90: 1441–1448.
- Priyadharsini JV, Vijayashree Priyadharsini J, Smiline Girija AS, et al. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species. *Archives of Oral Biology* 2018; 94: 93–98.
- Teja KV, Ramesh S, Priya V. Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study. *J Conserv Dent* 2018; 21: 592–596.
- Manohar MP, Sharma S. A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists. *Indian J Dent Res* 2018; 29: 716–720.
- Nandakumar M, Nasim I. Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis. *J Conserv Dent* 2018; 21: 516–520.
- Varghese SS, Ramesh A, Veeraiyan DN. Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students. *J Dent Educ* 2019; 83: 445–450.
- Panchal V, Jeevanandan G, Subramanian E. Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial. *J Indian Soc Pedod Prev Dent* 2019; 37: 75–79.
- Nair M, Jeevanandan G, Vignesh R. Comparative evaluation of post-operative pain after pulpectomy with k-files, kedo-s files and mtwo files in deciduous molars-a randomized clinical trial. *Braz Dent J*, <https://bds.ict.unesp.br/index.php/cob/article/view/1617> (2018).
- Felicita AS. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The sling shot method. *Saudi Dent J* 2018; 30: 265–269.
- Trivunov N, Petrović B, Milutinović S, et al. Sex and age determination of human mandible using anthropological parameters and TCI and Kvaal methods: study of a Serbian medieval sample. *Surg Radiol Anat*. Epub ahead of print 17 October 2022. DOI: 10.1007/s00276-022-03031-5.
- Maćzka G, Kulus M, Grzelak J, et al. Morphology of the antegonial notch and its utility in the determination of sex on skeletal materials. *J Anat* 2022; 241: 919–927.
- Indira AP, Markande A, David MP. Mandibular ramus: An indicator for sex determination - A digital radiographic study. *J Forensic Dent Sci* 2012; 4: 58–62.
- Society for the Study of Human Biology. Symposium. *Human Sexual Dimorphism*. International Publication Service, 1985.
- Lelièvre M, Triumbari EKA, Brixi H, et al. Bone metastases in midgut neuroendocrine tumors: imaging characteristics, distribution, and risk factors. *Endocrine* 2022; 78: 380–386.
- Shakya T, Maharjan A, Pradhan L. Morphometric Analysis of Mandibular Ramus for Sex Determination on Orthopantomogram. *J Nepal Health Res Counc* 2022; 20: 65–71.
- Senol GB, Tuncer MK, Nalcaci N, et al. Role of mandibular anatomical structures in sexual dimorphism in Turkish population: a radiomorphometric CBCT study. *J Forensic Odontostomatol* 2022; 1: 53–64.
- Weiss E. A paracondylar process and early onset cervical osteoarthritis in a California Amerind adult. *Int J Paleopathol* 2013; 3: 307–309.
- Vickram, A. S., Rao, K. A., Archana, K., Jayaraman, G., Kumar S, V., & Sridharan, T. B. (2015). Effects of various semen extenders on semen parameters for the purpose of human male fertility preservation. *Cryoletters*, 36(3), 182-186.
- Sushanthi LC, Casilda Sushanthi L, Arthanari A, et al. Condylar Height: Age and Sex Determination Using Orthopantomogram in Forensics. *Journal of Pharmaceutical Research International* 2021; 266 271.