

ORIGINAL RESEARCH ARTICLE

MORPHOLOGY OF CONDYLE- A RADIOGRAPHIC STUDY

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Received: 23 Jan, 2022

Accepted: 21 Feb, 2022

Published: 15 Mar, 2022

Key words: Mandibular condyle; Morphology; Orthopantomograms.

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DOI: <https://doi.org/10.54530/jcmc.636>

Citation

Sakya PR, Nyachhyon R, Pradhan A, Tamrakar R, Acharya S. Morphology of condyle- a radiographic study. Journal of Chitwan Medical College. 2022;12(39):17-20.



Peer Reviewed

ABSTRACT

Background: Mandibular condyle has a variety of morphology. The changes in their shape and size has been attributed to ageing process, developmental abnormalities, distinct diseases, trauma, endocrine shock, radio therapy etc. Panoramic radiographs remain the easiest, safest and most cost-effective screening modality for temporomandibular joint abnormalities. The study aimed to assess the different shapes of condyles using orthopantomograms from the archives of the hospital data. The variations among the sexes and between the right and left sides of an individual were also determined.

Methods: This retrospective study was conducted at People's Dental College and Hospital within the time period of 1 year (November 2019- November 2020). Orthopantomogram of patients falling within the inclusion criteria were studied. The different shapes of condylar process were traced using marker pencil for both right and left sides. Data collected was entered in Microsoft Office Excel sheet 2013-- and calculated in SPSS version 24 and analyzed using descriptive statistics.

Results: Out of the 874 mandibular condyles of 437 patients, the most common was the oval shaped in both the right (275) and the left sides (277), followed by bird beak, diamond, flat and crooked finger respectively. The oval shaped condyle appeared to be predominant in both sexes. The flat shaped and diamond shaped condyle appeared to be a rarity.

Conclusions: The most common shape of condyle was found to be oval shape bilaterally and in both genders. Least observed shapes of condyle were flat shape in female patients and diamond shape in male patients.

INTRODUCTION

The ramus of mandible contains two process namely coronoid and condylar process separated by sigmoid notch.¹ The condyle is very important for mandibular growth. A variation of normal condylar morphology occurs with age, gender, facial type, occlusal force, functional load, and malocclusion between right and left sides. The morphological variations of mandibular condyle may be attributed to either developmental disturbances or functional variations during growth period.

The increasing incidence of temporomandibular joint disorders in recent years make it essential to have a thorough knowledge with understanding the anatomy and morphology of the temporomandibular joint for distinguishing normal variant from pathological conditions.² Most of morphologic changes are detected in elderly people due to joint degenerative changes.³ Changes in morphology of mandibular condyle may be caused by various causes as: infections, trauma, tumors, condylar hyperplasia and ankyloses.⁴ Different morphological variations of condylar processes of mandible have been documented in literatures.^{1, 5, 6} The present study documented

condylar shape into oval, bird beak, diamond, flat and crooked finger. This classification has been used by some previous studies using panoramic radiographs in their studies.⁷

Radiographic examination of temporomandibular joint structures is necessary for evaluating the abnormalities and bony changes that affect this joint.⁸ Panoramic radiographs are considered as the main screening modality for temporomandibular joint abnormalities for some obvious reasons.⁹ It has an acceptable cost benefit relationship and when compared to computed tomography, the radiation exposure dose is relatively low.¹⁰

Very few studies have been conducted in Nepal to recognize the variations and sexual dimorphism in condylar shapes. Findings of such studies are very helpful to forensic experts, oral surgeons, oral biologists and anthropologists, and it becomes quite justifiable to carry out this research in present context.

The current study focuses on the morphological variations of mandibular condylar process among the patients visiting Peoples Dental College and Hospital Kathmandu, Nepal. The

present study was aimed at observing the different shapes of condyle in Nepalese population on an OPG.

METHODS

A retrospective study was performed after obtaining the approval of the Institutional Review Committee of Peoples Dental College and Hospital Kathmandu, Nepal (IRC PDCH 2021 17). The OPGs of patients aged between 18-74 years visiting the Department of Oral and Maxillofacial Surgery and Department of Oral Medicine, PDCH within the time range of 1 year (i.e. November 2019 to November 2020) were included in the study. OPGs having any pathology in TMJ region or poor quality OPGs were excluded.

The printouts of 437 OPGs were traced using pencil over projection sheets with the help of the viewer box. The radiographs, thus obtained were assessed for various morphological shapes of the condylar process. These shapes were recorded for both right and left sides of both the sexes using each panoramic image.

Data collected was entered in Microsoft Office Excel sheet 2013 and calculated using SPSS version 24. The results were explained using tables and suitable diagrams.

RESULTS

This study included 437 patients i.e. total of 874 condyles were studied. Among them, 275 patients were females and 162 were males (Table 1).

Table 1: Gender distribution

Gender	Frequency (%)
Male	162 (37.1%)
Female	275 (62.9%)

Table 2 depicted the prevalence of condylar shape in right and left side among the Nepali population. They were categorized as Oval, Bird beak, Diamond, Crooked finger and Flat shapes. The most common shape of condyle (collectively) was found to be oval (61.9%), followed by bird beak (27.6%), diamond (3.8%), crooked finger (3.4%) and flat shape (3.3%) being the least common type.

Table 2: Shapes of condyle in right and left side

Condyle Type	Right (%)	Left (%)
Oval	270 (61.8%)	271 (62%)
Bird Beak	126 (28.8%)	115 (26.3%)
Diamond	12 (2.7%)	21 (4.8%)
Crooked Finger	14 (3.2%)	16 (3.7%)
Flat	15 (3.4%)	14 (3.2%)

Figure 1 depicted the distribution of condylar shape in right side in a bar diagram. The oval shape being most common (61.8%) and diamond shape being least (2.7%).

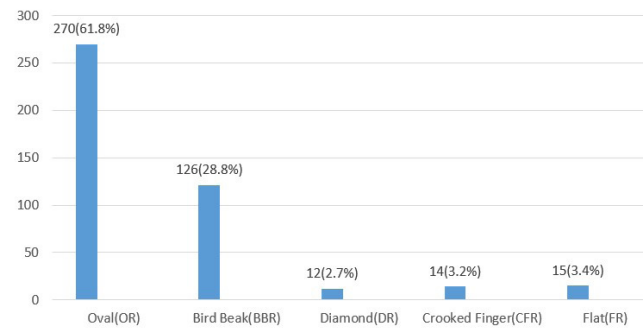


Figure 1: Distribution of shape of the right condyle.

Figure 2 depicted the distribution of condylar shape in left side in a bar diagram. The oval shape being most common (62%) and flat shape being least (3.2%).

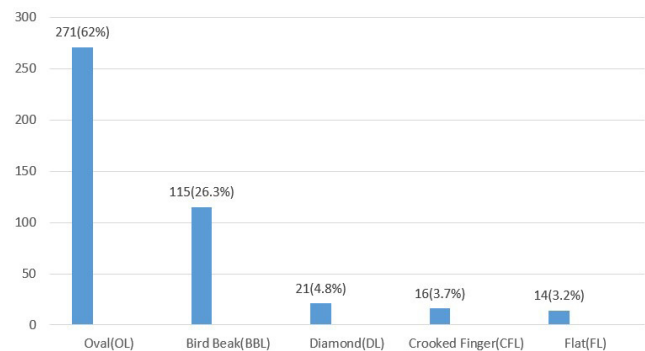


Figure 2: Distribution of shape of the left condyle

Table 3 depicted the distribution of condyle shape of right and left side, in male and female population. It appeared that oval shaped condyle was found in 63.8% of female and 59% of male population. Bird beak shape of condyle was found in 27.3% of females and 28.3% of males. Diamond shaped condyle was found in 4.18% of females and 3.1% of males. Crooked finger shape was found in 2.9% of females and 4.3% of males. Flat shape of condyle was seen in 1.8% of females and 5.9% of males.

There was not much difference in ratios between the shapes of condyle based on gender. Although there are minor variations on right and left sides of condyle, they were almost bilaterally symmetrical in morphology.

DISCUSSION

The mandibular condyle is a round projection which together with glenoid fossa and articular disc in between forms a joint called as temporomandibular joint. The condyle of mandible is an important structure as it acts as growth center in the post-natal life.^{5, 11}

It is very important to understand the anatomy and morphology of the temporomandibular joint (TMJ) so that a normal variant is distinguished from abnormal or pathological condition. Variation of morphology of condylar process like oval, bird beak, diamond, crooked finger and flat shape have been reported by several studies and also adopted in this

Table 3: Condyle shape distribution in male and female gender

	OR	OL	BBR	BBL	DR	DL	CFR	CFL	FR	FL
Female	176 (64%)	175 (63.6%)	80 (29.1%)	70 (25.5%)	10 (3.6%)	13 (4.7%)	5 (1.8%)	11 (4%)	4 (1.5%)	6 (2.2%)
Male	94 (58%)	96 (59.3%)	46 (28.4%)	45 (27.8%)	2 (1.2%)	8 (4.9%)	9 (5.6%)	5 (3.1%)	11 (6.8%)	8 (4.9%)

study. Attempts had been made by various authors to classify condylar process according to their shapes. It is often assumed that the normal condylar head must be convex and bilaterally symmetrical in the same individual.⁷ These variations have been observed in respect to age, sex, facial type, occlusal force, between the right and left side.^{4,6,7}

Several studies have been performed utilizing the dry mandible, histological methods and by use of radiological techniques such as Orthopantomograms (OPGs), Magnetic resonance imaging, Computed tomography and Cone-Beam Computed Tomography methods.^{5,12,13}

This study was performed to recognize the variations in the shape of condyles that exists, in the selected population utilizing their OPGs that were taken for purposes other than TMJ problems. We used OPGs as they have excellent cost benefit relationship and exposes patients to relatively low dose of radiation.

From our study we found that oval shaped condyle is predominant in both sexes whereas least common shapes were flat in females and diamond shaped in males. On comparison with other articles, we found that the results of our study in Nepali population were approximately similar to the results of studies conducted in other countries.

A study of the 200 pairs of condylar heads evaluated by Sonal V. in 2016 found that 60% were oval in shape, followed by bird beak (29%), diamond (9%) and least being crooked finger (2%)⁷ had similar results as our study.

The finding of our study is in accordance with the study done by Md Anisuzzaman, M., Khan, S. R., Khan, M. T. I., Abdullah, M. K., & Afrin, A. (2019). They evaluated the 500 mandibular condylar heads in 2-dimensional view (OPG). Out of them 60%

were oval in shape, followed by bird beak (29%), diamond (9%) and least being crooked finger (2%). Oval-oval was commonly occurring mix (67%), whereas crooked/ crooked finger was a rarity.⁴

Another study by AL-Saedi et al in 2020 stated that out of 900 mandibular condyles studied, type 1(oval) of condyle was the most commonly appearing shape (56 %), followed by type 3 (diamond), type 2(bird beak) and finally type 4 (crooked finger).⁹

The differences in the shape even in the same population had been attributed to various factors like attachment and action of temporalis muscle, unilateral chewing habits and hormonal factors.¹⁴ However, this study shows that there is no difference in the percentages of the different condylar shapes in males and females. Hence, our results are not in accordance to this hormonal concept. The findings obtained from small sample studies cannot be exact and counted as reliable.

CONCLUSION

This study was conducted to recognize the most prevalent radiographic shapes of the mandibular condyle on the OPG. The data from this study suggests that males and females have similar type of condylar process. The condyle shape was found to be in oval- oval combination in about two thirds of the studied sample. The flat- flat shape of condyle was the rarest combination. Other shapes of condyle present were bird beak, diamond, crooked finger and flat. For more reliable results, large sample size and three-dimensional imaging of condyle like in CBCT can be utilized.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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