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## Evaluation of morphological variation of mandibular condyle using panoramic radiography

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**Abstract**

**Background:** The current study was done to evaluate variations of TMJ condylar morphology using conventional panoramic radiograph.

**Methods:** This study comprised radiographic evaluation of 120 condylar heads of 60 patients. Then evaluate the mandibular condylar shape in 2D dimensional view (OPG).

**Results:** In this study, 60 pairs of condylar heads were evaluated. Out of them 55% were oval in shape, followed by bird beak (30%), diamond (12%) and least being crooked finger (3%).

**Conclusion:** Oval shape followed by bird beak type was found to be the most common in both genders with the condyle shape being symmetrical in about three quarters of the studied sample.

**Keywords:** TMJ, OPG, condyle

**Introduction**

Temporomandibular joint (TMJ) is a ginglymo-diarthroidal joint and is one of the most complex human body structures. The Temporomandibular joint is capable of producing a variety of movements like opening, closing, lateral and translator movements and helps in numerous functions including speaking, chewing and swallowing. The main components of TMJ includes: condylar process, glenoid fossa, articular disc and also the articular eminence. The key anatomic part of the mandible is condyle which is responsible for growth of mandibular bone in both vertical and sagittal directions. The Mandibular condyles, undergo morphological changes throughout the life in response to functional loading, the changes in mandibular condyle may occur because of many reasons as: infections, trauma, tumors, condylar hyperplasia and ankyloses<sup>[1, 2]</sup>. Investigative modalities like orthopantomograph (OPG) have low cost and exposes patients to relatively low doses of radiation<sup>[3, 4]</sup>. When clinical examination indicates some TMJ pathology, panoramic radiography is often used as the initial imaging technique for TMJ. The present study is aimed to evaluate and record the variation in the shapes of condyle on an OPG. To evaluate whether the determination of the shapes could help in diagnosis. The mandibular condyle shows considerably variation in size and shape. When viewed from above, condyle appears roughly ovoid in outline. It is 15-20 mm mediolaterally and 8-10 mm postero-anteriorly<sup>[5]</sup>. There is greater variation in the shape and size of the TMJ.

**Methods and Materials**

The present study comprised radiographic evaluation of 120 condylar heads of 60 patients. The digitalised OPGs taken for routine investigation. Mandibular condylar shapes were evaluated in 2D dimensional view (OPG). The study included radiographs of 20 males and 40 females ranging from the age 18 to 58 years.

**Inclusion criteria**

1. Patient's between 18-60 years age.
2. There was no history of TMJ dysfunction, occlusal discrepancy and trauma.

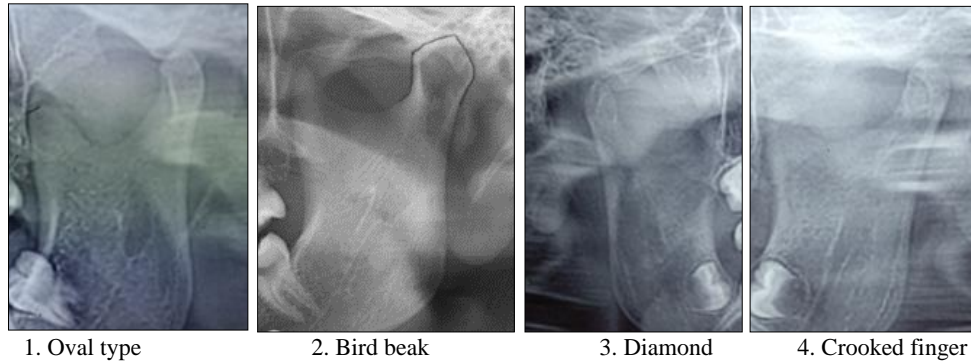
**Exclusion criteria**

1. Patients with previous history of TMJ pain, Arthritis.
2. Patients suffering from syndromes like Down’s syndrome.
3. Patients with autoimmune diseases like Rheumatoid arthritis.
4. Patient’s with previous history of trauma and fractures in TMJ.

All OPG’s was conducted by one radiologist (taken on

Carestream-exposure parameters being: 10 mA, 70 Kv) free of any projection errors, which showed a full condylar view on either side with optimal density and contrast. Morphology of mandibular condyles was classified into 4 shapes as identified by Chaudhary *et al.* (2015) (Figs.1 to 4):

- Type I: Oval;
- Type II: Bird beak;
- Type III: Diamond and
- Type IV: Crooked finger



**Statistical methods**

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Data were expressed as Mean±SD. Pearson chi-square test was used to evaluate the correlation between males and females, and between age groups Paired t-test was employed to determine changes in cephalometric measures after treatment. A *P*-value of less than 0.05 was considered statistically significant.

**Results**

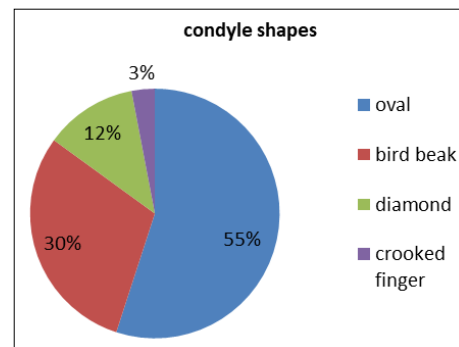
OPGs for 60 patients which include 20 male and 40 female was included in the present study, with age range between 18-60 years and average age of 34.4 years. Four types of condyle head shape was reported in the total sample namely (i) Oval, (ii) bird beak, (iii) diamond, and (iv) crooked finger (figure 2)

- Type 1 (oval) was the most common and predominant appearing shape. It was reported in 55% of the sample. Oval shape of condyle occurred in 54.5% and 55.5% in male and females respectively.
- Type 2 (bird beak) was reported in 30% of the total sample which includes 31.5% in males and 29.5% in females patients whereas type 3 (diamond) was seen in 12% which includes 13.8% of males and 11.2% of females sample.
- Type 4 (crooked finger) was noticed in 3% of the total sample which includes 2.6% in males and 3.4% in females sample. Highly significant difference between right and left sides in males and females was reported in Pearson Chi-Square test and there was also a significant difference between the two sexes (Figure 3).

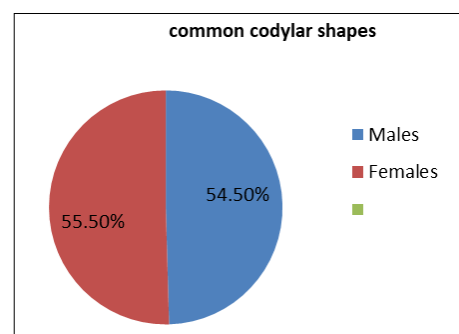
**Discussion**

TMJ because of many unique features both anatomically and functionally makes it a unique among other human body joints. Understanding the morphological of the temporomandibular joint (TMJ) is an important tool for evaluation of normal growth and development. This may also be helpful in the near future for the development of forensic odontology. The growth of mandibular condyle is expressed in an upward and backward direction. It is considered as one

of the main sites of facial growth [5]. The appearance and the shape of mandibular condyle varies enormously among different age groups and individuals. Morphologic changes of condyle occur because of remodeling, TMJ pathologies, developmental variations, trauma, endocrine disturbances, and radiation therapy.



**Fig 2:** Evaluation the combination of the shapes occurring in the population



**Fig 3** Oval shapes of the mandibular condyle in female were most common

Many imaging modalities are used for TMJ imaging, however panoramic imaging still remains as basic and fundamental screening techniques for TMJ abnormalities. OPG is a useful tool for obtaining general information about maxillary and mandibular dental arches along with other surrounding structures such as the maxillary antrum, nasal fossa, TMJ,

styloid processes and hyoid bone. It is also a routine recommended by dental surgeons and orthodontists for obtaining general information about the teeth, mandible, and adjacent regions of the jaw. It exposes patients to relatively low doses of radiation and also yields a favorable cost benefit relationship [6, 7]. The shape and size of mandibular condyle varies among different age & ethnic groups in different individuals. Human mandibular condyles are broadly classified into four basic types: oval, bird beak, diamond and crooked finger.

Our study is an attempt to identify the prevalent radiographic shapes of the condylar head on the OPG. The study was done on 60 patients and 120 condyles were evaluated. 55% of the condyles evaluated were oval in shape, followed by bird beak which constitutes about 30%. Diamond shape of condyles were seen in 12% of the total sample and least being crooked finger, which constitutes only 3% of the total sample. Again as it is a matter of fact that radiographs are two dimensional depiction of the three-dimensional structure. Hence TMJ needs to be viewed at different positional aspect also especially considering the tilt of the condyle anatomically. Now a days various other modalities have developed like CT scan, cone beam volumetric imaging, which can give detailed information shape, structure and anatomy of the condyle.

### Conclusion

The present study was done to identify the most prevalent radiographic shapes of the mandibular condyle on the OPG. Oval shape followed by bird beak type was found to be the most common in both genders with the condyle shape being symmetrical in about three quarters of the studied sample. Further studies using either CT scan or CBCT need to be done.

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