Assessment of Morphological Variations of Condylar Head Using Digital Panoramic Radiographs- A Retrospective Study

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Abstract

Aim: The aim of the current study was to assess the mandibular condyle's shape variation and identify the most common shape.

Materials and Methods: Following the analysis of 462 digitalised OPGs, 924 condylar heads were radiographically evaluated. Four distinct condyle morphologies were found. Combinations of the condylar shapes found in the population were determined, and variations in the shapes were evaluated.

Results: Of 462 pairs of condylar heads evaluated, 72% were oval in shape, followed by diamond (11%), bird beak(9%), and least being crooked finger (5%). Oval-oval was commonly occurring combination (58%)

Conclusion: Since it presents a diagnostic challenge, dental professionals need to be well-versed in distinguishing between normal and pathological condyle morphology in an OPG. When there are no clinical indications of TMDs, asymmetries in condyle

morphology that show up on radiography are regarded as normal**.**

Keywords: Orthopantomographs, Bird beak, Crooked Finger, Condyle, TMJ

Introduction

TMJ is a freely movable articulation between the condyle of the mandible and the squamous portion of the temporal bone at the base of the skull [1].

Mandibular condyle varies considerably both in size and shape. When viewed from above, the condyle is roughly ovoid in outline. It is 15–20 mm side to side and 8 to 10 mm from front to back [2] Age, gender, face type, occlusal force, functional load, malocclusion type, and the difference between the right and left sides all contribute to a natural variation in condylar morphology.

Morphological alterations in the condyle can be due to simple developmental variability or as remodeling of the condyle to cope with developmental variations, malocclusion, trauma, endocrine disturbances, and radiation therapy.[3,4] The mandibular condyle's basic shape is believed to be formed early in life and changes as needed to accommodate functional stress.

The radiograph of TMJ is difficult and inaccurate due to its complex structure which can be overcome by taking several graphs from different angles. [5] Orthopantomography is of diagnostic importance as it is both cost-efficient and relatively reduces the dosage of radiation received by the patients. [6] OPGs are routinely used in the dental practice for diagnosing conditions related to TMJ.

This study mainly aims to determine the predominant shape of the condylar head and the most common combination seen using digital panoramic radiographs.

Materials and Methods

The Institutional Review Board has approved the retrospective radiographic investigation which was conducted in the private dental college in Chennai. Digital panoramic radiographs which showed the complete view of the TMJ with optimal density and contrast were randomly selected from the oral medicine and radiology department, Tagore Dental College and Hospital**.**

The sample size was calculated, and the confidence level of 99.99% was set. The current study included a radiographic assessment of 924 condylar heads after evaluating 462 OPGs. Good-quality panoramic radiographs showing both the condyles and patients of either gender between 18 and 62 years were included in the study.

Panoramic radiographs with condylar fracture,

Genetic disorders affecting condyle,

Poor quality panoramic radiographs, and

OPGs that don't show both condyles

OPGs that don't have condylar head were excluded from the study.

Condylar morphology of four types by Chaudry et al identified which are

1) Type I - Oval shape.

2) Type II - Bird Beak Shape

3) Type III - Diamond shape.

4) Type IV - Crooked finger shape.

The OPGs were randomly selected and screened to determine the predominant shape.

Results

A total of 924 condylar heads after viewing 462 OPGs were analysed which included subjects with age ranging from 18-65 years, out of which 238 were female and 224 were male.

The shapes as suggested by Chaudry et al were seen namely i) Oval, ii) Bird Beak, iii) Diamond and iv) Crooked finger. [Figure 1]

Our results revealed that Oval was found to be the most common share 665 (72%), followed by Diamond 129 (14%), Bird beak 83 (9%) and the least being Crooked finger 47 (5%) [Figure 2]. The combination of commonly seen shape was oval-oval which accounted for about (58%)
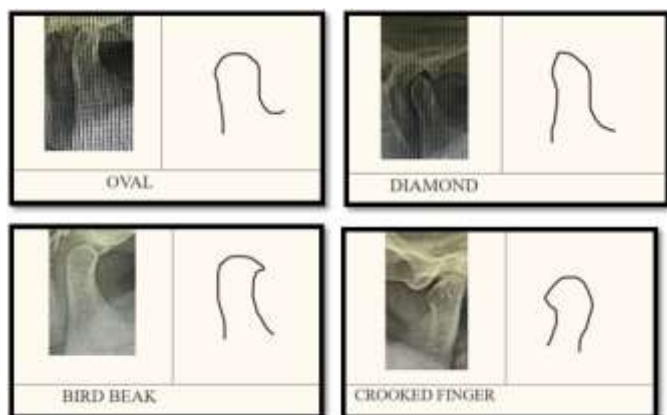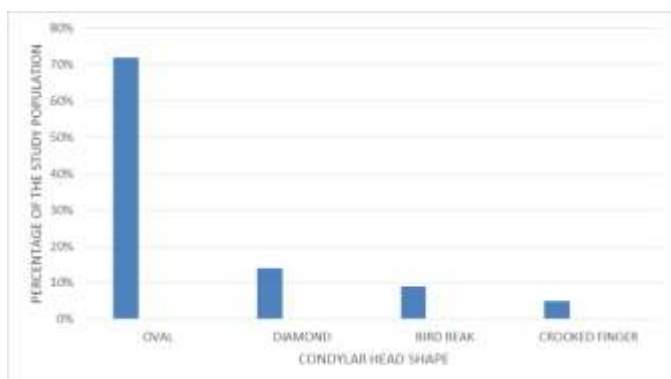

Figure 1: Different shapes of condylar head as described by Chaudry Et al

Graph 1: The graph represents the different types of condylar head morphology and the most predominant shape in the study population.

Discussion

TMJ is the most unique joint among others in the human body as it has many functional and anatomical values. [7] There are many classification theories for the morphology of mandibular condylar such as round, angle, convex, and flat; these studies were done using cone-beam CT. [8]

The first to report on the various mandibular condyle forms was Yale et al. in 1961. [9] Yale initially divided condylar heads into three groups based on superior view: concave, convex, and flat. Later, he simplified this number into five groups: convex, flattened, angled, rounded, and concave. Oval, bird beak, diamond, and crooked fingers were employed in this study to categorize the mandibular condyle shape from earlier research. [10,11]

Developmental variances, remodeling, trauma, endocrine disorders, and radiation therapy can all cause morphologic changes in the condyle. Panoramic radiographs continue to be the primary screening modality for TMJ abnormalities among the several imaging modalities utilized for TMJ imaging.

Normal morphological variants including diamonds, bird beaks, crooked fingers, and ovals should not be confused with TMJ disorders like Ely's cyst, pencil-shaped condyles, flattening of the articular surface, erosions, and osteophytes. To diagnose TMDs, radiological changes in the condyle should always be associated with clinical indications and symptoms.

Our study aimed to assess the variations in the condylar head morphology. Our results revealed that the most common shape was Oval (72%), followed by Diamond (11%), Bird beak (9%), and Crooked finger (5%) being the least.

Our findings were similar from those of a prior study by Sonal V et al[11] in terms of the predominant which revealed that ovals were the most common shape (60%) followed by bird beaks (29%), diamonds (9%), and crooked fingers (2%). In another study by Varshan I et al., [12] the most common shape was found to be Oval (53%), followed by bird beak (18%), crooked finger (18%), and diamond (12%)

Awareness of condylar head morphology is essential for general dentists, as the shapes of the condyles exhibit considerable variation among individuals, which is a

normal anatomical characteristic. This diversity should not be misinterpreted as pathological unless substantiated by definitive evidence.

A comprehensive understanding of the normal range of condylar shapes is critical for accurate assessment and diagnosis, thereby facilitating appropriate treatment decisions and minimizing the risk of unnecessary interventions. Such knowledge is pivotal in enhancing clinical practice and ensuring optimal patient outcomes.

Due to the small sample size, the current study's findings could not apply to all geographical areas. Additionally, the study was limited to only the samples that were available. Future research should be conducted with an adequate sample size.

Conclusion

This study identified that the oval shape was the predominant morphology of condylar heads among the participants, emphasizing the importance of recognizing the range of condylar shapes for effective clinical practice. Understanding these variations is crucial for accurate diagnosis and treatment planning in dentistry.

However, the limitations of this study, including the relatively small sample size and its restriction to a specific geographic area, may affect the generalizability of the findings. Future research with larger, more diverse populations is necessary to explore condylar morphology and its clinical implications further. By expanding our knowledge in this area, dental professionals can enhance their understanding of temporomandibular joint health, ultimately leading to improved patient care.

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