

An Analysis of Mandibular Condylar Morphology Using Orthopantomographs – A Descriptive Study

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Abstract: The appearance of mandibular condyle varies greatly among different age groups and individuals. Morphologic changes of condyle occur due to developmental variations, remodelling, various diseases, trauma, endocrine disturbances and radiation therapy. Genetic, acquired, functional factors, age groups, individuals have a role in morphologic changes in shapes and sizes of condyle. This study comprised radiographic evaluation of 464 condylar heads in 232 digitalised OPGs taken for routine investigation in a scan centre. Trends occurring in the shapes were evaluated, and their distribution in study population were identified. Of the four types identified (bird's beak, crooked finger, diamond and the oval), the oval shape is more frequently found and the crooked finger is less.

Key-words: Condylar Shape, Orthopantomographs, Tempromandibular Joint (TMJ),

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I. Introduction

Tempromandibular joint (TMJ) is a complex joint, formed by the mandibular condyle and the mandibular/glenoid fossa of temporal bone. Articular disc, a dense fibrocartilaginous tissue and its attachments divide the joint into upper and lower compartments that normally do not communicate. Rotation and translation of the condyle in the lower and upper compartment respectively contributes to normal mouth opening.[1]

The functions of the tempromandibular joint, is to provide smooth, efficient movement of the mandible during mastication, swallowing and speech and to provide stability of mandibular position and prevent dislocation from external or unusual forces.[2]Mandibular condyle varies greatly among different age groups and individuals. Morphologic changes may occur on the basis of simple developmental variability as well as remodelling of condyle to accommodate developmental variations, malocclusion, trauma and other developmental abnormalities and diseases [3,4]. A thorough understanding of the anatomy and morphology of the TMJ is essential so that a normal variant is distinguished from an abnormal condition.

In 1961, Yale et al. first reported about the different shapes of mandibular condyle [5]. based on superior view as concave, convex and flat, and later modified it into convex, flattened, angled and rounded [5,6,7]. It is often assumed that the normal condylar head must have a convex configuration throughout and that symmetry should exist between contralateral sides in the same individual. Several studies have attempted to evaluate the morphology of the human condyles [8]. Variation in the human mandibular condyle shapes was noted by previous researchers [8]. A normal variation of the condylar morphology occurs with age, gender, facial type, occlusal force, functional load, malocclusion type and between right and left sides. The most prevalent morphologic changes are detected in the TMJ of elderly persons due to the onset of joint degeneration.

TMJ morphology has been studied on dry and autopsy human skulls, histology, radiographic exams, magnetic resonance, computed tomography and Cone-Beam Computed Tomography (CBCT) methods. [9]

Investigative modalities like Orthopantomograph (OPG) yield replicable results, they have a favourable cost-benefit relationship and exposes patients to relatively low doses of radiation.[10] Panoramic radiography has been used as the initial imaging technique for TMJ screening when clinical examination suggests some type of joint pathology. Although there have been continued effort toward studying the dimensional analysis of the condyle and its surrounding structures-little attention has been paid to the variety of condylar morphology and configuration. [10]. The present study is aimed at observing and recording the variation in the shapes of condyle as seen in OPG and their frequency distribution in the observed population.

II. Subjects And Methods:

The present study comprised radiographic evaluation of 232 digitalised OPGs taken for routine investigation. All OPGs, where condyles were seen evidently were included in the study. The study included radiographs of 99 males and 133 females ranging from the age 20 to 59 years. Digital OPG’s 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 were selected in this retrospective study. The OPG’s of individuals with no history of TMJ dysfunction/occlusal discrepancy/trauma were selected. Most of them belonged to patients who sought treatment for dental caries or periodontal disease. Condylar morphology of four types as identified by Chaudhry *et al.* namely: Type I - Oval shape, Type II - Diamond shape, Type III - Bird beak shape, Type IV - Crooked finger shape shown in Figure 1.

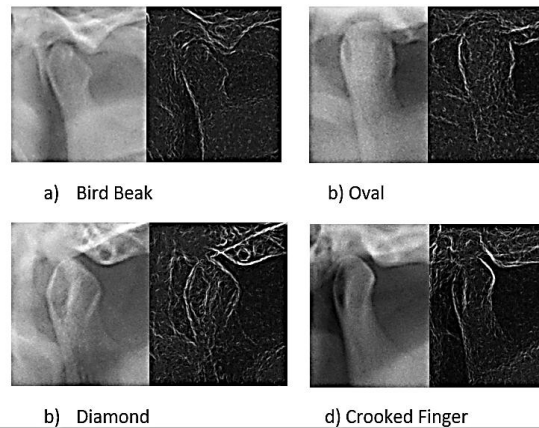


Figure 1 Condylar Morphology

III. Results

The 232 pairs of condyle/464 condyles in OPG were observed and grouped in four types as bird’s beak, crooked finger, diamond, and oval. The results were tabulated by SPSS version 23.0 in Table 1 for the type of morphology and in Table 2 for the gender distribution

Table 1: Condylar Morphology

Shape	Frequency	Percent
Bird beak	109	23.49
Crooked finger	55	11.85
Diamond	86	18.53
Oval	214	46.12
Total	464	100

Table 2: Gender Percentage Distribution

Shape	Female	Male	Percent
Bird beak	21.42857	26.26263	47.6912
Crooked finger	13.53383	9.59596	23.12979
Diamond	22.55639	13.13131	35.6877
Oval	42.4812	51.0101	93.4913

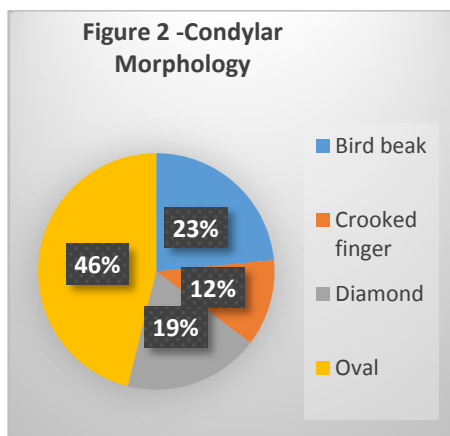


Figure 2: condylar morphology

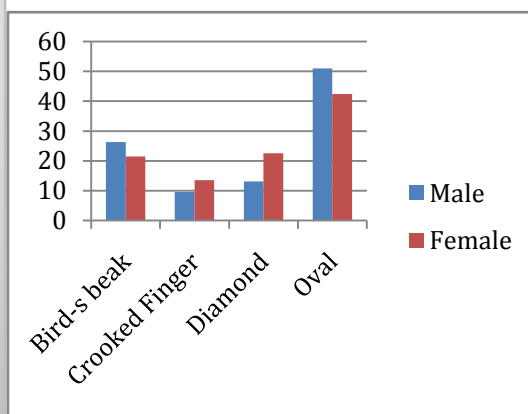


Figure 3 : Gender Distribution

IV. Discussion:

The present study is an attempt to look out the prevalent radiographic condylar shapes or morphology using OPG's. This study is in agreement with Sonal et al's., findings who reported the most common shape to be oval and the least commonly reported shape to be crooked finger. [10]The prevalence of crooked finger shape was more in the present study(11.85%) compared to Sonal et al's (2%).[10] The variation could be attributed to the difference in demographic variation of the study population chosen. Radiographs are two-dimensional depiction of the three-dimensional TMJ. Hence, needs to be viewed at different positional aspect also especially knowing the tilt of the condyle anatomically. Various other modalities have now developed like cone beam volumetric imaging, which can give detailed information of the condyle.

V. Conclusion:

From this observational retrospective study of the condylar shapes in OPG, the following facts can be arrived.

1. The following shapes were perceived among the study namely, (i) Oval, (ii) bird beak, (iii) diamond, and (iv) crooked finger
2. The most common shape was found to be oval (46.12%), followed by bird beak (23.49%), diamond (18.53%), and crooked finger (11.85%) .
3. The most common shape observed among both the males(51%) and females(42.4%) was the oval .

Minimal exposure dose and simplicity of prescription makes OPG a common choice of TMJ imaging prescription. Further increase in sample size and evaluation of other parameters may support in giving more information about the population. Condylar symmetry and age and gender variation needs to be elaborated further in this study.

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