Assessment of Mandibular Condylar Morphology Using Digital Orthopantomogram in Chennai Population

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Abstract

Objective: The present study was performed to evaluate the variation in shapes of mandibular condyle, determine the predominant shape and to assess any peculiarities in either gender in an Orthopantamogram(OPG).

Materials and Method: Radiographic evaluation of 3200 condylar heads after analyzing 1600 digitalized OPG's were done. On analyzing, there were four different morphology of condyles observed. Variations occurring in the shapes were assessed, and combinations of the condylar shapes present in the population were established.

Result: Of 1600 pairs of condylar heads evaluated, 78% were oval in shape, followed by diamond (12%), crooked finger (6%) and least being bird beak (3%). Oval-oval was commonly occurring combination (60.5%) whereas crooked finger-bird beak combination was found to be very rare.

Conclusion*:* Dental professionals must have thorough knowledge in differentiating between normal and abnormal condyle morphology in an OPG as it possess a diagnostic challenge for them. Asymmetries that occur in condyle morphologies radiographically in absence of clinical signs and symptoms of TMDs are considered to be normal.

Keywords**:** *Orthopantomographs, Bird beak, Crooked Finger, Oval, Diamond, Condyle, TMJ.*

Introduction

Mandibular condyle is seen roughly as ovoid in outline. Its dimensions are 15-20 mm mediolaterally and 8-10 mm postero-anteriorly[1]

Many assumptions were made towards the shape of a condyle. Most commonly reported shape of condyle was convexity throughout and it should be symmetrical on both the sides i.e. right and left sides of the same individual. Hence, anything, which deviates from this convex morphology, was considered as pathology but normal variation in shape of condyle does occur.

Morphological alterations in the condyle can be due to simple developmental variability or as remodeling of condyle to cope with developmental variations, malocclusion, trauma, endocrine disturbances and radiation therapy[2,3]. Hence, a thorough understanding of the morphology of mandibular condyle is essential to distinguish between normal variant from abnormal conditions.

The basic morphology of mandibular condyle is thought to be established early, and modified throughout life according to functional load[4]. Condyle morphology variations occur with age, gender, facial type, Occlusal force and also even between condyles on either sides[2].

Orthopantomographs is of diagnostic importance as it is both cost efficient and it relatively reduces the dosage of radiation received by the patients[4,5]. Panoramic

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radiography remains the main screening modality for TMJ abnormalities if clinical examination suggests any joint pathology. Hence, OPG's are valuable for determining the presence of osseous changes.

Our study aims to evaluate and document the variations in the shape of condyle on an OPG that aids in diagnostics i.e. distinguishing varying normal condylar shapes from abnormalities. The objective of this study is,

1. To evaluate the variations in shape of condyle seen in Chennai Population.

2. To determine the shape predominant in that population

3. To assess whether there is any peculiarity in either gender

4. To determine the occurrence of symmetry in shape of condyle on either side.

Materials and Method

Digital Panoramic Radiographs(OPG) (Planmeca-exposure parameters: 10 mA, 70 Kvp) which showed a full view of mandibular condyle on right and left side with optimum density and contrast were selected from the Oral Medicine and Radiology Department, Saveetha dental college. This is a retrospective study.

The present study comprised of radiographic evaluation of 3200 condylar heads after viewing 1600 digitalized OPG's taken for routine radiographic investigation among Chennai Population. In our study, radiographs of 807 males and 793 females ranging from the age 18-65 years were included. OPG's in which condyle heads can be visualized clearly were included in this study. OPG's taken for patients who came for treatment of multiple dental caries or generalized periodontal disease were selected. OPGs of patients with history of TMD's, Trauma, occlusal discrepancy, developmental abnormality, were excluded from this study. Condylar morphology of four types by Chaudry et al were identified which are

1) Type I - Oval shape.

2) Type II - Bird Beak Shape

3) Type III - Diamond shape.

3) Type IV - Crooked finger shape.

Results

A total of 3200 condyles were analyzed from 1600 subjects with age ranging from 18 to 65 years, out of which 807 were male and 793 were female.

A. Type of shape commonly seen: The shapes suggested by Chaudry et al were seen namely i) Oval, ii) Diamond, iii) Bird beak and iv) Crooked finger.

1. The most common shape was found to be Oval (78%), followed by Diamond (12%), Crooked finger (6%) and least being Bird beak (3%).

2. The most common shape observed among both males and females is Oval shape which accounted for about 74% in males and 72% in females respectively.

3. The combination of commonly seen shape among both male and female is Oval-oval which accounted for about 63% and 57% respectively as shown in

Figure 1-6.

B: The gender wise distribution of shapes was evaluated. In males, Oval shape (74%) was predominant followed by Diamond shape (18%), Crooked finger (6%) and Bird beak shape being least common (2%). In females, Oval shape accounted for about (72%) followed by Diamond shape (18%), Crooked finger (6%) and Bird beak (4%).

C: To evaluate the combination of shapes occurring radiographically, revealed Oval-oval being the commonest shape which accounted for about 60.5% and Crooked finger-Diamond and Crooked finger-Bird beak is the least common combination which accounted for about 0.02% and 0.03% respectively.

Figure 1: OPG shows Crooked Finger appearance of mandible on either sides.

Figure 2: OPG reveals Diamond Shape of condyles on both the sides of mandible

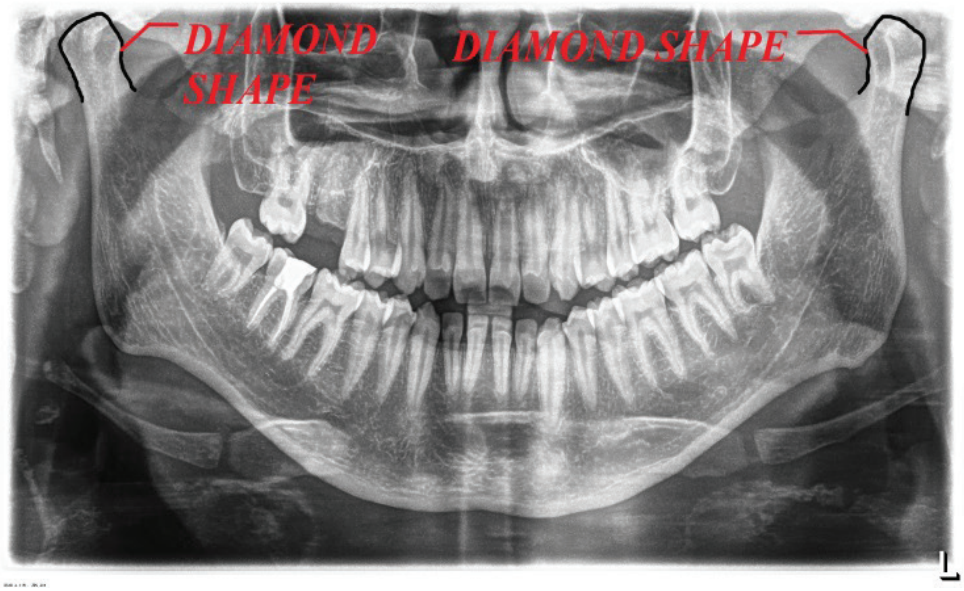


Figure 3: OPG reveals Bird beak and Crooked finger shape Combination

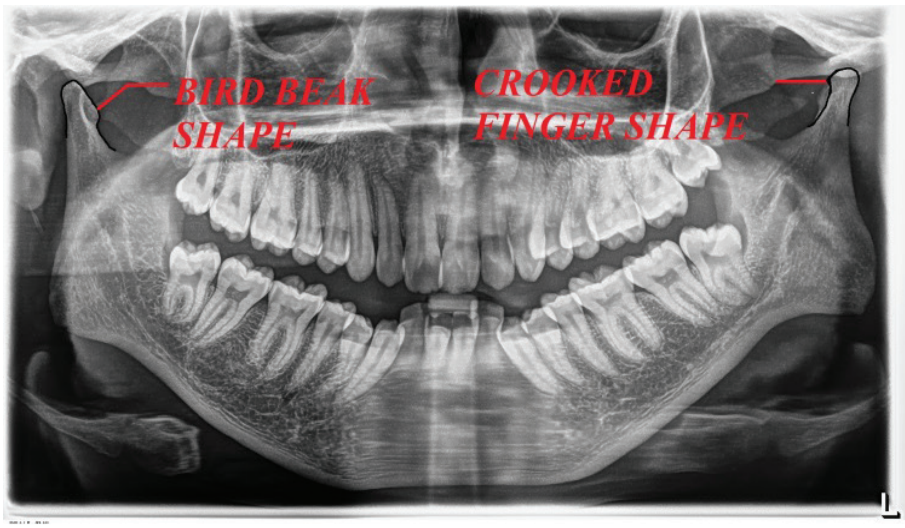


Figure 4: This OPG shows Oval and bird beak shape combinations of condyle

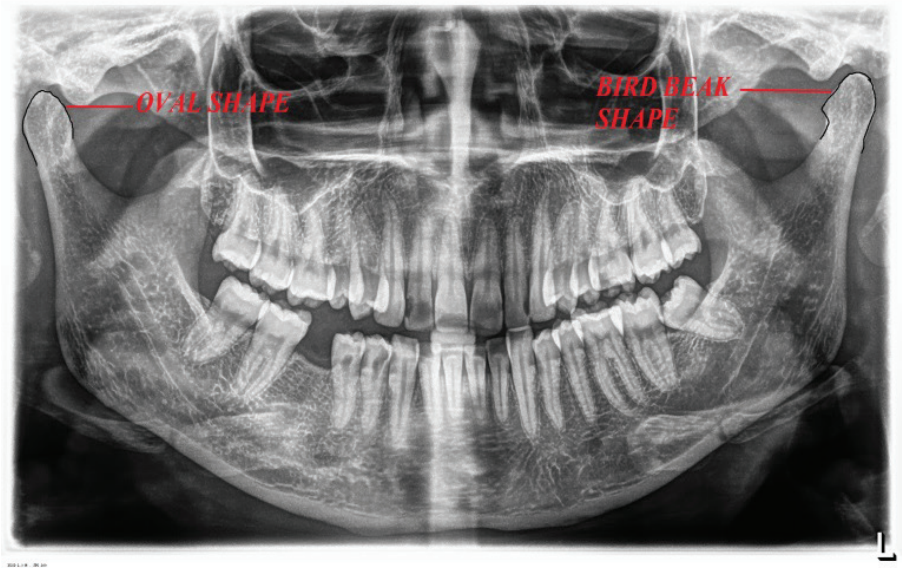
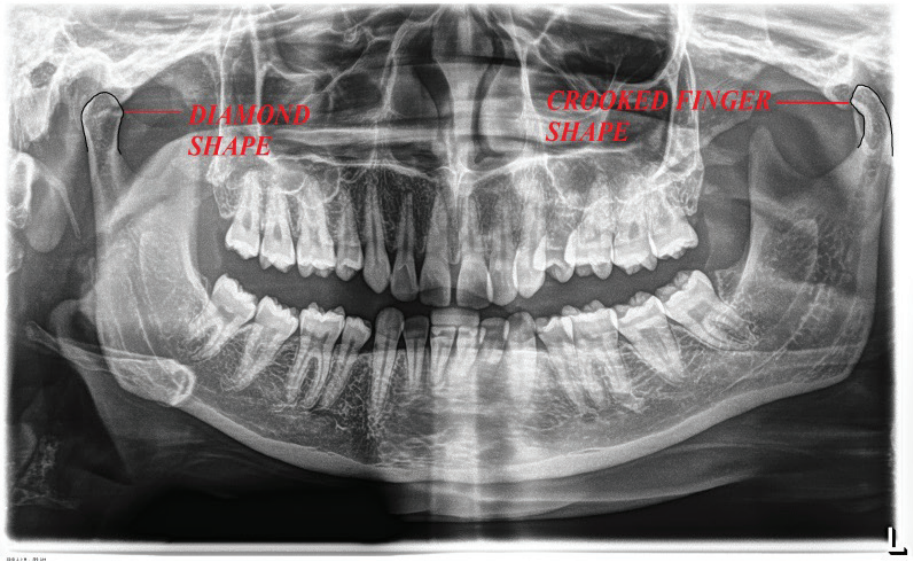


Figure 5: This OPG reveals Oval and Crooked finger shape combination of condyle

Figure 6: This OPG shows Diamond and Crooked Finger combination of condyle on either sides



Discussion

Condyle responds to continuous stimuli throughout the remodeling process, and thus plays an important role in the final morphological dimensions of the adult mandible. The condyle has a special importance in growth of mandible [2].

Figure 1: Shapes of Condyle on a Radiograph

The appearance of mandibular condyle varies in different shape and size among different age groups and individuals. In 1961, Yale et al. was the first one to report about the different shapes of mandibular condyle[6,7,8]. Initially Yale classified condylar head based on superior view into three categories namely concave, convex and flat, however later on he simplified it into five categories namely convex, flattened, angled, rounded and concave.

Evaluation of the shape of condyles upon surgical exposure of TMJ revealed that most of the condyles had a normal size and shape. Other varieties like excavated form, oblique shape, small round condyles and flattened condyles were noted [9].

Using different radiographic techniques many studies were done to detect the condylar morphology, to compare the accuracy of detecting condylar changes in temporomandibular disorders.

The most prevalent morphologic changes are detected in the TMJ of elderly persons due to the onset of joint degeneration [4].

The normal morphological variations like diamond, bird beak, crooked finger, oval should not be mistaken with TMJ pathologies like flattening of articular surface, erosions, pencil shaped condyles, osteophytes, anterior lipping of condyle and ely's cyst.

Flattening is loss of an even convexity of condyle surfaces, Osteophyte is local outgrowth of bone arising from a mineralized joint surface, Erosion is local area of rarefaction in the cortical plate of a joint surface, Sclerosis is thickening of the cortical bone on a joint surface, Ely's cyst is sub cortical cyst is rounded radiolucent area that may be just below the cortical plate or deep in trabecular bone.

Radiological variations of condyle should be always correlated with clinical signs and symptoms to arrive at the diagnosis of TMDs. Anuna Laila Mathew et al, in their study revealed that, radiographic abnormalities in the condylar morphology increased with age[11]. They were seen more frequently in patients with clinical signs and symptoms of TMD.

Small asymmetries between left and right condyles were common. Small asymmetries are expected to develop during normal condylar growth, but the manner in which this asymmetry occurs has to be differentiated. Asymmetries in size differs from shape, volume or position asymmetries [3].

Asymmetries in condyle morphology without clinical signs and symptoms of TMD's, careful radiological examination of condyle are required to rule out TMJ pathologies.

Our study aimed to detect the most common shapes on the head of condyle seen in a radiograph among Chennai Population. Of 3200 heads 78% were oval in shape, followed by diamond (12%), crooked finger (6%) and least being bird beak (3%). Our results showed a variation to previous study done by Sonal V et al[12], where the most common shape was found to be oval (60%), followed by bird beak (29%), diamond (9%), and crooked finger (2%).

In the same study, the oval was the most common shape in both males and females which accounted for about 61% and 46% [12]. Similar results were obtained from our study in which oval being the commonest shape showed a high prevalence of about 74% in males and 72% in females as shown in the figure 3.

Combination of condyle shapes in OPG revealed that Oval-oval combination, was 60.5%, followed by Oval-diamond combination (12.25%), Diamond-diamond (7.6%), Bird beak-bird beak (5.43%), Oval-crooked finger(5.31%), Crooked finger-crooked finger (4.93%) and Crooked finger-Diamond and Crooked finger-Bird beak is the least common combination which accounted for about 0.02% and 0.03% respectively. In the similar study conducted by Sonal V et al, Oval-oval combination (67%) was most prevalent followed by Oval-bird beak (25%), Oval-diamond (5%), Bird beak-bird beak (3%) and Crooked finger- crooked finger is least common combination which accounted for about 1% only [12].

In the study Sonal et al, the combination of shapes commonly seen in male and females were evaluated where oval-oval combination was seen most prevalent in 58% of female population and 42% of male population [12]. In our study, Oval-oval combination was seen in 63%

of male population and 37% of female population.

Gender wise distribution of shapes was recorded. In males, Oval shape (74%) was predominant followed by Diamond shape (18%), Crooked finger (6%) and Bird beak shape being least common (2%). In females, Oval shape accounted for about (72%) followed by Diamond shape (18%), Crooked finger (6%) and Bird beak (4%). But in previous study done by Sonal V et al, only the prevalence of commonest shape was recorded which showed Oval being most common in both males (62%) and females (46%).

Panoramic radiography is a screening tool for diagnosing TMDs. Various advanced imaging techniques are needed to confirm any pathology in addition to diagnosis made by OPG such as Radionuclide bone scanning which is a useful technique for showing early functional and biochemical bone changes, CT images which are highly accurate for osseous abnormality [13]and Cone-beam computed tomography images which are superior over others for the bony morphology of mandibular condyles and detection of condylar cortical erosion[14]. CBCT is a useful tool to measure and evaluate the condylar dimensions.

Conclusion

Dentists should have thorough knowledge on the characteristic normal mandibular condyle variations to give a diagnosis of TMD's. Amount of condyle morphology asymmetry is considered as 'normal asymmetry' in the absence of signs and symptoms of TMD's. Genetic, acquired, functional factors, age groups, individuals have a role in morphologic changes of condyle. Thus variability in the shapes and sizes of condyles should be an important factor in diagnosing the disorders of temperomandibular joint. OPG's are preferred imaging technique as it is easily prescribed by most of the dental surgeons and is a screening tool for TMD's. Hence, Dental professionals must have thorough knowledge in differentiating between normal and abnormal condyle morphology in an OPG, as it possess a diagnostic challenge for them.

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