Variation in condylar morphology in different malocclusion among Indians

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Abstract:
Temporo-mandibular joint (TMJ) joint and the condyle of mandible are observed in the radiographs of the skull and the jaw. Therefore, it is of interest to assess the predictability of four different shapes of condyle in skeletal class I, II and III malocclusion. The four commonly visualized shapes are oval, bird beak, diamond and crooked were assessed using an ortho pantomogram (OPG). Each of the malocclusion was visualized for different shapes of the condyle. 987 OPGs were radiographically evaluated and the morphology of 1974 condylar heads was visualized. The shapes of the condyles were grouped under four different types. Data shows that oval shaped condyle was most common followed by bird beak. There was variability in the diamond and crooked shape and was lesser than the other types. Thus, the shapes of the condyle are useful predictable guide in deciding the nature of the occlusion.

Keywords: Condyle, Temporomandibular joint, malocclusion, orthopantogram

Background:
Temporomandibular joint (TMJ) is a ginglymoarthroidal joint that is formed by articulation between two bones, the condyle part of mandible and glenoid fossa at the base of the skull [1-4]. The anatomic features of TMJ show variations among individuals and there are numerous factors that play a role in its shape and are concerned with the differences in functional loads imposed on the bone. There is a strong association between the form and function of the mandible and condyle among patients with different type of malocclusion [5]. Several studies have evaluated condylar circularity on symptomatic or asymptomatic samples in normal occlusion and malocclusion [6,7]. There are adequate data on how anatomical morphology or even the progression of symptoms [8]. Taking proper case history and diagnostic records are very essential to arrive at a proper diagnosis and formulate the treatment plan for the particular patient. Diagnostic aids used in orthodontic treatment planning were broadly divided into essential or non-essential diagnostic aids [9]. Management of TMD involves the work of dentists from various specialties. It is multifactorial in nature and requires proper examination and treatment planning. The first and foremost are the work of the specialist from oral medicine and radiology department to
identify and diagnose the problem, followed by the work of the orthodontists, prosthodontists, or oral surgeons [2]. In orthodontics, the position of the condyle may be of significance for two main purposes, either TMJ dysfunctions or to differentiate the body of mandible positions, which affect diagnosis and treatment [10]. Therefore, it is of interest to evaluate the morphology of the condyle in Angles Class I, Class II and Class III malocclusions using ortho pantomograms and to assess if the type of malocclusions is a confounding factor in the shape of the condyle.

Materials and Methods:
The study consisted of evaluation of radiographs of 1974 condylar heads by examining condylar heads in a two-dimensional view on an ortho pantomogram. This study is done in an online setting of Dias software of the Saveetha Dental College. The sample was chosen between June 2019 to end of March 2020. Data collection was done using OPG of orthodontic patients and data to be verified by two examiners and records tabulated for verification by two examiners and the records tabulated for excel sheet. The independent variables of this study are the condylar morphology and the dependent ones are the various classifications of malocclusions.

Results and Discussion:
The sample evaluated were 1974 condyles, which were studied from 987 cases with the age of subjects ranging from 16 to 45 years out of which 512 were female patients and 475 male patients (Figure 1). The types of mandibular condyles seen Indian population, the following shapes are witnessed in the Indian populations are oval, bird beak, diamond and crooked finger [1]. The most common shapes are oval, bird beak, diamond followed by crooked in the order of accordance (Figure 2 and 3).

Mandibular condylar shapes noted in both gender more in female cases and in both the gender more in female cases and in both the genders oval shaped in more common. The condyle is a site of facial growth and usually this growth is an upward and backward growth direction [11]. The position of the condyle is important where the practitioner plans to correct the occlusal plane, on modification on mandible growth and also in cases where the gonial angle of the mandible is altered. The shape of the mandible condyle varies in different stages of growth and among different subjects. In different imaging techniques using temporomandibular joint imaging orthopantomograms in remains of fundamental screening modality of TMJ abnormalities [12]. Subjects with an increased mandibular plane angle are at a higher risk of fracture of the angle and can often present with its complications [13]. Prediction of treatment based on anchorage preparation in skeletal malocclusion helps in efficient treatment results [14]. Orthodontists use various skeletal, dental, and soft-tissue analyses to diagnose and formulate a treatment plan [15].

The orthopantomogram can be used to visualize the maxillary and the mandibular arches, the dentition, the maxillary antrum, the nasal fossa, the temporomandibular joint, styloid process and
the hyoid bone [16]. OPG is a part of an essential diagnostic aid as a part of radiographic examination in dentistry in diagnosing teeth, and the arches. It is a cost efficient and the effect dose of radiation is low [17]. Most common predictors include differences in maxillary mandibular morphology and its relationship [18]. Every individual will have some degree of asymmetry, as a completely symmetric face will not be esthetically pleasing, this minimal asymmetry often is unnoticed in the society [19].

According to this study, oval shaped was more common. In previous studies they have found round shape of the condyle in growing individuals in the anteroposterior slices [20], other studies have reported that rounded is most common at 66%, followed by flattened (17%) and angular forms (17%) . The anatomical morphology in the mandible starts getting established in early life and ossification of the bone even in the embryonic life, there is constant remodelling of the condylar bone and the morphology varies depending on the functional load and the activities of the jaw [21]. The prospect of investigation in this topic would be to determine if the different skeletal mal relations tend to generate different levels of functional load on the mandibular fossa [22]. There is often a finding of anterior condyle being displaced in the class I sample but the difference is less difference in the anterior and posterior article space of 1.3 and 1.7mm respectively.

There is a component of muscular overload onto the joint in Class II div 2 subjects and this is found to vary from other subjects who have different dentofacial morphologies. Thus orthodontic patients reporting with Class II div 2 malocclusion often present with different characteristic findings [23]. On clinical evaluation there is not always finding of centric condyles, mostly there are non-concentric condyles, this factor does not necessarily affect the TMJ signs and symptoms. A finding that is similar to other recorded literature is that there is a predilection towards non-concentric condyles with the anterior articular space reduced [24].

The low dose of radiation and being cost effective OPG is a preferred diagnostic aid. OPG is a readily available diagnostic aid to make observations. The most common morphology seen among various genders is oval. An efficient sample size collection based on power analysis along with parameters like the age, population would be an extensive knowledge in terms of significance. That reasonable predictability of condylar morphology with any deviation from the oval shape would require the need for further investigation with relevance to any clinical significance.

**Conclusion:**
The predictability of condylar morphology is of significant importance. Data showed that all three types of skeletal malocclusion I, II and III, the oval shaped condyle was found to show the maximum occurrence. The next common shapes are diamond and bird beak and the crooked shaped condyle is the least common. There was no significant difference between the left and right side of the condyle. Results of the study suggest that reasonable predictability of condylar morphology with nature and any deviation from the oval shape would require the need for further investigation with relevance to any clinical significance.

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