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MORPHOLOGICAL VARIATION OF THE CONDYLE: ASSESSMENT BY CBCT

Dentistry

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ABSTRACT

Background: This study was conducted to assess different morphology of the condyle using cone beam computed tomography in coronal and sagittal sections. Cone beam computed tomography (CBCT) can detect morphological variations of the condyle accurately in three dimensions. **Materials And Method:** CBCT images were taken from radiology archives and were analyzed to assess the different morphology of right and left condyles with i-cat using In-vivo software. 100 Scans (200 condyles bilaterally) of the patients between age group 15 to 44 yrs was taken in our study group. Qualitative data analysis was done using chi square test. **Results**: The present study has illustrated various shapes of condyles in coronal as well as sagittal sections using CBCT. In sagittal view three types of condyles were seen type III beaked 18%, type II flat 12% and type I round 70% (p value<0.05) whereas in coronal view 4 types of condyles were seen type I convex 40%; type III round 27%, type II flat 23%; and type IV angled 10% (p value <0.05). **Conclusion:** The present study observed with varied prevalence as well as distribution among different age groups. CBCT evaluation of condylar morphological variations aids in an early detection of the temporomandibular joint disorders alterations more accurately in all the three planes by using cone beam computed tomography.

KEYWORDS

Cone Beam Computed Tomography, Condyle morphology, Temporomandibular Joint, Degenerative, 2D images.

INTRODUCTION:

The temporomandibular joint is a unique joint, and its anatomical knowledge is one of the principles of clinical practice[1], which allows understand the pathological changes, evaluating the diagnostic evaluation and choosing the right treatment[2]. TMJ departments are functionally and morphologically independent. . The bony components of the TMJ must be understood and carefully examined for a reason, as changes in these components can indicate dysfunction and pain3. Temporomandibular joint disorders are mainly related to degenerative bone changes such as; Osteophytes, flattening, erosion, etc., all involving mainly the bony parts of the TMJ[3].

In bony sections, there is a large topographical difference between the mandibular fossa and the articular fossa, which is affected by changes due to condyle shape or bone remodeling[4] and because the primary growth center of the mandible is the joint to continuous stimuli during the remodeling process and therefore plays a role in the final dimensions of the adult mandible[5]. Radiological evaluation of the maxillofacial TMJ is essential to assess all abnormalities and bony changes affecting the TMJ. Due to its low radiation dose and high spatial resolution, CBCT is considered the best method for imaging the bony components of the TMJ. The aim of this study is to evaluate morphological variations and the prevalence of different morphologies among different age groups using CBCT.

MATERIALS AND METHOD

This is a retrospective observational study and was conducted for duration of three months (October-December, 2023) in the Department Of Oral Medicine And Radiology in Lucknow. The sample size consist of 100 CBCT images of the condyle (200 images bilaterally), were retrieved from the radiology archives. These images were previously obtained for the radiographic evaluation of periodontal assessment, bone assessment for implant & impacted third molars. Images of the patients between 15 and 44 yrs were collected. CBCT images of these 100 patients (200 condyles) were further evaluated by a single examiner.

Intra examiner calibration was assessed performing test-retest exercises in 10 images of patients with intra examiner agreement of 95%. The images were excluded with any radiographic artifacts, full skull images that had no condylar morphological details and patients with temporomandibular joint disorders. Morphological variations in the condyle were assessed and morphology was classified further in Sagittal and coronal views with I-cat unit using In-vivo software.

In the sagittal view; the morphology was classified based on the classification given by **Koyama et al (2007)**[6] as round, beak shaped and flat.

In the coronal section; the morphology of the condyle was categorized based on the classification given by **Yale et al (1966)**[7] as convex, round, flat and angled.

The sample was divided into three different groups, group I(15-24 yrs), group II(25-34 yrs), group III(35-44 yrs) based on the age and also the prevalence of different condylar patterns among groups was studied. Statistical analysis was carried out with SPSS version 16. Qualitative data analysis was carried out using chi square test. The results with p value < 0.05 with 95% confidence level were considered to be significant in this study.

RESULTS

In our study no erosions can be seen in the sagittal view. In this study the most common pattern was Round 140 of total condyles which further followed by beak shaped 36 and flat 24 morphology in sagittal view (Graph-1) whereas, the most common morphology observed in coronal view was convex 80 followed by round 46, flat 54 and angled type 20 (Graph-2).

In this study condyles examined had convex morphology nearly 36% in group I, 28.33% had round morphology, 21.03% had flat condyles and only 14% were angled. In group II, 59.71% of condyles were of convex morphology, 12.71% had round morphology, 22.3% were flat condyles and only 5.24% showed angled shaped deformity. In group III, 63.57% of condyles were convex, 18.67 % of condyles had round morphology and 8.86% of condyles showed flattening as well as angled in coronal view (Graph-3)

There was no significant difference in the distribution of other morphologies among the three groups (p value> 0.05). In the sagittal view, majority of the subjects among group I had round morphology 80%, whereas it is reduced to 68% and 53% among group II and group III subjects respectively. On the other hand, beaked morphology increased from 11.6% to 36.73% among group I to group III subjects (p value< 0.05).

DISCUSSION

The bony components of the TMJ should be examined radiographically to assess their integrity, morphology and any structural changes. Degenerative bone changes affecting the TMJ can be assessed by various radiographic methods, which require a clear and precise image of the TMJ, which is difficult to obtain with two-dimensional imaging[8].

Advances in CT have increased the accuracy of diagnosing degenerative bone changes by limiting problems visible during imaging, such as overlapping of adjacent structures, different angles of

the joint, presence of artifacts and mandibular movements during the study. Thus, CBCT provides high-quality images with lower exposure and is cost-effective compared to Ct[9].

The type of morphology of the condyle when photographed creates an initial environment that constantly changes throughout life due to the type of compression an individual has and also because it functions as a primary growth center[1,3].

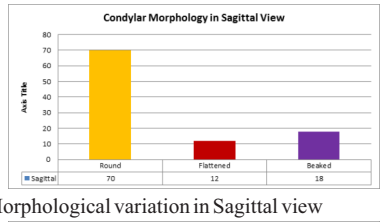
Degenerative changes affecting the TMJ can be more accurately diagnosed using CBCT, which produces images with lower exposure than CT[1]. Our study revealed that in coronal section, convex morphology was more commonly observed(40%) followed by round(27%).This was in accordance with the study conducted by Yale et.al(1966)[7]. Subhashin et al. conducted study and found that the most common morphology was in the angle in the coronal view (37.5%)[10].
In the sagittal view the most common morphology was round (70%). This was in accordance with the study conducted by Subhashini et. al(2016)11 (71.9%)[10]. In contrast to this study, no erosions were observed in the sagittal view in any age group of the samples selected in our study.

The significant increase in the prevalence of beak shape of condyle from group I to group III shows the association between the morphological pattern and the functional adaptation in the present study. This association of condylar morphology and bone changes with physiological adaptation independent of age and gender CT was also in accordance with the study conducted by Naveen Kumar et al(2016)[11]. Morphology of the condyle contributes to the masticatory system, the beak shaped and angled condyles are usually associated with a hard bite[9]. Flattening may also result from overload on the TMJ and may be associated with involvement of masseter and temporalis muscles.

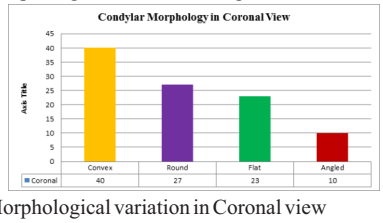
However, this study has some limitation of distribution in different groups. Hence, further studies with extended wide range of sample size with its equal distribution among the gender as well as age groups are suggested to correlate the morphological variations with degenerative changes.

CONCLUSION

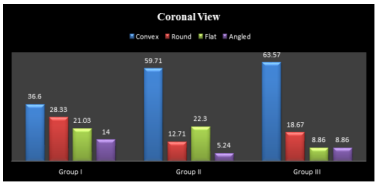
The likelihood of an unevenly shaped condyle increases with bone cortical maturity, suggesting that remodeling during growth and development may be the cause of the observed changes in condyle morphology. Changes in condyle morphology might indicate dysfunction, discrepancies, deformities, and degenerative changes in the temporomandibular joint (TMJ), which can be attributed to various physiological adaptations and factors in addition to senescence. Therefore, a comprehensive analysis of the condyle and joint morphology overall is necessary, and CBCT provides more precise radiological guidance in this regard. Even though the patients are clinically asymptomatic, CBCT can be used to detect morphological or functional changes and abnormalities early on.



Graph 1: Morphological variation in Sagittal view



Graph 2: Morphological variation in Coronal view



Graph 3: Prevalence of different morphologies in three different groups in Coronal view

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