Research Article

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Evaluation of antero-posterior position of condyle among skeletal Class I, Class II and class III subjects from Central India region

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ABSTRACT

Background: To evaluate antero-posterior position of condyle (APC) in TMJ among skeletal Class I, Class II and class III subjects in age range of 18-25 years from Central India region.

Material & Methods: The study comprised of 90 subjects, divided into three groups of 30 subjects each belongs to skeletal class I malocclusion (Group A), skeletal class II malocclusion (Group B) and skeletal class III malocclusion (Group C). Lateral cephalometric and CBCT of the patients were taken of right side of TMJ and anterior and posterior joint space was measured on it. Mean and Standard Deviation was noted and subjected to statistical tests. The comparison between the different group was done and Tukeys post hoc analysis was applied for inter group comparison.

Results: APC was slightly more in class II study subjects as compare to class I and III. It was 7.58±0.93 mm, 7.82±1.06 mm and 7.33±1.43 mm among skeletal class I, II and III patients respectively. There was statistically no significant difference found in APC between class I, II and III study subjects (p=0.266). Tukeys post hoc analysis showed no statistically much difference between the groups (p>0.05).

Conclusion: Antero posterior condyle position was higher in Class II skeletal pattern followed by Class I and Class III skeletal pattern. The variation in APC in the healthy joints should be taken into consideration for a particular population to provide correct and successful treatments.

Keywords: Orthodontics, skeletal deformity, malocclusion.

INTRODUCTION

The temporo-mandibular joint (TMJ) is a fundamental articulation for professionals performing orthodontic and prosthodontic treatments. The position and function of the mandibular condylar portion of the TMJ is directly controlled by the oral structures including the associated muscles.[1,2] Mandibular condyle undergoes a remodeling process as it responds to continuous stimuli from childhood to adulthood. As part of the TMJ structure, the mandibular condyle is considered to play a key role in the stability of long-term treatment results after orthodontic and orthognathic treatments.[3]

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Cephalograms have been widely used in clinical implementations and as an investigation technique to evaluate growth and treatment responses.[4] However, there are several disadvantages of 2-dimensional cephalometry as a scientific method. After the introduction of 3D imaging, clinicians have had great opportunity to evaluate anatomic structures three dimensionally. The recent advent of 3D, in particular the cone beam computed tomography engineering, has overcome traditional CT scanners and permits us a more complete analysis of the TMJ and the mandibular condyle than before.[3] Cone beam computed tomography (CBCT) allows the evaluation of bone structures, articular space, and dynamic function in all three dimensions without superimposition and deformity.

A study in 1980's on mandibular condyle morphology in relation to malocclusion in children revealed that the condylar size in males was greater than in females and midline discrepancy significantly altered the increase in condylar size during growth.[5] In past there has been limited studies done on TMJ as there was lack of advanced 3D diagnostic imaging technique for studying TMJ anatomy, but with the advent of CBCT it has now become easier to study anatomy of TMJ. Thus the present study aims to evaluate antero-posterior position of condyle (APC) in TMJ among skeletal Class I, Class II and class III subjects in age range of 18-25 years from Central India region.

MATERIAL AND METHOD

This prospective and comparative study comprised of 90 subjects belonging to central India population who volunteerd for the study being conducted in department of orthodontics and dentofacial orthopedics. Lateral cephlometric were taken in the department of oral medicine and radiology to differentiate the subjects in to different malocclusions. Later CBCT of the patients were taken of right side of TMJ with each subject in the rest position of mandible, using standardized technique described by Attilio Tacconi and Piero Mozzo.[6]

A written informed consent was obtained from each participant or his or her parents and an ethical clearance was obtained from the Institutional Ethical Committee. Total sample size was of 90 subjects in age range of 18 to 25 years (young adult stage), which was divided into three groups of 30 subjects each belongs to skeletal class I malocclusion (Group A), skeletal class II malocclusion (Group B) and skeletal class III malocclusion (Group C). Subjects in age range of 18 to 25 years of age with no history of trauma or any disease to face, TMJ and jaws and having no difficulties in mandibular movements and should not have any pain, discomfort or clicking in their TMJ, and had not undergone any orthodontic treatment were included in the study. All subjects who do not belong to the age group, and Central India region and having asymmetric face, traumatic injury and had signs and symptoms of TMJ aberrations, anomaly, trauma, disease or dysfunction were excluded from the study.

Lateral cephalometric radiographs were taken using a standardized technique and tracing was done. CBCT volume scans of all subjects were obtained by using the Master 3D dental-imagning system (Sirona orthophos SL Digital CBCT, Benstein, Germany).

Anteroposterior position of condyle was measured with a horizontal straight line drawn between most prominent point on the posterior border of condyle and true vertical reference line (TVRL) passing through center point of external auditory meatus (Figure1).

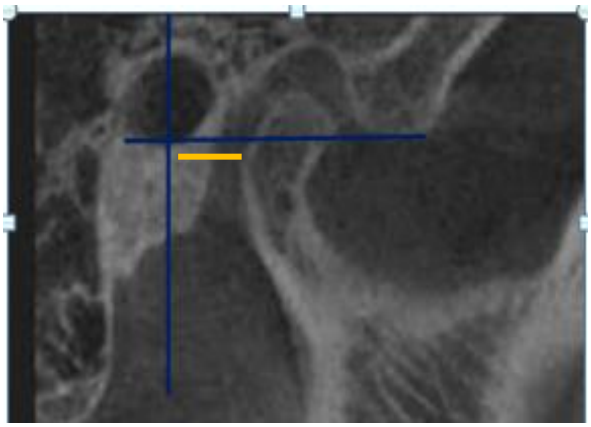


Fig 1: Measurement of anteroposterior position of condyle in relation to external auditory meatus.

The data thus collected was subjected to statistical tests using SPSS Software (Statistical Package for Social Sciences, IBM, 20.0 version). Mean and standard deviation was noted and subjected to statistical tests.The comparison between different

groups were done using 't' test and *P* value < 0.05 was considered statistically significant. Tukeys post hoc analysis was applied for inter group comparison.

RESULTS

Table 1/Graph 1 reveals comparative evaluation of mean antero-posterior position of condyle (APC) in TMJ among skeletal Class I, Class II and Class III Study subjects. APC was slightly more in class II study subjects as compare to class I and III. It was 7.58±0.93 mm, 7.82±1.06 mm and 7.33±1.43 mm among skeletal class I, II and III patients respectively. There was statistically no significant difference found in APC between class I, II and III study subjects (p=0.266). Tukeys post hoc analysis (Table 2) was applied for inter group comparison. It also shows there is no statistically much difference between group A (class I) and B (class II), group A (class I) and group C (class III) and group B (class II) and group C (class III) (p>0.05).

Table 1: Comparative evaluation of mean antero-posterior position of condyle (APC) in TMJ among skeletal Class I, Class II and class III study subjects.

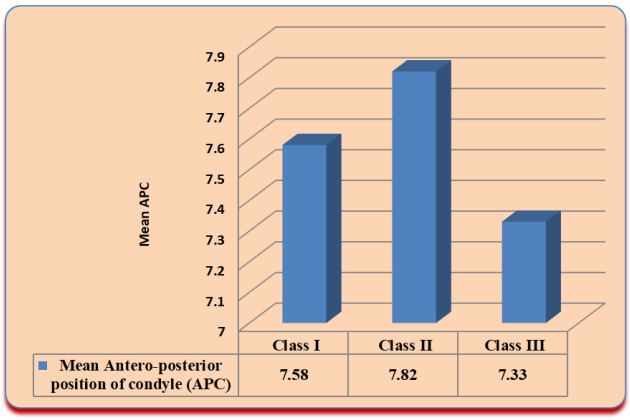
Groups			Antero-posterior position of condyle (APC) (mm)	
	Groups	Number	Mean	SD
Skeletal Class I	Group A	30	7.58	0.93
Skeletal Class II	Group B	30	7.82	1.06
Skeletal Class III	Group C	30	7.33	1.43
	Total	90	7.58	1.17
ANOVA 'F' Value	1.344			
Significance 'p' Value	0.266(NS)			

Table 2: Tukeys post hoc analysis for inter group Comparison (APC)

Groups	Mean Difference	Significance 'p' Value
Group A vs. Group B	-0.240	0.706(NS)
Group A vs. Group C	0.253	0.678(NS)
Group B vs. Group C	0.493	0.235(NS)

DISCUSSION

In orthodontics it is widely accepted that function affect form and it also holds true for occlusion and TMJ morphology.[2] For years, dentistry used occlusal position as a gold standard for the correct mandibular position in orthodontic and prosthodontic diagnosis, although dental alterations may lead to anomalous mandibular position. Imaging is an important diagnostic part in the determination and interpretation of TMJ disorders.



Graph 1: Comparative evaluation of mean antero-posterior position of condyle (APC) in TMJ among skeletal Class I, Class II and class III study subjects.

With the rise of CBCT and its utilization in the head and neck region, due to its lower radiation dose and higher resolution compared to CT, the use of CT in TMJ evalution has become very limitated now a day. The CBCT technique has been indicated for analysing skull structures. Image data is acquired in a digital format from a single 360^0 rotation scan around the patient. The digital data corresponds to radiographic projection for each rotational step during the scan. Image reconstruction is made using a algorithm for volumetric tomography.[7,8]

The aim of the present study to evaluate APC in TMJ among skeletal Class I, Class II and class III subjects in age range of 18-25 years from Central India region. APC was measured with a horizontal straight line drawn between most prominent point on the posterior border of condyle and TVRL passing through center point of external auditory meatus.

Our present study showed that mean value of APC was higher in Class II skeletal pattern (Group B) i.e. 7.58mm ± 1.06mm which was followed by Class I skeletal pattern (Group A) i.e. 7.58mm ± 0.93mm and than Class III skeletal pattern s (Group C) i.e. 7.33mm ± 1.43mm. Similar results was obtained in study by Akbulut *et al* [9] where mean value is higher in class II malocclusion i.e. 6.87mm ± 0.50mm

followed by class I and class III malocclusions. In another study by Mishra *et al* [10] APC was 8.5±1.4 on right side in class I subjects which was greater than APC 7.8±1.0 in class III subjects.

The variation in APC in the healthy joints should be taken into consideration if treatment is chosen to normalize the mandibular condyle position by bringing it into a centric position in the glenoid fossa. In different populations APC may varies, so while planning any orthodontic or other treatment APC should be known for that particular population to provide correct and successful treatments.

CONCLUSION

Antero posterior condyle position was higher in Class II skeletal pattern followed by Class I and Class III skeletal pattern. The variation in APC in the healthy joints should be taken into consideration for a particular population to provide correct and successful treatments.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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