

Assessment of Condylar Changes in the Patients with Temporomandibular joint Pain with Digital Radiography

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ABSTRACT

Background: CBCT is less costly and the dose of radiation is lower; the amount of radiation varies according to the brand of the appliance and the structure to be imaged. The aim is to evaluate the diagnostic ability of Digital OPG in comparison with CBCT for diagnosing the condylar osseous changes in patients with TMJ pain and to assess their prevalence amongst males and females.

Materials & Methods: A total of 80 condyles were included in the study with complaint of pain in TMJ. Detailed clinical examination was done. The patients clinically suspected to have TMJ pain was subjected to Digital OPG and CBCT and all good quality radiographs was included in the study. The TMJs were assessed as follows: 0- normal;1-erosion;2-flattening;3-osteophytes;4-sclerosis5-resorption;6- any other changes.

Results: The results of our study showed, there exists a definite correlation between the morphological changes of condyle and TMJ pain and these changes showed slight inclination towards females. OPG could even detect the gross bony changes such as flattening, large erosions and osteophytes, whereas CBCT could detect condylar changes like erosion, bifid condyle and Ely's cyst more precisely and accurately

Conclusion: CBCT provides more precise, accurate and valid information of condylar changes than OPG and it was also found the existence of correlation between TMJ pain and morphological changes of condyle.

Keywords: Condylar bony changes, CBCT, OPG, TMJ pain.

INTRODUCTION

Temporomandibular joint is one of the most fascinating and complex synovial systems in the body. It is the area in which the mandible articulates with the cranium. The masticatory system is extremely complex, which comprises primarily of bones, muscles, ligaments, and teeth, all of which are responsible for activities like mastication, speech, and deglutition.¹ All these movements are regulated by an intricate neurological controlling mechanism, which is important for the system to

function normally and efficiently. Lack of such harmony may lead to disruptive muscle behavior or structural damage to any of the components. The function of the TMJ is unique, in that the condyle both rotates within the fossa and translates anteriorly along the articular eminence.^{2,3}

Temporomandibular disorder (TMD) refers to a collective term including clinical problems that involve the masticatory muscles, the

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temporomandibular joint (TMJ), and associated structures.⁴ TMD is frequently associated with disc displacement and degenerative changes in the TMJ. TMJ pains are usually reported to be multifactorial in origin like stress, malocclusion, poor postures, bruxism, arthritis etc. Disorders of TMJ are those which interfere with the normal form or function of the joint. These disorders include: dysfunction of articular disc and associated ligament and muscles, joint arthritis, inflammatory lesions, neoplasms, growth and developmental abnormalities.⁵

CBCT provides high definition three dimensional digital data on precise anatomical information of all oral and maxillofacial structures at reduced cost and less radiation to patient, in comparison to traditional imaging systems, which are limited by distortion, magnification changes, restricted clarity, lack of accuracy in measurements and not allowing for 3D reconstructions.^{6,7}

CBCT is less costly and the dose of radiation is lower; the amount of radiation varies according to the brand of the appliance and the structure to be imaged.⁸ Hence this study is undertaken to evaluate the diagnostic ability of Digital OPG in comparison with CBCT for diagnosing the condylar osseous changes in patients with TMJ pain and to assess their prevalence amongst males and females.

MATERIALS & METHODS

Source of data:

The study subjects were selected from the outpatients visiting the Dental College and Hospital, with age of 20 years and above including equal number of male and female subjects.

Method of collection of data:

The patients reporting to the Dental College and Hospital, with age 20 years and above were included in the study after obtaining the informed consent. A total of 40 subjects with TMJ pain was included in the study with equal number of males and females. Each subject who volunteered for the study received an explanation of the purpose of the study and the method involved, they were included in the study, brief history of present illness, past medical/surgical history. All the patients were subjected to digital radiography and CBCT. Ethical

clearance was obtained from institutional ethical committee.

Inclusion criteria

The patients visiting the outpatient of the institution with temporomandibular joint pain and tenderness of TMJ were included in the study.

Exclusion criteria:

Patients with developmental anomalies affecting jaws or syndromes of craniofacial structures, Patients with history of condylar fractures, surgery of condyles, Patients with limited mouth opening due to oral sub mucous fibrosis, space infections or malignancy of oral cavity, Lactating & pregnant females, Patients with any systemic disease Panoramic radiographs which do not reveal the condylar morphology were excluded from the study.

Method of study:

Informed consent was taken from each patient and ethical clearance was obtained from institutional ethical committee. Patient data was recorded as per the proforma designed for the study.

Clinical examination

Detailed clinical examination was examined for: mouth opening, deflection, deviation, lateral movements of the mandible. Muscles of mastication were palpated for any tenderness. Temporomandibular joint was examined for any tenderness using extra auricular & intra auricular methods. The patients clinically suspected to have temporomandibular joint pain were subjected to radiographic examination.

Radiographic examination:

Patients was subjected to Digital OPG (closed mouth) on Kodak 8000C Digital Panoramic and Cephalometric machine using all standard radiographic reference lines and exposure parameters as specified by the manufacturer and all good quality radiographs was included in the study. This was followed by a radiographic assessment of TMJ using a Cone Beam NEW TOM 3D imaging system at a Diagnostic Centre. The 2D images and 3D reconstructed images (closed mouth) thus obtained was evaluated for radiographic changes in

the various components of the TMJ. All the subjects were protected with lead aprons and thyroid collars.

Exposure parameters

The TMJ were assessed by both panoramic and CBCT images. In CBCT images 0.150mm sections was taken in all the three planes that is Sagittal, Axial and coronal planes with FOV of 5x5cm. The osseous changes noted was assessed as follows:

0-normal, 1-erosion, 2-flattening, 3-osteophytes, 4-sclerosis, 5-resorption, 6- Any other changes

Statistical Analysis:

All the variables from the study were statistically analyzed using T-test, Chi-square test & One-way ANOVA test. Subsequently logistic regression analyses were done using SPSS 20 version software. For all test 'p' value of 0.05 or less were utilized for statistical significance.

RESULTS

The present study was aimed to assess the different condylar changes in patients who visited to the department with a complaint of pain in both the genders as mentioned in methodology. The study also tries to assess the sensitivity and specificity of the two imaging modalities. The study was conducted in a total of 80 subjects. The data obtained was subjected to chi-square test for the analysis of condylar changes.

This study included 80 condyles with equal distribution of male and female subjects in the age range 20 to 70 years with mean age of male patients is 36 years and females is 33 years. There is no statistical significant difference found in males and females in age.

Amongst males it was observed that flattening is more common in 22 cases followed by resorption in 4 cases and very few had erosion and any other changes in each, at least 10 of them were presented with normal condyles. Similarly in females flattening was common finding in 14 patients; followed by sclerosis in 6 patients and very few were presented with osteophytes and resorption was seen in 2 cases and 16 cases presented with normal morphology. On comparison amongst both

genders, flattening was found to be more common, males were affected more frequently than females, however the difference in the statistical values was negligible.

According to grading of condylar changes in all 80 condyles, 4 of patients showed grade 0 (normal) condyles, 16 patients showed grade 1(erosion), 22 patients showed grade 2 (flattening), 4 patients showed grade 3 (osteophytes), 14 patients of them showed grade 4 (sclerosis), 6 patients showed grade 5 (resorption) and 14 patients presented with grade 6. However it was found that there was no statistical significant difference found in grading's among males and females where $P > 0.05$ ($P > 214$).

The grading's of the condylar change as seen in digital panoramic radiography among 40 subjects showed flattening is most common with 18 patients diagnosed with it, followed by sclerosis and resorption each with 6 patients and very few were observed with any other changes such as (pointed bifid & Ely's Cyst) and erosion seen in 2 patients in each, however very few presented with normal condyles with total of 26 patients.

Similarly the CBCT grading's among 80 subjects showed that flattening was seen in 22 patients; that is most common sign observed, that was followed by erosion in 16 patients, sclerosis was observed in 14 patients, other changes like pointed, bifid & Ely's Cyst was observed in 14 patients, resorption of condyles was seen in 6 patients and very few of them were found with osteophytes and normal condyles in 4 patients.

On comparing the grading's in two imaging modalities it was found that flattening of condyle could be detected in both OPG & CBCT with higher predominance in OPG, however the statistical values were non-significant where $P > 0.203$. Osteophytes can be observed in both OPG and CBCT with slight predominance in CBCT, but there was no statistical significant difference was observed $P > 0.843$. Condylar changes with sclerosis and resorption is better determined in CBCT, however showed no statistical significant difference with $P > 0.364$ & $P > 1.000$ respectively. Whereas condylar changes with erosion and other changes as pointed bifid & Ely's Cyst and condyles with normal morphology showed highly statistical significant difference in

determining so where $P > 0.000$ the same is dissipated.

DISCUSSION

Unique anatomical configuration and complex relations in temporomandibular joint (TMJ) demand for special imaging techniques in radiological evaluation of TMJ. Several radiographic methods are used to assess bony changes that affect TMJ.⁹ It is essential to obtain a clear and precise image of this region, but this can be difficult owing to the superimposition of adjacent structures, different angulations of the condyle, limitations of mouth opening in some patients, presence of artifacts and mandibular movements during the examination. There are many imaging modalities for TMJ examination.^{10, 11}

The present study was conducted to assess the different bony changes of condyles in patients with TMJ pain using CBCT and OPG, and to assess and compare the diagnostic reliability of both the imaging modalities in determining such bony changes. Different bony changes assessed in our study are erosion, flattening, osteophytes, sclerosis, resorption and other change such as pointed, bifid & Ely's Cyst.

According to the available literature bony changes of the condyles can be seen in any patients complaining of pain irrespective of their age and gender. Our study revealed that condylar changes were more frequently found in females as compared to males due to the fact that hormonal influences of estrogen and prolactin, which may exacerbate degradation of cartilage and articular bone in addition to stimulating a series of immunological responses in the TMJ. However condylar changes were also observed in males due to psychologic stress and habits, but results showed a slight predominance for females with non-significant values. Our results are in accordance with Pontual et al and Shetty et al.¹²

According to the present study CBCT could detect even the fine bony changes very efficiently. Changes like flattening, erosion, sclerosis were also easily detected which is in accordance with various authors. The present study revealed that the flattening is the most common finding followed by erosion, sclerosis, other changes, resorption and

osteophytes, similar were the results showed by various other studies.

CBCT allows the visualization of TMJ components without overlapped and distorted images and it provides a significantly more reliable diagnosis. Therefore it accurately detects the precise bony changes such as erosion, flattening, osteophytes, subchondral sclerosis and resorption, this can be explained by the fact that it is a three dimensional imaging modality in which images can be viewed in all three sections that is axial, coronal and sagittal.

CONCLUSIONS

The study concludes that gross bony changes of the condyle could be detected by OPG, with high sensitivity in determining the changes but not specific whereas precise changes such as erosions and other changes could easily be detected by CBCT. Common condylar changes seen in our study are flattening, erosion, sclerosis and other changes.

CONFLICTS OF INTEREST

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

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