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A Hospital Based Prospective Study to Evaluate the Correlation between OPG and MRI Subjects with TMJ Pathology

Vani Mehrotra[1], Pankaj Singhal[2], Rashi Rauka[3], Saurabh Sharma[4*]

[1]Senior Resident, Department of Oral Maxillofacial Surgery, Safdarjung Hospital, Delhi, India.
Email: drvanimehrotra0711@gmail.com
Orcid ID: 0000-0001-9404-0799,
[2]Senior Resident, Department of Oral Maxillofacial Surgery, Safdarjung Hospital, Delhi, India.
Email: psinghal21@gmail.com
Orcid ID: 0000-0001-8144-5551,
[3]Senior Resident, Department of Oral Maxillofacial Surgery, Safdarjung Hospital, Delhi, India.
Email: rashirauka02@gmail.com
Orcid ID: 0000-0002-8822-2577,
[4]Senior Resident, Department of Oral Maxillofacial Surgery, Safdarjung Hospital, Delhi, India.
Email: doc.saurabh@outlook.com,
Orcid ID: 0000-0003-3835-5248,
*Corresponding author

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Abstract

Background: Arthrography and MRI have been shown to have similar degrees of diagnostic accuracy and both techniques can provide excellent diagnostic information. The choice of soft tissue imaging technique depends on factors such as cost, availability, and patient factors described above which may contraindicate a particular technique.The aim of this study to evaluate the correlation between OPG and MRI of subjects with TMJ pathology. **Material & Methods:** This is a cross- sectional observational study done on 50 subjects reporting to the dental OPD with history of pain in TMJ region was conducted among the outpatients with TMJ problem visiting to the oral maxillofacial surgery department in safdarjung hospital, Delhi, India.Data collection included detailed history, clinical examination, radiological examination with OPG & then MRI examination of TMJ. **Results:** Our study showed that the mean age of male patients were 32.63 yrs and female patients were 31.85 yrs. No statistically significant difference was seen between male and female patients.40% patients with ADDR and 50% with ADDWR had abnormal condylar head surface and only 0% patients with ADDR and 20% patients with ADDWR had normal condylar head surface. The condylar head surface and condylar neck was statistical non-significant between abnormal and normal disc position. **Conclusion:** MRI is the diagnostic study of choice for evaluation of disk position and internal derangement of the joint. Understanding of the TMJ anatomy, biomechanics, and the imaging manifestations of diseases is important to accurately recognize and manage these various pathologies.

Keywords: MRI, TMJ, OPG, Pathology, Articular Disc, Condylar Head, Condylar Neck.

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.[1]The unique feature of the temporomandibular joint is the articular disc. The articular disc is a fibrous extension of the capsule in between the two bones of the joint. The disc functions as articular surfaces against both the temporal bone and the condyles and divides the joint into two sections [FIG.1].

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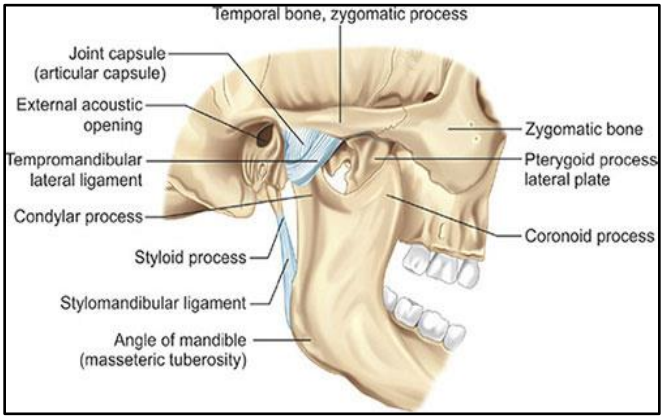

Figure 1: Anatomy of TMJ

There are three ligaments associated with the temporomandibular joints: one major and two minor ligaments. These ligaments are important in that they define the border movements, or in other words, the farthest extents of movements, of the mandible. Movements of the mandible made past the extents functionally allowed by the muscular attachments will result in painful stimuli, and thus, movements past these more limited borders are rarely achieved in normal function. All of these mandibular maneuvers may occur during mastication and are regulated by a combination of neurological control mechanisms together with complex muscle systems (muscles of mastication) that react to the nervous stimuli. However, limitations in mobility can be caused by muscular dysfunction or restricted movement of the articular disc which may constrain certain TMJ movements and may subsequently lead to TMJ dysfunction.[2] The position of the articular disc cannot be seen on plain x-ray examination, e.g.a panoramic radiograph, TMJ Tomogram but an accurate assessment of the space between the glenoid fossa and the head of the condyle may provide the clinician with a clue to a possible pathological problem.[3]

A panoramic radiograph is considered a "screening" projection and is often used in combination with other hard tissue imaging techniques to image the TMJs.[4] It gives an overview of the jaws and teeth, allowing evaluation of mandibular symmetry, maxillary sinuses and dentition. Mandibular asymmetries may not be clinically apparent and a discrepancy in size of one condyle or one side of the mandible may be a contributing factor in the development of TMD.[5,6,7]TMD in itself is an umbrella term which incorporates in itself a variety temporo-mandibular disorders. Radiograph also provides a clear view of posterior maxillary teeth, which may refer pain to the TMJ, simulating TMD. Although the TMJ clinical examination should also include examination of the teeth, occult inflammatory lesions may occasionally be overlooked. Any abnormality of the teeth noted in the panoramic view should be imaged with one or more intraoral views in order to provide maximum bony detail, which aids in arriving at an accurate diagnosis. With this the myofacial status should also be kept in mind for an accurate diagnosis.Condylar position cannot be evaluated in panoramic view because the patient is placed in a protrusive and slightly open position. Furthermore, the glenoid fossa does not image clearly and the articulating surfaces of the condyles are distorted due to the angle of the projection so osseous components of the joints cannot be accurately assessed [FIG-2].

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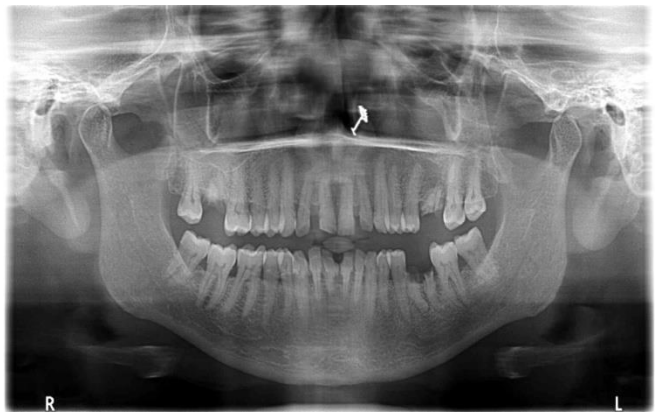

Figure 2: Orthopantogram

To overcome the short comings of radiographic assessment MRI gives a bull's eye view of the entire region. Magnetic resonance imaging (MRI) uses a magnetic field and radiofrequency pulses rather than ionizing radiation to produce multiple digital image slices. The TMJs are imaged in the closed and open positions. Images can be constructed in either the sagittal or coronal planes and therefore this technique is especially useful for diagnosis of any anomaly especially disk displacement.MRI has the advantage of being non-invasive and enables evaluation of the disk, surrounding muscles, and can image joint effusions.[8] Contraindications to MRI include pregnancy, pacemakers, intracranial vascular clips, the presence of metal particles in vital structures, patient claustrophobia, obesity or inability to remain motionless for the examination, which may take several minutes to complete.[9] The technique is also relatively expensive and is not readily available at all the centers.

MRI and Arthrography have been shown to have similar degrees of diagnostic accuracy and both techniques can provide excellent diagnostic information. It should be kept in mind that latter is invasive and involves injecting a radiopaque dye, associated with its own sets of complications and contraindications. The choice of soft tissue imaging technique depends on factors such as cost, availability, and patient factors described above which may contraindicate a particular technique.

MATERIALS & METHODS

This is a cross- sectional observational study with a sample size of 50 subjects, who reported to the oral maxillofacial surgery department of Safdurjung hospital, Delhi, India, with history of pain in TMJ region on outpatient basis.

Inclusion Criteria

1. Patients in age group between 25-40 yrs.
2. Patients with TMJ tenderness during palpation or function.
3. Patients with restricted mouth opening.
4. Patients with unilateral or bilateral clicking observed from last 6 months.
5. Patients with no history of developmental anomaly.
6. Patients with no systemic illness.

Exclusion Criteria

1. Patients with recent history of ear infection.
2. Patients with myofacial muscle problem only.
3. Patient who gives history of claustrophobia and is uncooperative.
4. Patient who is pregnant or with pace makers, aneurysm clips, partial dentures, hearing aids, metallic implants, crowns.

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Method of Collection of Data

Data collection included detailed history, clinical examination, radiological examination with OPG & then MRI of TMJ.After filling the case history, each patients were examined clinically. The examination was done extra orally and intraorally.

Panoramic Radiograph

Ortho pantomogram was taken as a screening radiograph. Imaging was carried out with rotograph plus with 5A current & 17s exposure time for bilateral TMJ. Data was collected on digital x ray sheet. Proper patient positioning was done by making the patients to bite on bite block & also by keeping central & lateral indicator at correct position. All the OPG were taken in standing position.

Magnetic Resonance Imaging

Bilateral TMJ MR images were obtained of all patients included in the study even though if patient complaint only in one joint so that other joint images were used for comparison. MR images were taken by means of 1.5T MR scanners (GE Scanner) and a dedicated circular polarized transit and receive Head coil for TMJ. The data was collected on a 256X192 matrix with a field view of 12 mm. Axial localizing images were taken from which the sagittal and coronal planes were described. The maximum intercuspation position was used for close mouth images. After the closed-mouth image was obtained, the patient was instructed to open the mouth as wide as possible to obtain reduction of a displaced disc[FIG 3,4]. Pulse sequence were obtained on sagittal and coronal T_1 weighted images, T_2 weighted images, proton density images (PD) and Gradient Echo (GRE) weighted images.

The position of disc was diagnosed as:

a. Normal: when the disc was located superior to the condyle both in closed and open mouth position.
b. Disc displacement with reduction: when the disc was displaced at the closed-mouth position and in the normal position in the open-mouth images.
c. Disc displacement without reduction: when the disc was displaced in both the closed and open mouth positions,

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Figure 3 & 4: On T1-weighted images, normal anatomy was identified & disc position on saggital& coronal plane. On T2-weighted images, joint effusion was identified as an area of high signal intensity in the region of the upper or lower joint spaces.

On T1-weighted images, normal anatomy was identified & disc position on saggital& coronal plane. On T2-weighted images, joint effusion was identified as an area of high signal intensity in the region of the upper or lower joint spaces.

Statistical Evaluation

Data collection included detailed history, clinical examination and radiological examination with OPG and MRI. The data were analyzed by a statistician.

RESULTS

Our study showed that the out of 50 patients the number of male patients were 22 and female were 28. The mean age of male patients was 32.63 yrs and female patients were 31.85 yrs. No statistically significant difference was seen between male and female patients (Table 1).

40% patients with anterior disc displacement with reduction (ADDR)had abnormal condylar head surfacecompared to 50% with anterior disc displacement without reduction (ADDWR). 20% patients with ADDWR had normal condylar head surfacecompared to patients with ADDR who all had discrepancies in condylar head surfaces (Table 2). Depicting a strong correlation between these two factors though in our study it was not statistically significant.

47.05% patients with ADDR and 41.17% with ADDWR had abnormal condylar neck. Whereas none of the patients with ADDR and

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50% patients with ADDWR had normal condylar neck which shows correlation between these two exist but results are not statistically significant (Table 3).

Table 1: Distribution according to age & sex of the patients

Age group (yrs)	Sex		Total
	Male	Female	
25-30 yrs	4 (18.18%)	12 (42.85%)	16 (32%)
30-35 yrs	12 (54.54%)	6 (21.42%)	18 (36%)
35-40 yrs	6 (27.27%)	10 (35.71%)	16 (32%)
Total	22 (44%)	28 (56%)	50 (100%)

Chi square test=3.186, P-value=0.2033

Table 2: Distribution of condylar head surface and disk position

Condylar head surface	Disc position						
	ADDR			ADDWR			Normal
	Right	Left	Total	Right	Left	Total	
Abnormal (N=40)	8 (20.0%)	8 (20.0%)	16 (40.0%)	6 (15.0%)	14 (35.0%)	20 (50.0%)	10 (25.0%)
Normal (N=10)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (20%)	0 (0.0%)	2 (20%)	8 (80%)
Total (N=50)	8 (16%)	8 (16%)	16 (32%)	8 (16%)	14 (28%)	22 (44%)	18 (36%)

Chi square test (Abnormal v/s Normal)=5.25, P-value>0.05

Table 3: Distribution of condylar neck and disk position

Condylar neck	Disc position						
	ADDR			ADDWR			Normal
	Right	Left	Total	Right	Left	Total	
Abnormal (N=34)	10 (29.41%)	6 (17.64%)	16 (47.05%)	4 (11.76%)	10 (29.41%)	14 (41.17%)	8 (23.52%)
Normal (N=16)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (25%)	4 (25%)	8 (50%)	10 (62.5%)
Total (N=50)	10 (20%)	6 (12%)	16 (32%)	8 (16%)	14 (28%)	22 (44%)	18 (36%)

Chi square test (Abnormal v/s Normal)=3.586, P-value>0.05

DISCUSSION

Temporomandibular disorders (TMD) are a broad group of clinical problems involving the masticatory musculature, temporomandibular joint, surrounding bony and soft tissue components, and combinations of these problems.[10]

Panoramic radiography is a good imaging modality for TMJ visualization.[11] Although

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morphological abnormalities of the condyle can be assessed with panoramic radiography, they do not necessarily represent a sign of TMD.[12] MRI is gold standard in assessing initial changes in TMJ, like thickening of anterior or posterior band, rupture of retrodiscal tissue, changes in shape of the disc, joint effusion.[13]

Our study showed that the mean age of male patients were 32.63 yrs and female patients were 31.85 yrs. Results of our study showed that the prevalence increases as age advances. No statistically significant difference was seen between male and female patients. Lipton and colleagues showed that patients with TMD symptoms present over a broad age range; however, there is a peak occurrence between 20 and 40 years of age.[14,15]

Raman Kumar et al (2015) found that all the subjects were in the range of 20-40 years.[16]The mean age in Group 1 (symptomatic group) was 26.55 ± 6.82 and Group 2 (asymptomatic group) was 25.90 ± 2.10 yrs. Porto CV et al (2004) reported that prevalence and severity of internal derangement of TMJ increases with age as shown in our study.[17]Yap Jua et al (2003) suggested that there is possible link between gender and age distribution in TMD.[18]This could be because of exogenous female reproductive hormones or oral contraceptives which have been implicated as a risk factor for TMD as age advances.

Frequency of condylar head flattening & neck shortening on panoramic radiography is more prevalent with anterior disc displacement (8/15) in MRI & even out of ADDR & ADDWR more prevalence was present with ADDWR.

Hirata FH et al (2007) investigated the relationship between the articular eminence morphology and disc patterns in patients with disc displacements. The results showed that changes in the morphology of articular eminence (flattened) and disc could contribute to the appearance of disc displacement without reduction on that side.[19]

Our study showed correlation between the type of internal derangement and change in condylar surface morphology. Although a larger sample size is needed for a much-detailed analysis.Sener S, Akgänlü F (2004) concluded that degenerative changes and effusion did not appear to be markers of either ADDR or ADDWR.[20]The prevalence of sideways displacement, disc deformation, signal intensity changes, scar tissue, and osteonecrosis was greater in ADDWR than ADDR.

CONCLUSION

MRI is the diagnostic study of choice for evaluation of disk position and internal derangement of the joint. Understanding of the TMJ anatomy, biomechanics, and the imaging manifestations of diseases is important to accurately recognize and manage these various pathologies. Although already many studies have been done on MRI but such type of studies should be conducted on large scale in future based on specific parameters for early diagnosis and treatment planning for patients suffering with TMD in order to provide quality treatment to the patients at initial stage.

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