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Review article

Review of Frequency of MR Image Findings in Clinical Osteoarthritis Patients Referred to Oral and Maxillofacial Radiology Department of Tehran University of Medical Sciences

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ABSTRACT

Given the high prevalence of temporomandibular joint disorders (TMD) and the negative impact that the lack of treatment in rodent systems, the need for timely diagnosis and treatment of TMJ problems are obvious and also plays a role in diagnosing imaging and especially its advanced types. (1 and 2) In this study, MRI method was used that an excellent way to detect most of temporomandibular joint disorders, especially in soft tissue. Although the role of imaging in the diagnosis of soft tissue TMJ problems has been proven but its capacity for diagnosis of hard tissue is under investigation. (3) Although osteoarthritis in the joint, the CT scan is better than MRI but in CT, bone marrow and effusion signals is not traceable. Since in MR imaging, x-ray is not used, therefore, if possible, the use of MRI in the diagnosis and TMJ problems will be less aggressive than CT method. In this study, we aimed to investigate the prevalence of osteoarthritis image in order to take advantage of MRI in the diagnosis of MR images and osteoarthritis instead of CT Scan. In this study which was the cross-sectional type, joint MRI images of 50 patients referred to radiology department of Oral Medicine, School of Dentistry of Tehran University of Medical Sciences with the voice of Crepitation and pain in the joints was investigated and the frequency of the image indicate pathological changes in the joint (effusion) and a hard place was reported. MRI images were obtained in sagittal and coronal directions miles and protocols PDFS and 2T in the mouth. The images of patients were evaluated for presence of effusion and also the hard disk status and location. According to the results of this study, in people in the study, disc location in most patients (39 joints of 78%) for anterior displacement and detailed in 11 (22%) disc at the normal place was observed. In terms of shape, disc was often (25 joint 50%) in the form of elongated. In terms of the presence of effusion mostly (27 joints of 54%) were positive and the other 23 joints (46%) of effusion was not observed.

Keywords*:* MR, MRI, Clinical osteoarthritis, Effusion ,Osteoarthritis, Oral and Maxillofacial Radiology

INTRODUCTION

A set of different clinical conditions that different parts of the joint including the muscles of mastication affects TMJ joint and different structures which can cause interference in figure or joint natural function, is called TMD. These disorders include extensive disk platter function, ligaments and muscles along, joint arthritis, inflammatory lesions, neoplasms and growth or developmental abnormalities. Signs and symptoms of Dysfunction can be pain in TMJ or ear or both, headache, muscle tenderness, joint stiffness, joint clicking or other noises, decreased range of motion, joint locking and Subluxation. A bunch of degenerative diseases of the temporomandibular joint is known that the wear of articular cartilage and underlying bone remodeling and can be prevented with early detection of serious adverse events and imperative. In the first of patients with TMD, the role of clinical examination is very important [1]. TMD diagnosis is based on clinical symptoms along with a wide range of imaging

helps. The most common cause of TMJ problems is internal derangement that is defined as an abnormal disc and condyle relationship. The exact location of the disk is very important to recognize the internal derangement and is easily accessible by MRI. Given the high prevalence of temporomandibular joint disorders (TMD) and the negative impact that the lack of treatment in rodent systems necessary to timely diagnosis and treatment of TMJ problems are obvious and also the role of advanced imaging and especially its advanced types have in recognition [2]. MR method is an excellent way to detect most of temporomandibular joint disorders, especially in soft tissue. Although the role of this imaging is well established in the diagnosis of soft tissue TMJ problems but its capacity for diagnosis of hard tissue under investigation. [3] Although osteoarthritis in the joint, the CT scan is better than MRI but in CT, and bone marrow signal is not detected effusion. [4] Imaging of the TMJ by MRI can give us a lot of information from the synovial fluid quality hard disk retro tissue and bone status. If we consider that the diagnostic power of this technique Sagittal oblique and coronal images were obtained in 95%, this imaging device is ideal as a way to study hard place. Since in MR imaging, x-rays are not used, therefore, if possible, the use of MRI in the diagnosis and TMJ problems will be less aggressive than CT. Most part of MRI in studies is considered liquid due to the joint space which represents the exudate is caused by the inflammation of the hip, retro disk and other inflammatory changes in other parts of joint, as a result of these changes on MRI characterized by effusion. The study aimed to investigate the prevalence of osteoarthritis circuit (effusion and place of disk and disk-shaped) in order to take advantage of MRI in the diagnosis of MR images and osteoarthritis instead of CT Scan.

Research Literature

1. De Bone and his colleagues in 1986 examined autopsy specimens obtained from 22 Temporomandibular by optical microscopy. In that study Subchondral bone resorption and bone marrow fibrosis surrounding landscape is often accompanied by a large detachment and accumulation of chondrocyte (neurodegenerative diseases) in articular substrate were intact. They conclude that the definition of osteoarthritis include degenerative changes in articular cartilage and bone Subchondral the layers. Although articular microscopic levels are intact. [5]

2. Schellhas and his colleagues in two studies in 1989 and 1990 based on the stereotypes of MRI patients, bone marrow changes associated with a range of pathologies that began with Osteochondritis disecans and lead to avascular necrosis of acute and chronic. [6]

3. Lieberman and his colleagues in 1996, examined the prevalence of abnormal signals condyle bone marrow of stereotypes MRI in 449 patients. In 43% of cases, edema (low signal on T1 and high signal on T2), 23% Sclerosis (low signal on T1 and T2) and less than 21% was observed in both of edema and sclerosis. [7]

4. Larheim and his colleagues in 1999, studied Core biopsy specimens obtained from 50 joints a painful TMJ surgery due to internal derangement were related to the symptoms and the results of MRI. In this study, the sensitivity and specificity of MRI for the diagnosis of osteonecrosis of the mandibular condyle was respectively 78% and 84%. They observed that the stereotypes MRI 5 of the 9 cases of osteonecrosis histological evidence showed that osteoarthritis in four other cases, MRI was normal cortical bone in stereotypes. They conclude that it can affect osteonecrosis of the mandibular condyle and after the cortical bone weakening, lead to osteoarthritis. They also considered the most reliable model for the diagnosis of osteonecrosis of the stereotypes of MRI, a combination of edema and sclerosis [8]

5. Sano and his colleagues (1999) examined the relationship between abnormal signals osteoarthritis condyle bone marrow and stereotypes MRI in two patients (study groups). They stereotypes MRI in 15 of 37 patients with bone marrow showed abnormal signals, observed symptoms of osteoarthritis. They conclude that abnormal signals can be observed in the bone marrow without evidence of osteoarthritis in MRI, which over time may lead to secondary osteoarthritis. [9]

6. Tsukasa Sano and his colleagues in 2000 examined the stereotypes MRI (PDFS images and T2), 112 were diagnosed with temporomandibular joint that A.D.D without reduction. In MRI64 sick, abnormal signals the bone marrow and other natural signals was observed. The pain associated with bone marrow status signals were examined. The pain value in the joints that bone marrow changes were significantly more joints with normal signals. [10]

7. Larheim and his colleagues in 2001, compared stereotypes MRI (PDFS images and T2) 2 groups of subjects (study and control) in terms of bone marrow changes and fluid in the joint spaces. Changes were observed in none of the 62 healthy subjects in the study group. But the changes in 29 of the 58 symptomatic patients (pain along with click-locking or Cryptosporidium) were observed. In this study, all patients with bone marrow changes, there was no return removable disk with Osteoarthritis. [11]

8. M.Chiba and his colleagues in 2006 examined the pattern changes condyle bone marrow edema in 14 joints that were successfully treated by aspiration for closed lock, before treatment, all patients were pain and limited mouth opening and stereotypes in their MRI (PDFS images and T2), bone marrow edema pattern was observed. MRI stereotypes in which at least one year after treatment were successful, bone marrow edema pattern remained in the 10 detailed, but the pain was reduced statistically. They conclude that the pattern of condyle bone marrow edema associated with the occurrence of pain. [12]

The main objective of the project:

Review of frequency of MR imaging in clinical osteoarthritis patients referred to Oral and Maxillofacial Radiology Department of the Faculty of Dentistry, Tehran University of Medical Sciences in 2009.

Secondary objectives of the project:

Determination of frequency of disc location in clinical osteoarthritis patients

Determination of frequency of disc shape in clinical osteoarthritis patients

Determination of frequency of effusion existence in clinical osteoarthritis patients

Review of the relationship between effusion and disc location

Review of the relationship between effusion and disc type

The applied objective of the project:

Review of the possibility of using MRI for the diagnosis of osteoarthritis

Hypotheses or research questions:

How is the frequency of articular disk location in the patients studied?

How is the frequency of articular disk shape in the patients studied?

How is the frequency of effusion existence in the studied patients?

Is there a relationship between effusion and disk location?

Is there a relationship between effusion and disk type?

RESEARCH METHODOLOGY

This study is designed to be cross-sectional. The statistical population of this study consists of patients referring to the Department of Radiology at the Faculty of Dentistry who referred to this center for the diagnosis of TMJ. Patients with clinical diagnosis of osteoarthritis were defined as the presence of both pain and crepitus. A total of 50 joints were consecutively entered into the study. The choice of patients was that the patient was asked to open his or her mouth, in the event of pain in this location, the joint was considered as a positive sign. For a joint touch, the lateral condyle was pressed, if the pain in this sign was considered positive. Patients with both pain states were considered as patients with a positive pain symptom. The sound was evaluated in the joint by two-finger touch and with a stethoscope. [13] If it was touched or heard with a cystoscope and finger touch, this sign was also considered as positive crepitus. Patients who were positive had both symptoms of crepitus pain in those with clinical osteoarthritis. MRI was prepared from these patients with informed consent. Images were reviewed by two observers individually. Results were reported. In the event of a conflict, the comments of the images were reviewed again and the results were reported in agreement. PD images (proton density) and T2 were examined on a computer by two observers and

radiographic findings indicating effusion changes and also the location and shape of the joint disk were studied. The results were analyzed by statistical methods (Frequency table, Fisher test, Cal-Square test and Kruskal-Wallis test).

Information collection tools and how to collect them

MRI images are provided by Tesla MRI 1.5 (WI and Milwaukee, General Electric and Sigma) and using 8-channel series coils acting as receivers. MRI images are prepared in the direction of the Sagittal and Coronal miles and with proton density protocols and 2T in the mouth closed and open according to Table 2.

Table 1. Features of the provided images

	Proton density	T_2
TR/TE	1500.24 ms	2000.80 ms
FOV	10-12 Cm	10-12 Cm
Thickness	3 mm	3 mm
Matrix	256 * 256	256 * 256
NEX	1	1

Sample size calculation method:

Based on the following formula and source information, the following was determined:

$$h=\frac{p\times q\times\left(u_{\frac{\alpha}{2}}\right)^2}{h^2}\cong 50$$

$$p=0.96 \quad q=0.04 \quad u_{\frac{\alpha}{2}}=1.96 \quad h\cong 0.054$$

In the osteoarthritis group, the ratio of those with the above source was OA and abnormal signal. = p

Number: 50 joints.

Ethical Considerations:

Although MRI method, ionizing radiation and harmful radiation are not used, informed consent is received from all patients for MRI.

Constraints of the design and method of reducing them:

Finding patients with the above conditions is difficult.

According to the research objectives, descriptive statistical methods (frequency tables and inferential tables) (Fisher's exact test, Chi-square test and Kruskal-Wallis test) were used.

The criterion of statistical tests is the attention to P-value and its comparison and comparison at a significant level of 5%.

SPSS ver 16 software was used to analyze the data.

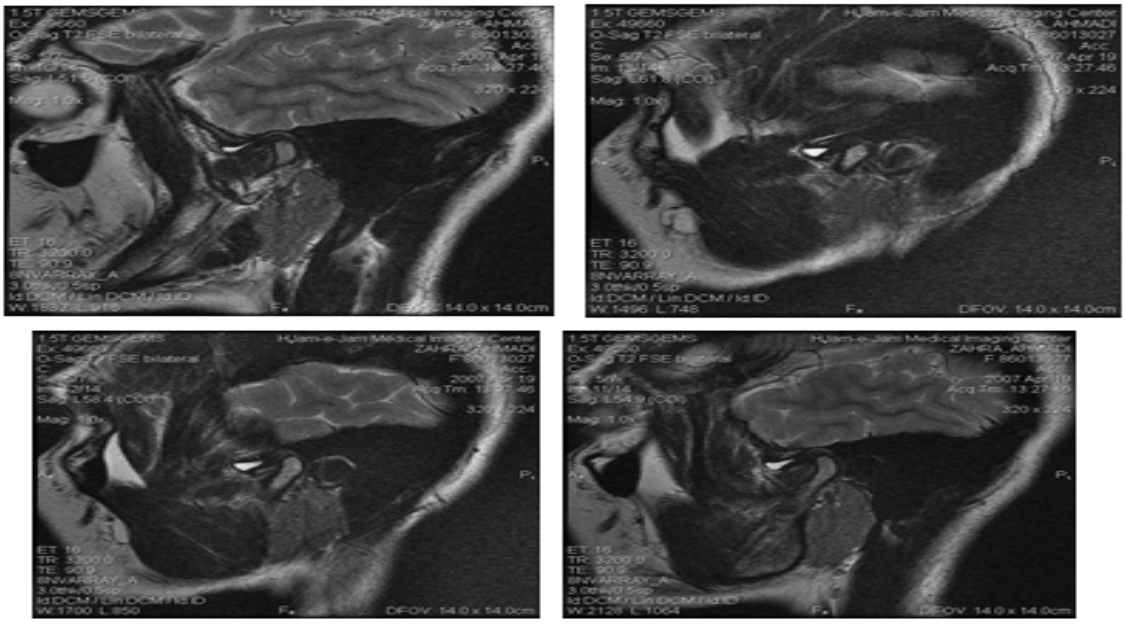

Figure 1. Effusion in PD image

Figure 2. The normal location and shape of the articulated disk in the PD image

Figure 3. Disk with AD status and as elongated shape

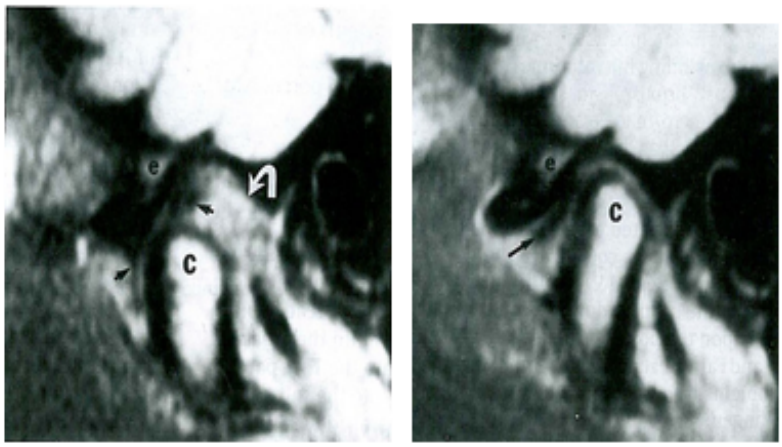

Figure 4. Anterior motion of the disc with a return

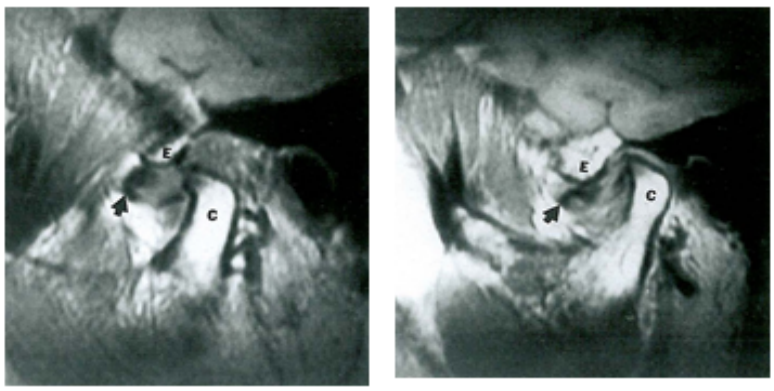

Figure 5. Anterior dislocation without return and disk with ovoid shape

RESEARCH RESULTS

Table 2. Research findings according to the shape and location of the disk and presence of effusion

		Count	%
Disk location	Anterior displacement	39	78.0
	Normal	11	22.0
Disk shape	Elongated	25	50.0
	Normal	17	34.0
	Ovoid	8	16.0
Effusion	Negative	23	46.0
	Positive	27	54.0

According to this table, in the subjects studied, the disc location was seen in most individuals (39 joints, 78%), as anterior displacement, and in 11 other (22%) discs observed in the natural site. In terms of the shape, the disc is often elongated (25 joints 50%) and the least disk (8 joints equivalent to 16%) was oval in shape. In 17 joints (34%), a normal disc shape was observed. In terms of effusion, most of them (27 equivalent to 54%) were positive and in 23 other cases (46%), effusion was not observed.

Table 3. The frequency of effusion presence in terms of disk shape and location

		Effusion				
		Negative		Positive		P-Value
		Count	%	Count	%	
Disk location	Anterior displacement	16	69.6	23	85.2	0.305*
	Normal	7	30.4	4	14.8	
Disk shape	Elongated	12	52.2	13	48.1	0.501**
	Normal	9	39.1	8	29.6	
	Ovoid	2	8.7	6	22.2	

*: Using Fisher's exact test

**: Using Kruskal Wallis Test

Based on this table, in the subjects studied, regardless of the presence or absence of effusion (85.2% and 69.6%) in terms of AD disk location is prevails. Also, most people who had effusion (48.1%) and had not (52.2%) were elongated in terms of disk shape. Also, based on the above table, there was no significant relationship between effusion and the shape and location of the disk.

Table 4. Chi-square test results about hypotheses

Variable name	Test statistic	P-Value	Considerations
Presence of effusion	032	0.572	1
Disk shape	8.86	0.013	2
Disk location	15.68	0.0001	3

1: According to this test, in the statistical society, the ratio of people with effusion has no significant difference with those who do not have it (P-Value≥0.05).

2: According to this test, in the statistical society, the shape of the disks shows a significant difference, with each other, which is often elongated.

3: According to this test, in the statistical society, the location of the disc shows significant differences with each other, which is often anterior displacement.

DISCUSSION AND CONCLUSION

The results of our study indicated that 27 joints of 50 joints (54%) effusion was observed these results are consistent with the results of the study by Larheim et al that was conducted in 1999. It is also consistent with the results of the study by Sano et al that was conducted in 1999 but it is different from the results of Tsukasa Sano et al that was conducted in 2000 that this can be due to the different sampling method in the two studies, also the result of the study is in perfect agreement with the study of Larheim et al in 2001 and M.chiba et al in 2006 that was conducted on PD and T2 images. In our study, it

has been found that there is no significant difference in the effusion between individuals with clinical osteoarthritis based on different statistical tests (P value> 0.05). The results of this study indicate that there is no significant relationship between the shape of the disk and the presence of effusion. Based on the results of this study, the presence of AD in the studied patients, whether positive or negative, is much more common than the placement of the disk in the normal location (78% versus 22%), which is justified by the chronic course of osteoarthritis. According to the results of this study, the most common form of disc in patients with elongated shape with 25 numbers is equivalent to 50% and the least common form of an ellipse-shaped disk with 25 numbers is equivalent to 16% and 17 patients showed the equivalent of 34% of normal disk shapes.

In this study, due to the presence of ionizing radiation in the CT Scan method and the ethical problems of using it, we decided to use the MRI method to evaluate these patients despite the greater ability of CT to detect bone problems. In this study, due to the above mentioned limitations in the case of the CT method, our patient's diagnostic criteria were based on a clinical examination that ideally all our patients should have a stereotypic CT so that the diagnosis of radiographic osteoarthritis is confirmed and then the samples are included in the study, which can be taken into account above as disadvantages of studying.

Of course, according to a study of doctor Fatemitabar and Mr. Mousavi, it was found that all patients with a diagnosis of clinical osteoarthritis in a radiographic stereotype whose CT showed erosion, indicates that they are in complete agreement with clinical and radiographic osteoarthritis diagnosis. Another problem is the limited statistical population of patients with osteoarthritis, due to the low frequency of these patients and therefore, for future studies, it is suggested that sampling of both healthy and osteoarthritis is conducted and compare the presence of the effusion and the shape and location of the disk in the two groups so that the results can be transferred to the entire community.

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