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The Future Role of MR T2 Mapping in Detection of Early Cartilage Degeneration in Shoulder Joint

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Abstract

Background: Osteoarthritis of the shoulder or glenohumeral osteoarthritis is referred to as progressive damage of the glenohumeral cartilage associated with bony erosions pain and a loss in function of the glenohumeral joint. Osteoarthritis is characterized by progressive joint alteration, due to a combination of mechanical, inflammatory and metabolical factors not only affect the hyaline cartilage but also the surrounding tissues, including the subchondral bone, the joint capsule and the synovium as well as the ligaments and in case of the shoulder the rotator cuff. These alterations are thought to arise from an imbalance between destruction and repair of the affected tissues.

Aim of Study: To highlight the role of MR T2 mapping in early detection of cartilage degeneration.

Patients and Methods: The study included 30 patients and was conducted in Radiology Department at Ain Shams University Hospitals. The patients underwent MR examination using a 1.5 T machine (Ingenia, Philips medical system, Eindhoven, Netherland) using phased array coil and T2 cartilage mapping was added to routine examination.

Results: In our work, the T2 values of the humeral and the glenoid zones were higher than those of the central zone because of the friction force, also higher T2 values have been reported in the deep layers than in the superficial layers as it is nearer to bone. Our study showed red-orange-yellow color in normal cartilages while green-blue color showed in case of cartilage degeneration. In the current study, we used the kappa agreement to show the degree of agreement between conventional MRI and T2 intensity as well as color map.

Conclusion: In conclusion, the addition of T2 mapping sequence to routine MRI of the shoulder significantly increased the sensitivity for detecting cartilage lesions within the shoulder joint, with improved detection of early cartilage degeneration.

Key Words: *Future role MR – T2 Mapping – Cartilage degeneration – Shoulder joint.*

Introduction

PAIN around the shoulder joint with or without reduced range of motion are commonly referred to the radiologist for evaluation. Clinical examination and plain radiographic assessment help in providing proper choice of subsequent investigation modality. MRI because of its excellent soft tissue contrast, imaging capability in any desired plane & non ionising and non-invasive nature is an ideal modality of investigation. It has replaced all other tests and considered as screening modality of choice in evaluation of shoulder problems [1].

The shoulder is a complex structure consisting at its most basic level of two joints, one of which, the glenohumeral joint, is reinforced by a fibrocartilaginous labrum and is supported by multiple ligaments, muscles, tendons, and articular surfaces. Although each imaging modality used in the evaluation of the shoulder joint has strengths and weaknesses, MRI provides, by far, the most comprehensive and simultaneous review of its important anatomic structures, serves as the imaging reference standard for the evaluation of labral pathologic abnormalities, and is the preferred modality for the evaluation of rotator cuff tears and radiographically occult fractures, among other indications [2].

Aim of the work:

To highlight the role of MR T2 mapping in early detection of cartilage degeneration in shoulder joint.

Patients and Methods

Patients: The study included 30 patients and was conducted in Radiology Department at Ain Shams University Hospitals. The patients underwent MR examination using a 1.5 T machine (Ingenia, Philips medical system, Eindhoven, Netherland) using phased array coil and T2 cartilage mapping was added to routine examination.

Inclusion criteria: Patients presented with shoulder pain (above 18 years).

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Exclusion criteria: Contraindications for MRI, Implanted device, Pacemakers, Claustrophobia and Patients with any previous shoulder surgery.

Methods:

Type of study: Descriptive study.

Study period: 10 months from July 2020 to May 2021.

Sampling method: Convenient sample of cases with shoulder pain.

Imaging protocol: All patients underwent conventional MRI with the routine MRI sequences taking the T2 TSE and the PD as the sequences of comparison with the T2 mapping and color map.

Table (1): Conventional MRI imaging.

Sequence	TR (msec.)	TE (msec)	FOV (mm)	Matrix	Slice thickness (mm)	Slice gap (mm)
Axial T2 fat sat	3130m/s	60m/s	22* 18mm	310*620	4mm	0.4mm
Coronal oblique T1	630m/s	1 0m/s	22* 18mm	310*620	4mm	0.4mm
Sagittal oblique T2	3360m/s	80m/s	22* 18mm	310*620	4mm	0.4mm
Coronal oblique T2 fat-sat	3245m/s	70m/s	22* 18mm	310*620	4mm	0.4mm
Coronal oblique T2 (TSE)	3220m/s	70m/s	22* 18mm	310*620	4mm	0.4mm
Axial PD	3500m/s	20m/s	22* 18mm	310*620	4mm	0.4mm
Coronal oblique T2 mapping	2630 m/s	39m/s	22* 18mm	159*318	3mm	1mm

Position the patient in supine position with head pointing towards the magnet (head first supine) Position the shoulder in the Shoulder coil and immobilize with sand bags Centre the laser beam localiser over the shoulder joint or the mid line of the coil Register the patient on the scanner as 'head first supine.

Plan the axial slices on the coronal plane; angle the position block perpendicular to glenohumeral joint. Check the positioning block in the other two planes. An appropriate angle must be used in the sagittal plane (perpendicular to the humeral head). Slices must be sufficient to cover the whole shoulder joint from top of acromioclavicular joint to two slices below the inferior glenohumeral Ligament (articular capsule).

Plan the coronal slices on the axial plane; angle the position block parallel to supraspinatus tendon. Check the positioning block in the other two planes. An appropriate angle must be used in the sagittal plane (parallel to the humeral head). Slices must be sufficient to cover the whole shoulder joint from anterior portion of coracoid process to two slices posterior to the humeral head.

Plan the sagittal slices on the axial plane; angle the position block perpendicular to supraspinatus tendon. Check the positioning block in the other two planes. An appropriate angle must be given in the coronal plane (parallel to the glenohumeral joint). Slices must be sufficient to cover the whole shoulder joint from deltoid muscle to two slices medial to the glenoid.

Then the patients were assessed using a multi-echo spin pulse sequence (T2 mapping) of the coronal plane. Three areas were considered to evaluate the cartilage-humeral zone (zone A), glenoid zone (zone C), and central zones (zone B) by manually drawing the region of interest (ROI).

After that a colored T2 map was generated using the default functions and settings of the software. The T2 maps included 16-22 color coronal-oblique images of the glenohumeral joint.

Image interpretation: The basic parameters of the T2 intensity were default parameters of 25-75 msec. Color scale included the spectrum range from red to blue. Thus, the cartilage with the lowest T2 intensity (lowest concentration of the extracellular water) was marked with colors of the lower part of the scale (red-orange-yellow), and the cartilage with the highest T2 intensity was marked with the colors of the upper part of the scale (green-blue).

Hyaline cartilage was considered normal if uniform in thickness and intermediate signal, colored orange-red in the spectrum of color map, with low T2 values.

The cartilage was considered abnormal if T2 values of the cartilage increased, colored green-blue in the spectrum or if the cartilage had a defect, was thin, or absent.

All patients underwent routine MRI, T2 mapping and colored map and we compared the conventional coronal T2 TSE and PD with the T2 map and the colored map to assess the results.

Statistical analysis: The collected data was revised, coded, tabulated and introduced to a PC using statistical package for social science SPSS (15.0.1 for windows).

Results are expressed as mean (as a measure of central tendency) ± standard deviation (as measures of variability) or number (%).

Table (2): Kappa agreement was used to assess the agreement between conventional MRI and T2 intensity and also colour mapping; the kappa agreement interpretation in our study was as follows:

Kppa	Agreement	Interpretation
<0	Less than chance agreement	Poor
0.01-0.20	Slight agreement	Slight
0.21-0.40	Fair agreement	Fair
0.41-0.60	Moderate agreement	Moderate
0.61-0.80	Substantial agreement	Substantial
0.81-1.00	Almost perfect agreement	Almost perfect

Results

This study was carried out on 30 patients suffering from shoulder pain who referred to Radiology Department at Ain Shams University Hospitals during the period from July 2020 to May 2021.

The age was ranged from 19 years to 62 years. The median age in patients was 44.5 years with IQR 19-56 years.

15 patients (50%) were males and 15 of them (50%) were females with Male to Female ratio of 1:1.

21 patients suffered from shoulder pain and 9 patients were exposed to trauma.

Table (3): Distribution of age in study group.

Age (years)	Mean ± SD	37.18±20.56
	Median (IQR)	44.5 (19-56)
	Range	0.75-62
Gender	Male, n (%)	15 (50%)
	Female, n (%)	15 (50%)

SD = Standard deviation.

Cartilage Assessment by conventional MRI:

As shown on Table (4), 18 (60%) had intact cartilage, 4 (13%) had decreased cartilage thickness, and 8 (26%) had high signal cartilage.

On routine MRI sequences, hyaline cartilage was considered normal if uniform in thickness and intermediate intensity. The cartilage was considered abnormal if there was increased signal or if the cartilage had a defect, was thin, or absent.

Table (4): Cartilage assessment by conventional MRI.

		N	%
Cartilage Assessment	Intact cartilage with no effusion	18	60
	Decreased cartilage thickness	4	13
	High signal cartilage	8	26

- T2 Value of glenoid zone cartilage (measured at the most inferior portion of the glenoid cavity).

Table (5): T2 values of glenoid zone.

	T2 value Deep	T2 value intermediate	T2 value superficial
Mean	52.73	46.26	47.32
Median	48.2	40.95	43.45
Std. Deviation	31.42	24.75	27.77
Minimum	3.9	5.3	8.1
Maximum	124.1	88.0	85.4
IQR:			
25th percentile	37.0	27.5	29.0
75th percentile	66.6	60.7	76.5

This box plots shows that the mean in the deepest part of the glenoid zone is the highest which means that it's the most affected part.

- T2 Value of central zone (measured at the central part of cartilage).

Table (6): T2 Value of central zone.

	T2 value Deep	T2 value intermediate	T2 value superficial
Mean	43.22	46.68	58.0
Median	47.05	50.25	45.9
Std. Deviation	18.5	17.41	37.28
Minimum	2.0	17.3	21.6
Maximum	70.8	78.5	157.1
IQR:			
25th percentile	34	38.1	34
75th percentile	54	55.8	61.5

This table shows that the intermediate part has the highest values which means that this the most part exposed to degeneration.

- T2 Intensity of humeral zone (measured at the most superior-lateral portion).

Table (7): T2 values in humeral zone.

	T2 value Deep	T2 value intermediate	T2 value superficial
Mean	65.37	47.63	42.63
Median	62.1	53.2	44.8
Std. Deviation	30.27	16.34	15.08
Minimum	18.3	9.6	10.7
Maximum	136.6	63.5	61.3
IQR:			
25th percentile	51.9	37.6	31.3
75th percentile	78.9	61.1	58.2

From the above box plot we can conclude that the mean of the deep part is the Highest as it is the most degenerated part.

Color Mapping of humeral zone:

Table (8) showed color mapping of humeral zone, 15 (50%) patients showed green to blue color appearance, 3 (10%) patients showed orange to yellow, orange to red, orange to green, yellow to green and green to yellow separately.

- Red- orange- yellow indicates low T2 intensity.
- Green- blue indicates high T2 intensity.

Table (8): Color Map of humeral zone.

		N	%
Color Map-Humeral zone	Green to blue	15	50.0
	Orange to yellow	3	10.0
	Orange to red	3	10.0
	Orange to green	3	10.0
	Yellow to green	3	10.0
	Green to yellow	3	10.0

Color Mapping in glenoid zone:

Table (9) showed color mapping of glenoid zone. The color scale ranged from red to blue. 9 (30%) patients showed orange to yellow color appearance, 6 (20%) patients showed green to blue, yellow to green and blue appearance separately and only 3 (10%) patients showed red color appearance.

Table (9): Color Mapping in glenoid zone.

		N	%
Color Map-Glenoid zone	Green to blue	6	20.0
	Orange to yellow	9	30.0
	Yellow to green	6	20.0
	Blue	6	20.0
	Red	3	10.0

This table shows that 9 cartilages (30%) (the highest percentage) shows orange-yellow color in the spectrum which means the T2 values are not high and that they are not exposed to degeneration yet. On the other side 6 cartilages (20%) shows green-blue color in the spectrum which means that their T2 values are high and they are the cartilages most exposed to degeneration. This appears early before being detected by the conventional MRI.

Table (10): Conventional MRI (coronal T2 TSE, PD) finding regarding abnormality.

	Normal	Abnormal		
		Decreased Cartilage thickness	High Signal Intensity	Cartilage Defect
Number of cases	18 (60%)	5 (16%)	5 (16%)	2 (8%)

Table (11): T2 Intensity regarding cartilage abnormality.

	Normal T2 value (25-75msec)	High T2 value (ABNORMAL)
Number of cases	12 (40%)	18 (60%)

Table (12): Color map regarding cartilage abnormality.

	Orange to Red color (NORMAL)	Green to Blue (ABNORMAL)
Number of cases	10 (33.3%)	20 (66.6%)

Table (13): Agreement table between conventional MRI and T2 intensity as well as color map using kappa test.

	Conventional MRI		Test value*	*p*-value	Kappa agreement (95% CI)
	Normal No.=18	Abnormal No.=12			
T2 intensity:					
Normal	9 (50.0%)	3 (25.0%)	1.875	0.171	0.231 (-0.0858 to 0.547)
Abnormal	9 (50.0%)	9 (75.0%)			
Color Map:					
Normal	9 (50.0%)	0 (0.0%)	8.571	0.003	0.444 (0.192 to 0.697)
Abnormal	9 (50.0%)	12 (100.0%)			

*: Chi-square test. CI: Confidence interval.

Illustrative Cases:
Case (1):

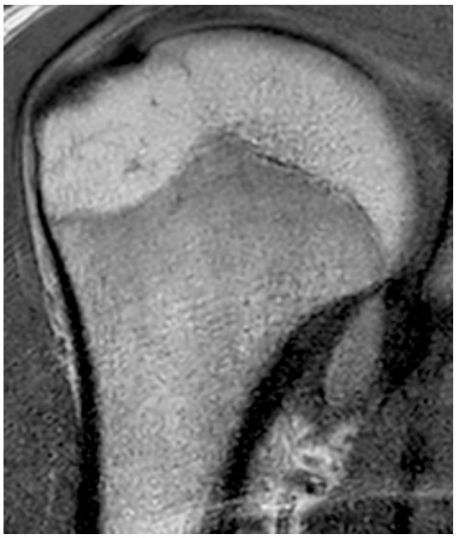
History: Male, 19 -years-old, came as a volunteer.

Findings:

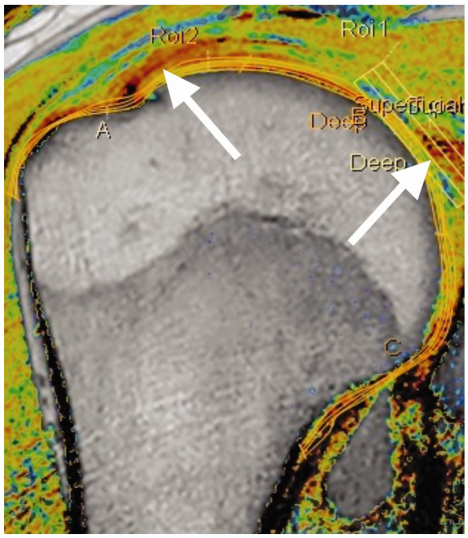
- Conventional sequence: Coronal T2 turbo spin echo of right shoulder showed low Cartilage signal and average thickness of the glenohumeral Cartilage (Fig. 1A).
- Color map: Revealed that the superficial layers have red-orange color (white arrows) indicating low T2 value (Fig. 1B).

By measuring T2 values at the three zones (glenoid, humeral and intermediate zone) we found that the average T2 value at the deep layer range between 37-54ms. (Fig. 1C).

(A)



(B)



(C)

Roi2	A	B	C
Deep	37.6 (36.5)	54.0 (52.8)	37.4 (42.7)
Intermediate	37.6 (27.2)	38.1 (19.8)	27.5 (25.0)
Superficial	30.0 (20.8)	43.7 (10.6)	29.0 (69.8)

(D)

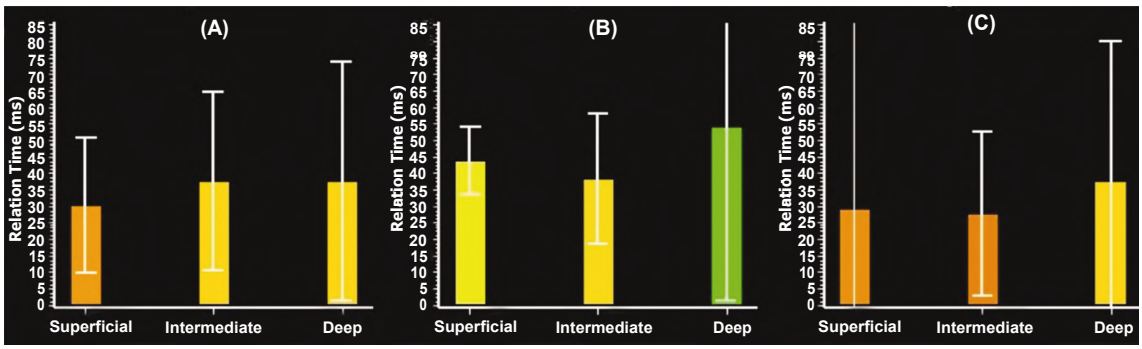


Fig. (1): (A) Coronal T2 turbo spin echo of right shoulder revealed intact appearance of glenohumeral cartilage with average thickness about 1.4mm. (B) T2 mapping with color map revealed red to orange color (white arrows) corresponding to low T2 value matching with intact cartilage. (C) Table shows the values of mean T2 mapping in each zone of the glenoid, humeral and central and each zone in the superficial, deep and intermediate layer revealing that the T2 values are higher in the deep layers than the superficial layers. (D) Colored Bar chart shows T2 values at each layer (superficial, deep, intermediate) showing orange and yellow colors (low T2 values).

Conclusion: Intact glenohumeral Cartilage by assessment of conventional sequence and confirmed data by T2 mapping that shows low T2 value and normal red color denoting intact cartilage.

Final diagnosis: At T2 mapping, intact glenohumeral Cartilage.

Case (2):

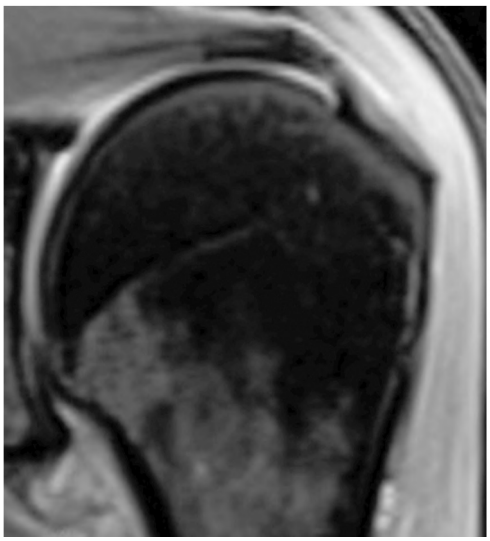
History: Male, 79 years, moderate degree chronic shoulder pain.

Findings:

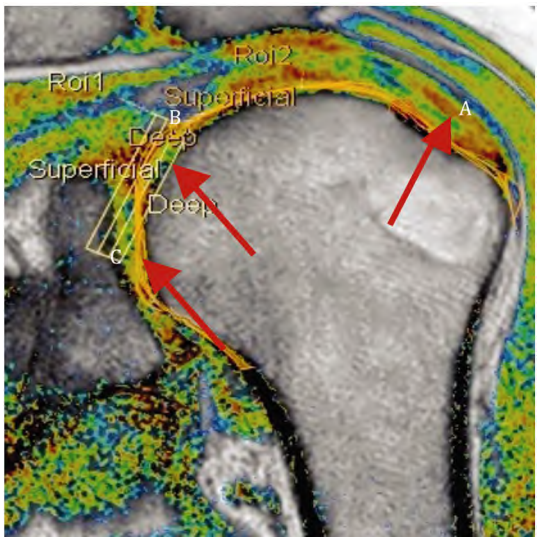
• Conventional sequence: Coronal T2 turbo spin echo of left shoulder Shows areas of high signal of glenohumeral cartilage.

• Color map: Showing areas of green color (red arrows) seen as fragmentation of color covering the humerus corresponding to high T2 values matching with cartilaginous changes.

(A)



(B)



(C)

Roi2	A	B	C
Deep	46.4 (139.9)	48.2 (23.4)	51.9 (51.6)
Intermediate	33.9 (45.4)	38.6 (25.2)	52.1 (43.2)
Superficial	44.8 (125.3)	43.2 (44.7)	58.2 (31.9)

(D)

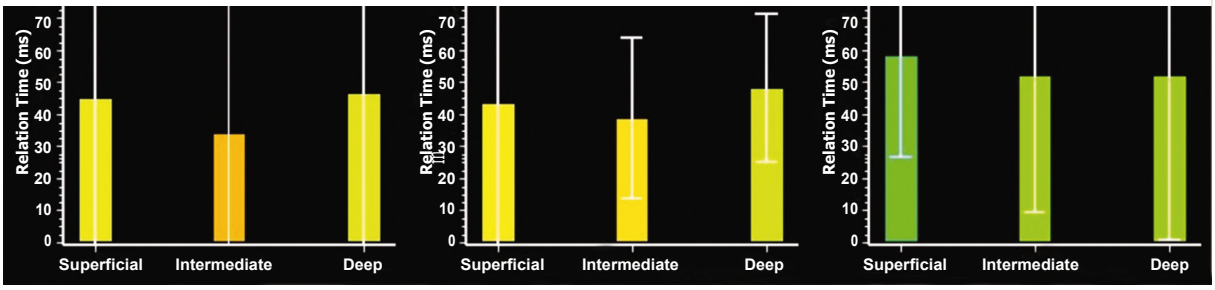


Fig. (2): (A) Coronal T2 turbo spin echo of left shoulder revealed osteoarthritic changes in the form of areas of high signal. (B) T2 mapping with color map revealed areas of green color (high T2 value) covering the humerus (red arrows). (C) T2 values in the 3 zones (glenoid, humeral, central) each in the 3 layers (superficial, deep, intermediate) showing high T2 value in the deep layer and lower T2 value in the superficial layer. (D) Colored Bar chart shows T2 values at each layer (superficial, deep, intermediate) showing yellow to green color indicating high T2 values matching with cartilaginous changes.

Conclusion: At conventional sequence high signal of glenohumeral Cartilage with a cartilaginous defect in the humeral head and At T2 mapping glenohumeral cartilage shows elevated T2 values matching with cartilaginous defects.

Final diagnosis: At T2 mapping osteoarthritic changes of glenohumeral Cartilage.

Case (3):

History:

Female, 34 years, moderate degree chronic shoulder pain.

Findings:

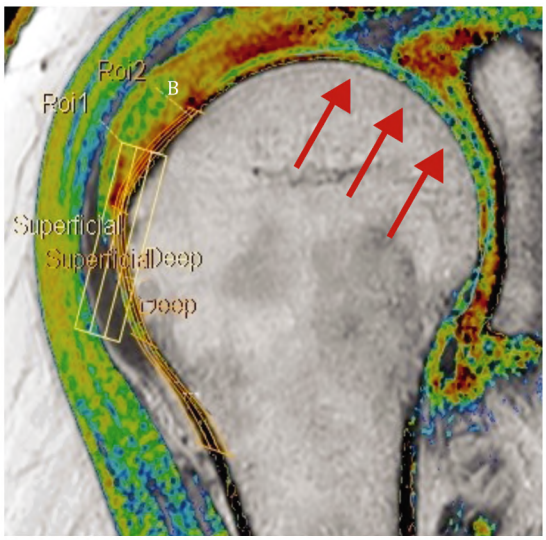
Conventional sequence: Coronal fat suppressed T2 Showed focal high signal involving the glenohumeral Cartilage.

Color map:

Showing diffuse area of green to blue color (red arrows) of the glenohumeral Cartilage corresponding to elevated T2 values matching with cartilaginous changes.

(A)

(B)



(C)

Roi2	A	B	C
Deep	91.6 (59.7)	121.2 (20.5)	132.8 (12.9)
Intermediate	60.4 (31.6)	104.1 (27.2)	102.9 (48.6)
Superficial	75.4 (25.5)	120.2 (39.1)	128.0 (45.7)

(D)

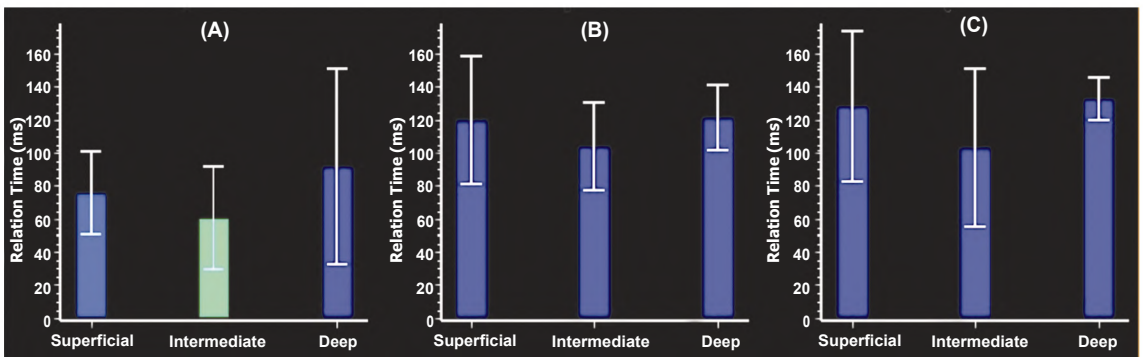


Fig. (3): (A) Coronal fat suppressed T2 of right shoulder revealed osteoarthritic changes. (B) T2 mapping with color map revealed diffuse area of blue color of the glenohumeral Cartilage corresponding to elevated T2 values. (C) T2 values in the 3 zones (glenoid, humeral, central) each in the 3 layers (superficial, deep, intermediate) showing very high T2 values in the deep layers corresponding to cartilage degeneration. (D) Colored Bar chart shows T2 values at each layer (superficial, deep, intermediate) showing light blue color in the superficial layer which tends to be darker in the deep layer indicating high T2 values explaining the cartilaginous changes in the shoulder joint.

Conclusion:

- At conventional sequence reduced glenohumeral Cartilage thickness with high signal
- At T2 mapping glenohumeral Cartilage showing high T2 value denoting significant cartilaginous changes

Final diagnosis: At T2 mapping osteoarthritic changes of glenohumeral Cartilage appears.

Discussion

The study was carried out on 30 patients suffering from shoulder pain. 15 patients (50%) were males and 15 of them (50%) were females with Male to Female ratio of 1:1 and the age ranged from 19 years to 62 years (with mean age 44.5 years) Table (3).

In the study of [8], the patient population consisted of 16 women and 11 men (ages 21-83 years, mean age 46 years).

In our study we used the conventional MRI to compare with the T2 mapping and color map in detection of early cartilage degeneration.

Conventional MRI showed 18 patients (60%) with intact cartilage, 4 patients (13%) with decreased cartilage thickness, and 8 patients (26%) with high signal cartilage Table (4).

Osteoarthritis is characterized by progressive joint alteration, due to a combination of mechanical, inflammatory and metabolical factors. These alterations are thought to arise from an imbalance between destruction and repair of the affected tissues.

On routine MRI, normal cartilage appeared intact with uniform thickness and intermediate signal, while abnormal cartilage showed either decrease in cartilage thickness or high signal intensity.

These findings may detect cartilage degeneration in the shoulder joint that helps in early diagnosis and treatment.

In this study we compared the mean T2 values of the patients from three specific articular surface zones at the coronal plane: The humeral zone, the central zone, and the glenoid zone.

In our work, the T2 values of the humeral and the glenoid zones were higher than those of the central zone because of the friction force, also higher T2 values have been reported in the deep layers than in the superficial layers as it is nearer to bone.

In our study, mean T2 values of the deep layer in the glenoid zone showed higher values than the superficial layer T2 values. Table (5) refer to Case (1).

On the other hand, in the central zone the mean T2 value in the deep layer was lesser than that in the superficial layer Table (6) refer to Case (2).

Concerning the humeral zone mean T2 values of the deep layer was higher than the superficial layer T2 values. Table (7) refer to Case (3).

In agreement [9] study showed that normal articular cartilage demonstrates an increase in T2 values from the deep zone, where the T2 value is shortest to the superficial zone.

T2 is sensitive to slow molecular motions of water protons and anisotropy of the tissue matrix. The limited mobility of cartilage water within a highly anisotropic matrix produces relatively short T2 values in the cartilage. Results of prior studies showed that normal articular cartilage demonstrates an increase in T2 values from the deep zone, where the T2 value is shortest to the superficial zone. Cartilage T2 mapping uses intrinsic cartilage water as a probe to study the structural integrity of the extracellular matrix. Changes of the spatial distribution of the T2 values reflect areas of increased and decreased water content and may be used to diagnose cartilage degeneration even before decrease of cartilage can be appreciated.

Contrary to our study, [10] study reported that the mean and the median T2 values varied widely in both humeral and glenoid zones. These differences might be due to the different segmentation and regions of interest (ROIs) used in the selection protocols of the two studies.

In agreement [11] study, T2 mapping has been used to look at glenohumeral osteoarthritis and focal cartilage damage compared the median T2 values of patients with glenohumeral osteoarthritis to patients with normal macroscopic cartilage and demonstrated significantly higher total (glenoid and humeral head combined) T2 values for patients with osteoarthritis (median 37.52ms; range 36.84-39.11ms) compared to patients without (median 36.00ms; range 33.89-37.31ms).

In agreement with [11] the current study detected higher T2 values in glenoid and humeral zones for patients with shoulder pain (40.95ms; range 43.45-48.2) and (median 53.2ms; range 44.8-62.1ms) respectively.

On contrary, In [12] study no significant change in T2 values with cartilage degeneration relative to normal cartilage were reported.

In the current study, T2 color maps were used to show the difference in color in healthy cartilage with low T2 value (red-orange) as in Case (1) and degenerated one with high T2 value (green-blue) as in Case (7).

In agreement the study of **[8]** in nine joints, the cartilage had higher than normal T2 values which appeared as green-blue color. In seven of these joints, increased signal in cartilage on conventional MR sequences was readily demonstrated. In two other joints, an increased signal in cartilage on conventional MR sequences was less apparent than the green-blue color on T2 map in the corresponding segment of the articular surface.

In the current study, we divided the glenohumeral cartilage into glenoid and humeral zones:

In the glenoid zone:

9 cartilages (30%) showed orange-yellow color on T2 colour map which means the T2 values are not high and that they are not exposed to degeneration yet. On the other hand 6 cartilages (20%) showed green-blue color in the spectrum which means that their T2 values are high and they are the cartilages most exposed to degeneration. This appears early before being detected by the conventional MRI Table (9).

In the humeral zone:

15 (50%) patients showed green to blue color appearance, 3 (10%) patients showed orange to yellow, orange to red, orange to green, yellow to green separately Table (8).

We can conclude that in the humeral zone a high percentage (50%) of the patients are in the green to blue zone which means they have high T2 values and that predicts early cartilage degeneration which can assist in early cartilage management and treatment.

While in the glenoid zone the percentage of patients in the green to blue zone is less (20%) and those in the orange to red zone is higher (30%)

This difference may be due to a specific region on the articular surface might be prone to degeneration more than other regions. For example, deep layers are more susceptible to degeneration due to their friction with the bone while superficial layers are away from the bones which makes them less prone to degeneration **[1]**.

In the current study, we used the kappa agreement to show the degree of agreement between conventional MRI and T2 intensity as well as color map.

Conventional MRI fairly agrees with T2 intensity (0.231) while it agrees moderately with the color map (0.444).

This degree of agreement highlights the importance and the added value of T2 MAPPING in detection of early degeneration of shoulder cartilage Table (12).

Conclusion:

In conclusion, the addition of T2 mapping sequence to routine MRI of the shoulder significantly increased the sensitivity for detecting cartilage lesions within the shoulder joint, with improved detection of early cartilage degeneration.

In addition, the results of this study demonstrate the feasibility of acquiring cartilage T2 maps of the shoulder in routine clinical settings. Also the addition of T2 colored maps with clinical MR imaging had a very significant role in the early diagnosis of degenerative joint disease.

Cartilage T2 mapping has valuable potential practical applications. It can be used to diagnose “cartilage at risk” and cartilage with irreversible damage. This may be extremely helpful in the assessment of functional potential, especially in young patients and sportsmen.

Furthermore, it can be used as a non-invasive tool to study cartilage composition of repair tissue post-cartilage repair procedures or to monitor the effect of chondroprotective therapy. Cartilage T2 mapping of glenohumeral joint may also have clinical research applications in the study of arthritis and may provide novel information that improves understanding of the pathophysiology of generalized osteoarthritis.

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الدور المستقبلى لرسم الخرائط MRT2 فى الكشف المبكر عن تآكل مفصل الكتف

الخلفية: يشار إلى هشاشة العظام فى الكتف أو إلتهاب المفاصل الحقانى العضدى على أنه تلف تدريجى للغضروف الحقانى العضدى المرتبط بألم تآكل العظام وفقدان وظيفة المفصل الحقانى العضدى. يتميز الفصال العظمى بالتغيير التدريجى للمفصل، بسبب مجموعة من العوامل الميكانيكية والالتهابية والأيضية التى لا تؤثر فقط على الغضروف الهيالينى بل تؤثر أيضاً على الأنسجة المحيطة، بما فى ذلك العظم تحت الغضروف وكبسولة المفصل والغشاء الزليلى وكذلك الأربطة وفى الحالة من الكتف الكفة المدورة. يُعتقد أن هذه التغييرات تنشأ من عدم التوازن بين تد مير وإصلاح الأنسجة المصابة .

الهدف من الدراسة: هو تسليط الضوء على دور رسم خرائط MRT2 فى الكشف المبكر عن تنكس الغضروف.

المرضى وطرق الدراسة: شملت الدراسة ٣٠ مريضاً وأجريت فى قسم الأشعة بمستشفيات جامعة عين شمس. خضع المرضى لفحص التصوير بالرنين المغناطيسى باستخدام آلة ١.٥ تسلا (Ingenia، Philips، نظام الطبى، أيندهوفن، هولندا) باستخدام ملف صفيف مرحلى وتم إضافة خرائط غضروف T2 إلى الفحص الروتينى.

النتائج: أثبتت دراستنا أيضاً أن قيمة T2 أعلى بكثير فى جميع المناطق المقاسة عند مقارنة مجموعة التحكم بمجموعة الزراعة العضوية. فى عملنا، كانت قيم T2 للنطاق العضدى والحقانى أعلى من تلك الموجودة فى المنطقة الوسطى بسبب قوة الاحتكاك. أظهرت دراستنا ألواناً حمراء – برتقالية – صفراء فى الغضاريف الطبيعية بينما أظهرت الألوان الخضراء المزرقة فى حالة تنكس الغضروف.

الخلاصة: فإن إضافة تسلسل رسم الخرائط T2 إلى التصوير بالرنين المغناطيسى الروتينى للكتف زاد بشكل كبير من الحساسية للكشف عن آفات الغضروف داخل مفصل الكتف، مع تحسين الكشف عن نتكس الغضروف المبكر.