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Role of MRI in Evaluation of Anterior Knee Pain

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Abstract

Background: MRI is well known for being particularly useful for scanning and detecting abnormalities in soft tissue structures like the cartilage tissues, tendons, and ligaments. Moreover, MRI can also aid in determining those patients with knee injuries who will require surgical intervention. MR imaging is recognized as a standard procedure and has replaced diagnostic arthroscopy as the primary diagnostic modality for many knee pathologies. Furthermore, MR images can be used to assess anatomic variants that may contribute to chronic patellar instability.

Aim of Study: To go over several of the most common causes of Anterior Knee Pain (AKP), with emphasis on their MRI findings with the goal of allowing diagnosis that is more accurate and grading of some of the most common pathologies, for interpreting, reaching an efficient treatment and drastic improvement of this common complaint.

Patients and Methods: This study included 25 patients (8 females and 17 males). Their ages ranging between 10-60 years (average age 30 years). All presented by anterior knee pain and were referred to Radiology Department of Ain Shams University Hospital or private centers for MRI examination after orthopedic consultation. This descriptive study was done to detect the role of MRI in the evaluation of anterior knee pain and apply advanced MRI techniques such as sagittal T2 mapping to visualize the articular cartilage of the knee. Most patients were subjected to MR imaging of the affected knee joints on high field strength scanners using Philips scanners Achieva or Intera (1.5T).

Results: The present study revealed that 26% patellar tendon disorders which included (patellar Tendinopathy 21% and Osgood Schlatter disease 5%). Quadriceps tendon disorders represented 10% and they are including (Quadriceps Tendinopathy 5% and Quadriceps tendon tear 5%). 69% of the sample size showed Patellar disorders represent and they are including (chondromalacia patella 32%, patellar instability 21%, transient patellar dislocation 11% and painful bipartite patella 5%). Hoffa's disease was demonstrated in 21% of the sample size and they are including (Hoffa impingement syndrome and Hoffa ganglion cyst), finally we have torn anterior horn of the lateral meniscus and they represent 5%.

Conclusion: MRI is generally safe, accurate, and specific modality, which has been proven to be the modality of choice in the diagnosis of different knee pathologies that cause anterior knee pain in different age groups. Also it has a high specification in detecting the grades and types of some of these diseases or factors predispose to them as patella Alta and trochlear dysplasia.

Key Words: *Anterior knee pain – Patellar maltracking – T2 mapping.*

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Introduction

ANTERIOR Knee Pain (AKP) is the most common knee complaint. Adolescents and young adults are most likely to suffer from it [1].

It is more common in athletic individuals, having an incidence rate of as high as 9% in young active adults and reaching up to a quarter of all knee problems treated at sports injury clinics [2]. AKP can cause chronic disability, limited sports participation, and can affect the overall quality of life. Despite its prevalence, AKP remains poorly understood, as it has not been well studied in the literature, making it difficult to come up with the appropriate treatment among the various pathologies affecting the knee [3].

In the recent decades, Magnetic Resonance Imaging (MRI) has become the gold standard imaging modality for several knee pathologies as it is safe, and the Radiofrequency (RF) pulses used in MRI do not cause ionization.

MRI is well known for being particularly useful for scanning and detecting abnormalities in soft tissue structures like the cartilage tissues, tendons, and ligaments. Moreover, MRI can also aid in determining those patients with knee injuries who will require surgical intervention. MR imaging is recognized as a standard procedure and has replaced diagnostic arthroscopy as the primary diagnostic modality for many knee pathologies. Furthermore, MR images can be used to assess anatomic variants that may contribute to chronic patellar instability [4].

Aim of the work:

The main objective of our work is to go over several of the most common causes of AKP, with emphasis on their MRI findings with the goal of allowing diagnosis that is more accurate and grading of some of the most common pathologies, for interpreting, reaching an efficient treatment and drastic improvement of this common complaint.

Patients and Methods

This descriptive study included 25 patients (8 females and 17 males). Their ages ranging between 10-60 years (average age 30 years). All presented by anterior knee pain and were referred to Radiology Department of Ain Shams University Hospital or private centers for MRI examination after orthopedic consultation. This was done during the period from September 2018 to October 2019. verbal consents were obtained from all enrolled patients and the approval of this study was taken from the Institutional Ethics Committee of Ain Shams University.

Inclusion criteria: Traumatic and non-traumatic AKP patients.

Exclusion criteria: Patients with absolute contraindications to MRI examination e.g. cardiac pace maker Patients subjected to previous knee surgeries. Overweight, more than 150kg (cannot fit in the MRI machine).

All included patients underwent the following: Detailed history taking including past history, medical history and surgical history. Plain X-ray of the affected knee joint (if clinically indicated). MRI of the affected knee.

History taking: Personal history: It included age, sex, and occupation. Present history: It included: Analysis of patient complaint (knee pain): Site, onset, course, duration, and the relationship to posture. Associated swelling, stiffness, and deformity. Past history: Previous trauma or operations.

MRI technique: Most patients were subjected to MR imaging of the affected knee joints on high field strength scanners using Philips scanners Achieva or Intera (1.5T). MRI was performed by knee coil in all cases. The patients were positioned supine with the affected knee completely or nearly completely extended in the knee coil. Whereas for T2 mapping, the sequence is easy to acquire using the same maneuver and does not require any knee repositioning [5].

Imaging parameters (Table 1): The following parameters were applied; slice thickness 4mm slice gap 4mm, matrix 256/192 or 512/224 and field of view ranged from 12 to 16cm. For T2 cartigram; slice thickness 3mm, matrix 208 X 205 and field of view 290 X 290. The average duration time of the examination was from 25 minutes up to 30 minutes.

Data analysis: In case of chondromalacia patella, the following grading system was applied depending on International Cartilage Repair Society (ICRS) and Outerbridge grading system Brittberg and Winalski [6].

Table (1): MRI sequences parameters on high field strength scanners.

Parameters	Sagittal T1	Sagittal T2	Sagittal STIR	Sagittal PD	Coronal T2 FFE	Axial T2	T2 maps sagittal
TR	600	3600	2400	1620	380	3600	1780
TE	17	100	60	30	13	100	6.0
FOV anterior/posterior	30	30	30	30	30	20	30
Right/left	35	35	50	35	50	60	35
Feet/head	50	50	20	50	20	40	50

Table (2): MRI grading of chondromalacia patella.

	MRI findings
Grade I	• Focal areas of hyper intensity with normal contour
Grade II	• Blister-like swelling/fraying of the articular cartilage extending to the surface with less than 50% thickness cartilage loss.
Grade III	• More than 50% thickness cartilage loss with focal Ulceration
Grade IV	• Full thickness cartilage loss with underlying bone reactive changes

Cases who were suspicioned to suffer from Patella Alta, we used Insall-Salvati index for assessment of the patellar height, which is calculated as the length of the patellar tendon measured posteriorly from the apex of the patella to its attachment to the tibial tuberosity, divided by the longest supero-inferior diameter of the patella. Patella Alta is defined as the patellar height ratio of more than 1.3 (N: 0.8 to 1.1) Ward et al. [7].

Trochlear dysplasia has been identified as one of the main factors contributing to chronic patella-femoral instability. In individuals with trochlear dysplasia, the trochlear joint surface shows the following types:

Table (3): Classification of trochlear dysplasia Diederichs et al. [8].

Type A	• Normal shape of the trochlea preserved but a shallow trochlear groove.
Type B	• Markedly flattened or even convex trochlea.
Type C	• Asymmetric trochlear facets, with the lateral facet being too high and the medial facet being hypoplastic, which results in the flattened joint surface forming an oblique plane.
Type D	• In addition to the features of type C, a vertical link between medial and lateral facets (cliff pattern on parasagittal images).

In case of patellar mal-tracking, we measure the following different parameters for the assessment of the trochlear dysplasia. Lateral Trochlear Inclination (LTI) according to Carrillon et al. [9]. It was defined on the MR-slices at about 3cm above the femoro-tibial joint space by measuring the angle between a line tangential to the sub-chondral bone of the posterior aspects of the femoral condyles and a line tangential to the sub-chondral bone of the lateral trochlear facet. An inclination angle of less than 11º indicates trochlear dysplasia. Trochlear facet asymmetry according to Pfirrmann et al. [10]. MRI slices at about 3cm above the femoro-tibial joint space were used; trochlear facet asymmetry was expressed with the relation of the length of the medial facet (e) to the lateral facet (f) ([e/f] X 100%). A trochlear facet ratio of less than 40% indicates dysplasia. Depth of the trochlear groove according to Pfirrmann et al. [10].

MRI slices at about 3cm above the femoro-tibial joint space were used for the assessment of the trochlear depth by measuring the maximal antero-posterior distance of the medial (distance a) and lateral femoral (distance b) condyle and the minimal antero-posterior distance between the deepest point of the trochlear groove and the line paralleling the posterior outlines of the femoral condyles (distance c). Trochlear depth was calculated by the formula ([a + c]/2)-b). Trochlear dysplasia is assumed if the trochlear depth is 3mm or less.

In cases where we assess cartilage integrity: Firstly, the standard imaging planes of the knee were evaluated with focusing on its articular cartilage at different imaging sequences, and then complementary T2 maps were generated using a special software technique. Thereafter, these standard planes were evaluated together with complementary T2 maps for the same regions, and articular cartilage was evaluated using color scale from red to blue. Intact articular cartilage was defined by the normal signal intensity in different pulse sequences with uniform thickness, while in T2 maps normal knee articular cartilage at different sites generally below 40 milliseconds which corresponds to the red, yellow and green zones on the color scale.

Affected articular cartilage on conventional MRI in early stages of osteoarthritis appears in PDFS sequence as an area with non-uniform thickness, or of altered signal intensity. Cartilage affection on T2 maps in early osteoarthritis can be delineated as it takes a certain color (aqua or blue) corresponding to high T2 value on the color-coded scale found in the scanner software. On T2 maps the hyaline cartilage lesions were graded according to an ICRS-like score (inspired by the International Cartilage Research Society score) in medial and lateral femoro-tibial joints, the T2 value of the severest lesion was the one considered. No Degeneration: (Grade 0-1) superficial and deep zones normal (red, yellow or green) Grade 2 Degeneration: Superficial zone aqua and deep zone is normal (red, yellow or green) Grade 3 Degeneration: Superficial zone aqua/blue and deep zone aqua/blue with no associated bone degeneration. Grade 4 Degeneration: Superficial zone aqua/blue and deep zone aqua/blue with associated bone degeneration. T2 mapping findings were compared to pain location, and retrospectively to the initial standard sequences. Any associated meniscal, ligamentous, muscular or bony abnormalities in the knee were reported.

Statistical analysis:

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± Standard Deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done: Chi-square (χ^2) test of significance was used in order to compare proportions between qualitative parameters. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: Probability (p-value): p-value <0.05 was considered significant. p-value <0.001 was considered as highly significant. p-value >0.05 was considered insignificant.

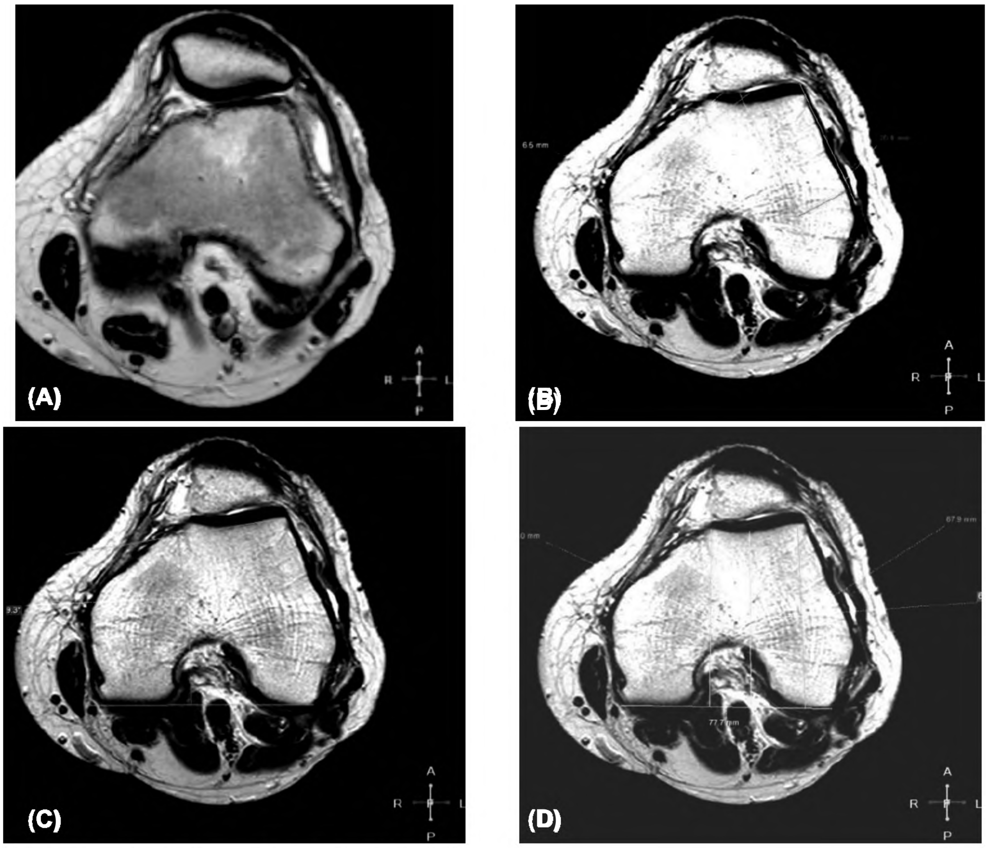

Fig. (1): 17-year-old male patient presented by anterior knee pain showing lateral patellar subluxation with patella Alta and trochlear dysplasia type C as predisposing factors. Axial T2 weighted images shows, A- Loss of contact between the patellofemoral joint surfaces laterally. B- Trochlear facet asymmetry 32% (normally not less than 40%), C- Lateral inclination angle 9.3 degrees (normally not less than 11) and D- Trochlear depth 1.5mm (normally up to 3mm). E- Sagittal PDWI shows Patella Alta (Insall Salvati index about 1.5).

Results

Table (4): Age (years) distribution of the study group.

Age (years)	Total (n=25)
Range	16-40
Mean ± SD	32.05±8.90

Table (5): This table shows the gender distribution of the study group with male being 56% and female 44%.

Gender	No. of patients	Percentage
Male	14	56%
Female	11	44%

Table (6): Relation between sex and different causes of AKP of the study group (n=25).

Disease	Total	Sex	
		Male	Female
Patellar cause	7 28%	3 29%	4 71%
Hoffa disease	4 16%	3 75%	1 25%
Quadriceps femoris tendon cause	2 8%	2 100%	0 0%
Patellar tendon cause	5 20%	4 80%	1 20%
Meniscial tear	1 4%	1 100%	0 0%
Cartilage injury	6 24%	2 33%	4 67%

Using: Chi-square test; p-value >0.05 NS.

Table (7): Demonstrates the prevalence of 10 diseases entity found among the patients in the study sample.

	Disease not exist		Disease exist	
	No. of patients	Percentage of patients	No. of patients	Percentage of patients
Chondromalacia patallae	13	68%	6	32%
Hoffa disease	15	79%	4	21%
Transient patellar dislocation	17	89%	2	11%
Patellar instability	15	79%	4	21%
Quadriceps tendonopathy	18	95%	1	5%
Quadriceps tendon tear	18	95%	1	5%
Patellar tendonopathy	15	79%	4	21%
Osgood schlatter disease	18	95%	1	5%
Bipartite patellae	18	95%	1	5%
Anterior meniscial tear	18	95%	1	5%
Sum			19	

Table (8): Demonstrates overlapping between patients who have more than one disease.

	Hoffa	Transient pat dislocation	Chondromalacia Patella	Sum
• Patellar tendinopathy	1		2	3
• Patellar • Instability		1	1	2
• Bipartite patella	1	1		1
• Sum		2	3	6

Table (9): Demonstrates percentage of sex prevalence among different diseases.

	Male	Female	Sum
Chondromalacia Patella	2 (33%)	4 (67%)	6
Hoffa disease	3 (75%)	1 (25%)	4
Chronic Patellar instability	1 (25%)	3 (75%)	4
Transient-patellar-dislocation	1 (50%)	1 (50%)	2
Quadriceps-tenondinopathy	1 (100%)	0 (0%)	1
Quadriceps tendon tear	1 (100%)	0 (0%)	1
Patellar tendinopathy	3 (75%)	1 (25%)	4
Osgood Schlatter disease	1 (100%)	0 (0%)	1
Bipartite patella	1 (100%)	0 (0%)	1
Anterior-Meniscal-Tear	1 (100%)	0 (0%)	1

Table (10): Chondromalacia patellae (ICRS grading system) distribution of the study group (n=19).

Chondromalacia patellae (ICRS grading system)	No. (%)
• Grade I: Focal areas of hyperintensity with normal contour.	0 (0%)
• Grade II: Blister-like swelling/fraying of the articular cartilage extending to the surface with <50% thickness cartilage loss.	2 (10.5%)
• Grade III: >50% thickness cartilage loss with focal ulceration.	2 (10.5%)
• Grade IV: Full thickness cartilage loss with underlying reactive bone changes.	2 (10.5%)

Table (11): Patellar dislocation distribution of the study group.

Patellar dislocation	No. of patients	Percentage
Patellar instability	4	67%
Transient patellar dislocation	2	33%
Sum	6	100%

Table (12): Relation between patellar instability and patellar cause of the study group (n=19).

Patellar cause	Patellar instability		Chi-square test	
	Yes (n=4)	No (n=15)	x^2	p-value
Trochlear dysplasia	4 (100%)	0 (0%)	20.00	<0.001**
Patella alta	1 (25%)	0 (0%)		
No	0 (0%)	15 (100%)		

**p-value <0.001 HS.

Table (13): Patellar cause distribution of the study group (n=19).

	Type A	Type B	Type C	Grand total
• No of trochlear dysplasia patients	0/4	1/4	3/4	4
• Percentage of trochlear dysplasia patients	0.0%	25%	75%	100%

Table (14): Painful bipartite patella distribution of the study group (n=19).

Painful bipartite patella	No. (%)
Yes	1 (5.3%)
No	18 (94.7%)

Table (15): Quadriceps femoris tendon cause distribution of the study group (n=19).

Quadriceps femoris tendon cause	No. (%)
Tendonopathy	1 (5.3%)
Tendon thickness tear	
Partial	1 (5.3%)
Complete	0 (0%)

Table (16): Patellar tendon cause distribution of the study group (n=19).

Patellar tendon cause	No. (%)
Tendonopathy	4 (21.1%)
Tendon tear	0 (0.0%)
Osgood-schlatter disease	1 (5.3%)

Table (17): Hoffa disease distribution of the study group.

Hoffa disease	Total (n=19)
Infrapatellar Bursitis	1 (5.3%)
Infrapatellar fat pad impringement syndrome	1 (5.3%)
Hoffa's pad of fat ganglion cyst	2 (10.5%)

Table (18): Meniscial tear distribution of the study group (n=19).

Meniscial tear	No. (%)
Medial meniscus	0 (0.0%)
Lateral meniscus	
Anterior horn	1 (5.3%)
Posterior horn	0 (0.0%)

Table (19): Demonstrates the statistically calculated minimum, maximum, median and mean values of trochlear groove depth by (mm), trochlear facet asymmetry by (%) and lateral inclination angle by (º).

	D: Depth of trochlear groove by mm			T: Trochlear facet asymmetry by %			L: Lateral inclination angle by º		
	Type-A	Type-B	Type-C	Type-A	Type-B	Type-C	Type-A	Type-B	Type-C
Minimum	3.00	1.500	1.500	35.00	33.00	32.00	10.00	1.500	9.300
Maximum	6.00	4.000	2.000	50.00	60.00	50.00	23.00	20.00	23.00
Median	5.00	2.000	2.000	39.00	55.00	33.00	20.00	9.000	9.400
Mean	4.80	2.500	1.833	40.80	50.60	38.33	17.80	9.540	13.90
St dev.	1.15	1.000	0.289	6.221	10.45	10.11	5.586	8.032	7.881

Table (20): Distribution of medial tibio-femoral degeneration according to ICRS degeneration grades.

Medial tibiofemoral (peripheral and central regions)	Pain group	
	Count	%
No degeneration - Grade 1	0	0
Grade 2 degeneration	2	33
Grade 3 degeneration	3	50
Grade 4 degeneration	1	17

Table (21): Distribution of lateral tibiofemoral degeneration according to ICRS degeneration grades.

Lateral tibiofemoral (peripheral and central regions)	Pain group	
	Count	%
No degeneration - Grade 1	1	17
Grade 2 degeneration	4	67
Grade 3 degeneration	1	17
Grade 4 degeneration	0	0

Discussion

MRI has the superiority over other radiological modalities in being able to detect different important etiologies and predisposing factors causing knee pain.

The purpose of this study is to detect the accuracy of MR imaging, whether conventional or advanced techniques (T2 mapping) as a diagnostic tool in the evaluation of different knee joint pathologies that cause anterior knee pain, with emphasis on some of their grades and types for better assessment.

Diederichs et al., [8] reported that Anterior Knee Pain (AKP) may affect up to one third of adolescents at any time. The majority of patients had their symptoms most commonly in their second and third decades of life.

In our results, about 56% were male with their average age 31 years and 44% of the study sample was female with their average age 32 years.

In our study we divided the pathological process that causes the symptom of anterior knee pain in a fashion similar to that proposed by McNally et al., [14] to five categories according to location and anatomical structure affected as following: (A) Patellar tendon disorders, (B) Quadriceps tendon disorders, (C) Patellar disorders (D) Hoffa diseases and (E) Miscellaneous causes including anterior meniscal tear and cartilage injuries.

In our study each category represented the following percentages: (A) Patellar tendon disorders represent 26% of the sample size and they are including (patellar Tendinopathy 21% and Osgood Schlatter disease 5%). (B) Quadriceps tendon disorders represent 10% of the sample size and they are including (Quadriceps Tendinopathy 5% and Quadriceps tendon tear 5%). (C) Patellar disorders represent 69% of the sample size and they are including (chondromalacia patella 32%, patellar instability 21%, transient patellar dislocation 11% and painful bipartite patella 5%). (D) Hoffa's disease represent 21% of the sample size and they are including (Hoffa impingement syndrome and Hoffa ganglion cyst), finally we have torn anterior horn of the lateral meniscus and they represent 5%.

Patellar's tendinitis or jumper's knee is one of the most common tendon abnormalities in young active individuals. Kerkar PD [15]. In our results, 21% of the patients presented with anterior knee pain showed MRI evidence of patellar tendinopathy (66% below the age of 30 years). In all cases the hyperintense focal thickening was at the proximal third of the tendon, with the AP diameter of the patellar tendon greater than 8mm, and that was concordant with the study of Samim et al. [17] as regard with the MRI findings of patellar tendinitis. According to Smith JM and Varacolla M [18] Osgood Schlatter disease is most common among adolescent male athletes and caused by repetitive micro-trauma.

In our study about 5% had an MRI evidence of OSD (all of them are <30 years, of male predominance and caused by repetitive trauma to the knee).

Nakamura, O et al., [19] stated that patella Alta is one of the predisposing factor to OSD, in our result our case showed MRI evidence of patella Alta as a predisposing factor.

Quadriceps tendon rupture more common than patellar tendon rupture. It is more common in older (>40 years) individuals McKean [20] . In our results 5% (1 patient), had a quadriceps tendon partial tear, 30 years of age. This patient had a history of trauma and with no predisposing factor for spontaneous tendon rupture.

Pfirrmann et al., [10] stated that, altered biomechanics or chronic tensile forces to the quadriceps tendon might lead to chronic tendinosis of the tendon that clinically may present as anterior knee pain. In our results, quadriceps tendinopathy was detected in about 5% of the patients who presented by anterior knee pain.

Iraj Salehi-Abari et al., [21] reported that Chondromalacia patella is more common in female adolescents and young adults and this was matched with our study (67% female 33% male and 30 years age average).

Mattila et al., [22] reported that the MRI diagnostic accuracy is higher for high grade lesions (grade III and IV). That was concordant with our study in which 16% of the cases of chondromalacia patellae were grade IV, 10.5% grade III, 5% grade II and 0% grade I.

In another study done by Hanan Hanafi et al., [23] revealed that the most constant finding in all patients of the transient patellar subluxation was the presence of joint effusion, abnormalities in the medial patellar retinaculum, abnormal lateral patellar position, contusions of the lateral femoral condyle and medial patellar facet. This was concordant with our study, where patella-femoral instability (i.e. transient patellar dislocation) was detected in 11 % of the patients who were presented by anterior knee pain, almost all patient had MRI evidence of joint effusion, showed abnormalities in the medial patellar retinaculum. Almost all patients had the same exact MRI findings.

McNally [14] also stated that there is a link between Patellar subluxation with both chondromalacia patella and patellar tendinopathy. In our result, only 5% of the patients with patellar subluxation had MRI evidence of a chondromalacia patella and 5% had MRI evidence of patella Alta.

Dejour and Coultre [24] described trochlear dysplasia as one of the most important predisposing factors for patellar instability and recurrent patellar dislocation. They also classify trochlear dysplasia into four main types (type A, B, C and type D). In our study, we founded that 21 % of the patients had patello-femoral pain with mal-alignment (i.e. chronic patellar instability) and showing MRI evidence of trochlear dysplasia. 0.0% categorized as type A, 25% as type B, and 75% as type C according to Dejour et al., classification.

Nelitz et al., [25] did a study on 80 knees of 78 patients, aiming to evaluate whether specific measurements of the femoral trochlea can be assigned to the qualitative classification system of Dejour. They concluded that, by using a descriptive statistics using box plot diagrams, none of the objective measurements other than femoral trochlea described in the literature could be assigned to the four-grade descriptive classification of trochlear dysplasia of Dejour as the median and average range of these measurements allow no discrimination between trochlear dysplasia type B, C and D. However, threshold values to discriminate between low-grade (Dejour type A) and high grade dysplasia (Dejour type B-D) could be identified.

In our results, type B and C trochlear dysplasia showed nearly similar median and average values of both the trochlear groove depth and lateral inclination angle, (median value of trochlear groove depth for both B and C was 2mm and for A was 5mm, the median value of lateral inclination angle for both B and C were 9 degrees and 9.4 respectively and for type A was 20 degrees. The median values for trochlear facet asymmetry were different between different types of trochlear dysplasia (the median value for type A was 39%, for type B was 55% and for type C was 33%).

Chun Hao et al., [26] also reported that most patients with patellar dislocation are young and active individuals, with women in the 2nd decade of life having a high risk. In our study, we found that 66% of the patients were female and 34% of them were male.

Bipartite patella represents failure of the fusion of the secondary ossification centers of the patella. Samim et al., [17] mentioned that there are three types of bipartite patella according to Saupe et al., classification. In a study by Kavanagh et al., [27], bone marrow edema within the bipartite fragment was the sole finding in 49% of the patients having this disease. In our study, 5% of the patients (1/19) with anterior knee pain had symptomatic bipartite patella. It was of the third type and had MRI evidence of bone marrow edema within their fragments.

Chung et al., [28] studied 50 patients with anterior knee pain and reported that 50% of the sample had Hoffa impingement syndrome. In our study, only 5% of patients showed edema within the Hoffa pad of fat. Therefore, our study differs with Chung et al., [28] study as regard the prevalence. This might be explained by the difference in the criteria of the selected sample between the two studies, as Chung et al., [28] excluded patients outside the ages of 14 50 years or those with a history of direct trauma to the knee, but in our study both were included. In our study, about 5% of the patients had an MRI evidence of infra-patellar bursitis. According to Gholve et al., [29], when infra-patellar bursitis is found in adolescents, it should be differentiated from Osgood-Schlatter disease.

McNally et al., [14] also mentioned that anterior meniscal tear and cartilage injuries as other main pathologies that are considered to be major causes of anterior knee pain.

In our results about 5% of the patients in the study sample, had MRI evidence of tear in the anterior horn of lateral knee meniscus and with history of trauma.

In our study, we conducted T2 mapping images on 6 patients. We assessed their degree of cartilage degeneration according to the ICRS degeneration grades in the non-weight baring regions of the knee joint and in the weight baring regions.

The medial tibio-femoral peripheral and central regions showed no grade 1 degeneration and 33% with grade 2 degeneration while 50% grade 3 and 17% grade 4 degeneration.

The lateral tibio-femoral peripheral and central regions showed 17% grade 1 degeneration and 67% with grade 2 degeneration, 17% grade 3 and no grade 4 degeneration.

This agrees with Hesper et al., [37] regional differences in the T2 values were observed. T2 values in the weight-bearing regions were higher than those in the non-weight-bearing regions.

Furthermore Chang et al., [28], who reported that the potential value of T2 mapping as a biomarker for early cartilage degeneration is highlighted by its inclusion in the MRI protocol for the early osteoarthritis.

Conclusion:

MRI is generally safe, accurate, and specific modality, which has been proven to be the modality of choice in the diagnosis of different knee pathologies that cause anterior knee pain in different age groups. Also, it has a high specification in detecting the grades and types of some of these diseases or factors predispose to them as patella alta and trochlear dysplasia.

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دور الرنين المغناطيسى فى تقييم آلام الركبة الآمامية

يعتبر مفصل الركبة واحداً من آكثر المافصل فى الجسم تعرضاً للإصابة بالإعتلالات المختلفة نظراً لتعقيد تركيبه كما آن الزيادة الحالية فى مختلف النشاطات الرياضية كان مصاحباً لها زيادة موازيه فى الإصابات الداخلية للركبة.

آلم الركبة الآمامى هو الشكوى الآكثر شيوعاً لمفصل الركبة، والتى يمكن آن تكون مسببة لمجموعة متنوعة من الآمراض.

ويلعب الرنين المغناطيسى دوراً هاماً فى تشخيص إعتلالات الآنسجة حول مفصل الركبة كالآربطة، العضلات والآوتار، إرتشاح الركبة، الآكياس الزلالية وإلتهابات الغشاء المبطن للركبة.

وفى هذا المقال إستعرضنا مجموعة من الآمراض المسببة للآلم الركبة الآمامى والتركيز على خمسة مجموعات آساسية مسببة له وهى آمراض فى وتر العضلة رباعية الرؤوس ويشمل إلتهابات الوتر وقطع فى الوتر آمراض الرضفى ويشمل إلتهابات فى الوتر و (التنكس العظمى الغضروفى لآخدوية الطنبوب) آمراض فى عظمة الرضفة ويشمل (لين فى غضروف العظمة إنشقاق عظمة الرضفة المؤلم إنزلاق عظمة الرضف المؤقت وعدم إستقرار عظمة الرضفة) إلتهابات والكيسة العقدية فى الوسادة الدهنية تحت عظمة الرضفة وآسباب مختلفة كإصابات الغضاريف وقطع فى غضاريف الركبة الهلالية الآمامية هذا بالإضافة إلى إلتهابات الجرابات المختلفة حول المفصل.

تحسين فهم آلم الركبة الآمامى مع وجود وعى متزايد بالتشوهات الآكثر إنتشاراً ومظهرهم خاصة بالرنين المغناطيسى الذى يعتبر دقيق ونوعى فى تشخيص هذه الآمراض المختلفة هام لتحسين الخطة العلاجية.

وفى النهاية يمكننا القول آن الرنين المغناطيسى فائدة كبرى فى إكتشاف وتشخيص الكثر من الإعتلالات الخارجية ودور هام فى تشخيص الإصابات الداخلية لمفصل الركبة والعوامل التى تؤدى إلى هذه الآمراض بالإضافة لقدرته على تقييم الآنواع والدرجات المختلفة لبعض من هذه الآمراض كلين عظمة الرضف وخلل التنسج فى حفرة البكرة لعظمة الفخذ.

تم تحقيق ذلك على 1.5 T MR Scanner بإستخدام برنامج خاص لتقييم كفاءة تعيين T2 للكشف عن آفات الغضاريف لدى المرضى الذين يمثلون آلام فى الركبة ولا يتم تشخيصهم سريرياً على آنهم مصابون بإلتهاب المفاصل.

إن الفهم المحُسن لآلام الركبة الآمامية مع زيادة الوعى بالمشاكل الشائعة وظهورها، وخاصةً فى التصوير بالرنين المغناطيسى، وهو طريقة دقيقة ومحددة ويسمح بإجراء تشخيص آكثر دقة، قد يسهل آيضاً تحسين العلاج والتخطيط قبل الجراحة.

وشملت هذه الدراسة ٢٥ مريضاً. تم إجراء بروتوكول روتينى MR التقليدى على ١٩ مريضاً مع التركيز على العديد من الآمراض لشكوى التى ناتج عنها آلام الركبة الآمامية لديهم. فى حين آن كل من المرضى الستة الآخرين خضعوا لفحص MRI واحد بما فى ذلك البروتوكول الروتينى التقليدى MR وآضافوا رسم خرائط T2 واحد مكمل، تم فحص ٦ فحوصات MRI و٦ مناظرة T2 تكميلية مقابلة.

آولاً، تم تقييم التصوير القياسية للركبة مع التركيز على الغضروف المفصلى فى تسلسلات تصوير مختلفة، ثم تم إنشاء خرائط T2 التكميلية بإستخدام تقنية برامج خاصة. بعد ذلك، تم تقييم هذه الصور القياسية مع خرائط T2 التكميلية لنفس المناطق، وتم تقييم الغضروف المفصلى بإستخدام مقياس اللون من الآحمر إلى الآزرق.

تم تعريف الغضاريف المفصلية السليمة MR التقليدى بسمك موحد، بينما فى T2 يخطط الغضروف المفصلى الطبيعى للركبة فى مواقع مختلفة بشكل عام آقل من ٤٠ ميلى ثانية والتى تتوافق مع المناطق الحمراء والصفراء والخضراء على مقياس اللون فى دراستنا.

فى الخلاصة، يعد التصوير بالرنين المغناطيسى طريقة آمنة ودقيقة ومحددة بشكل عام، والتى ثبت آنها طريقة الإختيار فى تشخيص آمراض الركبة المختلفة التى تسبب آلام الركبة الآمامية فى مختلف الفئات العمرية. كما آن لديها مواصفات عالية فى الكشف عن درجات وآنواع بعض هذه الآمراض آو العوامل التى تهيئ لهم مثل الرضفة آلتا وخلل التنسج النسيجى.

آدت إضافة خرائط T2 إلى طرق العرض القياسية إلى تحسين الدقة فى تشخيص تنكس الغضاريف المبكر فى آلام الركبة. يبدو آن خرائط T2 هذه توفر إضافة مفيدة للتصوير بالرنين المغناطيسى القياسى عندما يشتبه فى إنحطاط الغضروف خاصة بين الشباب.