Al-Azhar Med. J.(Medicine). *Vol. 50(3), July, 2021, 2351-2362*
DOI : 10.21608/amj.2021.179483
https://amj.journals.ekb.eg/article_179483.html

ROLE OF ULTRASOUND IN THE EVALUATION OF PAINFUL KNEE

A COMPARATIVE STUDY TO MRI

By

Muhammad Reda Abdullah Ali, Ahmed Abdul Fatah Mahmoud Abo-Rashed, and Ahmed Muhammad Moustafa

Department of Radio diagnosis, Faculty of Medicine, Al-Azhar University

Corresponding author: Muhammad Reda Abdullah Ali,

E-mail: muhammad_reda325@yahoo.com

ABSTRACT

Background: One of the frequent musculoskeletal problems is knee pain. The trend of increasing of knee pain among the populations is noted. Therefore, choosing a reliable screening tool with reasonable cost is mandatory. Although magnetic resonance imaging (MRI) is the gold standard imaging modality for knee soft tissue structures, it has been widely abused with its high cost. Ultrasound is an established modality to image the soft tissue structures of the knee.

Objective: To show the role of ultrasound (US) in evaluating of knee pain and comparing the results with magnetic resonance imaging (MRI).

Patients and methods: This study included 40 patients (18 males and 22 females) with an age ranging from 15-69 years. This study was carried out at the Radiology Department of Al-Azhar University Hospitals for ultrasonography and MRI examination during the period from October 2019 to November 2020.

Results: Regarding meniscal horn tear, ultrasound detected tear in 2 cases, while MRI detected tear in 5 cases. Regarding meniscal horn degeneration, Ultrasound detected degeneration in 1 case, while magnetic resonance imaging detected degeneration in 6 cases. These results indicated that sonography was not accurate enough to be used as the only modality for diagnosing lesions of the knee menisci. Regarding medial collateral ligament (MCL) injury, ultrasound detected medial collateral ligament injury in 3 cases, while magnetic resonance imaging detected medial collateral ligament injury in 4 cases. The majority of the knees with osteoarthritis (OA) had effusion using ultrasound (100%) and magnetic resonance imaging (100%). Synovial thickening observed on ultrasound and magnetic resonance imaging. This study confirmed that there was a significant correlation between the magnetic resonance imaging and ultrasound techniques for evaluating the cartilage and soft tissue changes in the patients with knee osteoarthritis.

Conclusion: Ultrasound is an effective imaging modality that can be suitable as a screening tool for patients having knee pain. Knee US has reasonable accuracy in detecting collateral ligament and meniscal pathology. US with the advantages of being widely available lower in cost and with no contraindications should be the first modality of choice in evaluating knee pain. MRI can be reserved for equivocal US results.

Keywords: Ultrasound, Painful Knee, Magnetic resonance imaging.

INTRODUCTION

Pain and other disorders of the knee are a common presenting complaint in the ambulatory setting. Although the cornerstones of imaging evaluation of the knee are radiographs and magnetic resonance (MR) imaging, ultrasonography (US) is less expensive than MR imaging,

easily available, and of comparable accuracy in the evaluation of certain pathologic conditions of the knee. The benefits of US include portability, low cost, high spatial resolution, dynamic imaging, and ability to guide percutaneous interventions when indicated *(Alves et al., 2016)*.

Ultrasonography (US) offers several unique strengths over MR imaging, that make it a promising technique for the evaluation of certain disorders of the knee. First, US has higher spatial resolution than MR imaging, which may be helpful in evaluating the superficial structures of the knee in detail. Second, US allows for dynamic assessment, which can be particularly helpful in differentiating partial from complete tears involving the quadriceps and patellar tendons. Third, the ability to interact with patients during US evaluation allows one to obtain a relevant history and guide the US examination to identify the cause of specific patient complaints. US also allow easy comparison with the contralateral knee, which can be very helpful for problem solving. Fourth, US may be the modality of choice in evaluating patients with contraindications to MR imaging and claustrophobia *(Jacobson, 2013)*.

Ultrasound is particularly well suited for evaluating injuries of the quadriceps and patellar tendons, injuries of the medial and lateral collateral ligaments, joint effusions, and fluid collections around the knee. There is additional utility in evaluation of the distal hamstrings tendons, the iliotibial tract, the superficial patellar cortex, the common peroneal nerve, the popliteal vessels, and juxta-articular cystic collections including Baker cyst. In-depth appreciation of relevant sonographic anatomy, common pathologic conditions, knowledge of important pitfalls, and mastery of US technique will allow one to effectively use this powerful bedside tool for the evaluation of a wide variety of knee disorders *(Foley et al., 2016)*.

Magnetic resonance imaging (MRI) has become the preferred modality for imaging the knee to show pathology and guide patient management and treatment. The knee is one of the most frequently injured joints, and knee pain is a pervasive difficulty that can affect all age groups. Due to the diverse pathology, complex anatomy, and a myriad of injury mechanisms of the knee, the MRI knee protocol and sequences should ensure detection of both soft tissue and osseous structures in detail and with accuracy *(Nacey et al., 2017)*.

Advances in MRI technology provide the imaging necessary to obtain high-resolution images to evaluate menisci, ligaments, and tendons. Furthermore, recent advances in MRI techniques allow for improved imaging in the postoperative knee and metal artifact reduction, tumor imaging, cartilage evaluation, and visualization of nerves. As treatment and operative management techniques evolve, understanding the correct application of these advancements in MRI of the knee will prove to be valuable to clinical practice *(De Smet et al., 2014)*.

The aim of this study was to show the role of ultrasound (US) in evaluating of knee pain and comparing the results with magnetic resonance imaging (MRI).

PATIENTS AND METHODS

This study included 40 patients (18 males and 22 females) with an age ranging from 15-69 years. This study was carried out at the Radiology Department of Al-Azhar University Hospitals for ultrasonography and MRI examination during the period from October 2019 to November 2020.

Inclusion criteria: Any patient complaining of knee pain.

Exclusion Criteria: Patients with absolute contraindication to MR examination as cardiac pace maker, aneurismal clipping and claustrophobia.

All patients were subjected to history taking, clinical examination and radiological assessment.

Ultrasound assessment of the medial compartment structures of the knee:

All patients had standardized ultrasonography of the knee joint with excess gel was used instead of the gel pad. Ultrasound examinations were performed using Toshiba probe (7-11MHz). The routine US examination of the knee starts with its anterior aspect, followed by the medial, lateral and posterior aspects in both longitudinal and transverse planes. The anterior aspect of the knee is best examined with patient supine and the knee flexed approximately 20 – 30 degree obtained by placing a small pillow beneath the popliteal space. In this position, the anterior aspect of the knee is examined starting from cranial to caudal with careful examination for the following check list:

- Quadriceps tendeon.
- Supra, medial and lateral patellar recesses.
- Medial and lateral patellar retinacula.
- Femoral trochlear articular cartilage.
- Patellar tendon.
- Infra and pre patellar bursae.

MRI examination:

All patients had MR imaging of the affected knee joints on a high field-strength scanners. MRI was perfomed using Philips scanners Achieva or Intera (1.5 T) by knee coil in all cases.

Technique:

- **Positioning:** The patients were positioned supine with affected knee completely or nearly completely extended in the knee coil.
- Protocol: MRI imaging sequences: The MRI study included the following pulse sequences:

- Sagittal T1 WIs.
- Sagittal T2 WIs.
- Sagittal PD WIs.
- Sagittal STIR WIs.
- Sagittal T2 fat sat WIs.
- Axial T2 WIs.
- Coronal T2 fat sat.
- Coronal PD WIs.
- Coronal STIR WIs.
- Coronal GRE WIs.

Statistical Analysis:

All data were collected, tabulated and statistically analyzed using SPSS 20.0 for windows (SPSS Inc., Chicago, IL, USA). Quantitative data were expressed as the

mean ± SD & (Minimum-maximum), and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Calculate sensitivity (sens) and specificity (spec) as follows:

It is a graphic presentation of sensitivity against 1- specificity. It is done by comparing values of cases to detect a cutoff of certain outcome.

Sensitivity=

$$P(\text{test+} \mid \text{disease+}) = \frac{\text{TP}}{\text{TP} + \text{FN}}$$

It is the ability of the test to detect the true +ve cases with minimal false negatives.

Specificity =

$$\text{spec} = P(\text{test}- \mid \text{disease}-) = \frac{\text{TN}}{\text{FP} + \text{TN}}.$$

It is the ability of the test to detect the true –ve cases with minimal false positives.

RESULTS

In our study among the studied cases there were 18 male patients (45%) and 22 females (55%) with their age ranged between 15-69 years with the mean age 42.65 years **(Table 1)**.

Table (1): Sex and age distribution among the studied cases

Variables		No.	%
Sex	**Male**	18	45.0
	Female	22	55.0
Age (years)	**Range**	15 – 69	
	Mean ± SD	42.65± 13.65	

In our study among the MCL injuries there were 3 patients diagnosed by US representing (7.5%) and 4 patients diagnosed by MRI representing (10%), while ACL injuries there were no patients diagnosed by US representing (0%) and 4 patients diagnosed by MRI representing (10%) and among the tendinous lesions there were 3 patients diagnosed by US representing (5%) and 2 patients diagnosed by MRI representing (5%) and concerning meniscal horn tear there were 3 patients diagnosed by US representing (7.5%) and 5 patients diagnosed by MRI representing (12.5%) and among the meniscal horn degeneration there were one patient diagnosed by US representing (2.5%) and 6 patients diagnosed by MRI representing (15%) and among the meniscal horn extrusion there were 3 patients diagnosed by US representing (7.5%) and 5 patients diagnosed by MRI representing (12.5%) **(Table 2)**.

Table (2): Comparison between US and MRI in the detection of MCL injuries, ACL injuries, tendinous lesions, meniscal horn tear, meniscal horn degeneration and meniscal horn extrusion

Parameters / Results			US	MRI
MCL injuries	**Positive**	**No.**	3	4
		%	7.5	10
	Negative	**No.**	37	36
		%	92.5	90
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
75%	100%	100%	97.3%	97.5%
ACL injuries	**Positive**	**No.**	0	4
		%	.0	10
	Negative	**No.**	40	36
		%	100	90
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
0%	100%	0%	90%	90%
Tendinous lesions	**Positive**	**No.**	2	2
		%	5	5
	Negative	**No.**	38	38
		%	95	95
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
100%	100%	100%	100%	100%
Meniscal horn tear	**Positive**	**No.**	3	5
		%	7.5	12.5
	Negative	**No.**	37	35
		%	92.5	87.5
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
60%	100%	100%	94.6%	95%
Meniscal horn degeneration	**positive**	**No.**	1	6
		%	2.5	15
	negative	**No.**	39	34
		%	97.5	85
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
16.7%	100%	100%	87.2%	87.5%
Meniscal horn extrusion	**Positive**	**No.**	3	5
		%	7.5	12.5
	Negative	**No.**	37	35
		%	92.5	87.5
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
60%	100%	100%	94.6%	95%

Concerning Osteoarthritis in our study there were 4 patients diagnosed by US representing (10%) and 6 patients diagnosed by MRI representing (15%) and among the bone erosions there were 5 patients diagnosed by US representing (12.5%) and 5 patients diagnosed by MRI representing (12.5%) and among joint effusion there were 8 patients diagnosed by US representing (20%) and 8 patients diagnosed by MRI representing (20%) and among bone marrow edema/contusion there were no patients diagnosed by US representing (0%) and 3 patients

diagnosed by MRI representing (7.5%) and among bone fracture there were one patient diagnosed by US representing (2.5%) and 2 patients diagnosed by MRI representing (5%) and among Baker's cyst there were 4 patients diagnosed by US representing (10%) and 4 patients diagnosed by MRI representing (10%) and among prepatellar bursitis there were 4 patients diagnosed by US representing (10%) and 4 patients diagnosed by MRI representing (10%) **(Table 3)**.

Table (3): Comparison between US and MRI in the detection of osteoarthritis, bone erosions, joint effusion, bone marrow edema/contusion, bone fracture, Baker's cyst and prepatellar bursitis

Parameters \ Results			US	MRI
Osteoarthritis	**Positive**	**No.**	4	6
		%	10	15
	Negative	**No.**	36	34
		%	90	85
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
66.7%	100%	100%	94.4%	95%
B*one erosions	**Positive**	**No.**	5	5
		%	12.5	12.5
	Negative	**No.**	35	35
		%	87.5	87.5
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
100%	100%	100%	100%	100%
Joint effusion	**Positive**	**No.**	8	8
		%	20	20
	Negative	**No.**	32	32
		%	80	80
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
100%	100%	100%	100%	100%
Bone marrow edema/contusion	**Positive**	**No.**	0	3
		%	.0	7.5
	Negative	**No.**	40	37
		%	100	92.5
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
0%	100%	0%	92.5%	92.5%
Bone fracture	**Positive**	**No.**	1	2
		%	2.5	5
	Negative	**No.**	39	38
		%	97.5	95
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
50%	100%	100%	97.4%	97.5%
Baker's cyst	**Positive**	**No.**	4	4
		%	10	10
	Negative	**No.**	36	36
		%	90	90
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
100%	100%	100%	100%	100%
Prepatellar bursitis	**Positive**	**No.**	4	4
		%	10	10
	Negative	**No.**	36	36
		%	90	90
Sensitivity %	**Specificity %**	**PPV%**	**NPV%**	**Accuracy%**
100%	100%	100%	100%	100%

DISCUSSION

Our study included 40 patients complained of knee pain with 18 of them were male patients (45 %) and 22 were female patients (55 %). *Mostafa et al. (2019)* included 62% male patients and 38% female patients (38%). *Unlu et al. (2014)* found that 71% were male patients and 29% were female patients.

Our study showed that US has sensitivity of 60% and specificity of 100% for meniscal tears, while *Mostafa et al. (2019)* showed slightly higher US sensitivity of 88.9% and specificity of 77.3%. Our study disagreed with *Unlu et al. (2014)* that showed US sensitivity and specificity of young group in their study (below 35 years old) of 80% and 100% respectively. Their young group showed statistically significant agreement between US and MRI that agreed with our study.

Our study showed that US sensitivity of 16.7% and specificity of 100% for meniscal degeneration, and *Mostafa et al. (2019)* showed much higher US sensitivity and nearly similar specificity of 63.6% and 88.9% respectively. Our study low sensitivity of US for meniscal degeneration may be due to that US is operator dependent.

Our study showed 60% sensitivity and 100 % specificity for meniscal extrusion while *Nogueira-Barbosa et al. (2015)* showed US sensitivity and specificity of 95.5% and 76% respectively.

These results indicated that sonography was not accurate enough to be used as the only modality for diagnosing lesions of the knee menisci.

Our study revealed sensitivity of US in detecting MCL injury 75% and specificity of 100% and *Ghosh et al. (2017)* showed sensitivity and specificity of 67% and 83% respectively.

Our study revealed 100% sensitivity and specificity of US in detecting Baker's cyst which agreed with *Ward et al. (2011)* that showed 100% sensitivity and specificity.

Our study revealed 100% sensitivity and specificity of US in detecting joint effusion which disagreed with *Draghi et al. (2015)* that showed sensitivity and specificity of 81.3% and 100%.

The majority of the knees with osteoarthritis (OA) had effusion using US (100%) and MRI (100%). Synovial thickening observed on US and MRI. This study confirmed that there was a significant correlation between the MRI and US techniques for evaluating the cartilage and soft tissue changes in the patients with knee OA.

Our results after data analysis regarding the role of US the detection of knee joint osteoarthritis compared to MRI showed sensitivity of 66.7% and specificity of 100%. This did not matched with the study done by *Abraham et al. (2011)* that showed 100% sensitivity and specificity.

Our study revealed that the US was 100 % sensitive, specific and accurate in detection of bone erosions, which agreed with Schäfer and his Coworkers (2016) that showed 95 % sensitivity and 98 % specificity.

This was not consistent with the results concluded by *Malattia and his Colleagues (2010)* which stated that MRI was the best method for the identification of erosions, revealing more than twice as many

erosions as radiography and ultrasonography.

Our study revealed high sensitivity and specificity of US in detecting tendinous lesions of 100% which agreed with *Abraham et al. (2011)* that showed 100% sensitivity and specificity.

Our results after data analysis regarding the role of US the detection of knee joint articulating bone fractures compared to MRI showed sensitivity of 50% and specificity of 100%. This did not match with the study done by *Schäfer and his Colleagues (2016)* that showed sensitivity of 97% and specificity of 100%.

Our study revealed high sensitivity and specificity of US in detecting prepatellar bursitis of 100% compared to MRI, while *Draghi et al. (2015)* showed sensitivity of 86 % and specificity of 100 %.

CONCLUSION

Knee US has reasonable accuracy in detecting collateral ligament and meniscal pathology. US with the advantages of being widely available lower in cost and with no contraindications should be the first modality of choice in evaluating knee pain. MRI can be reserved for equivocal US results.

REFERENCES

1. **Abraham M, Goff L, Mark S, Roger M and Birrell F (2011):** Reliability and validity of ultrasound imaging of features of knee osteoarthritis in the community, BMC Musculoskeletal Disorders, 12(70):1-8.
2. **Alves TI, Girish G, Kalume MB and Jacobson JA (2016):** US of the Knee: Scanning Techniques, Pitfalls, and Pathologic Conditions. Radiology, Division of Musculoskeletal Imaging, University of Michigan Health System, 36(6):1759-1775.
3. **De Smet AA, Graf BK and Rosas HG. (2014):** MR Imaging-based diagnosis and classification of meniscal tears. RadioGraphics, 34: 981– 999.
4. **Draghi F, Urciuoli L and Alessandrino F. (2015):** Joint effusion of the knee: potentialities and limitations of ultrasonography. Journal of Ultrasound, 18(4): 361–371.
5. **Foley R, Fessell D, Yablon C, Nadig J, Brandon C and Jacobson J. (2016):** Sonography of traumatic quadriceps tendon tears with surgical correlation. J Ultrasound Med., 34(5):805–810.
6. **Ghosh N, Kruse D and Subeh M. (2017):** Comparing Point-of-care-ultrasound (POCUS) to MRI for the Diagnosis of Medial Compartment Knee Injuries. Journal of Medical Ultrasound, 25 (3): 167–172.
7. **Jacobson JA. (2013):** Knee ultrasound. In: Jacobson JA, ed. Funda¬mentals of musculoskeletal ultrasound. 2nd ed. Philadelphia, Pa: Elsevier Saunders, Pp. 212–256.
8. **Malattia C, Damasio M, Magnaguagno F, Pistorio A. (2010):** Magnetic resonance imaging, ultrasonography, and conventional radiography in the assessment of bone erosions in juvenile idiopathic arthritis. Arthritis & Rheumatism, 59: 1764–1772.

9. **Mostafa H, AbouElfotuh A and Alsakka M. (2019):** MRI Versus Ultrasound in Diagnosis of Meniscal Tear In Knee Joint,74 (2): 303-309.

10. **Nacey NC, Geeslin MG, Miller GW and Pierce JL (2017):** Magnetic resonance imaging of the knee: An overview and update of conventional and state of the art imaging. J Magn Reson Imaging, 12(5):714-722.

11. **Nogueira-Barbosa MH, Gregio-Junior E and Lorenzato MM. (2015):** Ultrasound Assessment of Medial Meniscal Extrusion: A Validation Study Using MRI asReference Standard. American Journal of Roentgenology, 204 (3): 584-588.

12. **Schäafer VS, Schmidt WA, Backhaus M and Hartung W (2016):** Arthritis of the Knee Joint in Rheumatoid Arthritis - Evaluation of Treatment Response by Ultrasound in Daily Clinical Practice, 10: 81–87.

13. **Unlu E, Ustuner E and Saylisoy S. (2014):** The role of ultrasound in the diagnosis of meniscal tears and degeneration compared to MRI and arthroscopy. Acta Med Anatol., 2 (3): 80-87.

14. **Ward EE, Jacobson JA and Fessell DP (2011):** Sonographic detection of Baker's cysts: comparison with MR imaging. American Journal of Roentgenology, 176(2): 373-380.

دور الموجات فوق الصوتية في تقييم الركبة المؤلمة دراسة مقارنة مع فحص الرنين المغناطيسي

محمد رضا عبدالله علي، أحمد عبدالفتاح محمود أبوراشد، أحمد محمد مصطفى

قسم الأشعة التشخيصية، كلية الطب، جامعة الازهر

E-mail: muhammad_reda325@yahoo.com

خلفيـــــــــــة البحـــــــــث: ألم الركبة من أكثر أعراض الجهاز الحركي شيوعا و يتزايد بين الناس، و لذلك فإن اختيار أداة تشخيصية ذات كفاءة بتكلفة مناسبة أمر ضروري، و بالرغم من أن الرنين المغناطيسي هو الأداة الأساسية لتشخيص أمراض الأنسجة الرخوة بمفصل الركبة إلا إنه عالي التكلفة، و في نفس الوقت تعد الموجات فوق الصوتية أداة فعالة لتشخيص أمراض الأنسجة الرخوة بمفصل الركبة.

الهـــــدف مـــــن البحـــــث: قياس مدى فعالية الموجات فوق الصوتية في تشخيص حالات ألم الركبة بالمقارنة مع الرنين المغناطيسي.

المرضـــى وطـــرق البحـــث: شـــملت هـــذه الدراســـة 40 مريضـــاً (18 ذكـــر و 22 أنثـــى) تتـــراوح أعمـــارهم بـــين 15-69 ســـنة. أجريـــت هـــذه الدراســـة فـــي قســـم الأشـــعة بمستشـــفيات جامعـــة الأزهـــر لفحـــص الموجـــات فـــوق الصـــوتية والـــرنين المغناطيســـي خلال الفترة من أكتوبر 2019 إلى نوفمبر 2020.

نتـــائج البحـــث: فيمـــا يتعلـــق بتمـــزق القـــرن الهلالـــي، كشـــفت الموجـــات فـــوق الصـــوتية عـــن تمـــزق فـــي حـــالتين، بينمـــا كشـــف التصـــوير بـــالرنين المغناطيســـي عـــن تمـــزق فـــي 5 حـــالات. وفيمـــا يتعلـــق بتـــنكس القـــرن الهلالـــي، فقـــد إكتشـــفت الموجـــات فـــوق الصـــوتية إنحطاطًـــا فـــي حالـــة واحـــدة، بينمـــا إكتشـــف التصـــوير بـــالرنين المغناطيســـي انحطاطًـــا فـــي 6 حـــالات. وتشـــير هـــذه النتـــائج إلـــى أن التصـــوير فـــوق الصـــوتي لـــيس دقيقًـــا بدرجـــة كافيـــة لاســـتخدامه بإعتبـــاره الطريقـــة الوحيـــدة لتشـــخيص آفـــات الغضـــروف المفصـــلي فـــي الركبـــة. فيمـــا يتعلـــق بإصـــابة الربـــاط الجـــانبي الإنســـي، كشـــفت الموجـــات فـــوق الصـــوتية عـــن إصـــابة فـــي الربـــاط الجـــانبي الإنســـي فـــي 3 حـــالات، بينمـــا كشـــف التصـــوير بـــالرنين المغناطيســـي عـــن إصـــابة الربـــاط الجـــانبي الإنســـي فـــي 4 حـــالات.

وغالبيـــة الـــركبتين المصـــابة بهشاشـــة العظـــام كـــان لـــديها إنصـــباب بإســـتخدام الموجـــات فـــوق الصـــوتية (100٪) والتصـــوير بـــالرنين المغناطيســـي (100٪). ولوحظـــت ســـماكة زليليّـــة علـــى الموجـــات فـــوق الصـــوتية والتصـــوير بـــالرنين المغناطيســـي. وأكـــدت هـــذه الدراســـة وجـــود علاقـــة إرتبـــاط معنويـــة بـــين التصـــوير بـــالرنين المغناطيســـي وتقنيـــات الموجـــات فـــوق الصـــوتية لتقيـــيم تغيـــرات الغضـــاريف والأنســـجة الرخـــوة لـــدى مرضى التهاب مفاصل الركبة.

الأســـــــــــــــــــــتنتاج: الموجات فوق الصوتية أداة تشخيصية فعالة في حالات ألم الركبة، و الموجات فوق الصوتية لها دقة مناسبة في تشخيص أمراض الغضاريف الهلالية و الأربطة الجانبية لمفصل الركبة، و لأن الموجات فوق الصوتية واسعة الانتشار وذات تكلفة منخفضة و بلا موانع للفحص فيجب إستخدامها كفحص أولي لحالات ألم الركبة و يترك الرنين المغناطيسي للحالات المبهمة.

الكلمـــات الدالـــة: الموجـــات فـــوق الصـــوتية، الركبـــة المؤلمـــة، التصـــوير بـــالرنين المغناطيسي.