



Original Research Article MRI in Evaluation of Knee Cystic Lesions

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Cystic knee lesions (synovial cysts, bursae, ganglia, and meniscal cysts) are frequently discovered and can be divided into real cysts and lesions that simulate cysts (hematomas, seromas, abscesses and vascular lesions).

Aim of the Work: The aim of this study was to assess the role of magnetic resonance imaging in evaluation of cysts and cyst like lesions in and around the knee.

Subjects and Methods: From January 2018 to August 2019, 30 patients were referred from outpatient clinics and orthopedic surgery department to MRI unit of radiodiagnosis and medical imaging department at Tanta University Hospitals, for MRI evaluation of suspected knee cystic lesions.

Results: MRI was able to detect all clinically suspected cystic lesions within the knee. It also helped to describe morphology and its relation to surrounding tissues. 16.7% and 3.3% of the studied cystic lesions had fine and thick septa respectively, and 67 % of the studied cystic lesions had communication with the joints. MRI could identify the associated pathology of most of the detected cystic lesions (80%). The most common pathology were meniscal degeneration (26.7%) followed by meniscal tear and osteoarthritis (23.3%) and (20%) respectively. Ligament tear / sprain

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formed 6.7% of the total cysts while bone contusion forms 3.3%.

Conclusion: The findings of this study confirm that In spite of its high cost, limited availability and the need for highly expert radiologists, MRI remains the method of choice for both diagnosis, characterization and uncovering the associated pathology and cause of cystic lesions around the knee. The high ability of MRI to image soft tissues plays a key role.

Keywords: Cystic knee; magnetic resonance imaging; orthopedic surgery; radiodiagnosis.

1. INTRODUCTION

Cystic knee lesions (synovial cysts, bursae, ganglia, and meniscal cyst) are frequently discovered and can be divided into real cysts and lesions that simulate cysts (hematomas, seromas, abscesses and vascular lesions) [1].

The anatomical location also makes the correct diagnosis for the cystic lesion. In difficult cases, detection of the atypical position of cystic mass or visualisation of internal solid contrast changes in MRI should raise questions about a neoplasm and the need for more evaluation and intervention [2]. Frequently, cystic lesions of the knee are described as asymptomatic. However, they might be manifested with pain, functional restriction, mechanical dysfunction or even palpable masses [3].

Imaging studies allow the diagnosis of knee cystic lesion. The ultrasound is used in case of palpable masses, also used to differentiate between cystic and solid lesion. It is cheap and generally speaking, it is an accessible resource [4,5].

X-ray and computed tomography are the original radiological studies in most suspected knee disorders. Radiographs show joint spaces and bones, but are comparatively insensitive to soft-tissue conditions [6].

Magnetic resonance imaging (MRI) has emerged as the primary imaging method for the knee. It is the most sensitive, noninvasive test for the diagnosis for almost all bone and soft-tissue disorders in and around the knee [7].

In addition, MRI offers information that can be used to grade pathology, guide therapy, prognosticate conditions, and assess treatment for a broad variety of orthopedic circumstances in the knee [7,8].

2. PATIENTS AND METHODS

From January 2018 to August 2019, 30 patients (13 male &14 female) aged from 5 to 65 years

were referred from outpatient clinics and orthopedic surgery department to MRI unit of radiodiagnosis and medical imaging department at Tanta University Hospitals, for MRI evaluation of suspected knee cystic lesions.

Inclusion criteria were as follows: Patients with swelling or suspected cystic lesions in the knee diagnosed clinically or by previous imaging modality.

Exclusion criteria were as follows: Patients who have contraindication to MRI scan including those with: aneurysm clips, any metallic fragments or foreign bodies, coronary and peripheral artery stents, aortic stent graft, prosthetic heart valves, vena Cava filters, cardiac pacemaker, implanted cardioverter defibrillator (ICD), electronic implant or device e.g. Insulin pump or other infusion pump, cochlear implant and claustrophobia.

All patients were subjected to:

1. History taking: especially the course and duration of the swelling growth, presence of pain.
2. Clinical Examination: site, size, shape, borders, tenderness, and consistence of the swelling.
3. Review of all available other previous imaging studies.
4. Magnetic resonance imaging of knee with multi-sequences.

MRI scanning protocol was as follow:

MRI was performed for all patients using 1.5 Tesla MRI scanner (Signa Explorer, GE health care).

The following steps were adopted:

- Screening for any contraindication to MRI.
- **Instructions to patients:** these included mainly minimizing motion and the nature of the technique and expected time for

the procedures as well as the expected reactions.

- **Positioning:** For routine MRI examination; the knee was placed in 15° flexion (to stretch the patellar and quadriceps tendons). Patients were placed in supine position with the affected extremity in the knee coil and the head outside the magnet to minimize claustrophobia
- **Sequence:** Each examination included the following MRI sequences as needed: Axial gradient, Coronal PD fat saturated, Sagittal T1, T2, Fat suppression.
- **Utilized parameters:** Slice thickness = 4 mm for adult with inter slice 0.6 mm. T1WI sequence – TR 600 msec, TE 15 msec and matrix(256x192). T2WI sequence = TR 4000 msec ,TE 90 msec and matrix(256x256). Proton density sequence = TR over 2000 msec ,TE 10-20 msec and matrix(512x256). STIR sequence = TR over 4000 msec ,TE 120 msec and matrix (256x256).

2.1 Statistical Analysis

Statistical analysis and presentation of data was showed using SPSS (Statistical package for the social sciences) version 22 computer program. For all data, descriptive Statistics was done where categorical data were presented as numbers and percentages.

3. RESULTS

The majority were females (56.7%) while males constituted 43.3% of the studied group. Generally the range of age from 5 to 65 years and mean of 37 ± 16 years.

The majority suffered from pain (93.3%) and instability of the knee (63.3%), while those suffering from swelling and inflammation constituted 30% and 16.7% respectively Table 1.

MRI was able to detect all clinically suspected cystic lesions within the knee. It also helped to describe morphology and it's relation to surrounding tissues. 16.7% and 3.3% of the studied cystic lesions had fine and thick septa respectively, and 67% of the studied cystic lesions had communication with the joints Table 2.

The most commonly prevalent cysts were Baker's cysts (36.7%) followed by ganglion cysts (20%). Each of non-ossifying fibroma, Geode and para-meniscal cysts formed 10% of the total cysts while bursitis forms 13.3% Table 3.

MRI could identify the associated pathology of most of the detected cystic lesions (80%). The most common pathology were meniscal degeneration (26.7%) followed by meniscal tear and osteoarthritis (23.3%) (20%) respectively. Ligament tear / sprain formed 6.7% of the total cysts while bone contusion forms 3.3% Table 4.

Table 1. Clinical manifestations in the studied patients The majority suffered from pain (93.3%) and instability of the knee (63.3%), while those suffering from swelling and inflammation constituted 30% and 16.7% respectively

	N	%
Pain	28	93.3%
Instability	19	63.3%
Swelling	9	30.0%
Inflammation	5	16.7%

Table 2. Morphological characteristics of the cystic lesions in the studied patients using MRI. showed that 100.0% of baker cysts, geodes cysts and parameniscal cyst communicate with the joint. While 100.0% of bursitis and non ossifying fibroma not communicate with the joint

		N	%
Septa	None	24	80.0%
	Fine	5	16.7%
	Thick	1	3.3%
Communication with joint	Yes	19	63.3%
	No	11	36.6%

Table 3. Diagnosis of studied cystic lesions. showed that MRI could identify the associated pathology of most of the detected cystic lesions (80%). The most common pathology were meniscal degeneration (26.7%) followed by meniscal tear and osteoarthritis (23.3%) (20%) respectively. Ligament tear / sprain formed 6.7% of the total cysts while bone contusion forms 3.3%

		N	%
Diagnosis	Baker	11	36.7%
	Ganglion	6	20.0%
	Non ossifying fibroma	3	10.0%
	Bursitis	4	13.3%
	Geodes cyst	5	16.6%
	Para meniscal cyst	1	3.3%

Table 4. Associated pathology of studied knee cysts. showed that MRI could identify the associated pathology of most of the detected cystic lesions (80%). The most common pathology were meniscal degeneration (26.7%) followed by meniscal tear and osteoarthritis (23.3%) (20%) respectively. Ligament tear / sprain formed 6.7% of the total cysts while bone contusion forms 3.3%

		N	%
Underlying Pathology	Undefined	6	20.0%
	Meniscal degeneration	8	26.7%
	Osteoarthritis	6	20.0%
	Meniscal tear	7	23.3%
	Ligament tear / sprain	2	6.7%
	Bone contusion	1	3.3%

CASE 1

Clinical history: Thirty-seven year old female, complaining of anterior knee pain

MRI Findings

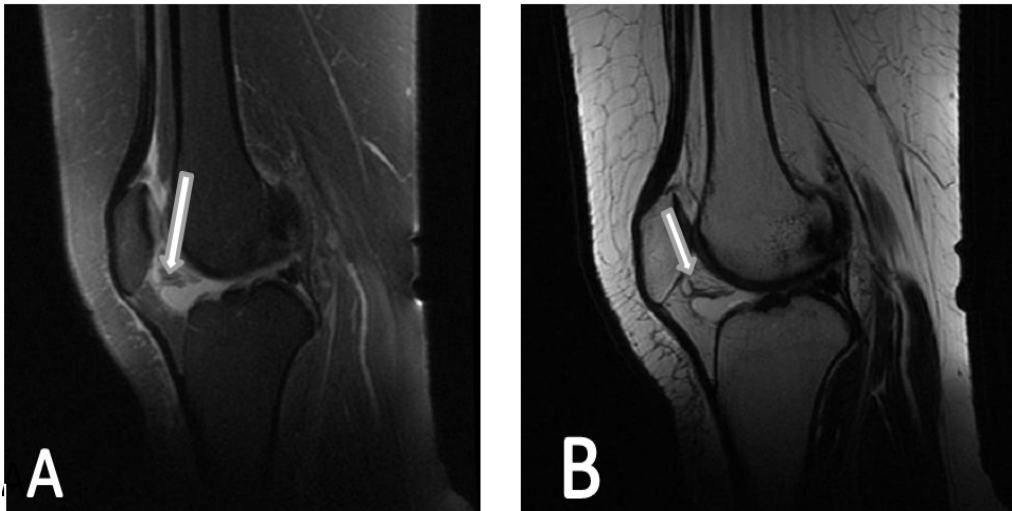


Fig. 1 and 2. A. sagittal PD weighted image & B. sagittal T2-weighted image showing a well defined hyperintense cystic lesion within Hoffas pad of fat (arrow)

MRI diagnosis: Hoffa pad of fat ganglion cyst

CASE 2

Clinical history: Thirty three year old male, complaining of pain and swelling of knee

MRI Findings

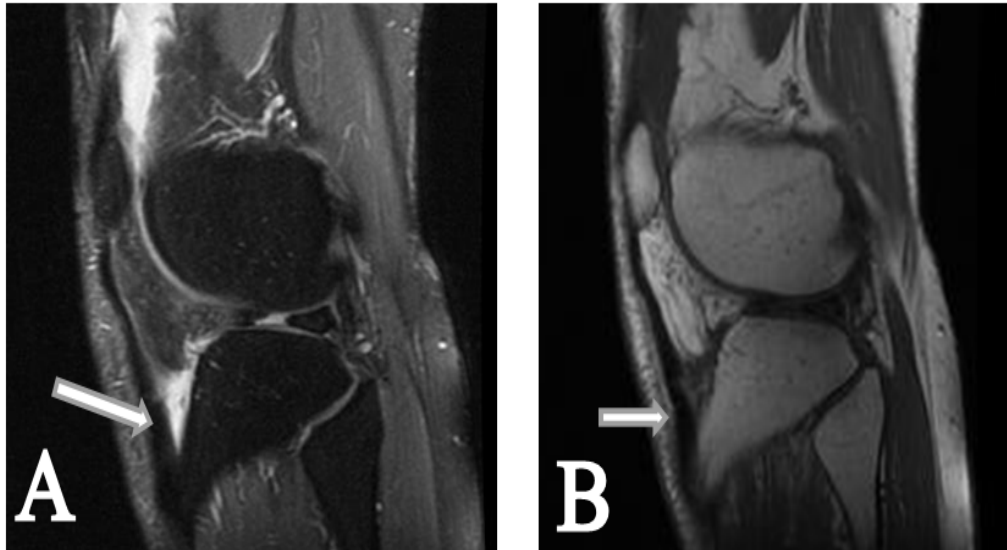


Fig. 3 and 4. A. sagittal PD weighted image, B. sagittal T1-weighted image showing well defined hyperintense cystic lesion (arrow) in infra-patellar region with its apex between the inferior patellar tendon and anterior tibial margin with associated knee effusion

MRI diagnosis: Deep infra-patellar bursitis

4. DISCUSSION

Knowledge of the common anatomical locations and appearances of bursae, recesses, cysts and ganglia is necessary so that radiologists do not misinterpret these benign entities as soft-tissue tumours [9].

The results of this study showed that the majority of cases were females (56.7%). Generally the range of age from 5 to 65 years and mean of 37 ± 16 years. In comparison to our study, Darwish and Kamel, demonstrated the mean age of the patients was 45 ± 16 years, Females to males' ratio was 3:1. In a previous study carried out in Alexandria University, the majority of cases were females (53.3%). The age ranged from 19 to 57 years with an average of 38.65 ± 12.55 years [10].

Pain was the most common (93.3%) clinical finding revealed by the current study among cases suffering from cystic lesions around the knee. This was followed by instability (36.7%), swelling (30.0%). Inflammation was only detected among 16.7% of cases. The high

prevalence of pain among the studied cases can be attributed to the nature of the cyst itself or the underlying cause of the lesion. In comparison to our study, Darwish and Kamel, demonstrated main complain, associated pain was seen in (75%) of the patients. In a previous study carried out in Alexandria University, Pain was the most common (97.5%) clinical finding revealed by the current study among cases suffering from cystic lesions around the knee. This was followed by clicking (37.5%), swelling (30.0%) and knee instability (27.5%). Inflammation was only detected among 5.0% of cases [11].

Although Baker cysts are often asymptomatic, patients with back knee pain, decreased mobility of the knee, or back knee mass may develop [12]. In the intraarticular knee condition of patients with degenerative and/or inflammatory arthritis, meniscal tears and other knee inner distraction, a baker's cyst is normal [13 and 14].

All of these underlying causes may cause pain in addition to other manifestations. Not only that but also complications such as rupture and compression of the nearby nerves and vessels

associated with the Baker's cyst can cause pain [15,16].

Also, in most cases, meniscal cysts are accompanied by mucoid degeneration and horizontal tear, with infiltration of synovial fluid into the capsular-meniscal complex [17].

The current study revealed that the most commonly prevalent cysts were Baker's cysts (36.7%) followed by ganglion cysts (20%) followed by geodes cyst (16.6%). Non ossifying fibroma form 10% of the total cyst-like lesions while bursitis form 13.3% and parameniscal cyst form (3.3%). In comparison to our study, Hayashi et al MRI study identified 24 cases Baker cysts (32.8%), 18 cases ganglion cysts (24.6%), and 6 cases meniscal cysts (8.2%). MRI identified 13 cases distended knee bursae (17%) [18].

Baker cyst is a common discovery in intraarticular knee disease patients such as degenerative or inflammatory arthritis, meniscal tears and other internal disruption of the knee [19,20].

In a previous study carried by Evangelos Perdikakis et al, revealed that the most commonly prevalent cysts were Baker's cysts (41%) followed by ganglion cysts (35%). Each of bursitis, Geode and para-meniscal cysts formed 9% of the total cysts while each of osteochondromatosis and CAD cysts formed 2.5% (1 case for each) [21].

The current study showed that 16.7% and 3.3% of the studied cystic lesions had fine and thick septa respectively and 63.3% of the studied cystic lesions had communication with the joints (100.0% of baker cysts, geodes cysts and parameniscal cyst communicate with the joint, While 100.0% of bursitis and non-ossifying fibroma not communicate with the joint). In comparison to our study, a previous study carried out by Kim et al, 37.5% and 2.5% of the studied cystic lesions had fine and thick septa respectively and 50% of the studied cystic lesions had communication with the joints [22].

The current study showed that MRI could identify the associated pathology of most of the detected lesions (80%). revealed that the most common pathology were meniscal degeneration (26.7%) followed by meniscal tear and osteoarthritis (23.3%) (20%) respectively. Ligament tear / sprain formed 6.7% of the total cysts while bone

contusion forms 3.3%. In a previous study carried out in Alexandria University, MRI could identify the underlying pathology of most of the detected lesions (95%) [11].

5. CONCLUSION

The findings of this study confirm that In spite of its high cost, limited availability and the need for highly expert radiologists, MRI remains the method of choice for both diagnosis, characterization and uncovering the associated pathology and cause of cystic lesions around the knee. The high ability of MRI to image soft tissues plays a key role.

CONSENT

- a) Written informed consent will be obtained from all patients after full explanation of the benefits and risks of procedures.
- b) Any unexpected risks appeared during course of the research will be cleared to participants.
- c) The privacy of participants and confidentiality of data will be guaranteed during the various phases of the study.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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