Original article:

Radiological Evaluation of Painful Knee

[1]Dr Rajpal Yadav* , [2]Dr Devidas S Kulkarni , [3]Dr Siddappa G Gandage , [4]Dr V.N. Marathe , [5]Dr Sushil G Kachewar

[1]Chief Resident, MD Radio-diagnosis, Rural Medical College , PIMS (DU), Loni , Tal.Rahata , Ahmednager , Maharashtra , India
[2] Professor in Radio-diagnosis Department, Rural Medical College , PIMS (DU), Loni , Tal.Rahata , Ahmednager , Maharashtra , India
[3]Professor in Radio-diagnosis Department, Rural Medical College , PIMS (DU), Loni , Tal.Rahata , Ahmednager , Maharashtra , India
[4] Professor in Radio-diagnosis Department, Rural Medical College , PIMS (DU), Loni , Tal.Rahata , Ahmednager , Maharashtra , India
[5] Professor in Radio-diagnosis Department, Rural Medical College , PIMS (DU), Loni , Tal.Rahata , Ahmednager , Maharashtra , India
***Corresponding Author email:** raajpaalyadaav@rediffmail.com

Abstract

Introduction: Painful knee is a common clinical presentation in any trauma or orthopedic specialty outpatient clinic. Traumatic as well as many non traumatic conditions of knee can present as painful knee. This study was undertaken to evaluate how imaging can help in pinpointing the exact cause of painful knee and thereby assist in proper management.

Methodology: 50 consecutive patients with painful knee as the presenting complaint were radiologically evaluated for the cause of knee pain. Non invasive imaging modalities like plain radiographs, ultrasound and MRI were used in this study.

Results: In this present study of 50 patients, 33 were males (66%) and 17 were females (34%).The patients age range from 15 years 65 years with most of the patients in the age group of 20-50 years. Traumatic causes outnumbered non traumatic etiologies of painful knee. Injury to the anterior cruciate ligament was the commonest soft tissue abnormality encountered.

Conclusion: Painful knee can be a presenting symptom of a host of clinical conditions affecting human knee. Plain radiographs were good in identifying bony abnormalities alone. Ultrasound could show effusion and few ligamentous injuries, but it was only the Magnetic Resonance Imaging which could demonstrate the complete etiology of each entity. Thus Radiological Imaging has an important role in identifying the cause of painful knee.

Keywords: Painful Knee , Ultrasound , Cystic Lesions

Introduction

Almost every one of us has suffered from knee pain at some or other time in life. Painful knee is a common presentation in many clinics. Trauma to the knee, fracture or infection is the commonest etiology. Clinical examination alone is often not sufficient to pinpoint the exact lesion causing pain [1, 2]. Hence, for want of correct diagnosis such patients might not get appropriate treatment. Here comes the role of non invasive imaging [3]. This study was therefore undertaken to analyze the utility of imaging in pinpointing the cystic lesions presenting as painful knee and therefore assist in proper management.

Materials and Methods

The present work was carried out at Department of radio -diagnosis in Rural Medical College, Loni at PIMS during last two years. The study was approved by Institutional Ethical Committee from our university. The sample was collected by simple random sampling. The patients were included who attended routine OPD from Department. The written

www.ijbamr.com P ISSN: 2250-284X E ISSN :2250-2858

consent was obtained after explaining purpose of study and other relevant information.

Plain Radiograph, High resolution ultrasound [HRUSG] and 1.5 T Magnetic Resonance Imaging [MRI] systems were used for evaluating 50 consecutive patients having painful knee as the presenting complaint. The aim was to find how imaging can help in finding the exact cause of painful knee in our setup. The findings were then noted in this descriptive study.

Observations and Results

Analysis of demographic characteristics show that in this present study of 50 patients, 33 were males (66%) and 17 were females (34%) (Table1). This is because males are generally more active than females and travel a lot. Hence their knees are exposed to more wear and tear.

Also they are at more risk of injury.

Table 1) Distribution of patients according to sex

SEX	NO.OF PATIENTS	PERCENTAGE
MALES	33	66%
FEMALES	17	34%
TOTAL	50	100%

The spectrum of findings as seen on different imaging modalities and the success of each modality in pinpointing the cause of painful knee are summarized in Table 2.

Plain radiographs (X-rays) were good in identifying bony abnormalities [5 out of 9]; but MRI was still better [9 out of 9]. HRUSG was better [31 out of 50] in diagnosing knee effusion than plain radiographs [9 out of 50]. MRI could satisfactorily identify all cases with knee effusion.

This difference in diagnostic ability of each modality is significant and is given by Fisher exact test, $p<0.01$

.

Table 2: Distribution of imaging findings and Success of imaging modalities in identifying them

Abnormality	**X-RAY No. (%)**	**USG No. (%)**	**MRI No. (%)**	**'p' value**
Bony abnormality's	5(10%)	1(2%)	9(18%)	
Effusion	9(18%)	31(62%)	50(100%)	p<0.01*
ACL injury	0	1(2%)	44(88%)	p<0.01*
PCL injury	0	0	6(12%)	
MM injury	0	17(34%)	42(84%)	
LM injury	0	9(18%)	29(58%)	p<0.01*
Miscellaneous				
Baker`s Cyst	1(2%)	2(2%)	3(6%)	

Conti….

www.ijbamr.com P ISSN: 2250-284X E ISSN :2250-2858

ACL Cyst	0	1(2%)	1(2%)	
Meniscal Cyst	0	1(2%)	3(6%)	
Osteomyelitis bony change	1(2%)	1(2%)	1(2%)	p<0.01*
Osteomyelitis soft tissue change	0	0	1(2%)	p<0.01*

* 'p' value, Fisher exact test, significant, p<0.01

[MRI was far better and superior in identifying the exact cause of painful knee. Other modalities have limited usage.]

Discussion

The spectrum of lesions that occur in the soft tissues and bones in and around the knee joint and cause pain is quite broad and beautiful. Imaging has an important role in not only identifying or confirming this lesion but also in assessing its extent and connections [3-6]. Most of these lesions produce clinical features suggestive of internal derangement of the knee. Hence a definitive diagnosis is needed to avoid unnecessary further invasive procedure like arthroscopy.

On plain radiographs, bony lesions are clearly seen but soft tissue and cystic lesions are rarely seen. Sometimes they may cause a focal bulge on overlying soft tissues. Computerized tomography (CT scan) may show the lesions, but exact tissue characterization may be limited. In experienced hands, HRUSG can very well depict the pathology. Cystic lesions typically appear hypo or anechoic on ultrasound. MRI on the other hand can give an idea of entire lesion and demonstrate it in multiple planes so that correct diagnosis and management strategy can be planned. Cystic lesions are seen as low signal intensity on T1 -weighted images and high signal intensity on T2-weighted images because of their high content of free water. Short Tau Inversion Recovery (STIR) MRI sequence demonstrates cystic lesions as hyper intense areas. On imaging studies, typical appearance of cystic lesions has been studied and mentioned in literature [4-16].

The following important painful soft tissue lesions were found in this study:

Suprapatellar bursitis

This cystic lesion is formed as a separate synovial space between the quadriceps tendon and the femur, proximal to the knee joint capsule cranial to patella [4-6]. It is best demonstrated on MRI as a focal fluid collection anterior to the distal femoral diaphysis, separated from the knee joint by a thin intact suprapatellar plica**.**

Deep infrapatellar bursitis

This cystic lesion is located between the tibial tuberosity and skin and is usually caused by chronic trauma. It is an uncommon site for bursitis [4-6]. MRI shows a focal poorly defined collection of fluid anterior to the tibial tubercle, best demonstrated on sagittal /axial images.

Ganglion cyst

Ganglion cyst is a benign cystic lesion having viscous, proteinaceous fluid. It occurs adjacent to or within muscles and their tendon sheaths. On MRI it appears hyper intense on T2W and STIR images.

www.ijbamr.com P ISSN: 2250-284X E ISSN :2250-2858

Synovial cyst and ganglion cysts are easily distinguished from meniscal cysts by the absence of a direct communication with the meniscus [5,6, 9, 10].

Meniscal Cysts

These cystic lesions occur at the joint line, almost invariably in association with degeneration and meniscal tears. Synovial fluid is forced through the tear and accumulates at the meniscal capsular junction [5, 6, 9, 10]. These are of two types:

1] Intrameniscal cyst-when the cyst is confined within the meniscus**,** it appears as a small, loculated area of altered signal intensity, seen communicating to the anterior horn of lateral meniscus appearing heterogeneously hyper intense on T2WI sagittal and STIR coronal images.

2] Parameniscal Cyst- when the meniscal cyst extends into the adjacent soft tissue**.** It is seen as a small, loculated area of altered signal intensity, communicating with the posterior horn of medial meniscus appearing hypo intense on T1WI coronal and hyper intense on STIR axial and coronal images.

Popliteal Cyst /Baker's cyst It usually originates between medial head of the gastrocnemius muscle and the more medial semi membranous tendon and demonstrates low signal intensity on T1-weighted images and uniformly increased signal intensity on T2-weighted images as well as STIR MRI images [11-13].

Sometimes, septations that compartmentalize the cyst are seen especially when the cysts arise in atypical locations. A narrow neck connecting the cyst to the joint can usually be identified on axial images, just below the proximal attachment site of the medial head of gastrocnemius.

Subchondral Cysts (Geode)

These are often associated with osteoarthritis. These may be multiple and segmental in distribution, and present with surrounding sclerosis [14]. It is seen as a small, round to oval, area of altered signal intensity noted involving the subchondral area of intercondylar region and partly lateral condyle of tibia and lateral condyle of femur, appearing hyperintense on STIR MRI images. In an effort to compare and contrast the role of different imaging modalities for evaluating painful knee it is obvious that

1. Plain Radiography is the first step in the evaluation of knee pain. It is quick and inexpensive yielding many diagnostic clues. It can readily reveal fractures, osteochondral defects, bony lesions, joint effusions, joint space narrowing, and bone misalignment. In patients with knee trauma, supine anteroposterior and cross-table lateral radiographic images are generally obtained. In patients whose knee pain is not due to trauma, standing projections are done, as well as dedicated projection of the patellofemoral articulation. A standing series is most helpful for evaluating joint space and alignment. But in some cases the radiographic findings may not explain the patient's clinical signs and symptoms like trabecullar fractures, bone edema, cruciate and collateral ligament injury, synovitis etc.
2. HRUSG has an important role. The knee joint is of the best accessible human joints for the Ultrasound examination as tissue examined is located superficially and there are only few structures that can interfere

www.ijbamr.com P ISSN: 2250-284X E ISSN :2250-2858

with the ultrasound waves. Although in the recent decades MRI has became the gold standard imaging modality for different knee pathologies, ultrasound technique offers some advantages over MRI. The equipment is generally less expensive than MRI devices. It allows a dynamic examination - the sonologist may observe the visualized tissues during their active and passive motion [15]. In addition, the complaints of the patient during sonopalpation with the probe can help to localize different musculoskeletal pathologies [16]. Drawbacks of HRUSG are that intra articular soft tissue like structures i.e. cruciate ligament and menisci couldn't be adequately demonstrated, bony details are not adequately visualized and it is user dependent.

3. MRI has revolutionized diagnostic imaging of the knee as this innovative technology allows superior soft tissue details with multiplanar imaging capability that provide accurate evaluation of the intra and extra articular structure of the knee which are demonstrated with other imaging modalities.MRI is accurate, non invasive technique for evaluating the structures of the knee, marrow space, synovium and periarticular soft tissue concerning the knee [17, 18]. It has great capacity in diagnosing meniscal tear and classifying them into grade and type which would avoid unnecessary arthroscopic examination. It is very good modality to diagnose complete tear of ACL.

With advances in science and technology, recently there is decrease in the cost of MRI knee studies. This has also contributed to their acceptance by the orthopedic community as a non invasive replacement for arthrography and non therapeutic arthroscopy [19].

Conclusion

Painful knee is a common clinical presentation in almost all age groups. Proper management of patient's plight needs accurate non invasive diagnosis. Radiological evaluation can definitely diagnose the exact cause of pain in such knees. Appropriate imaging modality must be chosen after the clinical examination to get out the best results as each imaging modality has certain advantages. adisadvantages.

References

1. Yoon YS, Rah JH, Park HJ: A prospective study of the accuracy of clinical examination evaluated by arthroscopy of the knee. Int Orthop 1997; 21(4):223-7.
2. Terry GC, Tagert BE, Young MJ: Reliability of the clinical assessment in predicting the cause of internal derangement of the knee. Arthroscopy 1995; 11(5):568-76
3. Trieshmann HW Jr, Mosure JC: The impact of magnetic resonance imaging of the knee on surgical decision making. Arthroscopy 1996; 12(5):550-5.

4. Christian SR, Anderson MB, Workman R, Conway WF, Pope TL. Imaging of anterior knee pain.Clin Sports Med. 2006; 25(4):681-702.
5. McCarthy CL, McNally EG. The MRI appearance of cystic lesions around the knee. Skeletal Radiol. 2004;33:187–209
6. Janzen DL, Peterfy CG, Forbes JR, Tirman PF, Genant HK. Cystic lesions around the knee joint: MR imaging findings. AJR Am J Roentgenol. 1994;163:155–61.
7. Hirji Z, Hanjun JS, Choudur HN. Imaging of Bursae. J Clin Imaging Sci. 2011;1:22.
8. Dorsey ML, Liu PT, Leslie KO, Beauchamp CP. Painful suprapatellar swelling: Diagnosis and discussion. (951-2).Skeletal Radiol. 2008;37:937–8.
9. Recht MP, Applegate G, Kaplan P, et al. The MR appearance of cruciate ganglion cysts: A report of 16 cases. Skeletal Radiol 1994; 23:597-600
10. Burk DL, DalinkaMK, Kanal E, et al . Meniscal and ganglion cysts of the knee: MR evaluation AJR Am J Roentgenol 1988; 150:331-336
11. Fielding JR, Franklin PD, Kustan J . Popliteal cysts: a reassessment using magnetic resonance imaging. Skeletal Radiol 1991; 20: 433-435
12. Miller TT, Staron RB, Koenigsberg T, et al. MR imaging of Baker's cyst: association with internal derangement, effusion and degenerative arthropathy. Radiology 1996;201: 247-250
13. Fritschy D, Fasel J, Imbert JC, Bianchi S, Verdonk R, Wirth CJ. The popliteal cyst. Knee Surg Sports Traumatol Arthrosc. 2006; 14:623–8.
14. Pouders C, De Maeseneer M, Van Roy P, Gielen J, Goossens A, Shahabpour M. Prevalence and MRI-anatomic correlation of bone cysts in osteoarthritic knees. Am J Roentgenol. 2008; 190:17–21.
15. Friedmqn L, Finlay K, Jurriaans E: Ultrasound of the knee.Skeletal Radiol 30:361-377,2001
16. Seminars In Ultrasound CT and MRI Vol 32, No 02 April 2011 page no 66-73.
17. Kachewar SG, Kulkarni DS. Distant perijoint calcifications: sequel of non traumatic brain injury-a review and case report. Journal of Clinical and Diagnostic Research 2013; 7:2606-2609.
18. Kachewar SG, Singh H. Perigenicular Heterotopic Ossification: A rare sequelae of non traumatic brain injury. Nepal Journal of Neurosciences 2010; 1:21-23.
19. Nikken JJ, Oei EHG, Ginai AZ, et al. Acute peripheral joint injury: cost and effectiveness of low-field-strength MR imaging—results of randomized controlled trail. Radiology 2005; 236: 958–67.

Date of submission: 18 September 2013 Date of Provisional acceptance: 22 October 2013
Date of Final acceptance: 27 November 2013 Date of Publication: 04 December 2013
Source of support: Nil; Conflict of Interest: Nil