

Original Research Article

Magnetic resonance imaging evaluation of painful knee joint: an experience from a rural medical college of West Bengal, India

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ABSTRACT

Background: Painful knee is considered as one of the most common causes of morbidity and disability affecting all age group. It happens due to varied reasons ranged from injury to various disease processes. The present study documented the magnetic resonance imaging (MRI) findings in painful knee.

Methods: A hospital based cross-sectional study was conducted among 100 painful knee patients referred to the Radiodiagnosis department of the Midnapore Medical College of West Bengal for evaluation. MRI scans performed using GE 1.5 Tesla MRI scanner. Results were expressed in terms of numbers and proportions.

Results: The commonest soft tissue lesion found was meniscal tears which mainly involved posterior horn of the medial meniscus and of grade 2 nature. In case of any injury, vertical meniscal tear was found the commonest type. Tear was found the commonest lesion involved the anterior-cruciate ligament (ACL), mostly acute in nature while partial tear commonly found in posterior-cruciate ligament (PCL). Nearly one-third (30%) had features of bone contusions; mostly tibia followed by lateral femoral condyle. Popliteal cyst was the commonest cystic lesion and was associated with effusions and meniscal tears while patello-femoral compartment mostly involved by the osteoarthritic process.

Conclusions: MRI is an ideal, non-invasive and more precised imaging technique for the radiological evaluate of the painful knee condition for better clinical management.

Keywords: Knee joint, Magnetic Resonance Imaging, Pain

INTRODUCTION

Evaluate the radiological findings, Knee is one of the largest and most complex joint in the body. Disease processes and injuries that disrupt ligaments, menisci, articular cartilage and other structures of the knee cause painful knee resulting in significant morbidity and disability. Magnetic Resonance Imaging (MRI) has revolutionized the knee imaging. Several studies reported

magnetic resonance imaging of painful knee joint is a better radiological technique for radiological evaluation as compared to the X ray and CT scan. A superior soft tissue details with multi-planar imaging capability, provides a distant advantage for MRI over other imaging modalities in addition to its non-invasive, non-operator dependent, and cost effective nature Considering these facts in mind, the present study was undertaken with an aim to identify the common lesions involved in the

painful knee joint and evaluate the radiological findings by means of magnetic resonance imaging (MRI) in painful knee joint.^{1,2}

METHODS

An institution based, observational, analytic study was conducted which was cross-sectional nature among the patients those attended the Department of Radiodiagnosis, Midnapore Medical College and Hospital, Paschim Medinipur, West Bengal, India referred from different departments of the same hospital for radiological evaluation of their painful knee joint. The study was conducted from June 2018 to March 2019 (for a total period of 10 months).

Patients of any age those attended the Department of Radiodiagnosis, Midnapore Medical College and Hospital for radiological evaluation of their painful knee joint after referred from different departments of the same hospital.

Exclusion criteria

The presents study excluded any post-operative cases involving knee joint.

The present study included all the patients those were referred to the department of Radiodiagnosis from different departments of the Midnapore Medical College and Hospital for radiological evaluation of their pain in knee joint and willing to participate voluntarily in the present study. A total 100 patients those had pain in the knee joint and met the inclusion criteria were included for the study purpose.

Ethical Issues

The study was approved by the Institutional Ethics Committee of the Midnapore Medical College, Paschim Medinipur, West Bengal, India. Informed written consent was obtained from each of the study participants after explained the purpose and expected outcome of the study.

A pre-tested and pre-designed semi-structured questionnaire was used as the data collection tool. Basic socio-demographic information such as age, sex, caste etc. was taken. Detailed history was taken from each of the study participant. Relevant investigation reports were evaluated if available. All the magnetic resonance imaging (MRI) scans of the knee were performed by using the 'GE 1.5 Tesla High gradient MRI scanner'. The knee joint was evaluated using MRI and various pathologies of the knee joint involving different compartments were tabulated and descriptive analysis in the form of percentages was used to explain the results. The MRI protocol consisted of the following sequences: T1 and T2 weighted sequences in sagittal planes, PD weighted sequences in axial, coronal and sagittal planes and fat suppressed T2 or STIR sequences wherever indicated.

Data entry and analysis

After thorough verification, data were entered and analyzed by using the SPSS 21.0 software package (statistical package for social sciences). The categorical variables were expressed in terms of numbers and percentages. Results were expressed by means of either tables or figures.

RESULTS

In this study group which comprised of a total number of 100 patients, the age at presentation with knee pain ranged from 10 to 65 years. The mean age of the study participants were 38.48 ± 14.53 . Among the study participants, 69 were male and remaining 31 were female. The maximum number of patients affected belonged to the 20-40 years age group. Out of 100 patients, 69% were males and remaining 31% were females. No abnormalities were found on MRI only among 2% patients while remaining 98% had any abnormality in MRI scan. The various lesions found on MRI scan affecting different pathological lesions of the knee joint were documented in the Table 1. The details of the knee pathologies were discussed below.

Table 1: Distribution of the study participants by different pathology of knee joint (n=100).

Different knee pathology*	Number	Percentages (%)
Anterior cruciate ligament (ACL) tear	33	33
Posterior cruciate ligament (PCL) tear	06	06
Meniscal Tear	37	37
Meniscal Degeneration	18	18
Collateral ligament injury	16	16
Bone contusion	30	30
Bone fractures	07	07
Cystic lesions	15	15
Neoplastic lesions	10	10
Osteoarthritis	26	26
Synovial pathology	05	05
Muscular injury and oedema	02	02
Joint effusion	88	88

*Knee pathologies were not mutually exclusive, total percentages may exceed 100%.

Meniscal Tear

Out of the 100 patients evaluated on the basis of the MRI scan of the painful knee joint, 37% (37 out of 100) patients had total 67 (67%) meniscal tears. Out of the total 37 meniscal tear patients, 28 (75.7%) involved the medial meniscus tear alone, 9 (24.3%) had the lateral meniscus tear alone and 15 (40.5%) had both medial as well as lateral meniscus tears. Of the total 67 meniscal tears detected on MRI evaluation of the knee joint, 43 (64.2%) were medial meniscus tear and remaining 24

(35.8%) were lateral meniscus tear. Of the 43 medial meniscal tears, 1 (2.3%) was Grade I tear, 29 (67.4%) were Grade II tears and 12 (27.9%) were Grade III tears. Out of 43 medial meniscal tears, 30 tears (69.8%) involved the posterior horn, 8 tears (18.6%) involved the body of the meniscus and 5 tears (11.7%) involved the anterior horn. Of the 24 lateral meniscal tears, 17 (70.8%) were Grade II tears, 6 (25%) were Grade I, and 1 (4.2%) were Grade III tear. Out of 24 lateral meniscal tears, 10 (41.6%) tears involved the anterior horn, 14 (54.2%) tears involved the posterior horn and 1 (4.2%) tear involved the body of the meniscus. Distribution of various types of meniscal tears were described in Table 2.

Table 2: Distribution of the different types of meniscal tear (n=67).

Different types of meniscal tear	Number of tears	Percentages (%)
Vertical tear	32	47.8
Horizontal tear	11	16.4
Complex tear	19	28.4
Bucket Handle tear	05	7.4
Total	67	100.0

Table 3: Distribution of the different types of bone contusion in the knee joint (n=30).

Different bone contusions	Number of tears	Percentages (%)
Tibia	15	50.0
Femur	10	33.3
Patella	02	6.7
Fibula	03	10.0
Total	30	100.0

Lesions of ACL

Out of total 100 patients, 33 patients (33%) had ACL pathologies. Among the total 33 patients those had pathology, 31 patients (93.9%) had ACL tears and 2 patient (6.1%) had myxoid degeneration. Out of 33 patients having ACL tear, 14 patients (42.4%) had acute partial tear, 14 patients (42.4%) had acute complete tear, 5 patients (15.2%) had chronic tears of ACL.

Lesions of PCL

Out of total 100 patients, 6 patients (6%) had PCL pathologies. Out of total PCL pathology patients, 5 patients (83.3%) were found to have PCL tear and 1 patient (16.7%) had myxoid degeneration. Out of total 5 patients having PCL tear, 3 (60%) of them had partial tear and 2 (40%) had complete PCL tear.

Collateral Ligament Injuries

Out of total 16 patients with ligament tears, 13 patients (81.3%) had medial collateral ligament (MCL) tears. Of

these total 13 patients with medial collateral ligament tear, 6 patients (46.2%) had Grade I tear (sprain), 6 patients (46.2%) had Grade II tear (Partial tear) and one patient (7.7%) had Grade III tear. Out of total 16 patients with ligament tears, only 3 (18.8%) patients were found to have LCL tears, all 3 patients (100%) had Grade II tear (partial tear).

Bone Contusions

Total 30 patients (30%) had signs of bone contusions. The distribution of bone contusions have been summarized in (Table 3). Bone contusions were found most common in tibia (15; 50%) followed by femur (10; 33.3%), fibula (3; 10%) and patella (2; 6.7%). Contusions in the lateral femoral condyle (8) being more common than in the medial femoral condyle (2). Out of 30 patients showing bone contusion, 3 (10%) patients also had MCL tears.

Bone Fractures

A total of 7 bone fractures were seen in 6 patients out of which 5 (71.4%) fractures involved the tibia, 1 (14.3%) fracture involved the femur, and 1 (14.3%) fracture involved the fibula.

Cystic Lesions

In the current study, 15 patients had a total 15 cysts. Baker cyst was seen in 10 (66.7%) patients, and parameniscal cyst was seen in 2 (13.3%) patient involving the medial meniscus and was associated with horizontal tear of the medial meniscus. Prepatellar bursal effusion seen in 2(13.3%) Pes anserine bursal effusion seen in 1 (6.7%) patient.

Neoplastic Lesions

Out of total 100 patients, neoplastic lesions were reported in 10(10%) patients. Out of 10 patients, 2(20%) patient had giant cell tumour, 1(10%) patient have synovial sarcoma, 2(20%) patient have chondroblastoma, 2(20%) had osteochondroma, 2(20%) patients had enchondroma and 1(10%) patient had lipoma.

Osteoarthritis

MRI changes suggestive of osteoarthritis were found in 26(26%) patients, out of which 12(46.2%) had involvement of medial compartment, 6(23.1%) of the lateral compartment, 2(7.7%) patient had involvement of bilateral compartments and in 6 patients (23.1%), patella-femoral compartment was involved.

Synovial pathologies

In this study of 100 patients, Synovial pathologies were seen among 5 patients (5%) , out of which 4 patients (80%) had synovial hypertrophy and 1 patient (20%) had synovial sarcoma.

Other lesions

On radiological evaluation of the painful knee joint by means of the MRI, around 2 patients (2%) had muscular injury and odema and 88 patients had signs of joint effusion.

DISCUSSION

Present study was an observational analysis of the various causes of a painful knee detected by MR imaging. In the present study, we found male dominance. Our results are in concordance with those of who described a mean age of 36.70 ± 14 years and a male preponderance in their study.³ Male preponderance was also seen in study done.⁴⁻⁶ Around 2% of our study population had a normal MRI. This is in contrast to a previously reported (17%) rate of normal MRI in sports related knee injuries.⁷ This might be due to the fact that we included patients with a painful knee rather than just traumatic knee injury. Meniscal tears were the commonest soft tissue abnormality found in our study. Tears involved posterior horn of the medial meniscus more commonly. The results were in concordance with the previously reported literature.^{6,8-11} Grade-2 was the commonest meniscal tear in the current study which contrasts with the results, who reported grade-3 as the commonest grade of meniscal tear.¹² Vertical tears were found to be the commonest type of meniscal tear. This contrasts with the previous finding of horizontal tear being the commonest meniscal type also reported.⁸ All the vertical tears in our study were associated with a history of trauma. Reported literature also describes vertical tears as being traumatic in nature.^{8,9} Only 2% of the study participants in our study had a bucket-handle tear involving the medial meniscus.

Literature also reports that most of the bucket-handle tears involve the medial meniscus.^{4,13} Tear was the commonest pathology affecting the ACL, most being acute in nature. The results are comparable to the study.¹⁴ The incidence of PCL pathology in our study was 6%, which is comparable to the 5.78% incidence reported.⁶ Partial PCL tear was the commonest PCL pathology in our study which was in accordance with the reported literature.⁸ 33% of our patients had bone contusion which compares well with the existing literature (28.3%).¹⁴ Tibia was more commonly involved than femur by contusions and lateral femoral condyle was involved more frequently than its medial counterpart.

Our results are in agreement with the existing literature.¹⁵ Authors found acute ACL tears were usually associated with bone contusions in our study. Similar association was reported previous studies.^{12,16-17} Popliteal cyst was the commonest cystic lesion (10%) involving the knee joint. Similar observations had been reported previously (10%).¹⁴ Popliteal cysts were associated with joint effusion, medial meniscal tear and ACL tear. MRI detects an associated disorder in 94% cases of 3355 popliteal cysts. An association of popliteal cyst with joint effusion, meniscal tear and ACL tear has been previously

reported.^{18,19} The finding of meniscal cyst involving the posterior horn of medial meniscus and its association with horizontal tear compares favorably with the reported literature.²⁰ Patello-femoral compartment was most commonly involved by the osteoarthritic process of the knee joint which is in accordance with the existing literature.²¹ MR has been established as an effective non-invasive modality for identifying the knee pathology.^{22,23} The study aimed to highlight the role of MR imaging in the evaluation of a painful knee and strengthen its superiority over the conventional imaging (X-rays) and CT scan thereby resulting in a better clinical management.

CONCLUSION

MR imaging is an accurate and non-invasive technique and a cost effective modality which depicts the anatomy of the knee joint without the need for an intravenous contrast. The present study also demonstrates a valuable role of MR imaging in the examination of a wide spectrum of chronic knee abnormalities unassociated with acute trauma. MR imaging of the knee may help in guiding the surgical management and is especially useful in the setting of indeterminate clinical findings. Its accuracy in the evaluation of meniscal tears as well as ACL pathologies is high.

The study is limited by its small sample size and an inability to correlate MR features with the arthroscopic findings.

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