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Radiodiagnosis

ROLE OF MAGNETIC RESONANCE IMAGING IN EVALUATION OF TRAUMATIC KNEE JOINT INJURIES.

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ABSTRACT

OBJECTIVES: This study aims to assess the role of MRI in the evaluation of traumatic injuries of knee joint.

MATERIALS AND METHODS: A total number of 100 patients referred with history of knee injury were imaged with 1.5 Tesla SEIMENS MRI machine using the required protocol and sequences in the department of radiology, Alluri Sitarama Raju Academy of Medical Sciences over a period of 18 months (July 2019 to January 2021). It was an observational study and a total of 100 patients fulfilling the selection criteria were studied.

RESULTS: Commonest injuries detected in the study are anterior cruciate ligament tear (65%), tear of posterior horn of medial meniscus (31%), bone contusions (30%) and joint effusions (60%). Clinical presentation and radiographs of the patient did not help in diagnosis in most of the cases of acute knee injury, especially in multiple ligament and bone injuries. MRI detected soft tissue injuries very well in addition to the bony injuries.

CONCLUSION: Magnetic resonance imaging is the excellent non invasive investigation tool for knee injury due to excellent soft tissue contrast resolution and multiplanar imaging capabilities which provides the most detailed evaluation in cases of various soft tissue injuries of knee joint

KEYWORDS :

INTRODUCTION:

The knee joint is a biggest joint of the human body with complex articulation characterized by the presence of ligamentous and meniscal structures that play an important role in the stability and mobility [1]. This articulation is subject of very high mechanical stresses.

The frequency, diversity and severity of ligament and meniscus injuries occur especially in the young and sportsmen, associated with significant morbidity, frequently need surgical treatment and extensive rest.

Joint injury has been recognized as a potent risk factor for the onset of osteoarthritis[2].

In cases of knee joint trauma, clinical examination along with radiographs and even CT scan is not enough to diagnose many internal derangements of this joint.

MRI, due to its excellent soft tissue contrast resolution and multiplanar imaging capabilities provides significant advantages over other imaging techniques in the evaluation of traumatic injuries of knee joint[3].

MRI has revolutionized diagnostic imaging of the knee by providing excellent soft tissue contrast and is capable of evaluating the soft tissue and bony structures in multiple imaging planes which provide significant advantages over other imaging techniques.MRI has also been demonstrated as a cost effective technique by reducing unnecessary surgical and arthroscopic intervention[4]

Current research aimed to study efficacy of MRI in the evaluation of traumatic injuries of knee joint, to study MRI presentations of various traumatic injuries of knee joint and to study the correlation between clinical presentations and radiological findings.

AIM OF THE STUDY:

This study aims to assess the role of MRI in the evaluation of traumatic injuries of knee joint

MATERIALS AND METHODS:

A total number of 100 patients referred with history of knee injury were imaged with 1.5 Tesla MRI scanner, Siemens magneto avento Syngo (MR D-13) 16 channel machine in the department of radiology over a period of 18 months (July 2019 to January 2021). It was a observational study and a total of 100 patients fulfilling the selection criteria were studied.

Source of data: Patients referred from outpatient department of tertiary care centre with history of knee injury.

Selection criteria:

Inclusion criterion:

Patients referred with history of knee injury.

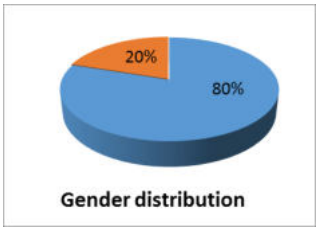
EXCLUSION CRITERIA:

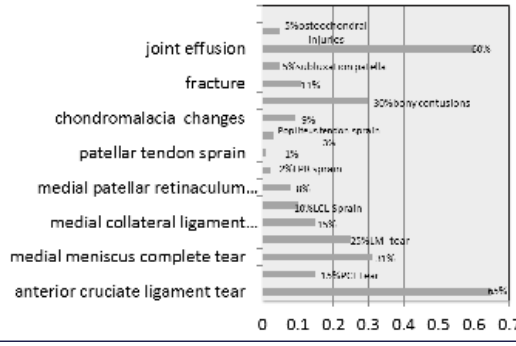
1. All patients who did not give consent to be a part of the study.
2. Patients with ferromagnetic implants, pacemakers, cochlear implants and aneurismal clips
3. Degenerative arthritis, infection, neoplasm and any previous surgery to the knee.

RESULTS:

A total of 100 patients with history of injury to knee joint referred for MRI scan of knee joint were studied.

Majority of the patients were male (80%) and (20%) patients were female with the male to female ratio is 4:1. The commonest age group was 21 to 30 years for both males and females with mean age of 31.67 years for male and 35.1 years for female.





- Among the knee injuries, the most commonly injured structure was anterior cruciate ligament (65%), followed by medial meniscus (31%), lateral meniscus (25%), medial collateral ligament (15%), posterior cruciate ligament(15%) , lateral collateral ligament (10%), medial patellar retinaculum (8%), lateral patellar retinaculum (2%), patellar tendon (1%) and popliteus tendon (3%).
- Out of total 65 ACL injuries, low grade partial ACL tear was commonest (46.1%), followed by complete tear (24.6%), high grade partial tear (21.5%) and grade I sprain (6.1%). The most common location of complete tear was midsubstance (46.1%), followed by femoral attachment (41.5%) and tibial attachment (10.7%).
- Commonest location of tear in menisci was posterior horn of medial meniscus (44.6%) followed by posterior horn of lateral meniscus (16.1%), anterior horn of lateral meniscus (14.2%), body of medial meniscus (12.5%), body of lateral meniscus (7.1%) and anterior horn of medial meniscus (5.3%).
- Horizontal tear was commonest (12%) followed by complex tear (11%), bucket handle tear (07%), radial tear (3%) and longitudinal tear (2%) in medial meniscus. Commonest type of tear in lateral meniscus was horizontal tear (42.3%) followed by complex tear (26.9%), longitudinal tear (15.5%), vertical radial tear (11.5%) and oblique tear (3.8%).
- Patellar subluxation was noted in five patients associated with medial patellar retinaculum sprain.
- 42.1%, 47.36%, 36.84% and 37.5% of ACL, PCL, medial meniscus and lateral meniscus injuries were associated with bone contusions.
- Injuries of PCL were noted commonly associated with bone contusions.
- From the present study, it was noted that Magnetic Resonance Imaging is most comprehensive, non invasive and safe modality in radiological evaluation of knee injury.

Fig 1: Posterior horn of medial meniscus grade III tear

Fig 2: PCL tear at femoral attachment

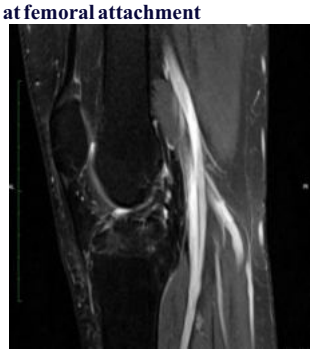


Fig 3: Grade III ACL tear

DISCUSSION:

The knee is an anatomically and biomechanically complex joint. The single most common indication of performing a knee MRI is to diagnose internal derangements in an injured knee. Out of total 100 patients, major cause of knee joint trauma was fall (32%), followed by road traffic accident (31%), sports injury (27%) and twisting injury (10%).

Pain (100%), followed by instability (42%), joint stiffness/ abnormal locking/decreased range of motion (27%) and swelling (7%) are the common presenting complaints of knee joint trauma.In the present study, there was wide variation in the MRI diagnosis and patient presented with clinical complaints. The clinical diagnosis of anterior cruciate ligament injury was noted in 42% of the study population, followed by meniscal injury (27%).The MRI findings noted were anterior cruciate ligament injury (65%), followed by medial meniscal injury (31%), lateral meniscus (25%), lateral collateral ligament (10%), posterior cruciate ligament (15%), medial collateral ligament (15%), medial patellar retinaculum (8%), lateral patellar retinaculum (2%), patellar tendon (1%) and popliteus tendon (3%).

We found clinical presentation did not helped in diagnosis in most of the cases of acute knee injury and is inconclusive in cases with injuries of multiple ligaments/menisci, which corresponded with study done by Li DK et al [5].

In the present study, male outnumbered female, as 80% of the patients were male and 20% were female with male to female ratio 4:1 with mean age for male is 31.67 years and 35.1 years for female which corresponded with the sex distribution pattern was reported in the study by Anil Madurwar et al where authors noted, out of 50 patients of knee trauma examined, 42 patients (76%) were males and 8 of them were females and Singh et al where authors noted 113 men (65.31%) and 60 women (34.69%) out of the 173 patients with history of knee injuries. The study by Jeevika Mu et al 6 in 2017 found that out of 43 patients the males (84%) are commonly affected than females (16%).

In this study the patients with age 0 to 70 years with history of knee injury included. Different age group included i.e. 0 to 10 years, 11 to 20 years, 21 to 30 years, 31 to 40 years, 41 to 50 years, 51 to 60 years and 60-70 years. The commonest age group was 21 to 30 years in male, which comprised 38.75% of the male patients. The next common age group was 31 to 40 years with 26.25% of the male patients and 13.75% of the patients with age group 41 to 50 and 11 to 20 years. Less commonly involved age group includes 0 to 10 years and more than 60 years. The mean age was 31.675 years. The commonest age group was 21 to 30 years in female which comprised 35% of the female patients. The next common age group was 31 to 40 years with 30 % of the female patients 15% for the age of 41 to 50 years and 10% for the age group 11 to 20 years. The mean age was 35.1 years for female. The age distribution pattern observed in the present study was comparable to the study of D S Shetty et al in which commonest age group was 21 to 30 years for both male and female. Singh et al also found that majority of the patients with knee injury were in third decade.

The commonest finding on MRI scanning was anterior cruciate ligament tear (partial and complete) and was present in 65% of the patients in our study which corresponded to study by Anil Madurwar et al in which authors noted 36 (76%) ACL tears in total 50 knees examined on MRI. Shetty et al in which commonest knee injury is ACL injury with midsubstance tear is the commonest location of ACL tear. Singh et al also found that major knee injury is ACL tear and the commonest complete ACL tear is midsubstance tear.

Out of total 100 patients, percentage of PCL injuries detected was 15%. Out of total 15 PCL injuries, partial and complete tear were noted in 6 and 6 patients respectively, total 12 PCL tears detected. Grade I sprain comprised 3 patients. In complete PCL tears, midsubstance and avulsion tear are commonest (33.33%) followed by femoral and tibial end (16.67%) which corresponded to study done by Anil Madurwar et al [6] , D J Singh et al [8] and Shetty et al [9] where authors noted 6%, 5.0% and 4.4% PCL tear respectively.

Patellar dislocation with medial patellar retinaculum sprain was noted in 1 patient. Patellar dislocation was associated with medial patellar retinaculum sprain which corresponded to the study done by Charles et al[10].

CONCLUSION:

Magnetic resonance imaging of the knee is the excellent non invasive investigation tool for knee injury due to excellent contrast resolution

and multiplanar imaging capabilities which provides the most detailed evaluation in cases of various soft tissue injuries of knee joint. Clinical features may suggest the soft tissue injury, but for further evaluation, MRI is necessary. MRI is unique in its ability to evaluate the ligaments, menisci, articular cartilage, articular capsule and bone marrow. Even though anatomical variants and technical artefacts can mimic a tear on MRI, it is still considered as the primary imaging tool for optimal depiction of internal derangement of knee injury.Commonest injuries detected in our study are- anterior cruciate ligament tear, tear of posterior horn of medial meniscus, bone contusions and joint effusions.

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