Original Research

Efficacy of MRI in diagnosis of internal derangement of knee joint

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ABSTRACT

Background: Knee is one of the largest and most complex joints 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. The present study was conducted to evaluate the efficacy of MRI in assessment of internal derangement of knee joint.

Materials & Methods:70 patients with painful knee joint of both gendersunderwent MRI of knee joint with 1.5 Tesla high gradient MRI scanner. T1 and T2 weighted sequences in sagittal planes, PD weighted sequences in axial, coronal and sagittal planes and fat suppressed T2 or STIR sequences were recorded. The direct coronal, sagittal, and axial views are the three common imaging planes. We used a 16x16 cm field of view, a 256 x 256 matrix, and a 3 mm slice thickness to analyze the knee in these three planes.

Results: Out of 70 patients, 32 were males and 38 were females. Age group 11-20 years had 7, 21-30 years had 15, 31-40 years had 24, 41-50 years had 14, and 51-60 years had 10 patients. The difference was non- significant (P> 0.05). Common knee pathologies were medial meniscal tears in 8, lateral meniscal tears in 7, marrow oedema in 9, joint effusion in 6, anterior cruciate ligament tear in 15, posterior cruciate ligament tear in 5, medial collateral ligament tears in 11, lateral collateral ligament tears in 9 patients. The difference was significant (P< 0.05). Sensitivity of MRI was 100%, specificity was 85%, positive predictive value was 86.5%, negative predictive value was 100% and kappa was 0.85.

Conclusion: Anterior and posterior cruciate ligament tears, chondromalacia patellae, rheumatoid arthritis, medial collateral ligament tears, lateral collateral ligament tears, medial meniscal tears, and lateral meniscal tears were among the frequent knee diseases. An accurate and reasonably priced radiographic tool for diagnosing sore knees is magnetic resonance imaging (MRI).

Keywords: Anterior cruciate ligament tear,knee, magnetic resonance imaging
Keywords: musculoskeletal, shoulder, MRI

Introduction

Knee is one of the largest and most complex joints 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.[1]Osteoarthritis, a common cause of knee pain in this age group, is expected to continue to increase in incidence, especially as the overall population ages and becomes increasingly more overweight.Knee injury may result in damage to the menisci, cartilage, ligaments or bone. Traumatic knee is very difficult to handle due to pain and restricted range of movements, so imaging is a very good modality to assess the injury. Even yet, arthroscopy is the gold standard for detecting different ligament and meniscal injuries, which require hospitalization and anesthesia-induced surgery, each of which has its own complications.[2] Many surgeons think that MRI is a reliable, non-invasive way to identify knee problems. It provides enough information to let patients make conservative treatment decisions and avoid needless arthroscopies. When magnetic resonance imaging (MRI) was first developed in the early 1980s, its usefulness for imaging the knee became evident almost immediately. The use of MRI in the knee has significantly increased with the advent of high field systems, open systems, extremity units, and specific closely connected extremity coils, among other technological advancements.[3]

In order to evaluate menisci and cruciate ligaments, MR examination, a non-invasive modality, has essentially replaced conventional arthrography.[4] This has reduced the morbidity and expenses associated

with negative arthroscopic examinations and is now routinely used to assess a wide range of internal knee derangements and articular disorders.[5] Preoperative planning and the selection of surgical candidates have both benefited from the use of MR imaging. The orthopaedic profession has accepted MR knee studies as a non-invasive alternative to arthrography and non-therapeutic arthroscopy, in part because of their declining cost.[6]The present study was conducted to evaluate the efficacy of MRI in assessment of internalderangement of knee joint.

Materials & Methods

The present study comprised of 70 patients with painful knee joint of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. A thorough physical examination was done. All underwent MRI of knee joint with 1.5 Tesla high gradient MRI scanner. T1 and T2 weighted sequences in sagittal planes, PD weighted sequences in axial, coronal and sagittal planes and fat suppressed T2 or STIR sequences were recorded. The direct coronal, sagittal, and axial views are the three common imaging planes. We used a 16x16 cm field of view, a 256 x 256 matrix, and a 3 mm slice thickness to analyze the knee in these three planes. The first localizer for sagittal and coronal plane images is an axial capture via the patellofemoral joint. The menisci's body and collateral ligament are best assessed in the coronal plane. The cruciate ligaments, menisci, and synovial anatomy—particularly the suprapatellar pouch—are visible in the sagittal plane. All three planes are integrated in the evaluation of the bones, muscles, tendons, and neurovascular structures. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table: I Distribution of patients based on gender

Total- 70		
Gender	**Males**	**Females**
Number	32	38

Table I shows that out of 70 patients, 32 were males and 38 were females.

Table: II Age wise distribution of patients

Age group (Years)	Number	P value
11-20	7	0.71
21-30	15	
31-40	24	
41-50	14	
51-60	10	

Table II shows that age group 11-20 years had 7, 21-30 years had 15, 31-40 years had 24, 41-50 years had 14, and 51-60 years had 10 patients. The difference was non- significant (P> 0.05).

Table: III Assessment of knee pathologies with MRI

Knee pathologies	Number	P value
Medial meniscal tears	8	0.05
Lateral meniscal tears	7	
Marrow Oedema	9	
Joint Effusion	6	
Anterior cruciate ligament tears	15	
Posterior cruciate ligament tears	5	
Medial collateral ligament tears	11	
Lateral collateral ligament tears	9	

Table III, graph I shows that common knee pathologies were medial meniscal tears in 8, lateral meniscal tears in 7, marrow oedema in 9, joint effusion in 6, anterior cruciate ligament tear in 15, posterior cruciate ligament tear in 5, medial collateral ligament tears in 11, lateral collateral ligament tears in9 patients. The difference was significant (P< 0.05).

Graph : I Assessment of knee pathologies with MRI

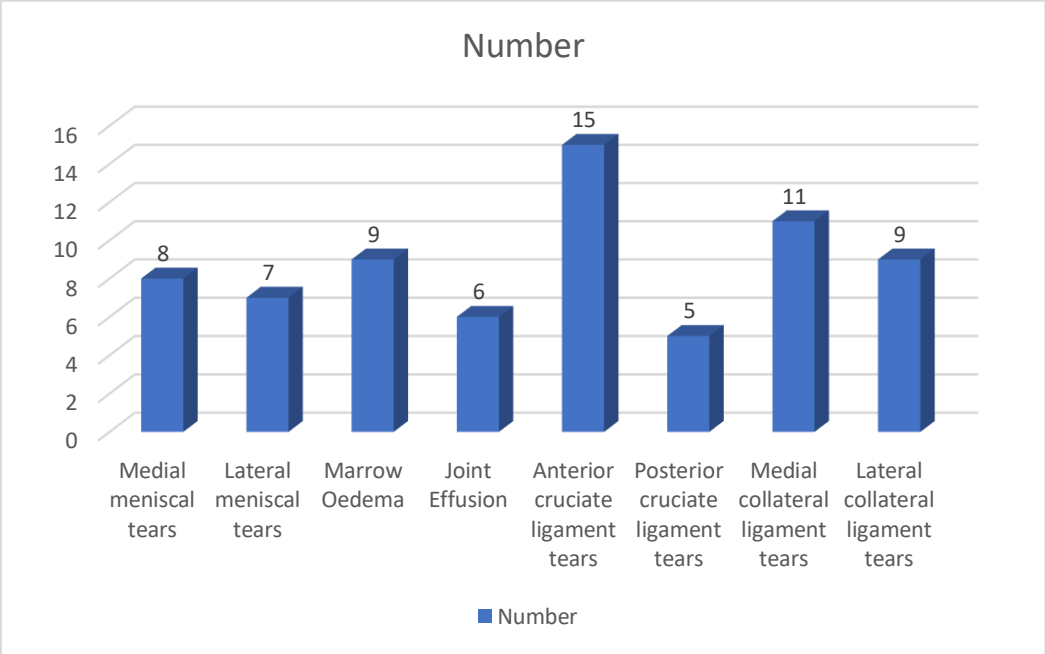

Table IV Efficacy of MRI

Efficacy	Value
Sensitivity	100%
Specificity	85%
Positive predictive value	86.5%
Negative predictive value	100%
Kappa	0.85

Table IV shows that sensitivity of MRI was 100%, specificity was 85%, positive predictive value was 86.5%, negative predictive value was 100% and kappa was 0.85.

Discussion

For the diagnosis of traumatic intraarticular knee injuries, arthroscopy is regarded as "the gold standard." However, because arthroscopy is an invasive treatment that necessitates anesthesia and hospitalization, it presents all of the possible risks associated with surgery.[7] Magnetic resonance imaging (MRI) has become more and more popular as a diagnostic method for musculoskeletal conditions since it was first used in the 1980s. In both clinical and scientific settings, magnetic resonance imaging (MRI) has emerged as the most significant method for evaluating pathologic alterations in knee cartilage. The ability to manipulate contrast to highlight various tissue types is one of MRI's main benefits.[8]Numerous MRI techniques that enable morphologic assessment of cartilage, quantification of its volume, and evaluation of its biochemical composition have been developed as a result of the new surgical and pharmaceutical options available to treat damaged cartilage and the need to track the effects of treatment. MRI is better than more traditional methods for assessing articular cartilage because of its multiplanar capabilities, higher soft-tissue contrast, and absence of ionizing radiation.[9]The present study was conducted to evaluate the efficacy of MRI in assessment of internalderangement of knee joint.

We found that out of 70 patients, 32 were males and 38 were females.We found that age group 11-20 years had 7, 21-30 years had 15, 31-40 years had 24, 41-50 years had 14, and 51-60 years had 10 patients. Meniscal tears were the most prevalent soft tissue anomaly according to Bansal et al.'s[10] evaluation of knee MRI. The majority of the tears were grade 2 and more frequently affected the posterior horn of the medial meniscus. The most prevalent kind of meniscal tear was vertical, and it was linked to a history of trauma. The most frequent condition affecting the ACL was tear, with the majority of these being acute in nature. The most prevalent PCL pathology was a partial tear. The tibia was most frequently affected, followed by the lateral femoral condyle, and one-third of the patients had bone contusions. Bone contusions were typically linked to acute ACL rupture. The most prevalent cystic lesion was a popliteal cyst, which was linked to meniscal tears and effusions.

We found that common knee pathologies were medial meniscal tears in 8, lateral meniscal tears in 7, marrow oedema in 9, joint effusion in 6, anterior cruciate ligament tear in 15, posterior cruciate ligament tear in 5, medial collateral ligament tears in 11, lateral collateral ligament tears in 9 patients. A study including 150 individuals was carried out by Shah et al[11] Thirty (20%) of the ninety individuals with articular cartilage abnormalities had full thickness

cartilage defects. Thirty patients (20%) with articular cartilage abnormalities had subchondral marrow edema. A complicated or macerated meniscal tear was present in 32 individuals (21.1%). Seven patients had a complete anterior cruciate ligament injury. Seventy percent of the knees (105) had joint effusions. Six percent of the knees had large Baker cysts.

We found that sensitivity of MRI was 100%, specificity was 85%, positive predictive value was 86.5%, negative predictive value was 100% and kappa was 0.85. Avcu et al[12] investigated how the patients' age and sex related to the pathological findings. The patients' ages ranged from 1 to 74 years. Meniscal tears and degeneration, medial collateral ligament degeneration, parameniscal cyst, and chondromalacia patellae were all substantially associated with age. Anterior cruciate ligament damage and male gender were significantly correlated. Both bursitis and medial collateral ligament injury were substantially associated with meniscal injury. There was a substantial correlation between bone bruise and anterior cruciate ligament injury, Baker's cyst, lateral collateral ligament injury, and medial collateral ligament injury. Anterior cruciate ligament damage, patellae alta, and osteochondral lesion were all substantially connected with chondromalacia patellae. The most frequent knee pathologies identified by MRI were bursitis (in 53.2% of patients) and grade-II meniscal degeneration (in 43% of patients).

The shortcoming of the study is small sample size.

Conclusion

Authors found that medial meniscal tears, lateral meniscal tears, marrow oedema, joint effusion, anterior cruciate ligament tear, posterior cruciate ligament, medial collateral ligament tears, lateral collateral ligament tears were among the frequent knee diseases. An accurate and reasonably priced radiographic tool for diagnosing sore knees is magnetic resonance imaging (MRI).

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