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EVALUATION OF INTERNAL DERANGEMENT OF THE KNEE JOINT BY MAGNETIC RESONANCE IMAGING

M. Muzafeer, R. Chidambaram, DR. Gunasekaran*
Sri Balaji Medical College and Hospital, Chennai - 600 044, India

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ABSTRACT

Knee injuries are quite prevalent. The requirement to appropriately diagnose knee injuries is critical for optimal care and result; otherwise, the patient would suffer from persistent impairment. In individuals with internal derangement, to connect MRI alterations with arthroscopic results. When it comes to detecting articular cartilage damage, MRI has a high sensitivity. Newer articular cartilage imaging sequences may increase MRI's sensitivity in identifying articular cartilage injuries. The findings of this investigation, which used MRI to identify lesions involving the articular cartilage, meniscus, and cruciate ligament, were consistent with those of earlier studies.

Corresponding Author:

Dr. G. Jayalakshmi,
Sri Lakshmi Narayana Institute of Medical Sciences,
Kudupakkam Post,
Puducherry - 605 502, India.
Email: jayalakshmi.2k15@gmail.com

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1. INTRODUCTION

Traumatic knee injuries are challenging to manage owing to pain and limited range of motion, imaging is an excellent way to examine the damage [1-4]. Despite the fact that arthroscopy is the gold standard for detecting various meniscal and ligament problems, patients must be admitted to the hospital and performed under anaesthetic, which has its own set of complications. In the 1980s, magnetic resonance imaging (MRI) was first used in the knee. Since then, the accuracy of MRI in identifying knee injuries, particularly soft tissue injuries, has ranged from 75 to 95 percent [5-9]. In most centres, MRI of the knee has supplanted arthrography and diagnostic arthroscopy to the menisci, ligaments, and tendons, as well as bone bruising and concealed fractures in the knee [10-13]. Failure to diagnose and treat knee injuries appropriately can lead to a reduced quality of life, lost work time, and early osteoarthritis. Appropriate treatment requires an accurate evaluation of the nature of these injuries. MRI provides a clear advantage over diagnostic arthroscopy in terms of reliability and non-invasiveness [14-17].

Arthroscopy is an intrusive surgery that comes with its own set of hazards and discomforts for the patient. Soft tissues, ligaments, fibro-cartilage, and articular cartilage are better defined anatomically and pathologically using MRI. MRI methods have enhanced the sensitivity and specificity of MRI in detecting lesions. Bone contusions, marrow abnormalities, and tibial plateau fractures are all detected by MRI [18-20]. Internal anatomy as well as the surface of the ligaments may be evaluated using MRI. The MRI is definitely the major tool for guiding pain treatment, and it represents a huge advancement in knee imaging. MRI has allowed noninvasive examination of the damaged knee, avoiding intrusive treatments and extra morbidity.

2. METHOD

2.1. Data source

This is a prospective study of patients who were sent to the department of Radio-diagnosis at Sri Lakshmi Narayana Institute of Medical Sciences in Pondicherry with clinical suspicion of internal derangement of the knee joint. The sample size is 100. Study period: December 2016 to September 2018 (period of 2 years).

2.2. Collection of data

A relevant history will be gathered, followed by the patient's or the patient's attender's agreement for magnetic resonance imaging. A 1.5 T Siemens Magnetom Essenza with Tim and Dot system will be used to assess the patient in several important sequences. Meniscal, cruciate, and collateral ligament tears, fluid collections in and around the joint, and any signal abnormalities in the surrounding bones, muscles, and tendons were also examined on the images. Following that, arthroscopy was performed on these instances.

2.3. Method of data analysis

Tables and graphs were used to present the information gathered. We determined the sensitivity, specificity, and predictive values. Using kappa statistics, data was analysed to reveal a strong connection between MRI knee and arthroscopic results.

2.4. Exclusion criteria

Any absolute contraindication to MRI, such as age-related degenerative arthrosis of the knee joint.

2.5. Inclusion criteria

The trial will include 100 individuals aged 11 to 60 who have been diagnosed with an internal abnormality of the knee joint and acute traumatic internal knee joint derangement.

2.6. Imaging protocol

Because certain imaging modalities can improve sensitivity and specificity for specific knee problems, a brief relevant clinical history can substantially aid in optimising the procedure for maximal diagnostic information. Equipment: A 1.5 T Siemens Magnetom Essenza with Tim and Dot system will be used to assess the patient in several important sequences.

2.5. Pulse sequences and imaging planes

As needed, we employed SE, rapid sequences such as GRE, FSE, or STIR sequences. Direct coronal, sagittal, and axial views are the three typical imaging planes employed. We used a 16 x 16 cm FOV, 256 x 256 matrix, and 3 mm slice thickness to study the knee in these three planes. The first localizer for future sagittal and coronal plane pictures is an axial acquisition via the patellofemoral joint. The menisci's collateral ligament and body are best evaluated in the coronal plane. The cruciate ligaments, menisci, and synovial architecture, particularly the suprapatellar pouch, are all visible in the sagittal plane. All three planes are combined to analyse the bones, muscles, tendons, and neurovascular systems.

The patient is positioned supine with the knee in a tightly connected extremity coil. The knee is externally rotated 15-20 degrees to allow for complete visualisation of the ACL on sagittal imaging (11). To improve the accuracy of measuring the patellofemoral compartment and patellar alignment, the knee is flexed slightly 5-10°. (69). Excessive flexion or hyperextension make it impossible to accurately assess patellar alignment. The MRI was done somewhere between 6 and 30 days after the accident. The duration between MRI and arthroscopy ranged from 1 to 30 days, with a 7-day average. The timing was determined by the patient's preference, the surgeon's availability, and the operating room's availability. The film hard copy photos and the monitor were used to make all of the observations. The pictures were examined for meniscal tears and ACL or PCL tears.

3. RESULTS AND ANALYSIS

The age range 21-30 has the highest number of individuals who have had knee injuries. This group accounts for 34% of patients, followed by 31%, 9%, 19%, and 7% in the age groups of 31-40, 11-20, 41-50, and 51-60, respectively.

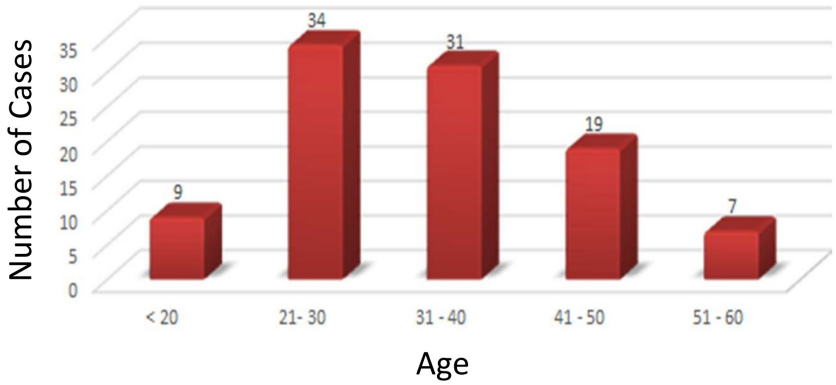

Figure 1. Age distribution

When the gender distribution in both groups was examined, it was determined to be 56.67 percent in men and 43.3 percent in females (Figure 2). Using the chi square test, the p-value was found to be 0.7953. As a result, the gender factor had no bearing. Male patients are more in number compared to females. This suffered knee injuries (Table 1).

Table No. 1: Internal Derangement Observation Based On MRI

Internal Derangement	Number of Cases	Percentage (%)
Anterior Cruciate Ligament	049	49.0
Posterior Cruciate Ligament	08	8.0
Medial Meniscus	040	40.0
Lateral Meniscus	022	22.0
Medial Collateral Ligament	06	6.0
Lateral Collateral Ligament	017	17.0
Bone Marrow Edema	028	28.0
Joint Effusion	099	99.0

4. DISCUSSION

This is a prospective research enrolling 100 patients with a history of knee injuries who received an MRI at Sri Lakshmi Narayana Medical College Hospital's 1.5T MRI unit in the department of Radiodiagnosis (Siemens Magnetom). Following that, these individuals had arthroscopy for both diagnostic and therapeutic purposes. Out of 100 patients in this study, 70 were males and 30 were girls. The age range is 21 to 40 years old, with a median age of 30.5 years. According to a study, males are more likely to have knee injuries because they participate in sports, and right knee injuries are more prevalent than left knee injuries [21]. Males make up the majority of patients in this research who have experienced knee injuries while participating in sports such as football. Knee injuries are most common in young people between the ages of 21 and 40. The right knee is implicated in 55 of every 100 patient knee injuries, whereas the left knee is involved in 45. In comparison to the left knee, the right knee is more involved.

Knee injuries affect a variety of structures. ACL damage is the most prevalent, accounting for 49 instances in MRI (a proportion of 49%) and 43 cases discovered by arthroscopy. The MRI's sensitivity and specificity in relation to arthroscopy are 100 percent and 84.31 percent, respectively, and it is quite good in diagnosing ACL tears. MRI has a positive predictive value of 85.96 percent. The MRI has a 100% negative predictive value. MRI detected 8 PCL injuries out of 100 patients, while arthroscopy detected 8 instances. The MRI's sensitivity and specificity in connection to arthroscopy are 100 percent, with a 100 percent positive and negative predictive value, and it has a good correlation in identifying PCL injuries. Chip fractures around the tibial attachment are the most prevalent cause of PCL injury [22].

The sensitivity, specificity, and accuracy of tears of the anterior cruciate ligament were determined to be 100, 85, and 87 percent, respectively, which corresponded to Fischer et al study54. The accuracy of MRI in detecting ACL rupture ranges from 93 percent to 97 percent. According to several research, sensitivity and specificity range between 61 percent and 100 percent, and 82 percent and 97 percent, respectively55. The positive and negative predictive values in our study were 85.96 and 100, respectively. The positive and negative predictive values, respectively, range from 70 percent to 76 percent and 70 percent to 100 percent. 55 According to the findings of two major studies [23]. T2 weighted pictures vividly demonstrated the signal intensity variations seen with these rips, as the typical low signal intensity of ligaments provides great contrast..

The second most prevalent form of injury is a medial meniscus tear, which accounts for 40 instances (40 percent). An MRI revealed 40 cases of medial meniscus damage, but an arthroscopy revealed just 38. The MRI's sensitivity and specificity for arthroscopy are 100 percent and 96.67 percent, respectively. The use of an MRI to diagnose a medial meniscal injury is highly recommended [24]. In our study, MRI found 22 incidences of lateral meniscal damage, with 18 out of 100 patients requiring surgery. The MRI's sensitivity and specificity for arthroscopy are respectively 84.31 percent and 100 percent. MRI is quite good at identifying lateral meniscus tears. MRI has a 100% positive predictive value in diagnosing lateral meniscus tears and a 94.87 percent negative predictive value. Silva and Silver52 looked analysed the chances of finding a tear at arthroscopy for each MRI signal grade [25].

MRI revealed 14 incidences of articular cartilage damage and 16 cases of arthroscopy out of 100 cases of knee injuries. The typical correlation between MRI and Arthroscopy in identifying articular cartilage injury is 60% sensitivity and 100% specificity. MRI has a 100% positive predictive value and a 92.59 percent negative predictive value. Using newer MRI sequences specialised to articular cartilage imaging can improve MRI sensitivity [26]. MRI can identify bone and soft tissue abnormalities surrounding the knee joint in addition to meniscal, cruciate, and collateral ligament damage.

5. CONCLUSION

MRI is a non-invasive, radiation-free imaging technology with good soft tissue delineation and multiplane capabilities. It can reliably identify, locate, and describe numerous internal derangements of the knee joint, assisting in the determination of a precise anatomical diagnosis and thereby directing the patient's subsequent therapy. Knee injuries are quite prevalent. The requirement to appropriately diagnose knee injuries is critical for optimal care and result; otherwise, the patient would suffer from persistent impairment. MRI and arthroscopy both have their drawbacks. When clinically required, these flaws might be solved by integrating both methods. In all situations of knee joint injuries, an MRI should be used as the first line of examination. Because it can identify osseous features as well as intra and extraarticular diseases. It serves as a road plan for arthroscopy based on MRI results. Arthroscopy will be used as a diagnostic and therapeutic treatment in the future.

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ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

COMPETING INTEREST

The authors declare no conflict of interest.

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