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A Clinical examination on traumatic knee injuries using Magnetic Resonance Imaging

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Abstract

Introduction: Accurate diagnosis and management of these injuries are crucial for effective treatment and rehabilitation. Traumatic knee injuries are prevalent in both clinical practice and sports medicine, often leading to significant long-term disability. Magnetic Resonance Imaging (MRI) has emerged as a valuable tool in evaluating internal knee derangements, providing detailed images that guide clinical decision-making and reduce the need for invasive procedures.

Methods: The study included 50 patients aged 20-50 years with traumatic knee injuries who underwent MRI. The imaging was performed using a Philips Achieva 1.5 T MRI machine, employing various sequences such as PD Fat Sat, T2 FSE, and T1 FSE. Data on the types and severity of knee injuries were collected and analyzed using descriptive statistics.

Results: The study found that the majority of patients (60%) were aged 20-40 years, with a higher prevalence of male patients (74%). Left knee involvement was more common (60%) than right knee involvement (40%). The most frequent injury was a medial meniscus tear, present in 84% of patients, with oblique tears being the most common type (46%).

Conclusion: MRI proved to be an effective tool in diagnosing various knee injuries, particularly medial meniscus and ACL tears. The detailed imaging provided by MRI allows for better treatment planning and can potentially reduce the need for surgical interventions.

Keywords: Knee, Ligament Injury, Meniscal Injury, Trauma, Soft Tissues

Introduction

Normal knee joint function is essential for daily life and many popular sports. The number of patients with complaints of trauma / clinical examination findings suggestive of trauma to the knee joint is quite significant and therefore magnetic resonance imaging (MRI) of the knee is of great value in understanding and diagnosing the varied internal derangement of the traumatic knee.

Among the various causes of knee pain, trauma to the knee holds one of the top positions as etiology.

Knee trauma can result in injuries affecting the menisci, cartilage, ligaments, or bone. The knee joint is the biggest and most intricate joint in the human body, and catastrophic knee injuries usually occur rapidly. These injuries can occur due to bone bruising, fractures, or injury to soft tissues, such as lesions in the menisci, cruciate ligaments, collateral ligaments, and surrounding muscles.

Traumatic knee injuries are a significant concern in both clinical practice and sports medicine, as they can lead to long-term disability and affect the quality of life of individuals. The knee joint, being one of the most complex and heavily utilized joints in the body, is particularly susceptible to injuries during physical activities. These injuries can range from ligament tears and meniscal injuries to cartilage damage, resulting from acute trauma or repetitive stress. As the prevalence of knee injuries continues to rise, particularly among athletes and active individuals, accurate and timely diagnosis becomes critical for effective management and rehabilitation [2,3].

Various imaging modalities, including radiography, sonography, nuclear medicine, CT scans, MRI, arthrography, and arthroscopy, can be used to examine internal derangement in the knee. Arthroscopy is commonly considered the most reliable method for assessing knee injuries. However, its accuracy can vary from 69% to 98% depending on the proficiency of the examiner. It is important to note that arthroscopy may not accurately evaluate rips inside the substance of a structure.

MRI methods have enhanced the sensitivity and specificity of MRI in detecting lesions. Bone contusions, marrow abnormalities, and tibia plateau fractures are all detected by MRI. Internal anatomy as well as the surface of the ligaments may be evaluated using MRI. MRI has allowed non-invasive examination of the damaged knee, avoiding intrusive treatments and extra morbidity.

Hence the present study will be undertaken to study the use of MRI in traumatic knee injuries as a major tool for guiding pain treatment and it represents a huge advancement in knee imaging.

Objectives of the Study

1. To study Internal derangement of the knee joint due to trauma using magnetic resonance imaging
2. To study the pattern of internal derangement in knee joint using magnetic resonance imaging

Materials and Methods

Study Design: The study was conducted as a prospective observational study.

Study Duration: The study spanned 6 Months

Study Population: The study population included patients aged 20-50 years who presented with traumatic knee injuries and were referred for imaging.

Inclusion Criteria

- The inclusion criteria were patients aged 20-50 years with traumatic knee injuries.

Exclusion Criteria

- Included patients with claustrophobia or other psychiatric conditions,
- Those with cardiac pacemakers, metal implants, or neurostimulators, and patients with age-related degenerative arthrosis of the knee joint.

Sampling Technique

A simple random sampling technique was employed. Study subjects were selected after applying the inclusion and exclusion criteria, and information was collected through a prepared proforma.

Study Procedure

The study enrolled patients presenting with knee joint pain due to trauma, referred for MRI. The MRI examinations were performed using a Philips Achieva 1.5T MRI machine, employing sequences such as axial, sagittal, and coronal sections of PD Fat Sat, T2 FSE, and T1 FSE.

Data Collection: Data were collected through clinical evaluations, MRI scans, and interviews using a structured proforma.

Independent and Outcome Variables

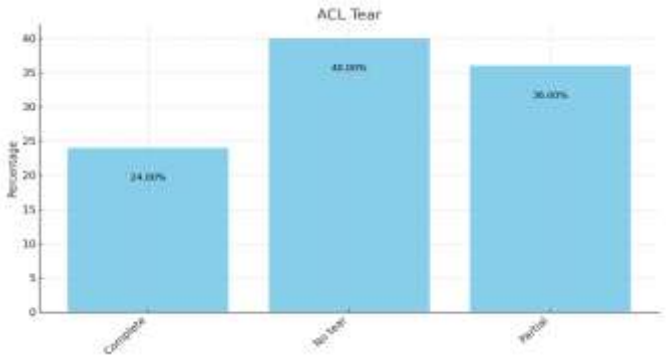
The independent variables included the patients' age, sex, and specific knee trauma history. The outcome variables were the types and severity of knee joint internal derangements identified through MRI.

Results

Table 1: ACL Tear

ACL Tear	Frequency	Percent
Complete	12	24.00
No tear	20	40.00
Partial	18	36.00
Total	50	100.00

In the assessment of ACL tears, 40.0% of patients had no tears, 36.0% had partial tears, and 24.0% had complete tears, with partial tears occurring more frequently than complete tears.

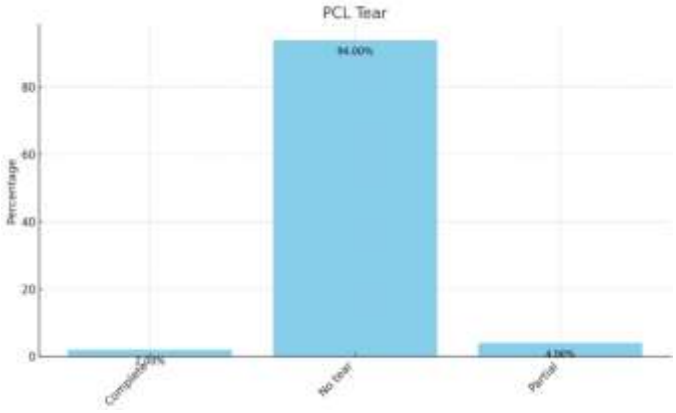


Graph 1:

Table 2: PCL Tear

PCL Tear	Frequency	Percent
Complete	1	2.00
No tear	47	94.00
Partial	2	4.00
Total	50	100.00

The evaluation of PCL tears shows that a vast majority (94.0%) had no tears, while partial and complete tears were present in 4.0% and 2.0% of patients, respectively, highlighting the rarity of PCL injuries.

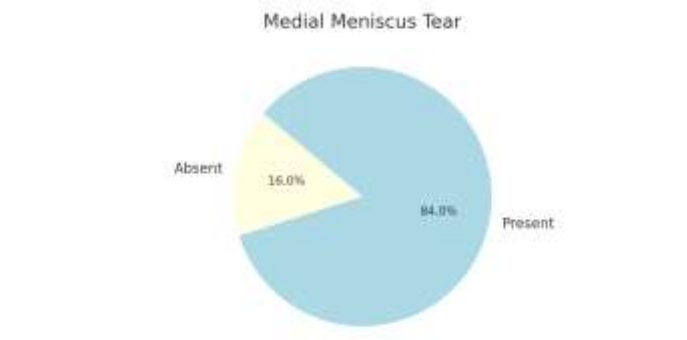


Graph 2:

Table 3: Medial Meniscus (MM) Tear

MM Tear	Frequency	Percent
Absent	8	16.00
Present	42	84.00
Total	50	100.00

A significant proportion (84.0%) of patients had a medial meniscus tear, with only 16.0% showing no tears, indicating a high prevalence of this type of injury in the study population.

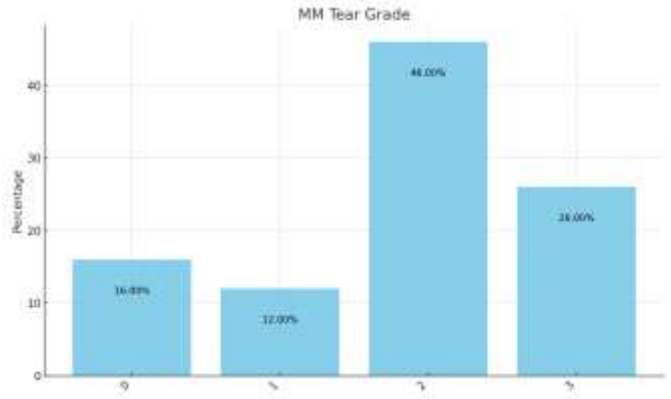


Graph 3:

Table 4: MM Tear Grade

Grade	Frequency	Percent
0	8	16.00
1	6	12.00
2	23	46.00
3	13	26.00
Total	50	100.00

Grade 2 medial meniscus tears were more prevalent (46.0%), followed by Grade 3 (26.0%) and Grade 1 (12.0%). Grade 0 (no tear) was present in 16.0% of the patients.

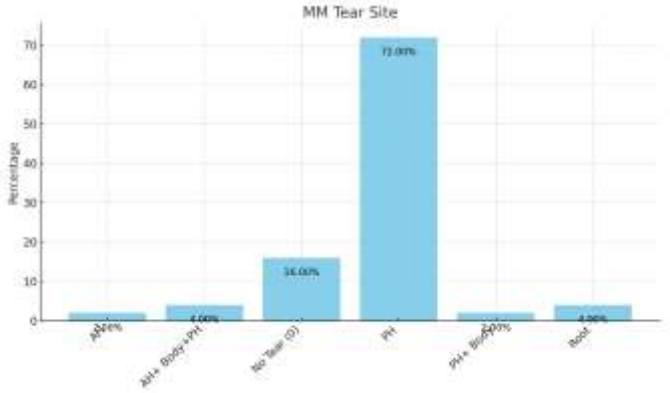


Graph 4:

Table 5: MM Tear Site

Site	Frequency	Percent
AH	1	2.00
AH+ Body+PH	2	4.00
No Tear (0)	8	16.00
PH	36	72.00
PH+ Body	1	2.00
Root	2	4.00
Total	50	100.00

The most frequent location for medial meniscus tears was the posterior horn (PH) accounting for 72.0% of cases, while other sites like anterior horn (AH), body, and root were less frequently involved.

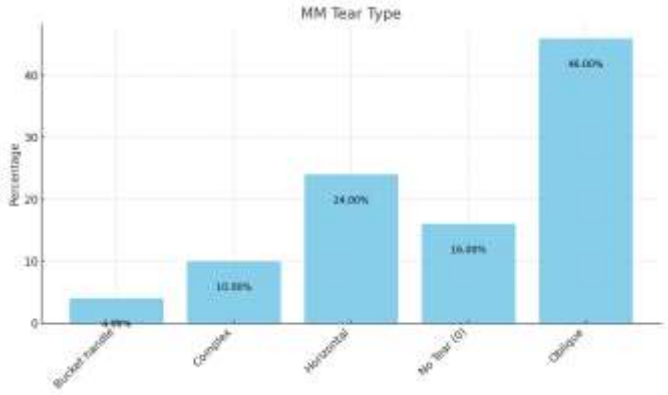


Graph 5:

Table 6: MM Tear Type

Type	Frequency	Percent
Bucket handle	2	4.00
Complex	5	10.00
Horizontal	12	24.00
No Tear (0)	8	16.00
Oblique	23	46.00
Total	50	100.00

Among the types of medial meniscus tears, oblique tears were the most frequent (46.0%), followed by horizontal tears (24.0%), complex tears (10.0%), and bucket handle tears (4.0%).



Graph 6:

Discussion

Our study's demographic analysis reveals that the majority of patients (60%) were aged between 21-40 years, followed by 36% in the 41-60 years' category, and a smaller proportion (4%) under 20 years. This age distribution aligns with global epidemiological trends indicating that young adults are more prone to traumatic knee injuries, likely due to their active lifestyle and participation in sports. Previous studies, including those by Kean and Li, have highlighted that this age group frequently presents with knee injuries, underscoring the importance of accurate diagnostic methods such as MRI. The high incidence among young adults suggests the need for targeted preventive measures and tailored rehabilitation protocols to mitigate the risk of long-term complications.

Conclusion

The majority of patients in the study were found to have varying degrees of meniscal tears, ligament injuries, and other internal derangements. MRI proved to be a critical tool in identifying the specific types and severities of these injuries, offering a comprehensive evaluation of the affected knee joints. The data revealed that medial meniscus tears were more common than lateral meniscus tears, and the posterior horn was frequently involved in meniscal injuries. Additionally, anterior cruciate ligament (ACL) tears were more prevalent than posterior cruciate ligament (PCL) tears, with a significant number of patients presenting with partial tears.

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