

Original Research Article

A study on MRI of internal derangements of knee

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Abstract

Background: The various imaging modalities used to evaluate pathological conditions of the knee include conventional fluoroscopy, arthrography, radiography, sonography, computed tomography, nuclear medicine, and magnetic resonance imaging. However, magnetic resonance imaging (MRI) has been recognized as an efficient, non-invasive test for identifying meniscal tears and other knee diseases.

The Aim of the study: To evaluate the internal derangements of ligaments of the knee in an acute traumatic knee setting and to identify their patterns in MRI.

Materials and methods: A cross-sectional study of fifty cases where MRI was used as the diagnostic modality evaluating the internal derangement of the knee. The study period was May 2017 to November 2018. The study included patients with traumatic knee injuries. The studies were carried out with a 1.5 Tesla Philips MRI machine.

Results: Majority of the participants having IDK had anterior cruciate ligament tear followed by medial menisci tear and lateral menisci tear while posterior cruciate ligament tear and lateral collateral ligament tear are not so much common.

Conclusion: MRI is a beneficial and non-invasive modality which possesses higher diagnostic accuracy and better sensitivity. It might be advantageous in the clinical conditions where the arthroscopy may not be useful for the inferior surface and peripheral meniscus tears. The results of this present study support that MRI can be very helpful in diagnosing the cruciate and meniscal ligament injuries. It can accurately detect, localize and distinguish various internal derangements of the knee joint with excellent soft tissue delineation and help in arriving at an accurate anatomical diagnosis thereby helping further management of the patients.

Key words

MRI, Arthroscopy, Internal derangement of the knee, Ligament, Tear.

Introduction

The knee is one of the most commonly involved joint in external injuries. Internal derangement of the knee joint is a common cause of morbidity in the young, active individuals like athletes [1]. Early detection of the cartilage and ligament abnormalities is vital for early intervention to prevent further degeneration. The most widely used investigations are arthroscopy and MRI [2]. Arthroscopy is considered as the gold standard for diagnosis of traumatic intra-articular knee lesions, however, it is an invasive procedure requiring hospitalization and anesthesia and is associated with complications [3]. Hence Magnetic Resonance Imaging (MRI) has now been accepted as the best imaging modality for non-invasive evaluation of knee injuries [4]. When compared with other diagnostic methods, MRI has the advantage of demonstrating the cartilages, bones, soft tissues and ligaments directly, in detail and in different planes. With the availability of the specialized extremity coil, the knee has become the most frequently studied articulation on MRI [4]. The purpose of this study was to find out the various types of traumatic lesions of the knee on MRI, to correlate the results with arthroscopy, and to establish the accuracy of MRI in detecting ligament and meniscus injury considering arthroscopy as the gold standard [5].

Materials and methods

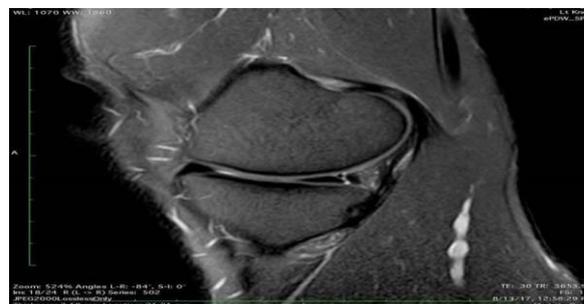
This was a cross-sectional study of fifty cases where MRI was used as the diagnostic modality evaluating the internal derangement of the knee. The study period was May 2017 to November 2018. The study included patients with traumatic knee injuries. The studies were carried out with a 1.5 Tesla Philips MRI machine. The present study was approved by the Ethical Committee of our institution. Written informed consent was obtained from all subjects. Basic demographic data were taken for all patients and complete preoperative data was obtained along with other

modalities of imaging before MRI examinations. The inclusion criteria were patients with acute knee injuries; with history of pain in the knee with or without swelling where MRI was utilized as an approach in investigating the cause and patients with clinically suspected tears. The exclusion criteria were previously operated by patients for knee injuries. Sequences used were axial, sagittal and coronal in T1, T2, STIR and PD. Interpretation of MRI Data Study was based on the presence or absence of Joint effusion, Anterior Cruciate Ligament tear, Posterior Cruciate Ligament tear, Medial Meniscal tear, Lateral Meniscal Tear and Multiple Derangements of Knee (**Figure – 1, 2**).

Figure - 1: MRI left knee PDW image shows ACL tear.



Figure - 2: MRI left knee PDW image showing medial meniscal tear.



Results

In this study, 40% of the participants who were <30 years had grade 3 ACL ligament tear, In the age group of 31- 40 years majority of the participants had ACL tear of grade 2 and 3. However in the age group of 41- 50 years, 7% of

the participants had grade 2 ACL tear. There was no significant difference across age group and grade of anterior cruciate ligament tear (**Table – 1**).

Table - 1: Age distribution of the participants.

Age group	Frequency	Percent
<30 years	15	30.0
31- 40 years	22	44.0
41- 50 years	7	14.0
>50 years	6	12.0
Total	50	100.0

In this study, majority of the participants having internal derangements of knee had anterior cruciate ligament tear (62%), followed by medial menisci tear (36%), lateral menisci tear (22%) while posterior cruciate ligament tear and lateral collateral ligament tear are not so much common and majority of the study participants were in the age group of 31-40 years, followed by 30% in the age group of <30 years (**Table – 2**).

Table - 2: MRI findings among the study participants.

Involvement	Frequency	%
Anterior cruciate ligament	31	62%
Posterior cruciate ligament	1	2%
Medial meniscus tear	18	36%
Lateral meniscus tear	11	22%
Medial collateral ligament	10	20%
Lateral collateral ligament	2	4%

Discussion

Early detection of the ligament and cartilage abnormalities is mainly done by arthroscopy and MRI. Arthroscopy has been considered the gold standard method for diagnosis of traumatic and intra-articular knee lesions; though, it is an invasive procedure with several complications [6]. Therefore, Magnetic Resonance Imaging (MRI) has been accepted and widely used as one of the best imaging modality for non-invasive evaluation caused by knee injuries [7]. In our study, there was a total of 50 study participants. The study consisted majority (70%) of the male participants In this study majority of the study

participants were in the age group of 31-40 years, followed by 30% in the age group of <30 years. This concludes that most of the male subjects were more vulnerable to bone injuries because of accidents, industrial injury [8]. In the study conducted by Michael G et al to study internal derangement of knee conducted over a span of a year, Majority of the participants were males and Patients in the age group 20 - 30 years accounted for a maximum number of cases. In our study majority of the participants had anterior cruciate ligament tear (62%) lateral menisci tear (22%) [9]. A similar result was seen in the study conducted by Miller TT where 45%, 37% and 42% of the participants showed ACL tears. In our study PCL tear was reported among only 2% of the participants, while 4.5% of PCL tear. In our study, 20% of the females had grade 2 and grade 3 anterior cruciate ligament tears. While among males 34% and 28% had ACL tear of grade 3 and grade 2 respectively. While only 2% of the males had posterior crucial ligament tear. There was no statistically significant difference found across the gender and ACL, PCL ligament tear [10]. Mink JH, et al. 86 found that majority of the patients who were diagnosed as internal derangement of the knee were having anterior cruciate ligament tear [11]. In our study grade, 1 patellar injury was found only among male participants with the age group of 41- 50 years, but there was no statistically significant difference seen across the age group and patellar injury. Majority of the male (57%) and female (60%) participants had joint effusion [12]. Polly DW, et al. found that 24% of the participants had joint effusion. In this study, it was found that fibular contusion was highest among females (67%). While among males 14.3% had grade 1 medial and lateral tibial contusion [13, 14].

Conclusion

MRI is a beneficial and non-invasive modality which possesses higher diagnostic accuracy, better sensitivity and their negative predictive value which makes it a very consistent screening test for the diagnosis of internal derangements at the knee joints. It might be advantageous in the

clinical conditions where the arthroscopy may not be useful for the inferior surface and peripheral meniscus tears. The results of this present study support that MRI can be very helpful in diagnosing the cruciate and meniscal ligament injuries. It can accurately detect, localize and distinguish various internal derangements of the knee joint with excellent soft tissue delineation and help in arriving at an accurate anatomical diagnosis thereby helping further management of the patients. Further, new radiological techniques and more powerful tomographers will improve MRI's accuracy leading to better diagnostics in knee injuries. And these results can be further extensively investigated in a large group of patients in better diagnostic perspective.

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