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Original Research Article

Magnetic Resonance Imaging (MRI) in Patients with Clinically Suspected Anterior Cruciate Ligament Injuries

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Abstract: ***Introduction*:** Knee joint is the numerous structures within it and their various pathologies, which result in pain and many other symptoms such as instability and restriction in range of motion. There have been numerous studies studying accuracy of the MRI of the knee, there has been only a few that have fully investigated the diagnostic accuracy of the MRI in patients with an acute ACL injury, thus the present study aims to assess role of magnetic resonance imaging (MRI) in diagnosis of anterior cruciate ligament (ACL) tears in patients with internal derangements of knee. ***Aim:*** The research aims to assess role of magnetic resonance imaging (MRI) in diagnosis of anterior cruciate ligament (ACL) tears in patients with internal derangements of knee. ***Methodology:*** This cross-sectional study was completed from December 2020- March 2021 at Department of Radiology of Tertiary Care Hospital. The 40 female patients with any age were made part of the study with painful or unstable knee joint. Clinical examination was performed after recording demographic data. MRI was performed and primary and secondary signs were noted for each case. SPSS 17 was used for the analysis of data. ***Results:*** The majority of the patients were male (n=29; 72.5%), whereas only 11 (27.5%) females. On findings regarding complete/partial ACL, 57.5% participants responded with complete ACL, whereas 42.5% with partial ACL. ***Conclusion:*** Accurate and non-invasive methods for the ligamentous injury evaluation are magnetic resonance imaging. In patients with soft tissue injuries to the knee, it might be performed as a first line examination.

Key words: MRI, ACL, Magnetic resonance imaging, anterior cruciate ligament.

INTRODUCTION

The anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) as well as the medial meniscus (MM) are also crucial features of the knee joints. In sports, knee injuries are exceedingly prevalent, with the predominance of knee disorders in meniscal and ligamentous lesions. Each injury within the knee must be identified for proper therapy [1, 22] knee injury is a common location, largely owing to trauma, repetition and sports. The accuracy, sensitivity and specific values of knee lesions vary substantially in literature [2]. A full knee exam is more than 80% sensitive for an ACL damage when conducted correctly.

An intact ACL might be revealed by examining the MRI. The precision, sensitivity and specificity for knee lesions in the literature vary greatly [3]

The gold standards in imaging soft tissue injuries of the knee have been magnetic resonance imaging (MRI) (4, 5). In clinical practice, MRI is utilized frequently before patients are given arthroscopic treatment to diagnosis or support clinical diagnostics for meniscal or ligamentous problems. MRI is a helpful screening instrument to identify people who would have surgery in patients with an acute sport knee injury [6-8].

In an oblique route, from the tibia into the side femoral condyle, the anterior cruciate ligament (ACL) goes. It is a compound of fiber that ranges from the anterior intercondylar area of the proximal tibia to the medial face of the lateral femoral condyle in the intercondylar groove. This ligament is comprised of fiber. The ACL fiber are organized according to their tibial insertion in two bundles known as the anti-medial and the post-tero lateral bundle. The anti-medial bundle inserting the lateral femoral condyle is more medial and superior, whereas the post-medical bundle inserting on the lateral and distal side of the femoral condyle. Sometimes between these two bundles, there is an extra

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medium bundle. The whole ACL is around 38 mm in breadth and length 11 mm. The length is 29.7 ±2.9 mm, the length of the anteromedial bundle is 19.3 ± 2.5 mm. Both bundles have a size close to the average width in the medium material 5.0 ± 0.7 mm and 5.3 ± 0.7 mm [21].

Injury to anterior cruciate ligament (ACL) is caused by intense contact or indirect knee trauma that lead to non-contractile, elastic soft-tissue joint components being stretched or teared. ACL is the largest ligament in the knee that is most often damaged [9]. Because the recovery from torn ACL is highly restricted in the long term, cartilage loss, subsequent meniscus injury and degenerative change are often involved.

The MRI examination provides accurate information on lesions in several organs and in the knee [10, 11]. The course and duration of the therapy of the patient is determined. In 10-43 percent of the total of ACL injuries partial ACL rupture occur [14-16].

During physical examination, partial ACL tears are difficult to diagnose. In contrast, numerous studies stress that the usual MRI methodology for diagnose partial ACL injury is not sufficient [10-13]. Magnetic imagery was the most important progress in imaging the knee, a key technique in the evaluation and therapy of inner knee disturbances that was evidently developed as a major tool. The MRI changing the old methodology for the treatment of suspected internal knee changes with the creation of novel sequences, increased sNR, better resolution, shorter imaging periods and greater accuracy.

MATERIAL AND METHODS

This prospective study was performed at Tertiary Care Hospital, Gujranwala Division. The study was conducted from December 2020 to March 2021 with inclusion of patients being referred from Orthopedics Department during this time. In total, 40 patients were made part of the study with inclusion criteria of painful or unstable knee joint, which was symptomatic or asymptomatic. The clinical suspicion of internal derangement of knee joint and acute traumatic internal derangement of knee joint were primary inclusion requirement. The patients with any age and gender were included. The exclusion criteria were set as previous history of surgery of the same knee, age associated degenerative arthrosis of knee joint and any contraindication for MRI. The patients were explained about the purpose of the study and asked to sign written informed consent. After clinical examination, patients were administered with imaging with the help of 1.5 T MRI.

RESULTS

In this survey, 35.0% participants were between the age range of 15 to 30 years old, 27.5% of the participants were between age range of 31 to 40 years old, 20.0% of the participants were between age range of 41 to 50 years old, 12.5% of the participants were between age range of 51 to 60 years old, 5.0% of the participants were between age range of above 60 years old as shown in table1.

Table-1: Age Distribution

Age	Frequency	Percent
15 to 30 years	14	35%
31 to 40 years	11	27.50%
41 to 50 years	8	20%
51 to 60 years	5	12.50%
above 60 years	2	5%
Total	40	100%

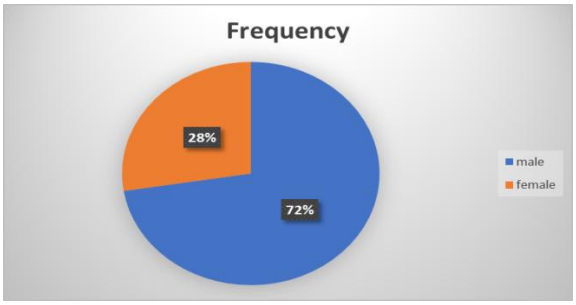

Fig-1: Gender Distribution

In this survey, male participants were 29% and females were only 11% as shown in Figure 1. Regarding the complete/partial ACL, 57.5% participants responded with complete ACL, whereas 42.5% with partial ACL. Regarding the ACL angle, 57.5% participants responded with yes, whereas in Blumensaat's angle, 60.0% participants responded with yes. Regarding the Anterior tibial displacement, 42.5% participants responded with yes, whereas in PCL angle, 65.0% participants responded with yes and 77.5% participants responded with yes in Lachman test. 67.5% participants responded with yes, whereas in Mcmurray's test, 75.0% participants responded with yes. Valgus strain,75.0% participants responded with yes, whereas in Varus strain, 90% participants responded with yes as shown in table 2.

Table-2: Frequency Distribution

Findings	Frequency	Percentage
Complete ACL	23	57.50%
Partial ACL	17	42.50%
ACL Angle	23	57.50%
Blumensaat's angle	24	60%
Anterior tibial Displacement	17	42.50%
PCL Angle	26	65%
Lachman test	31	77.50%
Post. Drawer Test	27	67.50%
Mcmurray's test	30	75%
Valgus strain	30	75%
Varus strain	36	90%

Regarding the gender related complete/partial ACL Crosstabulation, 17 males responded with complete ACL whereas 12 males responded with partial ACL. 6 females responded with complete ACL whereas 5 females responded with partial ACL as shown in table 3.

Table-3: Gender * Complete/Partial ACL Crosstabulation

Gender	Count	complete ACL	partial ACL	Total
male	Count	17	12	29
	% within Complete/Partial ACL	73.90%	70.60%	72.50%
female	Count	6	5	11
	% within Complete/Partial ACL	26.10%	29.40%	27.50%
	Count	23	17	40
Total	% within Complete/Partial ACL	100.00%	100.00%	100.00%

DISCUSSION

The research aims to assess role of magnetic resonance imaging (MRI) in diagnosis of anterior cruciate ligament (ACL) tears in patients with internal derangements of knee.

This cross-sectional study was conducted and there were 40 female patients with any age were made part of the study with painful or unstable knee joint. Clinical examination was performed after recording demographic data. MRI was performed and primary and secondary signs were noted for each case. SPSS 17 was used for the analysis of data.

On findings, regarding the Anterior tibial displacement, 60.0% participants responded with yes, whereas 40.0% with no, Regarding the PCL angle, 65.0% participants responded with yes, whereas 35.0% with no, Regarding the Lachman Test, 77.5% participants responded with yes, whereas 22.5% with no, Regarding the Posterior drawer test, 67.5% participants responded with yes, whereas 32.5% with no Regarding the Mcmurray's test, 75.0% participants responded with yes, whereas 25.0% with no.

ACL tears were identified with 82.5% MRI accuracy in our research, ranging in "very excellent" interaction (80-90%). The results of this study are in line with the literature which indicates that the ligament tears and ACL, PCL tears are 80 to 94% correct.

The sensitivities in the diagnosis of ACL rupture reported by Rubin et al. [17] were 93%. Several future investigations have also indicated 92-% sensitivity and 93-99 percent specificity for the identification of ACL injuries in MR images [18].

A combination of 29 studies from 1991-2000, meta-analysis by Oei and colleagues [19] assessed the MRI validity with regards to minor and important knee ligament problems. The combined medium and lateral meniscus sensitivity were 86% and 79%, with group specificities of 99% and 98% respectively. The sensitivities and specs of pooled ACL and PCL tears were 89%, 99% and 96%, 99% respectively.

The expertise and training of the radiologist is undoubtedly crucial in the interpretation of MRI simultaneously, the independent baseline is also linked with trustworthy statistical data on the diagnostic value of the MRI.

MRI is the diagnostic technology of most assistance. The accuracy to identify ACL tears was reported between 70% and 100%. [20] As the ACL crosses the knee joint at an angle that is slightly oblique, it is rare to capture complete ligament through MRI in same position.

In the diagnostic procedure of knee-related injury, the use of MRI should be advocated. It has advantages because it is non-invasive and economically efficient. It removes the intrusive methodological problems. Our study showed that ACL knee injury was very sensitive, specific and almost accurate. The use of MRI should be encouraged in diagnosis procedure of knee related injury. It has beneficial aspects of being non-invasive, and cost-effective. It eliminates the complications associated with invasive methods.

CONCLUSION

Our investigation demonstrated that ACL knee joint damage was highly sensitive and specific and virtually accurate. The results of this small population research are consistent with bigger research in this area. We thus have adequate data to conclude that ACL diagnosis is extremely accurate. MRI is a suitable screening technique for therapeutic arthroscopy that makes arthroscopy in most individuals unnecessary. Accurate and non-invasive methods for the ligamentous injury evaluation are magnetic resonance imaging. In patients with soft tissue injuries to the knee, it might be performed as a first line examination.

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