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Study of Correlation Between Clinical and Magnetic Resonance Imaging in Ligament and Meniscal Injuries of the Knee".

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Introduction

The knee joint is a common site of injury due to trauma and sports activities (1). Clinical tests routinely used in the diagnosis of meniscal and ligament injuries have limitations and it may be difficult to elicit objective signs repeatedly, mainly due to pain in an acute or subacute presentation.

Although clinical examination is most important for the diagnosis of a ligament injury, examinations which can be painful are not always accurate in recent injuries. Clinical tests may be confusing and may cause a delay in diagnosis. Therefore, complementary diagnostic tools are often necessary, mainly when suspicion of multiple internal derangements of the knee.

The knee is a complex joint with a many internal structures, which can give rise to symptoms of knee injuries. The essential part of diagnosis is imaging (2,3). The most significant advances made in terms of knee imaging have been in the realm of Magnetic Resonance Imaging. Magnetic resonance imaging (MRI), with its ability to generate a high contrast and high spatial resolution images of the muscles, ligaments and synovium without the use of ionizing radiation (4,5,) has an important role in the radiologic evaluation of joint disease.

Magnetic resonance imaging (MRI) has a better soft tissue contrast and multiplanar slice capability which has revolutionized and has become the ideal modality in imaging the anatomy of the knee joint. (6)

MRI is a completely noninvasive diagnostic modality and there is no ionizing radiation. Moreover, the ligaments of the knee are divided into intraarticular and extraarticular. MRI plays a most important role in their evaluation. Identification of meniscal tears can be difficult to interpret and can be observer dependent.

The main indication of MRI is in the assessment of meniscal and ligament injuries. However, it is useful in demonstrating another knee joint abnormalities (7,8) involving articular cartilage, bone marrow, synovium, patellofemoral joint and adjacent soft tissue. MRI can visualize both hyaline and fibrocartilage and has been instrumental in characterizing synovial-based and cartilage-based disorders (9,10). MRI has been proven to be effective in defining the various knee structures (11, 12) and has proved to be an imaging modality in defining damage to these structures (13) thus to providing an aid in planning the treatment if required. Because of its improved signal to noise ratio (SNR) (14), high resolution with reduced artifacts, shorter than before times and improved accuracy, MRI has emerged as the primary imaging tool in the workup of Internal Derangements of the Knee (IDK) joint. With the advent of MRI, it has opened up the possibility of looking into the injured knee noninvasively hence averting invasive procedures and also further morbidity. And also in the recent years, the decrease in the cost of MR imaging of the knee has very much contributed to the orthopedic community accepting them as a replacement which is noninvasive compared to arthrography and nontherapeutic arthroscopy (12).

A noninvasive modality, MR has replaced conventional arthrography (15) in the evaluation of the menisci and cruciate ligaments and has decreased both the morbidity and the cost associated with the arthroscopic examination that yields negative results. It is widely used to evaluate a wide spectrum of internal knee derangements and articular disorders. MRI has also proved beneficial in the selection of the patients, in preoperative planning, in diagnosis, and in improved patient-doctor communication (resulting in more meaningful informed consent). With MR imaging, the anatomic and pathologic definition of the soft tissue, ligaments, fibrocartilage and the articular cartilage is superior to that seen with computed tomography (CT). Fast spin echo imaging, used in conjunction with fat suppression MR technique, has extended the sensitivity and specificity of MR for the detection of articular cartilage injuries. In addition, three-dimensional (3D) volume techniques have demonstrated the versatility of Magnetic Resonance Imaging in the diagnosis and evaluation of meniscal tears. It can be used to reformat images of meniscal tears in orthogonal and nonorthogonal planes. An additional advantage of MR imaging is multiplanar and thin section capabilities and the ability to evaluate 3 subchondral bone marrow. As a result, MR imaging is recommended instead of CT for evaluation of bone contusion and occult knee fractures, including tibial plateau fractures of the knee.

Patient's history regarding the mechanism of injury and position of limb at the time of accident may provide clues to possible ligament involvement. (16) Painful stress examinations do not always yield accurate results in recent injuries. Hence MRI is routinely being indicated for early diagnosis of an acute injuries of the knee. (17) Arthroscopy though gold standard, is invasive. The ability of MRI to reliably identify IDK, multiplanar imaging capabilities, outstanding resolution, and non-invasiveness make it an important diagnostic modality. (18)

Materials and Methods

Aim:

To determine the correlation of a Magnetic Resonance Imaging scan with clinical findings in patients with ligament and meniscal injuries of the knee joint.

Objectives:

- To study the relationship between the observed findings on clinical examination and Magnetic Resonance Imaging findings in patients with ligament and meniscal injuries of the knee joint.
- To study the diagnostic utility of Magnetic Resonance Imaging in patients with ligament and meniscal injuries of the knee joint in terms of Sensitivity and Specificity.

Study design: - A prospective, observational, clinical and radiological diagnostic study.

Site and place of study: - Patients presenting with ligament and meniscal injuries to the Department of Orthopedics at a tertiary care center in Southern Rajasthan.

Sampling technique: - Purposive sampling technique with the consecutive scheme.

Inclusion criteria: -

- Patients with knee trauma suspected to have ligament and meniscal injuries between the ages of 18 to 60 years

Exclusion criteria: -

- Patients with contradictions to MRI like Pacemakers and Metallic Implants.
- Patients with fracture-dislocations of the knee joint.
- Patients with previous history of Knee joint surgery.
- Patients refusing to enroll in the study.

Results

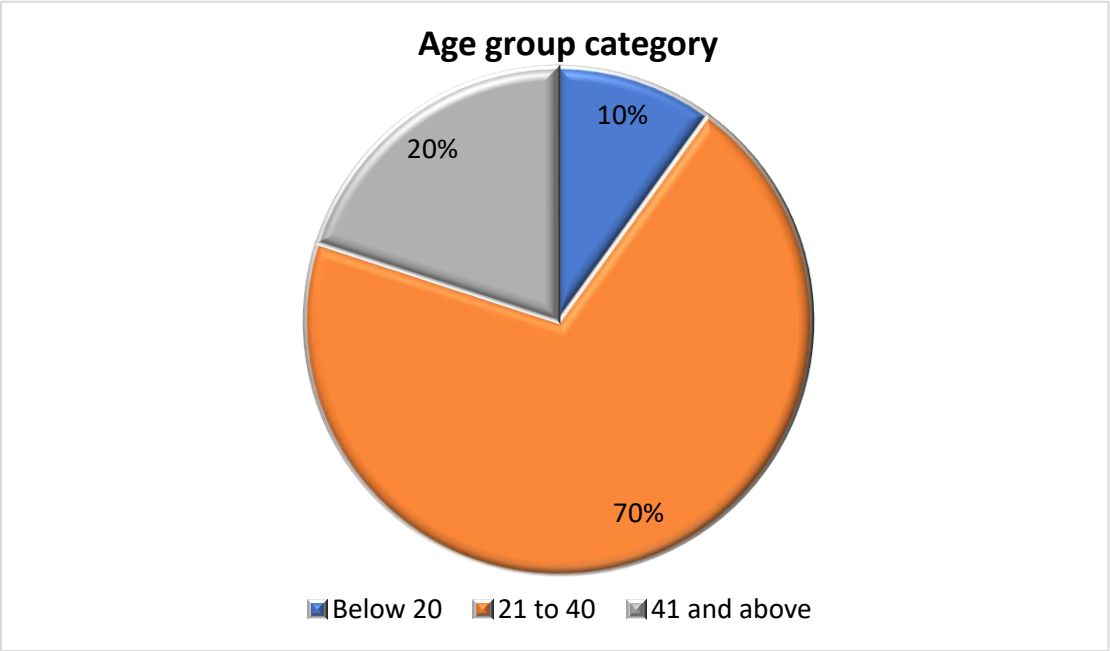
A total of 100 subjects were included in the final analysis.

Parameter	Mean ±SD	Median	Min	Max
Age	32.15 ± 10.37	30	18.00	60.00

Table 1: Descriptive analysis for age in study population (N=100)

Age group category	Frequency	Percentages
Below 20	10	10%
21 to 40	70	70%
41 and above	20	20%

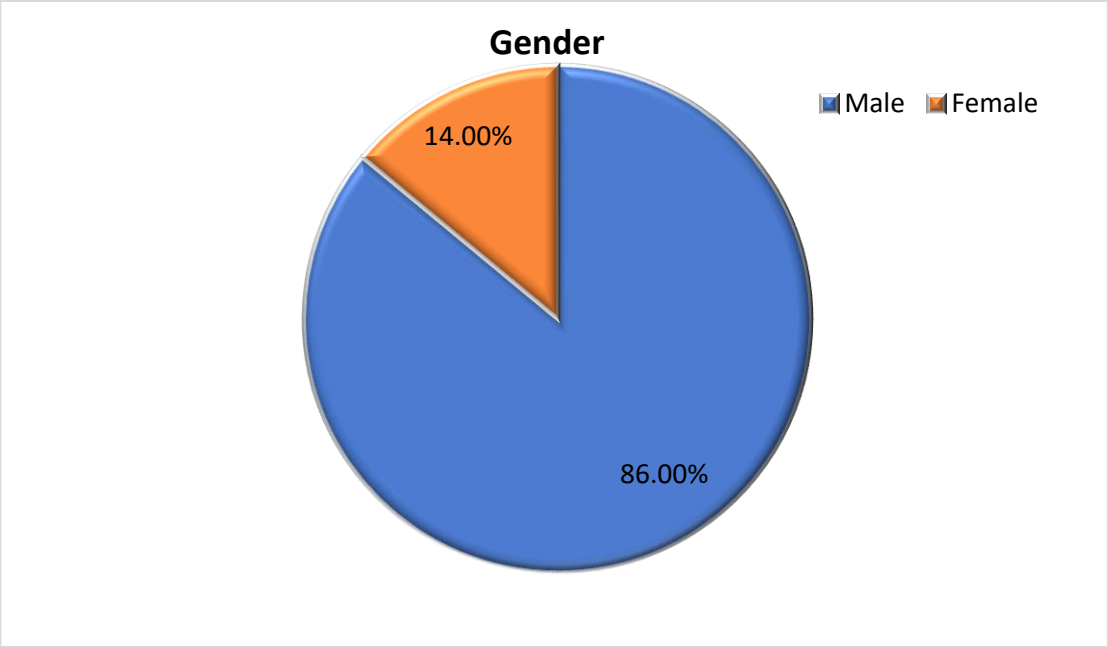
Table 2: Descriptive analysis of age group category in study population (N=100)



Gender	Frequency	Percentage
Male	86	86.00%
Female	14	14.00%

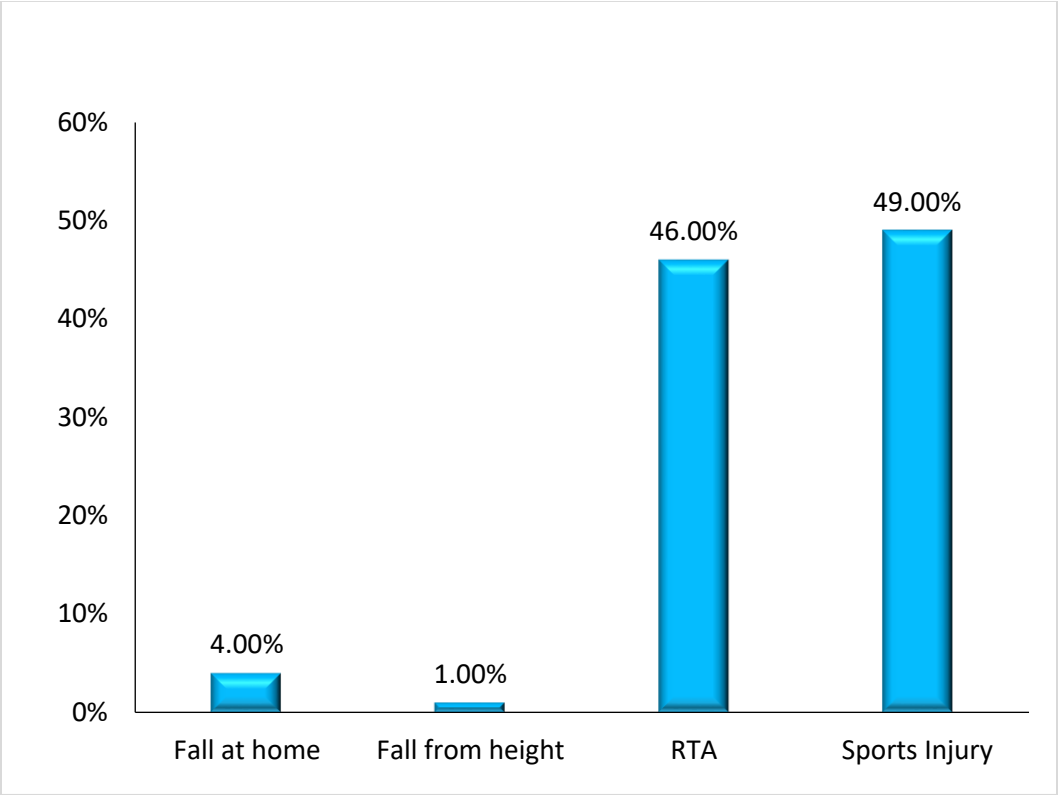
Table 3: Descriptive analysis of gender in study population (N=100)

Among the study population male participants were 86 (86.00%) reaming 14 (14.00%) were female participants.



Mode of Injury	Frequency	Percentage
Fall at home	4	4.00%
Fall from height	1	1.00%
RTA	46	46.00%
Sports Injury	49	49.00%

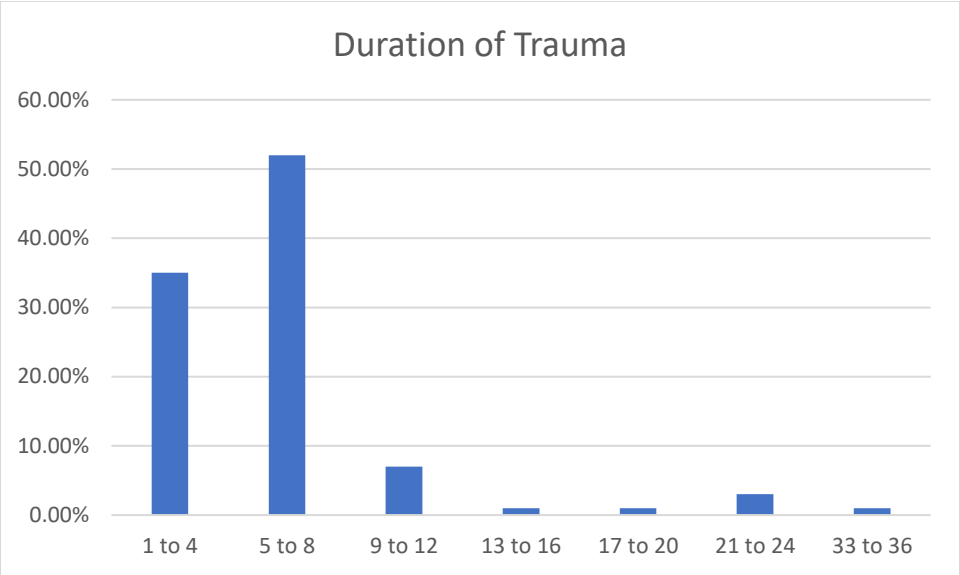
Table 4: Mode of Injury in study population (N=100)



Duration of Trauma (weeks)	Frequency	Percentage
1-4	35	35.00%
5-8	52	52.00%
9-12	7	7.00%
13-16	1	1.00%
17-20	1	1.00%
21-24	3	3.00%
33-36	1	1.00%

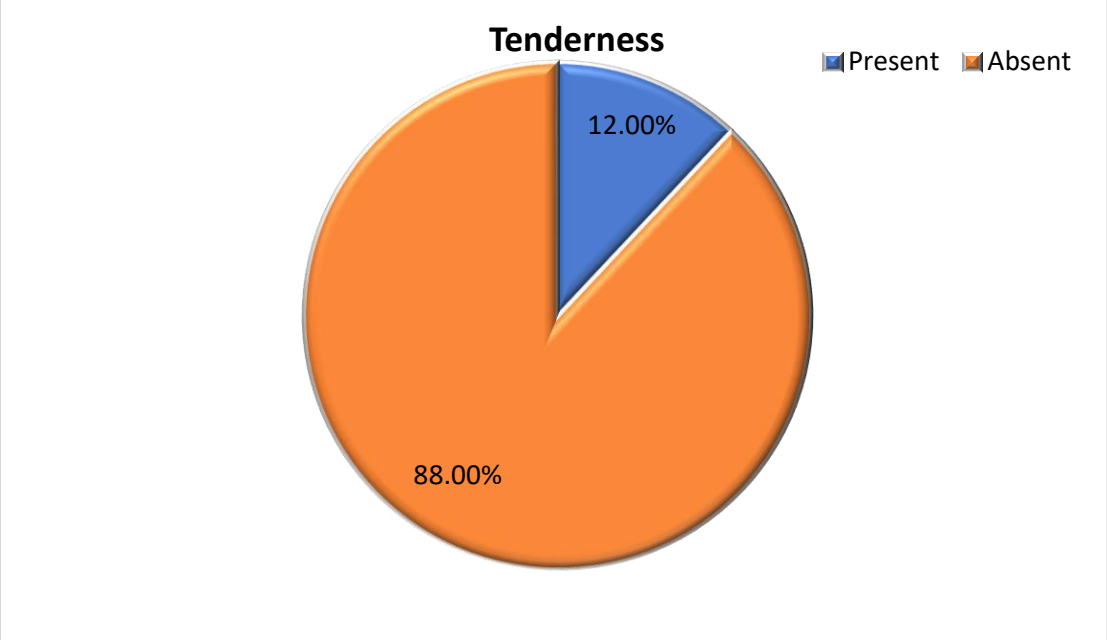
Table 5: Duration of Trauma

Mean Duration of Trauma (weeks) – 6.65 ± 5.09 weeks



Tenderness	Frequency	Percentage
Present	12	12.00%
Absent	88	88.00%

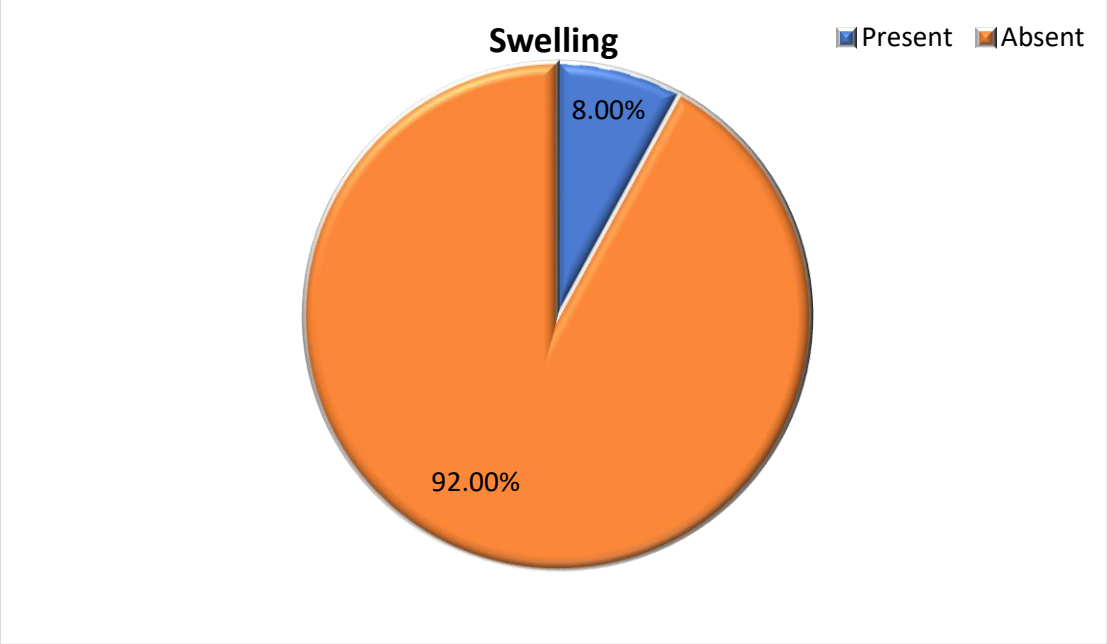
Table 6: Tenderness in study population (N=100)



Swelling	Frequency	Percentage
Present	8	8.00%
Absent	92	92.00%

Table 7: Swelling in study population (N=100)

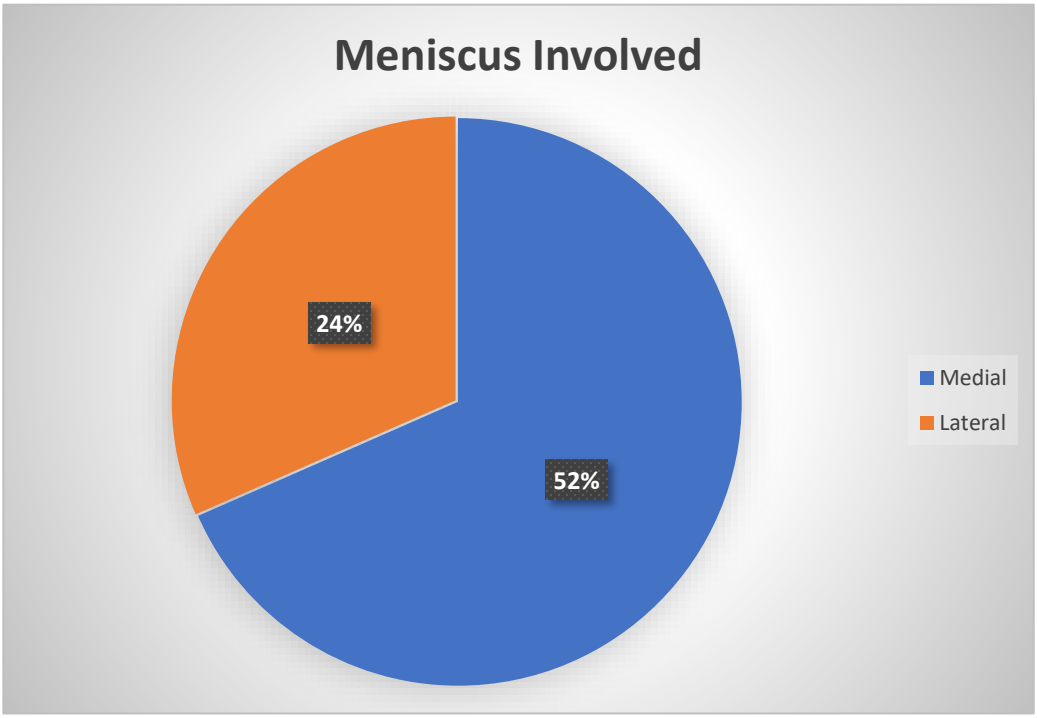
Among the study population, 8% cases had swelling at the site of injury.



Meniscus involved	Frequency	Percentage
Medial Meniscal Tear	52	52.00%
Lateral Meniscal Tear	24	24.00%

Table 8: Descriptive analysis of meniscus involved in study population on MRI (N=100)

Among the study population, 52 (52%) had medial meniscal tear on MRI and 24 (24%) had Lateral Meniscal Tear on MRI.



Out of 100 patients in our study, Medial Mcmurray test was positive in 41 patients (41%) and it was compared to Medial Meniscal tears on MRI which was found to be present in 52 patients (52%).

		Medial McMurray Test		
		Pos	**Neg**	**Total**
Medial Meniscus on MRI	Tear	41	11	52
	Normal	0	48	48
	Total	**41**	**59**	**100**

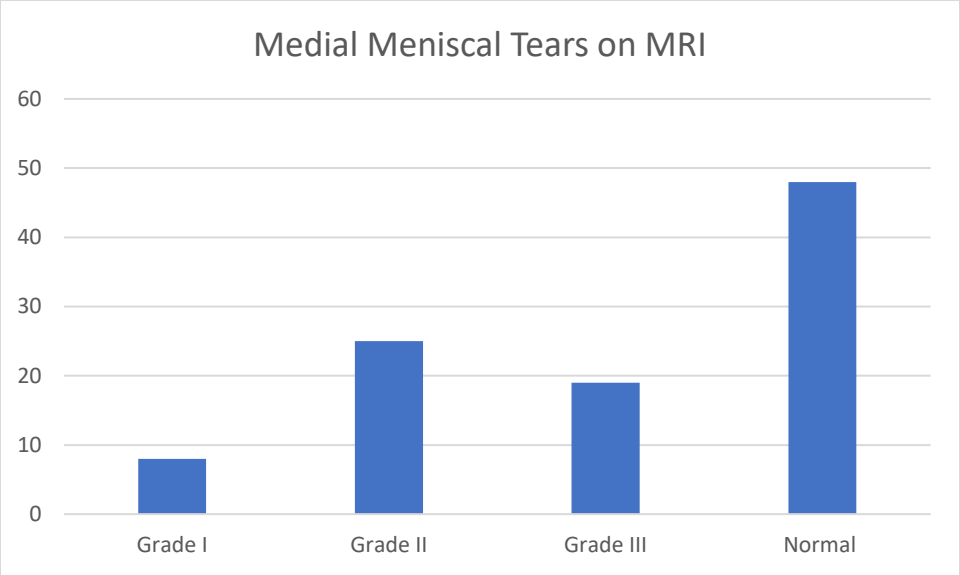
Table 9: Medial McMurray test vs medial meniscal tear on MRI

This gives us sensitivity of 80% of McMurray test for medial meniscus compared to MRI showing Medial Meniscal Tear.

On MRI, out of 52 positive patients for Medial Meniscal tears, it showed Grade I tear in 8 patients, Grade II tear in 25 patients and Grade III tear in 19 patients.

Medial Meniscal tear	Frequency	Percentage
Grade I	8	8%
Grade II	25	25%
Grade III	19	19%
Normal	48	48%
Total	**100**	

Table 10: Grades of medial meniscal tear in Study Population



Lateral Meniscal tear

Out of 100 patients in our study, 24 patients had Lateral Meniscal tears on MRI, and 20 patients had a positive Lateral Mcmurray test on clinical examination.

		Lateral Mcmurray		
		Pos	**Neg**	**Total**
Lateral meniscus on MRI	Tear	20	4	24
	Normal	0	76	76
	Total	**20**	**80**	**100**

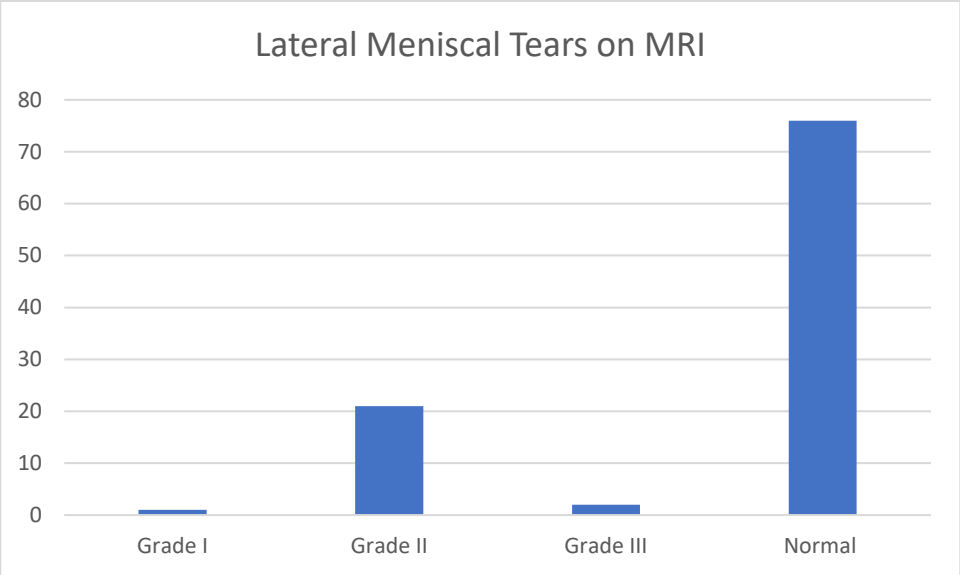
Table 11: Lateral McMurray test vs lateral meniscal tear on MRI

This gives us sensitivity of 83.33% of McMurray test for lateral meniscus compared to MRI showing Lateral Meniscal Tear.

On MRI, out of 24 positive patients for Lateral Meniscal tears, it showed Grade I tear in 1 patient, Grade II tear in 21 patients and Grade III tear in 2 patients.

Lateral Meniscal tear	Frequency	Percentage
Grade I	1	1%
Grade II	21	21%
Grade III	2	2%
Normal	76	76%
Total	**100**	

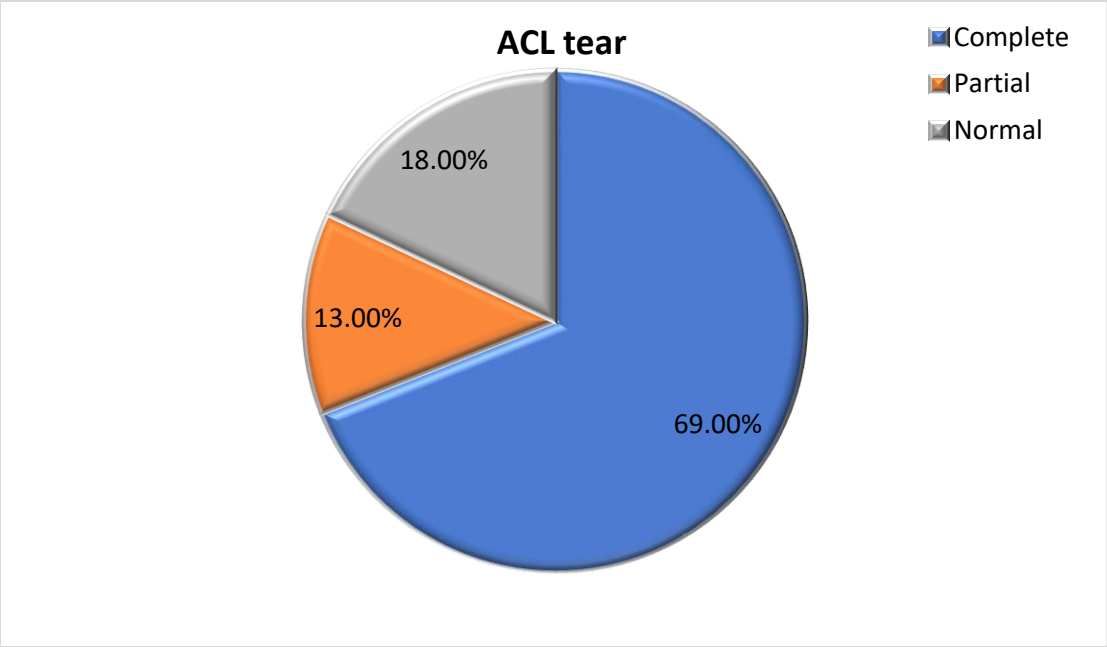
Table 12: Grades of lateral meniscal tear in Study Population



ACL tear	Frequency	Percentage
Complete	69	69.00%
Partial	13	13.00%
Normal	18	18.00%
Total	100	

Table 13: Descriptive analysis of ACL tear in study population

Among the study population with ACL tear, 69 (69%) had a complete tear of ACL, 13 (13%) had partial and 18 (18%) had intact ACL.



Grading of ACL tears

Grade 1: Ligament is mildly damaged and slightly stretched but ligament is able to keep the joint stable.

Grade 2: Ligament stretches to the point where it becomes loose, often called a partial tear.

Grade 3: Commonly referred as a complete tear of the ligament. The knee joint is unstable.

		Anterior drawer test		
		Pos	**Neg**	**Total**
ACL tear on MRI	Tear	79	3	82
	Normal	0	18	18
	Total	**79**	**21**	**100**

Table 14: Anterior drawer test vs ACL tear on MRI

This gives us sensitivity of 96% of anterior drawer test (positive in 79 cases) when compared to MRI (showing ACL tear in 82 cases).

		Lachmans test		
		Pos	**Neg**	**Total**
ACL tear on MRI	Tear	77	5	82
	Normal	0	18	18
	Total	**77**	**23**	**100**

Table 15: Lachmans test vs ACL tear on MRI

This gives us sensitivity of 93.9% of Lachmans test (positive in 77 cases) when compared to MRI (showing ACL tear in 82 cases).

		Pivot shift test		
		Pos	**Neg**	**Total**
ACL tear on MRI	Tear	78	4	82
	Normal	0	18	18
	Total	**78**	**22**	**100**

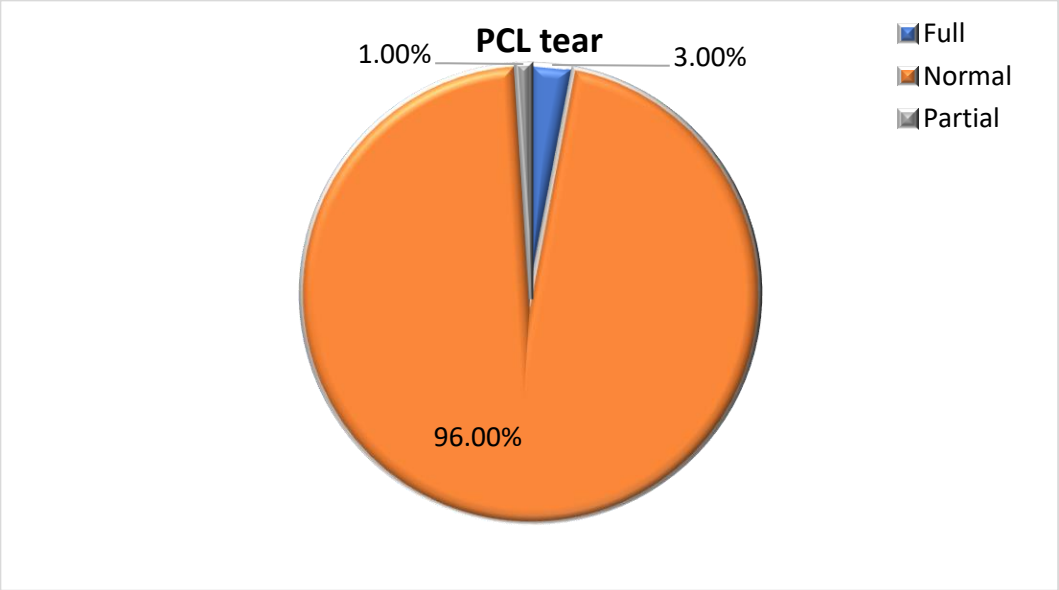
Table 16: Pivot shift test vs ACL tear on MRI

This gives us sensitivity of 95.12% of anterior drawer test (positive in 78 cases) when compared to MRI (showing ACL tear in 82 cases).

PCL tear	**Frequency**	**Percentage**
Full	3	3.00%
Normal	96	96.00%
Partial	1	1.00%
Total	100	

Table 17: Descriptive analysis of PCL tear in study population

Among the study population with PCL tear, 3 (3.0%) had a complete tear of PCL, 1 patient (1.0%) had a partial tear and 96 (96%) had an intact PCL.



		Posterior Drawer		
		Pos	**Neg**	**Total**
PCL on MRI	Tear	3	1	4
	Normal	1	95	96
	Total	**5**	**95**	**100**

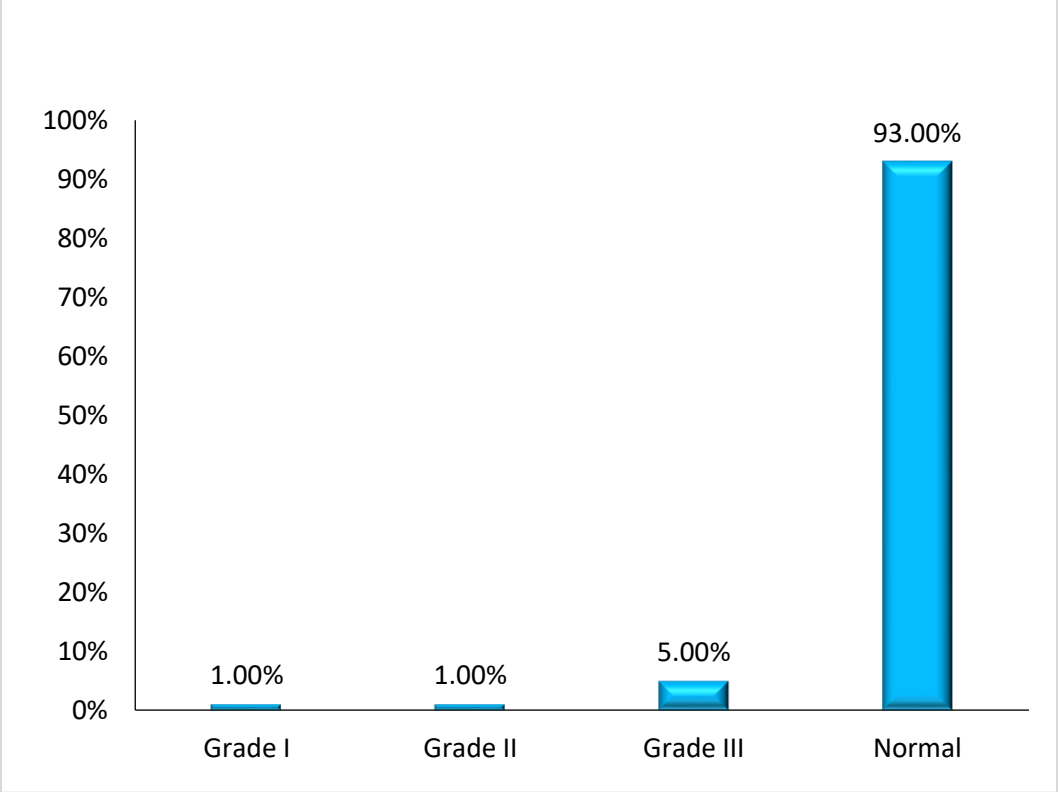
Table 18: Posterior drawer test vs PCL tear on MRI

This gives us sensitivity of 75% of posterior drawer test (positive in 3 cases) when compared to MRI (showing PCL tear in 4 cases).

LCL tear	Frequency	Percentage
Grade I	1	1.00%
Grade II	1	1.00%
Grade III	5	5.00%
Normal	93	93.00%
Total	100	

Table 19: Descriptive analysis of LCL tear on MRI in study population

Among the study population with LCL tear, 5 (5%) had a grade III tear of LCL tear, 1 (1%) had grade I and grade II tear each and 93 (93%) had a normal LCL.



LCL tear MRI classification

Grade I – Subcutaneous fluid surrounding the mid-substance of ligament at one or both insertions

Grade II – partial tearing of ligament fibres at mid-substance or one of the two insertions

Grade III – Complete tear of the ligament at mid-substance or one of the two insertions

		Varus Stress Test		
		Pos	**Neg**	**Total**
LCL On MRI	Tear	6	1	7
	Normal	2	91	93
	Total	**8**	**92**	**100**

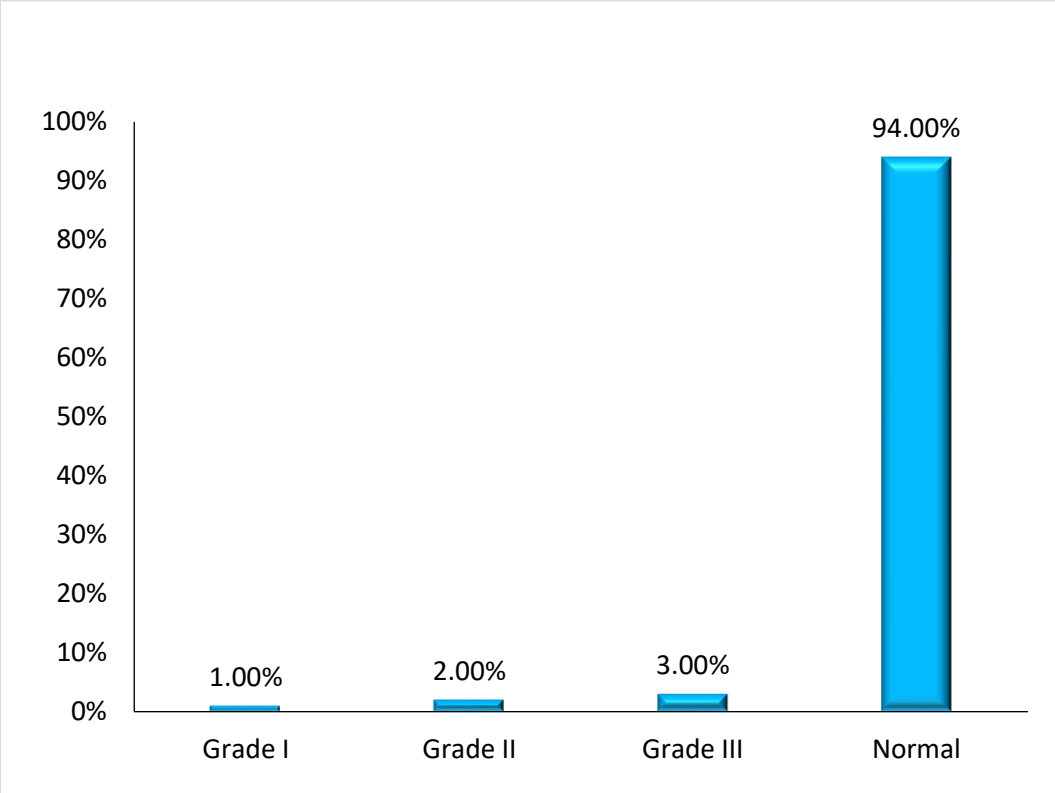
Table 20: Varus stress test vs LCL tear on MRI

Out of 100 patients in our study, 7 had LCL tear on MRI and 6 had a positive varus stress test giving us sensitivity of 85.71% for varus stress test.

MCL tear	**Frequency**	**Percentage**
Grade I	1	1.00%
Grade II	2	2.00%
Grade III	3	3.00%
Normal	94	94.00%
Grand Total	100	

Table 21: Descriptive analysis of MCL tear on MRI in study population

Among the study population with MCL tear, 3 (3%) had a grade III MCL tear, 2 (2%) had grade II, 1 (1%) had grade II tear and 94 (94%) had a normal MCL.



MCL Injury grading on MRI

Grade I – High signal intensity seen superficial (medial) to MCL, which looks normal. Also called minor sprain.

Grade II – High signal intensity seen medial to ligament with high signal or partial disruption of ligament.

Grade III – It shows complete disruption of ligament.

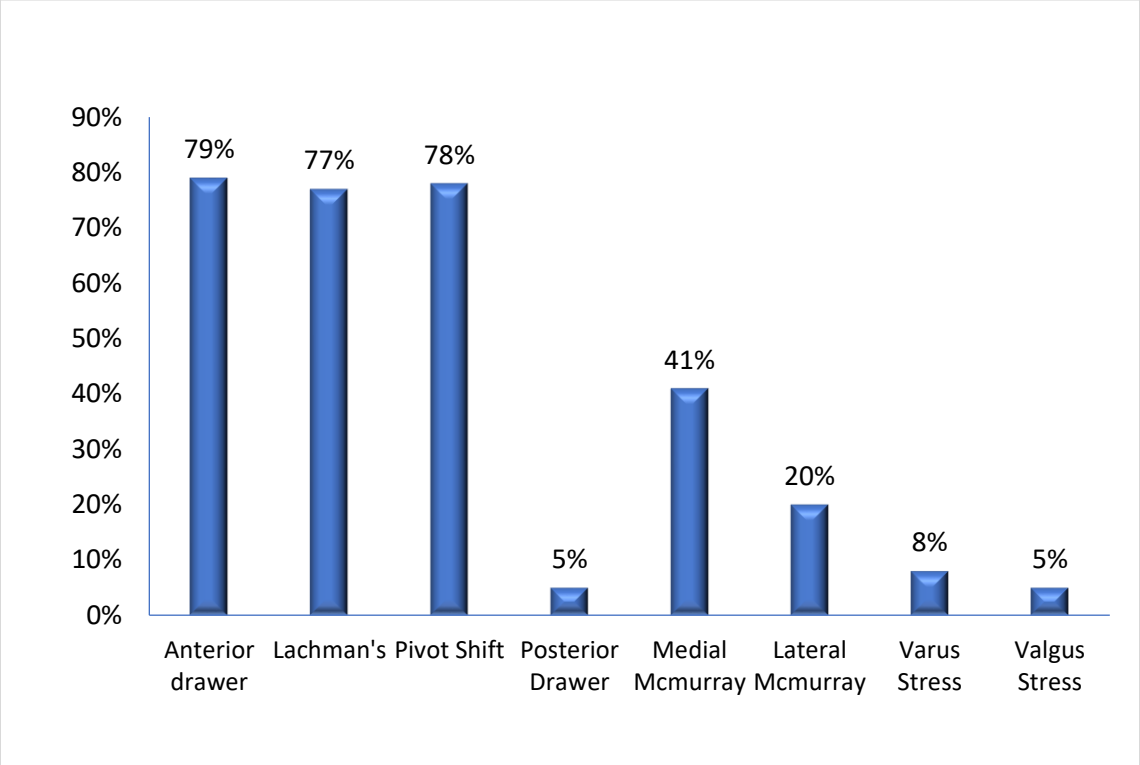
		Valgus Stress		
		Pos	**Neg**	**Total**
MCL on MRI	Tear	5	1	6
	Normal	0	94	94
	Total	**5**	**95**	**100**

Table 22 - Valgus stress test vs MCL tear on MRI

Out of 100 patients in our study, 6 had MCL tear on MRI and 5 had a positive valgus stress test giving us sensitivity of 83.33% for valgus stress test.

	Frequency	Percentage
Anterior drawer	79	79%
Lachman's	77	77%
Pivot Shift	78	78%
Posterior Drawer	5	5%
Medial Mcmurray	41	41%
Lateral Mcmurray	20	20%
Varus Stress	8	8%
Valgus Stress	5	5%

Table 23: Descriptive analysis in study population



Discussion

Internal derangement of knee is a commonly presenting clinical condition to the orthopaedic practitioner. They account for a large number of referrals to hospitals, not only from the peripherals and general practitioners but also from accident and emergency centres. Other than being very troublesome for the patient's day to day activities, it has a very significant financial and medico legal implication.

Disruption of various ligaments and cartilage around the knee joint leads to significant morbidity, especially in young adults involved with sporting activities. Therefore, imaging of this complex synovial joint becomes crucial to promptly identify the pathology affecting it. 1

The stability of the joint is highly dependent on its supporting ligamentous structures; therefore, injuries of ligaments and menisci are extremely common. The meniscus is one of the most important structures of the knee joint. It has important functions like load transmission, shock absorption and stress reduction.19 Treatment of meniscal and ligaments injuries is of prime importance for normal function of knee joint. An accurate diagnosis regarding the involvement of structures and the extent of injuries is essential for early operative as well as non-operative treatment. This requires an accurate clinical history, a thorough physical examination and complementary diagnostic tools.

Age and Sex of Patient

In our study was observed that majority of patients were in age group of 21 to 40 yrs. (70%), followed by more than 40 years 20% as this is the most active age group. Mean age of patients in our study was 32.15 ±10.37 years. Among the study population male participants were 86 (86.00%) remaining 14 (14.00%) were female participants.

In a study by Patwegar et al 20 the age ranged from 15 to 64 years with mean age of 33.2 years. Maximum were young subjects in the age group of 15-30 years (50%). 74% of subjects of this study were male and male outnumbered females in all age groups of this study.

73% of males and 61.5% of females belonged to acute traumatic group. In a study done by Majewski et al.21 acute traumatic injuries of knee were common in age group of 20-29 and 70% of them were male. In our study acute traumatic injury to knee was found in 86% of males as well.

So young adult males were predominantly imaged for clinically suspected ligamentous or meniscal injuries and majority of them had history of significant trauma to knee.

Ali Akbar Esmaili Jah et al, (2005) (22) conducted a prospective, single blind study, to compare diagnostic accuracy of clinical examination with MRI findings in assessing patients with acute traumatic internal derangement of the knee. A total of 57 males (81.4%) and 13 females (18.6%), ranging in age from 17 to 51 years (mean = 27.9) which is very well correlating.

Mode of Injury

Majority of patients had sports injury 49 (49%) followed by road traffic accident in 46 (46%), fall at home in 4 (4%) and one case of fall from height 1 (1%).

Venkateshwaran Arumugam et al (23) studied MRI evaluation of acute internal derangement of Knee observed that their common cause of injury was contact sports followed by road traffic accidents i.e., acute trauma.

Duration of Injury

It was observed that majority of patients reported within 8 weeks of duration of trauma (87%). Few patients reported very late up to 36 weeks of trauma mainly due to other injuries/ morbidities. Mean Duration of Trauma (weeks) was 6.65 ± 5.09 weeks.

Taneja et al (24) observed that majority of patients undergo MRI before 1 week of duration of symptoms (54%) followed by between 1-2 weeks of duration (28%). The patients above 6 months of duration were 6% only.

Taneja et al (2018) 24 observed that majority of patients were present with acute trauma (88%) and absent among 12% patients.

SOLOMON et al 2003 (25) stated "While most meniscal or ligamentous knee injuries heal with non-operative treatment; a subset should be treated with arthroscopic or open surgery". We believe that our clinical protocol including a second examination after 3 weeks of splinting can reduce the number of unnecessary MRIs, and should be particularly considered when the patient is not a professional sportsman, or is willing to wait for three weeks. However, in case of a high clinical suspicion of osteochondral damage and/or bony lesion, arthroscopy is required.

MADHUSUDHAN et al, 2008 (26) said that arthroscopy is inevitable considering the load in the National Health Service (NHS), however waiting time for the MRI from the point of definite clinical diagnosis was 3–7 weeks [average 4.1 weeks] and the waiting time for arthroscopy following the MRI was a further 5–8 weeks [average 5.8 weeks]. 3 patients were examined directly by the orthopaedic team following an acute episode and the rest were seen by the emergency medicine department at the time of injury to be followed by Orthopaedic consultation, In their study most of injuries were due to acute injury & sports person and recruits, since patient was given appointment for MRI and arthroscopy, mean duration was from 1-4 weeks (54.27%), and however due to load of patients most of patients were given 2 weeks of appointment for arthroscopy & few patient were managed conservatively initially and later advised surgery.

Swelling and Tenderness

Among the study population, 12% cases had tenderness at the site of injury. Among the study population, 8% cases had swelling at the site of injury. This is because of the duration of injury being more than

Mensical injury.

Among the study population, 52 (52%) had medial meniscal tear and 24 (24%) had Lateral Meniscal Tear.

SINGH et al 2004 27 In their study detection of Lateral Meniscal tears the sensitivity, specificity was 87% and 99.29%. The sensitivity of MRI in identifying medial meniscal tear has been reported to range from of 77%-97.5% and a specificity of 37%-100%. The occurrence of the false positive meniscal tears at MRI imaging has been noted earlier.

In our study for medial meniscus MRI revealed, sensitivity (90%). For lateral meniscus sensitivity (95%). Hence it co-relates with our study.

MANOJ K et al 2014 28 in their study only grade 3 tears were compared as grade 1 / 2 do not reach up to the articular surface and hence invisible to arthroscopic surface evaluation. Out of 80 patients 23 (28.75%) showed medial meniscal and 11 patients (13.75%) showed lateral meniscal tears on MRI. In our study we found medial meniscus anterior horn grade 2 and 3, 2 cases. 1 case of lateral meniscus tear mid substance. 1 case of medial meniscus was of a bucket handle tear which MRI failed to show up.

Anterior Cruciate Ligament

In our study, among the population with ACL tear, 69 (69%) had a complete tear of ACL, 13 (13%) had a partial tear and 18 (18%) had an intact ACL.

AHIRWAR LP et al, 2013 29 studied 100 patients of (Internal Derangement of the Knee) IDK. Out of 32 ACL tears, 25 (78%) were classified as complete tear and 7 (22%) as partial tears. 11(34.3%) of ACL tears were located in proximal segment, 17 (53.2%) in mid substance and 4 (12.5%) in distal segment of ligament. Arthroscopy was performed in 31 patients. Preoperative MRI reported ACL tear in 14, and 13 patients proven as tear on arthroscopy. 1 patient was normal on arthroscopy (false positive) and 1 case which were normal on MRI found to be torn on arthroscopy (false negative). MRI abnormal signal intensity was seen within the ligament with intact fibres.

MANOJ K et al, 2014 28 studied 98% in mid substance and 100% in femoral &tibial attachment out of total cases of 35. Most common sign of ACL Injury in MRI was hyperintensity. A critical review of false

positive and false negative findings in MRI showed 1 false positive and 1 false negative case. False positive case had both primary and secondary findings. Cause of primary finding was non visualization of ACL and the causes for the secondary findings is unclear; they may have reflected the physiological ligamentous laxity. In the false negative case that had a partial tear as seen in arthroscopy the MR image showed a linear band of intact fibres normally oriented in expected location of the ACL. Studies have showed that MR imaging has low sensitivity (40- 75%) but moderate to high specificity (62- 94%) in diagnosis of partial tears.

In a study by ANTON M ALLEN M.D et al 2014 30, ACL showed hyperintense signal in one of the cases in mid substance tear of ACL similarly in this study, they studied two manifestations in partial tear (1) an anteriorly angled ACL stump or (2) a heterogeneous variable-signal nodule projecting anteriorly from the ACL. Histologic evaluation of the nodules has revealed disorganized ACL fibres, fibrosis, inflammation, and haemorrhage, they came to conclusion as MRI adds some value in the evaluation and management of partial tears, and positive MRI findings should not be ignored, even in the setting of a negative Lachman test. Management of partial ACL tears are evolving. Factors favouring conservative treatment include advanced age, a normal or near-normal Lachman result, low athletic demands, and less than 50% involvement of the ACL fibres on arthroscopy. Most young and highly active patients, patients with a clearly abnormal Lachman result, and patients with greater than 50% or posterolateral band involvement on arthroscopy are best treated with ACL reconstruction.

Posterior Cruciate Ligament

Among the study population with PCL tear, 3 (3.0%) had a complete tear of PCL, 1 patient (1.0%) had a partial tear and 96 (96%) had an intact PCL.

COLLATERAL LIGAMENT

MCL Injury

Among the study population with MCL tear, 3 (3%) had a grade III MCL tear, 2 (2%) had grade II, 1 (1%) had grade II tear and 94 (94%) had a normal MCL.

MCL Injury grading on MRI

Grade I – High signal intensity seen superficial (medial) to MCL, which looks normal. Also called minor sprain.

Grade II – High signal intensity seen medial to ligament with high signal or partial disruption of ligament.

Grade III – It shows complete disruption of ligament.

Compared that with a valgus stress test in our study, it came out to be positive in 41 cases. This gave us sensitivity of 80% in case of valgus stress test in our study.

LCL Injury

Among the study population with LCL tear, 5 (5%) had a grade III tear of LCL tear, 1 (1%) had grade I and grade II tear each and 93 (93%) had a normal LCL.

LCL Injury grading in MRI

Grade I – Subcutaneous fluid surrounding the mid-substance of ligament at one or both insertions.

Grade II – partial tearing of ligament fibres at mid-substance or one of the two insertions

Grade III – Complete tear of the ligament at mid-substance or one of the two insertions

In our study, varus stress test was positive in 8 patients (8%) of the patients. When compared to the MRI findings, we found Grade III tear in 5 patients and Grade II tear in 3 patients and Grade I tear in 1 patient. This comes to sensitivity of varus stress to be 88%.

THOMAS H. BERQUIST et al, (2007) 31 Tears of the ACL are frequently noted in association with MCL tears (30%). O'Donoghue's triad (medial meniscal tear, ACL tear, and MCL tear) is a frequently described injury pattern. MRI criteria in two image planes can be graded by the extent of fibre involvement (grade 1 sprain: a few fibres torn; grade 2 sprain: about 50% of the fibres torn; grade 3 sprain: complete disruption of the MCL) or signal intensity changes in and about the ligament. Grade 1 injuries show increased signal intensity medial to the ligament with normal signal intensity in the ligament. Grade 2 injuries demonstrate increased signal intensity medial to and within the ligament without complete disruption. Grade 3 injuries are complete similar to that defined by a grade 3 sprain. Reported 87% accuracy for MRI in classifying MCL injuries. Minor injuries are particularly easy to detect due to the high sensitivity of MRI. Partial or grade 2 tears are more difficult to correctly classify with MRI.

ADIL ISMAIL NASIR et al, (2013) 32 In there study a total of 12 cases were registered in MCL & LCL injuries showed those injuries demonstrated increased signal intensity on T2- weighted images because of oedema and haemorrhage and others demonstrated displacement or complete loss of continuity of ligamentous fibres, depending on the severity of the injury.

VENKATESHWARAN ARUMUGAM et al, 2015 23 they studied Lateral collateral injury total no cases were 12 (10%) The main findings in their study were collateral ligament injuries were adjacent fascial oedema and increased signal intensity of ligament and associated with ACL injuries due to sports related injuries.

Among the study population knee injuries were tested. In majority of patients had an ACL tear. With anterior drawer test positive in 79 (79%), followed by Lachman's test in 77 (77%), Pivot shift in 78 (78%).

Medial meniscus was the next most commonly involved structure with medial McMurray test being positive in in 41 patients (41%) and Lateral McMurray in 20 patients (20%), Varus stress in 8 (8%), Valgus stress in 5 (5%) and Posterior Drawer in 5 (5%).

O'Donoghue's triad 32 (combination of ACL, MCL and medial meniscus tear) was seen in 6 cases.

Lateral compartment injuries are less common than medial compartment injuries. LCL injuries were found in 22% of cases in our study. Associated tear of capsule was found in 1 case and popliteus myotendinous injury in 2 cases.

Varus and valgus stress tests were used to test for LCL and MCL respectively. Valgus stress test was positive in 75% of cases with MCL injury and varus stress test was present in 88% of cases with LCL injury.

According to Malanga et al.34 although collateral ligament testing seems to be sensitive and specific, there is a lack of well-designed studies that scientifically validate the sensitivity and specificity of these tests.

Meniscal tear was diagnosed by either an area of abnormal signal within the meniscus on at least one image that extended to the meniscal articular surface, or abnormal morphology of the meniscus. If the abnormal signal extends to the articular surface on two or more images, the sensitivity for a meniscal tear increases from 56% to 94% medially and from 30% to 90% laterally. Meniscal tear was found in 50 cases in this study. 47% involved only the medial meniscus, 14% only the lateral meniscus and 39% involved both menisci.

Medial meniscus was commoner to get torn as it is a less mobile structure and transmits more force during weight bearing. 64.5% of tears involved the posterior horn.

Jee et al. 35 reported prevalence of torn posterior horn of medial meniscus to be about 56%. Anterior horn tear was found in 3% of cases in our study which is comparable to the study done by De Smet et al. that showed involvement of anterior horn of medial meniscus in 2% of cases. Grade III tear were the commonest seen in 13 cases (42%) followed by Grade II in 29%.

Various types of medial meniscal tears detected in this study were – horizontal tear (26%), oblique tear (42%), bucket handle (9.5%), radial tear (3%) and complex tears (19%).

Helms et al.36 reported that 10% of tears of medial meniscus were of bucket handle type. Our study also found similar occurrence of bucket handle tears (9.5%). All the 3 cases of bucket handle tear of medial meniscus showed double PCL sign, where the displaced fragment was seen as a hypointense

structure parallel to PCL on all sequences. MR has a sensitivity of 27% to 44% and a specificity of 98% to 100% in detecting bucket-handle tears.

According to Malanga et al, 34 for meniscal tears, the McMurray test is very specific but has a low sensitivity. In our study population, McMurray test was positive in 68% of medial meniscal tear and 79% of lateral meniscal tear.

Taneja et al.24 observed that out of 50 patients, McMurray Test was positive among 38% patients and Apley test was positive among 34% patients. The other test for 58 Meniscal tear like Bragard sign and Bounce Home test was positive in 30% and 22% patients respectively.

Taneja et al.24 observed that majority of patients were having isolated Medial Meniscal tear (26%) followed by isolated Lateral Meniscal tear (14%). The bilateral meniscal tear was observed in 8% patients while 52% patients showed no meniscal tear.

The results of the present study demonstrate that meniscal injuries can be accurately diagnosed by MRI and support the findings of other studies.

Taneja et al.24 demonstrated that meniscal injuries can be accurately diagnosed by MRI. Williams [56] performed a study in which MRI scans were performed on 69 patients waiting for knee arthroscopy.

We analysed anterior drawer test V/s ACL tear and found sensitivity of 96%, specificity of 92.00%.

Pushpa et al (2020) 37 Comparing the clinical test with MRI found that clinical tests for ACL were highly specific but low sensitive for ACL tears. Clinical tests were found moderately sensitive for ACL and poorly sensitive for meniscal injury. It was 0% for PCL. All the tests were highly specific for ACL, PCL and medial meniscus but moderately sensitive for lateral meniscus. Positive predictive value of clinical tests was high for ACL, moderate for medial meniscus but low for lateral meniscus. Negative predictive value was highest for PCL while moderate for ACL, medial meniscus and lateral meniscus.

The clinical tests show sensitivity of 96% and specificity of 98% for Anterior Cruciate Ligament tear vs MRI.

The sensitivity and specificity of clinical examination for Posterior Cruciate Ligament tear was 75% and 92% respectively vs MRI having sensitivity of 94%.

Compared to other studies, the specificity was better than sensitivity.

For Lateral Menisci, clinical examination showed sensitivity of 83.33% and specificity of 94% vs MRI.

For Medial Menisci, clinical examination showed sensitivity of 80% and specificity of 96% vs MRI.

For Medial Collateral ligaments, clinical examination showed sensitivity of 83.33% and specificity of 96% vs MRI.

For Lateral Collateral ligaments, clinical examination showed sensitivity of 85.71% and specificity of 95% vs MRI.

The results obtained from the present study were equal to or better than the results of other studies.

It is essential to note the efficacy of MRI because it will in turn, effect the treatment of the pathology. In a study done by Adil Ismail Nasir et al. in 2013 71 it was concluded that MRI is a safe, non-invasive imaging modality as MRI of the knee has been shown to be accurate in the assessment of menisci, ligaments and articular cartilage, i.e., excellent modality for assessment of soft tissue and knee joint derangements. Thus, we must underline a need for MRI before arthroscopy. In the present study, 67% of the patients tested positive by clinical examination, were confirmed by arthroscopy.

In a study conducted by Navali et al. 38 clinical examination and MRI had equal efficacy with clinical examination proving to be slightly better than MRI.

In the study by Uppin et al. 39 it was found true with regards to ACL injuries. Also, it was found that clinical examination was equal to or better than MRI in single lesion knees when compared to those with more than one structure involved.

The MRI has dramatically improved our ability to detect meniscal injuries of knee joints. MRI in clinically suspected cases of meniscal injuries would reduce the number of unnecessary diagnostic arthroscopies. Preoperative MRI will help orthopaedic surgeons in selecting proper therapy for their patients.

Conclusion

Knee joint is a common site of injury, particularly in young and athletic patients. The anatomy of the knee has many ligaments and medial and lateral menisci, which are prone to injuries. This causes a significant number of cases of Internal Derangements of the Knee (IDK) visiting the OPD setup.

Most of these patients had a positive history of sports injuries (49%) followed closely by RTA (47%). Such patients also visited the OPD setup at an average of 5-8 weeks post trauma. This leads to most patients not having tenderness or a significant swelling at the time of presentation to the OPD. Hence this provides the best possible scenario for performing a thorough clinical examination.

Clinical examination, when performed thoroughly, has high sensitivity and specificity compared to MRI in ligament and meniscal injuries of the knee. Moreover, the method of routinely prescribing MRI for such patients significantly increases the economic burden on the patients. Also, there were some patients who could not be made to undergo MRI, like those with implants/pacemakers or those who require sedation for claustrophobia.

However, in acute cases, a through clinical examination might not always be possible due to tenderness of the knee. This can lead to doubtful results as the clinical tests are observer dependent. But, in such cases MRI findings can also be clouded due to the presence of bone contusion and swelling of the joint.

Magnetic Resonance Imaging (MRI) is a valuable tool in diagnosis of IDK and has increased in accurate. But many studies have found false positive impressions on MRI for asymptomatic individuals. Hence, its interpretation and with correlation with clinical findings is mandatory in accurate diagnosis and management of the patient.

Also, that prescribing an MRI be reserved for doubtful cases or cases with complications and should always be correlated with clinical findings.

And the authors suggest, clinical reporting of MRI to be adapted by clinicians for improving the diagnostic accuracy with clinical and radiological correlation. Such reporting can guide medical professionals to decide the course of management in the form of conservative or surgical treatment.

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