

Original Research Article

Role of MRI in Knee Disorders- A Cross Sectional Study

Jazba Naseer^{1*}, Taiba Zulfiqar², Muhammad Ahmad Naeem³, Anisa Riaz⁴, Waseem Zafar⁵, Abid Ali⁶

^{1,4}Medical Imaging Doctor, Department of Radiological Sciences and Medical Imaging, University of Lahore Gujrat, Pakistan

²Senior Lecturer, Department of Radiological Sciences and Medical Imaging, University of Lahore Gujrat, Pakistan

³Lecturer, Department of Radiological Sciences and Medical Imaging, University of Lahore Gujrat, Pakistan

⁵Radiology Incharge, Medcare International Hospital, Gujranwala

⁶Associate Professor, Department of Allied Health Sciences, University of Lahore, Gujrat, Pakistan

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Abstract: Background: Knee pain is one of the most common problems faced by people from time immemorial. There is a wide range of disease ranging from traumatic to degenerative causing knee pain in which articular cartilage is involved. Over the past 15 years, MRI has become the premier, first-line imaging study that should be performed in the evaluation of the painful knee in particular in tears of menisci, cruciate and collateral ligaments, osteochondral abnormalities (chondromalacia, osteoarthritis and osteochondral defects), synovial cysts and bone bruises. MRI, by virtue of its superior soft-tissue contrast, lack of ionizing radiation and multiplanar capabilities, is superior to more conventional techniques for the evaluation of articular cartilage. **Aim:** The goal of this study to investigate the role of magnetic resonance imaging (MRI) in various knee disorders to minimize the risk of secondary complications by early detection of the pathology. **Materials and Methods:** A cross sectional study was carried out on 50 patients in the Medcare International Hospital, Gujranwala. Age between 15 to 50, all diagnosed patients with knee disorders and both males and female were selected, exclusion was set to be those with previous history of surgery of the same knee, Un diagnosed patient and patient with other co morbidities, metabolic disease and other systemic problems beside those using drugs. MRI was performed with Siemens 1.5 Tesla machine. **Results:** In our study of 50 patients with knee pain and the age range between 14 to 70 years old were included, male participants were 62% and female participants 38%. 46% of the participant were responded with no for knee pain, 94.0% of the participant were responded with no joint stiffness, 60% of the participant were responded with no for soft tissue swelling, 38% of the participant were responded with no for ACL tear. **Conclusion:** In conclusion, individual with acute or chronic knee pain without any definite history of trauma should be subjected to MRI study of the knee provided radiographs are non-informative or non-diagnostic. The study not only outlines the tendons, ligament and cartilage status, but also demonstrates subtle underlying bony pathologies causative for patient complaints.

Key words: MRI, knee disorders, ACL, Tear.

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INTRODUCTION

The knee joint is the largest and the most complex joint of the human body. Anteriorly, the knee joint is not covered by any thick muscular covering and because of this structural weakness and very thin anterior covering, this joint is prone to injuries from direct trauma and rotation. These twisting injuries cause tearing of the meniscus and ligaments. The meniscal and ligament tears and osteoarthritic changes cannot be diagnosed completely by clinical examination; therefore, we have to use extra noninvasive or invasive measures to diagnose these changes, e.g., magnetic

resonance imaging (MRI). Currently, MRI is the noninvasive examination of choice in evaluation of internal derangement of the knee, as MRI has played an increasing role in the evaluation of knee lesions in recent years, its diagnostic potential is fallible [1].

Knee disorders often result in disabilities as well as in a decrease in health-related quality of life and may lead to workplace absenteeism efficient management of patients suffering from knee disorders is often lacking because the initial diagnosis is either erroneous or incomplete. Magnetic resonance imaging (MRI) has been established as an effective, noninvasive

test for identifying meniscal tears and other knee pathology. When used for the appropriate indications, MRI is a valuable tool in the evaluation and management of knee pain.

MRI has several advantages compared with other modalities in evaluation the internal architecture of the knee. MRI is noninvasive and painless and provides excellent soft tissue contrast. The first MRI of the knee was reported in 1985, but initial results were compromised by poor SNR and resolution. The implementation of local coils for extremity imaging and higher field-strength magnets (1.0-1.5T) helped to overcome these limitations. MRI plays a dominant role in the evaluation of knee abnormalities. A complete examination of the knee must include evaluation of the menisci, ligaments, articular cartilage and bone marrow. A suggested approach for scanning the knee includes sagittal and coronal thin-section (3mm) T1 and T2 weighted images. Fast spin echo technique is usually used for T2-weighted exams and should be implemented with fat suppression. Sagittal images with the knee externally rotated 10 to 15 degrees (or angled to achieve these results) allow optimal depiction of the anterior cruciate ligament (ACL). The knee should be imaged in the neutral position for coronal scans. All scans must be obtained using an extremity coil. Good spatial resolution requires a small (15cm) field of View (FOV), which best demonstrates the menisci and ligaments. From the T1 –weighted scans, a second set of images is often filmed to improve visualization of the menisci, using a narrow window to give high contrast and large magnification. Some sites also acquire a Three-dimensional (3D) gradient echo scan. Articular cartilage can be highlighted using the approach. The scan also provides very thin contiguous section. If the patella femoral joint space needs to be imaged, axial scans should be acquired. Unfortunately, patient throughput must be considered, and the incorporation of all the prior pulse sequences requires excessive scan time. The 3D acquisition and axial scans should be reserved for situations in which the cartilage and patellofemoral joint, respectively, are specific clinical concern [2]. Diffusion MRI and functional MRI extends the utility of MRI to capture neuronal tracts and blood flow respectively in the nervous system, in addition to detailed spatial images. The sustained increase in demand for MRI within health system has led to concerns about cost effectiveness and over diagnosis [3, 4, 5].

It is known that most of the health clinician do not know the characteristic features of MRI and most of the cases remains undiagnosed or poorly diagnosed by the clinicians as only the physical examination cannot be enough to rule out the internal soft tissue pathology, so it is mandatory to identify and evaluate the role of MRI in various knee disorders thereby reduce the risk of secondary complication by early detection and properly treat the patient after making a proper evidence

based diagnosis as it will become more beneficial for the patient to treat with proper treatment.

MATERIALS AND METHOD

This was a cross sectional study of 50 participants who were selected from MRI Radiology Department of Medicare International Hospital, Gujranwala. The study was completed in the duration of 4 months i.e., December 2020- March 2021. The convenient Sampling Technique was used. The data were analyzed in SPSS (Statistical Package for social sciences) version 17.

The frequencies of the quantitative variables such as Age, Gender was simply analyzed through descriptive statistics. The frequency tables summarized the data.

Inclusion Criteria

- Age between 15 to 50.
- All diagnosed patients with knee disorders.
- Both males and female were selected.

Exclusion Criteria

- Previous history of surgery of the same knee.
- Undiagnosed patients.
- Patient with other co morbidities, metabolic disease and other systemic problems beside those using drugs.

RESULTS

In this survey, total 50 participants of both male and female gender were selected and the age range between 14 to 70 years old were included. The male participants were 62% and female participants 38%, as shown in the figure 1.

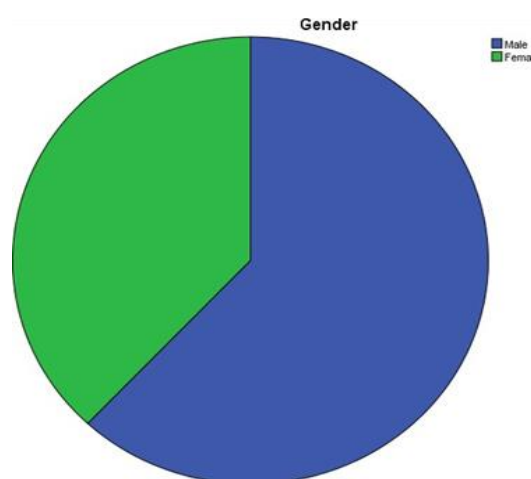


Fig-1: Pie Chart showing Gender Distribution

62% participants were responded with right knee whereas remaining 38% participants responded with left knee, as shown in table 1 and Figure 2

Table-1: Knee Side Involvement

Knee Side	Frequency	Percent
Right	31	62
Left	19	38
Total	50	100

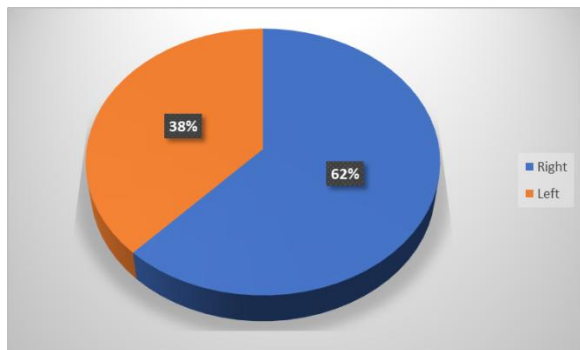


Fig-2: Knee Side Involvement

Regarding knee pain, 46% of the participant were responded with no for knee pain whereas remaining 54% of the participants were responded with yes for knee pain.

Joint stiffness was seen in 6% of the participant whereas remaining 94% of the participants were responded with no. The joint tenderness was absent in 82% of the participant whereas remaining 18% of the participants were having, 60% of the participant were responded with no for soft tissue swelling whereas remaining 40% of the participants were responded with yes. For ACL tear, 38% of the participant were responded with no, whereas remaining 62% of the participants were responded with yes.

For PCL tear, 84% of the participant were responded with no for PCL tear, whereas remaining 16% of the participants were responded with yes. Regarding MCL tear, 78% of the participant were responded with no, whereas remaining 22% of the participants were responded with yes. In case of LCL tear, 84% of the participant were responded with no, whereas remaining 16% of the participants were responded with yes. Regarding MM, 44% of the participant were responded with no for MM, whereas remaining 28% of the participants were responded with yes. 58% of the participant were responded with no for LM, whereas remaining 42% of the participants were responded with yes. Only 22% of the participant were responded with no for synovitis, whereas remaining

54% of the participants were responded with yes. As a case of bone fracture, 84% of the participant were responded with no for bone fracture, whereas remaining 16% of the participants were responded with yes, as shown. Regarding contusions, 96% of the participant were responded with no for contusions whereas remaining 4% of the participants were responded with yes. 92% of the participant were responded with no for cystic lesions whereas only 8% of the participants were responded with yes. The Degenerative changes were seen in 44% of the participant whereas remaining 66% of the participants were responded with no. Regarding osteochondroma, 96% of the participant were responded with no for osteochondroma whereas remaining 4% of the participants were responded with yes. Regarding quadricep tendon, 98% of the participant were responded with no for quadricep tendon whereas remaining 2% of the participants were responded with yes. 86% of the participant were responded with no for osteochondritis whereas remaining 14% of the participants were responded with yes. 70% of the participant were responded with no for chondromalacia whereas remaining 30% of the participants were responded with yes, as shown in table 2 below.

Table-2: Findings

Disease Findings	Frequency	Percentage
Knee Pain	27	54%
Joint Stiffness	3	6%
Joint Tenderness	9	18%
Soft Tissue swelling	20	40%
ACL	31	62%
PCL	8	16%
MCL	11	22%
LCL	8	16%
Medial Meniscus	28	56%
Lateral Meniscus	21	42%
Synovitis	39	78%
Bone Fracture	8	16%
Contusions	2	4%
Cystic Lesions	4	8%
Degenerative changes	22	44%
Osteochondroma	2	4%
Quadriceps Tendons	1	2%
Osteochondritis	7	14%
Chondromalacia	15	30%

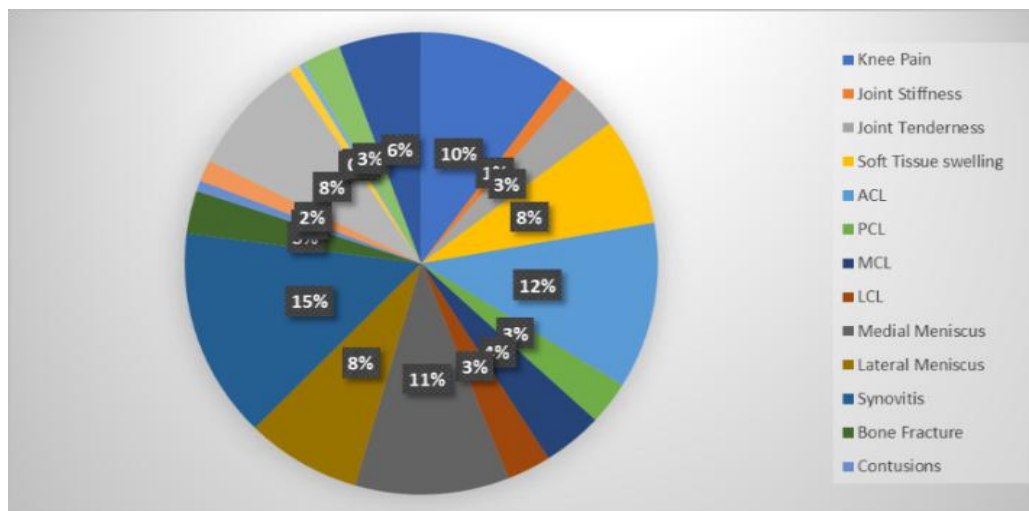


Fig-3: Findings

DISCUSSION

A cross sectional study was carried out on 50 patients in the Medicare international hospital, Gujranwala. Age between 15 to 50, all diagnosed patients with knee disorders and both males and female were selected, exclusion was set to be those with previous history of surgery of the same knee, Un diagnosed patient and patient with other co morbidities, metabolic disease and other systemic problems beside those using drugs. MRI was performed with Siemens 1.5 Tesla machine. In our study of 50 patients with knee pain and the age range between 14 to 70 years old were included, male participants were 62% and female participants 38%. 46% of the participant were responded with no for knee pain, 94.0% of the participant were responded with no for joint stiffness, 60% of the participant were responded with no for soft tissue swelling, 38% of the participant were responded with no for ACL tear.

Mary Fran Sowers et al. carried out a study in Michigan Hospital on associations of anatomical measures from MRI with radiographically defined knee osteoarthritis score (Lawrens Kellgren Score). Full-thickness cartilage defects of the medial, lateral and patella-femoral compartments were present in 14.5% (105 knees), 4.6% (33 knees) and 26.2% (190 knees), respectively [6]. In our study, full thickness articular cartilage defects of medial, lateral and patella-femoral compartments were present in 10% (15 patients), 4% (6 patients) and 20 patients (30%) respectively. Kijowski et al. did retrospective study on detection of bone marrow edema who had articular cartilage defects. Subchondral bone marrow edema was seen beneath 105 (19%) of 554 articular cartilage defects [7]. In our study, marrow edema was found in 30 patients (20%) who had articular cartilage defects. Hill et al. did study on cruciate ligament integrity in patients with knee pain using MRI. The study was performed in 360 patients. Complete ACL rupture was 22.8% and PCL rupture in 0.6% [8]. In our study, complete ACL ruptures was

found in 7 patients (4.6%). The difference in the results could be due to the difference in patient selection criteria in both studies.

In our study, prevalence of meniscal tear ranged from 15% among women 40-60 years of age to 45% among men age 60-80 years of age. Englund et al. did study on menisci findings in patients with knee pain in 2008. The prevalence of a meniscal tear as detected on MRI ranged from 19% among women 50-59 years of age to 56% among men 70-90 years of age [9]. Kolman et al. did correlation of joint fluid and internal derangement on knee MRI. Thirty-six patients out of total 105 patients (31%) showed joint fluid with anteroposterior measurement of 10 mm or less in the lateral aspect of the suprapatellar pouch [10]. In our study, 60 patients (40%) showed anteroposterior measurement of 10 mm or more which was considered pathological [11, 12].

CONCLUSION

MRI evaluation in patients with painful knee is of vital importance, as MRI can demonstrate the exact nature and extent of bony as well as soft tissue abnormality. Multiplanar imaging capacity and noninvasive nature of MRI enable a satisfactory diagnosis in such patients in whom a complete clinical examination is almost impossible due to pain. Furthermore, individual with acute or chronic knee pain without any definite history of trauma should be subjected to MRI study of the knee provided radiographs are non-informative or non-diagnostic. The study not only outlines the tendons, ligament and cartilage status, but also demonstrates subtle underlying bony pathologies causative for patient complaints.

Conflict of Interest: Nil

Funding Resources: Nil

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