Research Article

ROLE OF MRI FOR DIAGNOSING DIFFERENT KNEE PATHOLOGIES

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ABSTRACT

BACKGROUND: MRI is basically non invasive imaging technology which gives us three dimensional anatomical images MRI (Magnetic Resonance Imaging) provides us detailed images of body soft tissues. It is used for the detection of disease, diagnosis and monitoring treatment. There are different types of MRI of body some are plane MRI and some are contrast MRI according to requirement of Doctor or other Medical Health Profession the scan is performed for Patient. The MRI machine is of different tesla. **OBJECTIVE:** The main role of MRI for diagnosing different knee pathologies **METHODOLGY:** An Observational study was conducted at Radiology department at Gujrat Hospital (MRI unit) during the period of October 2020 to December 2020. Forty patients (40 knee) were examined out of which 27 where male and 13 were female and their age ranging from (25-70). **RESULT:** The main purpose of this study is to determine the diagnostic value of MRI for diagnosing the presence or absence of Knee pathologies. In this study MRI was performed on 40 patients with different complaints. In this study the knee pathologies were diagnosis in different age groups. **CONCLUSION:** All in all, the current examination upholds that MRI is exceptionally useful in diagnosing different knee pathologies e.g. joint effusion, posterior cruciating ligament, Anterior Cruciating ligament, Baker's Cyst etc. Regardless, what one should consistently have as a main priority is that determination alone isn't the end point of the treatment and doesn't take care of the issue.

Keywords: Magnetic Resonance Imaging, Posterior Cruciating Ligament , Anterior Cruciating Ligament , Baker's Cyst , Diagnosis.

INTRODUCTION

On 3rd July, 1977 the first MRI (Magnetic resonance imaging) was performed on a patient MRI identifies how atoms behave in magnetic field and with the passage of time it becomes the most powerful technology for the identification of internal body soft tissues and bones for differentiation between normal and pathological(1).In orthopedic MRI is used for the examination of bone, cartilage and tendons etc for structural abnormalities or for tear or tumor or for any type of injury. It is also used for detection of bone diseases like osteoarthritis or disc herniation or Discbuldge or spinal cord etc (2, 3). MRI can detect erosive changes of RA (Rheumatoid Arthritis) with greater sensitivity in comparison with conventional radiography, especially in early disease.(4) Likewise, MRI permits direct evaluation of synovitis, the essential lesion in RA and of bone edema, a discovering interesting to MRI and a likely sign of bone disintegration.MRI is basically non invasive imaging technology which gives us three dimensional anatomical images MRI (Magnetic Resonance Imaging) provides us detailed images of body soft tissues. It is used for the detection of disease, diagnosis and monitoring treatment. There are different types of MRI of body some are plane MRI and some are contrast MRI according to requirement of Doctor or other Medical Health Profession the scan is performed for Patient. The MRI machine is of different tesla. There is Open and closed MRI there is different variations in their properties and strength. In MRI the excitation and detection in direction of rotational axis of hydrogen and protons found in water that makes up living tissues takes place. In MRI the high prevalence of hydrogen in the body and properties of Proton takes place. Hydrogen nucleus is used because of its abundance in fat and water. In MRI powerful magnets are used that applies strong magnetic field that forces the protons in body to align.MRI of knee is standard imaging modality for evaluating

knee disorders, and for musculoskeletal (MSK) MRI assessments are performed on the knee than on some other district of the body.(5, 6) MRI has showed high exactness for evaluation of meniscal and cruiate tendon pathology and in routine it is used to identify is surgery required or not.(7, 8) At the point when patient moved into the MRI tunnel the strong magnetic field is applied at that point the longitudinal component of magnetic field aligned in the external magnetic field produces over all longitudinal magnetic field.(9) Then RF (Radio frequency) pulse is applied it is the electromagnetic wave and has the same frequency of the proton in section plane, then the energy transferred to proton the proton starts spinning its energy increases then it start translating then longitudinal component in transverse plane which then detected by MRI system .When RF pulse turned off immediately protons releases there absorbed energy and move back to original arrangement at point which is determined by T2 and T1 relaxation time.(10, 11) T1 and T2 Relaxation Times depend on physical and chemical nature of tissue where T2 is used for the determination of Anatomy in the body while T1 is used for the determination of pathology in the body. According to CSF there is difference appearances of T1 weighted Image and T2 weighted Image. On T1 CSF will shown Dark while on T2 the CSF shown Bright.MRI has many advantages in comparison with other modalities for evaluating internal structures of knee.(12) The local coils are applied for extremity imaging and then higher magnetic field strength used to overcome the limitations. A total assessment of the knee should involve assessment of the Menisci, Bone marrow, Tendons and Articular Cartilage.(13) A proposed approach for knee scan includes Sagital, Coronal and Axial includes T1 and T2 weighted Images. Articular ligament can be featured utilizing the methodology. Magnetic resonance imaging is best modality for evaluating knee pathologies. This study was to access the different pathologies of knee joint and MRI is gold standard modality for soft tissue and bony structures in knee joint and it gives us detailed image and useful for the diagnosis and treatment.

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METHODOLOGY

Patient and Methods

An Observational study was conducted at Radiology department at Gujrat Hospital (MRI unit) during the period of October 2020 to December 2020. Forty patients (40 knee) were examined out of which 27 where male and 13 were female and their age ranging from (25-70), Presented with various knee joint pathologies and they all were referred to MRI unit of Gujrat Hospital after their Physical examination by Orthopedic.

MRI examination Unit

The MRI examination was done using 0.35 Tesla Semen's Magnetom Open MRI with super conductive magnet and with additional extremity Coils (surface coils) as both of transmitter and receiver of radiofrequency waves was applied. The imaging system is enclosed in a high radio frequency room with high cooling temperature attached with a console room through which the machine operates and scan performed. Through the console the movement of patient is visualized and instruction are given to patient any type of magnet is not allowed in the MRI room because of High magnetic waves. MRI is contraindicated for the patients who have stunt or pace maker etc.

Preparation of Patient

Asked the patient to remove all the magnetic material, jewelry from the body or from clothes no sedation was required in MRI .If there is very serious case or patient do not cooperates to Technologist during scan so a small amount of sedation is given to patient with the consent of patient's attendant. The patients were questioned about the history of any Cardiac pace maker, or intracranial surgical clips or cochlear implants because all these things are made of metal and it is contraindicated for MRI because of High Magnetic waves. After all these things the patient positioned on the MRI couch according to examination and then move in to the MRI tunnel for examination.

Protocols

In routine for evaluating knee the protocols that are includes are T1 weighted images in all three planes Axial, Sagital and Coronal, T2*with 2D and 3D Fourier transform ,gradient echo with sagital images were used. T2 fast spin echo reverberation proton thickness weighted images with fat concealment were regularly used to survey liquid and articular ligament, also used to distinguish spaces of marrow hyperemia. A field of view of 14 cm provides better images of knee in all three planes. For evaluating acute trauma, infection, Arthritis required T2 or fast spin-echo T2 weighted images.

Table 1

		Frequency	Percent	Valid Percent	Cumulative Percent
		Gender			
Valid	Male	27	67.5	67.5	67.5
	female	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

Gender
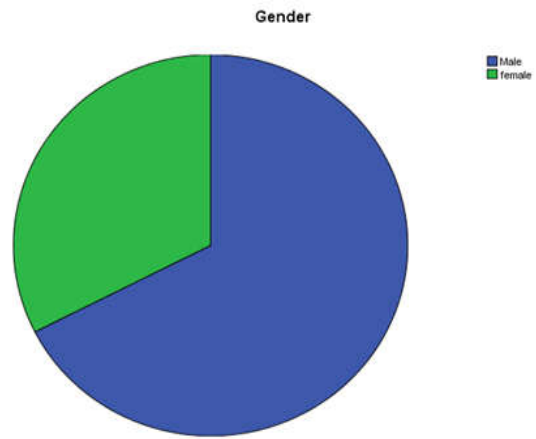
Table 2

		Joint effusion			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	10	25.0	25.0	25.0
	No	30	75.0	75.0	100.0
	Total	40	100.0	100.0	

Joint effusion
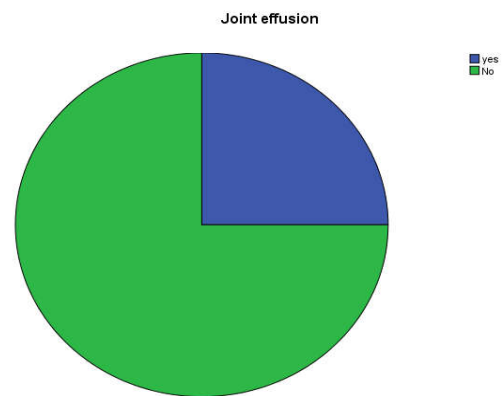
Table 3

		Anterior cruciate ligament injuries			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	7	17.5	17.5	17.5
	No	33	82.5	82.5	100.0
	Total	40	100.0	100.0	

Anterior cruciate ligament injuries
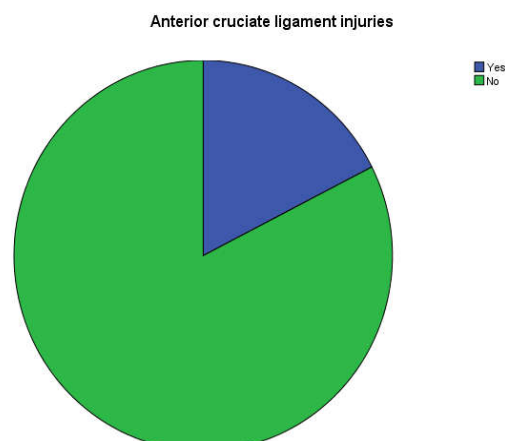
Table 4

		Lateral collateral ligament injuries			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1	2.5	2.5	2.5
	No	39	97.5	97.5	100.0
	Total	40	100.0	100.0	

Lateral collateralligament injuries

■ Yes
■ No
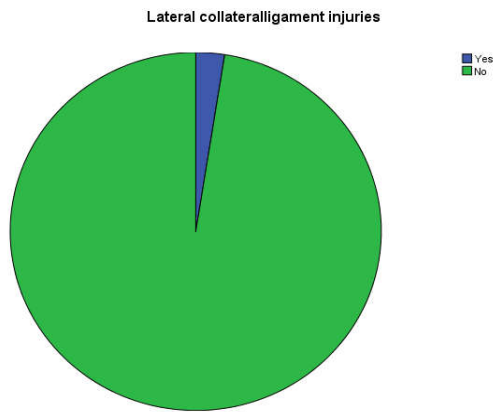
Table 5

		Posterior cruciate ligament injuries			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	13	32.5	32.5	32.5
	No	27	67.5	67.5	100.0
	Total	40	100.0	100.0	

Posterior cruciate ligament injuries

■ yes
■ No
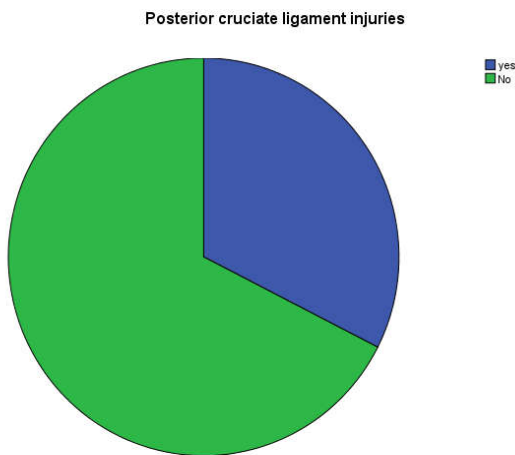
Table 6

		Baker's cyst			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	10.0	10.0	10.0
	No	36	90.0	90.0	100.0
	Total	40	100.0	100.0	

Baker's cyst

■ Yes
■ No
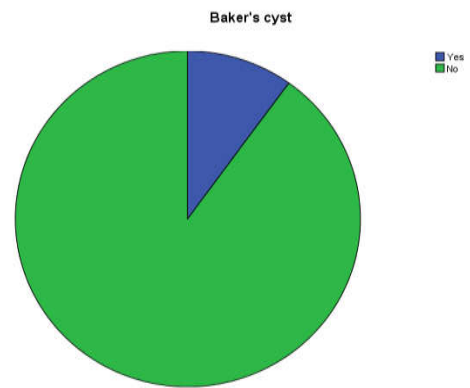
Table 7

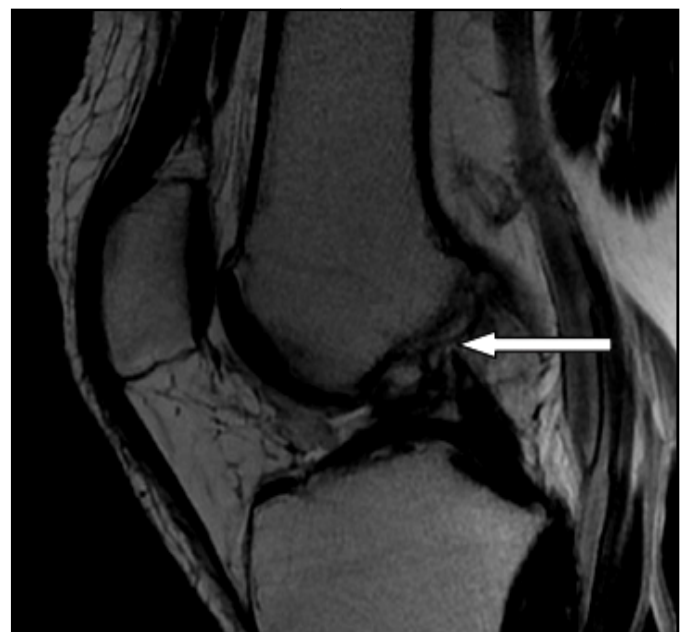|		Normal			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	12.5	12.5	12.5
	No	35	87.5	87.5	100.0
	Total	40	100.0	100.0	

Normal

■ Yes
■ No
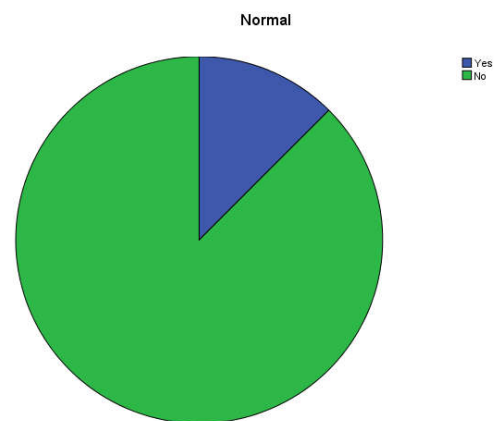
Images

Fig 1. T2 weighted image of knee MRI with T2 Sagital plane with ACL tear

Fig 2. The T2 weighted MRI of knee demonstrating grade III tear of PCI (posterior Cruciate Ligament). Arrow shows proximal Stump of PCI.

RESULT

The main purpose of this study is to determine the diagnostic value of MRI for diagnosing the presence or absence of Knee pathologies. In this study MRI was performed on 40 patients with different complaints. In this study the knee pathologies were diagnosis in different age groups ranging from (25 -70).From the examination of 40 patients in this study the abnormal signs of MRI was present in (35) patients, according to the study the knee pathology was present in (27) male patients and its percentage was about (67.5%) and (13) female patients whose percentage was about (32.5%) as shown in (Table 1) while on the other hand the joint effusion was present in (10) patients and its percentage was about (25.0%) and it was not present in (30) patients whose percentage was about (75.0%) as shown in (Table 2) apart from this the anterior Cruciate ligament injury was present in (7) patients whose percentage was about (17.5%) present and was not present in (33) patients whose percentage was about (82.5) present as shown in (Table 3)on the other hand Lateral collateral Ligament injury was present in only(1) patient whose percentage was about (32.5%) and was not present in (39) patients whose percentage was about (97.5%) as shown in (Table 4) while the Posterior cruciate ligament injuries was present in (13) patients and its percentage was about (32.5%) and was not present in (27) patients and its percentage was about (67.5%) as shown in (Table 5) another injury was Baker's Cyst and its present in (4) patients and its percentage was about (10.0%) and was not present in (36) patients and its percentage was about (90.0%) as shown in (table 6), the last table 7 shown as that there was about (5) patients was normal whose percentage was about (12.5%) and 35 diseased patients whose percentage was about (87.5%) as shown in (Table 7). This study shown us that the ratio of Posterior Cruciate ligament injury was more in comparison with other knee pathologies, and it shows a positive relationship on MRI examination for diagnosing knee pathologies.

Statistical Analysis:

In this study we use statistical tool by using SPSS. It is used to evaluate the association between the Joint effusion, anterior cruciate ligament injuries, Lateral collateral ligament injuries, Posterior cruciate ligament injuries and Baker's cyst. First we put the data and set data labels and assign values and variables the statistics are based on all cases with valid data. All examination finished with statistical bundle.

DISCUSSION

MRI is the basic modality which pays a roll of path way in treating the common knee pathologies. There is no uncertainty that the radiologist's experience and preparing are vital components in understanding of MRI. Simultaneously solid measurable information of the indicative worth of MRI is additionally related with the autonomous base of reference. Arthroscopy is considered as "the highest quality level" for conclusion of awful intra articular knee[14] While, MRI is a non invasive procedure that requires hospitalization and sedation (in serious cases in which the patient is not cooperative) and it is beneficial in diagnosing and for treating the Disease.[15] Since its introduction in 1980's MRI become the most common diagnostic tool for diagnosing Musculoskeletal Pathologies.[16] Particularly knee is most incessant inspected joint with MRI. Numerous specialists agrees in general accept that MRI is an exact, non obtrusive symptomatic modality for the knee pathologies. All things considered, even these days, stays over the top expensive. Patients that in plain X-beams had fractures, free bodies or signs of serious osteoarthritis were barred from the examination. Moreover, patients that after the MRI assessment have had new injury to a similar knee, before the arthroscopy or postponed to go through arthroscopy for over 3 months were too prohibited. In this examination no injury identified with the back cruciate tendon was distinguished, this is in concurrence with MRI discoveries of Schweitzer et al[17]In 2018 Nicholas BienID1 studied on Deep-learning-assisted diagnosis, for knee magnetic resonance imaging in which he said that profound learning model can quickly create exact clinical pathology arrangements of knee MRI tests from both inner and outside datasets. Also, our outcomes support the statement that profound learning models can improve the exhibition of clinical specialists during clinical imaging understanding. Further examination is expected to approve the model tentatively and to decide its utility in the clinical setting.[5] In 2016 a scientist named MA Adelani, studied on the Use of MRI in Evaluation of Knee Pain in Patients, Aged 40 Years and Older , he talked about the pathologies that are common in the patient related to knee he said that the purpose behind this investigation was to decide how regularly MRI is beneficial for diagnosing knee pathologies and was gotten before muscular reference in patients matured ≥40 years with knee injuries, how frequently weight-bearing radiographs were acquired before MRI, and whether such imaging affected treatment proposals.[18] More over another scientist named NC Nacey, MG Geeslin, in 2017 studied on MRI of the knee, an overview and update of conventional and state of the art imaging. He said that MRI has become the preferable methodology for imaging the knee to show pathology and guide patient administration and treatment. The knee is quite possibly the most habitually harmed joints, and knee torment is an unavoidable trouble that can influence all age gatherings. Because of the different pathology, complex life systems, and a heap of injury instruments of the knee, the MRI knee convention and groupings ought to guarantee identification of both delicate tissue and rigid designs in detail and with precision.[6] Another scientist named Frank W. Roeme studied on the role of radiography and MRI for eligibility assessment in DMOAD trials of knee OA in 2018 he said that the inadequacies of radiography-based qualification might have contributed, in any event in part, to the disappointment of likely DMOADs in clinical preliminaries to date. X-ray can help agents select investigation members who are generally appropriate for the particular point of a

preliminary, considering infection aggregates and the likely objective or focuses of the treatment being examined(19).

Conclusion

All in all, the current examination upholds that MRI is exceptionally useful in diagnosing different knee pathologies e.g. joint effusion, posterior cruciating ligament, Anterior Cruciating ligament, Baker's Cyst etc. Regardless, what one should consistently have as a main priority is that determination alone isn't the end point of the treatment and doesn't take care of the issue. It is the start of actions and thoughts related to treatment that what should do in treatment after diagnosis. To design and apply the right treatment pathways, the most significant isn't insights or cost adequacy information. Clinical experience and sufficiency of the specialist consistently have the best worth; with regards to the affirmation of the patient ideal treatment.MRI is safe and Non Invasive Imaging Modality.MRI of the knee has been demonstrated for evaluating menisci, tendons and articular ligament, for example fantastic methodology for evaluation of delicate tissue and knee joint disturbances.MRI can precisely analyze the tendon wounds of knee joint, which is an ideal procedure in the analysis of tendon pathologies of knee joint, and ought to be utilized as a routine looking at technique. So MRI influence the determination and the executives of the knee wounds by diminishing the quantity of arthroscopic techniques, improving clinician analytic conviction, and aiding the board decision.MRI of the knee gives the possibility to the quick, complete finding with a non obtrusive assessment.

Ethical Consideration:-

The author says that all the process is according to rules and regulations of Clinical Research Ethical Committee of University of Lahore while performing research and rights of research participants will be respected

Data Confidentiality:

The author ensures that all the information that is taken from the patient is only us for research purpose and it is all with the consent of patient. Every ting is in confidentiality the privacy of patient is our first priority and we ensure that all information related to patient is completely based on consent and there whole data is in very much secure.

Informed consenting and Privacy Right:-

We informed that everything is in consent with respect to patient and all the subjects that are present in Article. Everything related to patient is in Confidentiality and all consents are available that are taken from patient about their privacy.

Financial Support:

None

CONFLICT OF INTEREST:

We declared that there is no conflict of interest in this study

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