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# A STUDY ON CORRELATION OF MRI WITH ARTHOSCOPIC FINDINGS IN EVALUATION OF MENISCAL AND CRUCIATE LIGAMENT INJURIES IN TRAUMATIC KNEE JOINT

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## ABSTRACT

**Aims and objectives**: To study the spectrum of MRI findings in suspected cases of Meniscal and cruciate ligament injuries in knee joint .To correlate the MRI findings with arthroscopic findings and determining the accuracy of MRI in diagnosing knee injuries.

**Materials and method**: This analytical cross-sectional study was carried out in the department of Radiology and imaging in collaboration with department of Orthopaedics , ASRAM Medical college and Hospital, Eluru, during the period of May 2022 to March 2023. MRI of knee joint was performed using 1.5 Tesla MRI scanner, Seimens magnetom avento syngo (MR D- 13) 16 channel machine on 100 patients referred for evaluation of meniscal and cruciate ligament injuries in traumatic knee joint with arthroscopic correlation .

**Results**: Males commonly encounter knee injuries (82%).Age groups between 20-30 years were injured more (46%).Complete tears of ACL were more common ( 59.4%).Sensitivity and specificity for detection of tears by MRI were found to be 94.74%and 90.32% for Medial meniscus tears and 90.91% and 97.4% for lateral meniscus tears and for ACL tears 97.1% and 86.6% and PCL tears 87.50% and 98.00%.MRI is accurate in evaluation of cruciate ligament and meniscal injuries of knee joint with accuracy rate of 94% for ACL ,98% PCL ,92% for Medial Meniscus and 96% Lateral Meniscus.

**Conclusion**: MRI is highly sensitive and accurate in identification of both ACL ,PCL tears and Medial and lateral meniscus tears . A close correlation was observed between MRI and arthroscopic diagnosis.

**Key Words**: *Anterior cruciate ligament , posterior cruciate ligament , medial meniscus ,lateral meniscus.*

## INTRODUCTION:-

The knee joint is largest compound type of synovial joint of human body with complex articulation characterized by the presence of ligamentous and meniscal structure that play an important role in the stability and mobility , therefore injuries of ligaments and menisci are extremely common . Magnetic resonance imaging (MRI) has now been accepted as the best imaging modality for non-invasive evaluation of knee injuries . It has been reported to have a high diagnostic accuracy and does not involve the use of ionizing radiation. MRI has proved reliable, safe and offers advantages over diagnostic arthroscopy, which is currently regarded as the reference standard for the diagnosis of internal derangements of the knee.This study was undertaken to evaluate the types and incidence of cruciate ligament and meniscal injuries in traumatic knee joint by MRI and to compare with arthroscopy / surgical findings in selected cases.

## MATERIALS AND METHODS:-

An analytical cross-sectional study was performed in the department of Radio diagnosis and imaging, ASRAM Medical college , Eluru in co-ordination with departments of Orthopaedic of the same institute, during the period of May 2022 to March 2023. Total 100 patients of the age range 5 to 60 years either of sex who were referred to the

department with clinically suspected ligamentous and meniscal injuries of the knee and who underwent arthroscopy subsequently were included in the study. Patients with history of claustrophobia, having ferromagnetic implants and prosthesis and with major injuries were excluded from the study .Proper procedure was followed while obtaining consent from respondents. All the 100 respondents underwent MRI imaging of knee and required data has been collected in appropriate data sheets, including the arthroscopy result after follow up and the results were correlated. All data was kept confidential.

**IMAGING TECHNIQUE AND PROCEDURE:-**

MR imaging was performed using 1.5 Tesla. The patients were briefed about the procedure and consent obtained . Patient is placed in supine position with the knee in extremity coil. The knee is externally rotated 15-20° (to aid in visualization of the ACL completely on sagittal images) and is also flexed 5-10° (to increase the accuracy of assessing the patellofemoral compartment.)

**PULSE SEQUENCES AND IMAGING PLANES:**

Imaging of ligaments was performed in all three standard planes (sagittal, coronal and axial). The field of view varied between 14 and 16cm depending on patient's size. An axial acquisition through patello-femoral joint is used as initial localizer for subsequent sagittal and coronal plane images. T1 weighted images (TR/TE= 620/19) were obtained in sagittal and coronal planes. Then T2 weighted images (TR/TE=4500/100) were obtained in sagittal, axial and coronal images. Fat saturated images (TR/TE/TI=4770/27/90) were used in axial and coronal images to evaluate bone contusions, joint fluid and the ligaments. Finally proton density (TR/TE=2760/38) sequences in sagittal and coronal images were used to evaluate ligament tears as there is a loss in tight spiral of the collagen fibres (i.e. in a tear) causing increased mobility of water molecules. This increase water within the fibres prolongs the T2relaxation time and may be seen on short TE images.

**REPRESENTING IMAGES**

PD Fatsat coronal and sagittal images showing complete Anterior cruciate ligament tear

PD Fat sagittal images showing Bucket handle tear of medial meniscus

**RESULTS AND DISCUSSION:-**

In the present study of 100 cases , 5-60 years are taken , 21-30 year age group are mostly commonly involved ( 44%),Males patients were involved most (82%), anterior cruciate ligament tears were most common (59.4%).sensitivity and specificity for detection of tears by MRI were found to be 94.74% and 90.32% for Medial meniscus tears , 90.91%% and 97.4% for lateral meniscus tears and for Anterior cruciate ligament tears 97.1% and 86.6% and Posterior cruciate ligament tears 87.50% and 98.91%.MRI is accurate in evaluation of cruciate ligament and meniscal injuries of knee joint with accuracy rate of 94% for ACL,98.00% for PCL,92.00% for medial meniscus and 96% lateral meniscus.

**Table1: AGE DISTRIBUTION IN STUDY POPULATION**

| **age** | **Frequency** |
|---|---|
| 0-10 | 2 |
| 11-20 | 14 |
| 21-30 | 44 |
| 31-40 | 16 |
| 41-50 | 18 |
| 51-60 | 6 |

**Table2: SEX DISTRIBUTION**

| **Sex** | **Frequency** |
|---|---|
| **Male** | 18 |

**Table 3:TYPES OF TEARS IN CRUCIATE LIGAMENTS**

| | | | | |
|---|---|---|---|---|
| LIGAMENTS | ANTERIOR CRUCIATE LIGAMENT | COMPLETE | 44 | 74 |
| | | PARTIAL | 30 | |
| | POSTERIOR CRUCIATE LIGAMENT | COMPLETE | 04 | 8 |
| | | PARTIAL | 04 | |
| | NO TEARS | - | 18 | 18 |
| TOTAL | | | 100 | 100 |

**Table 4: TYPES OF MENISCAL TEARS**

| | | | | |
|---|---|---|---|---|
| MENISCUS | MEDIAL MENISCUS | VERTICAL | 14 | 42 |
| | | HORIZONTAL | 20 | |
| | | BUKETHANDLE | 8 | |
| | LATERAL MENISCUS | VERTICAL | 12 | 22 |
| | | HORIZONTAL | 4 | |
| | | BUKETHANDLE | 6 | |
| | BOTH | VERTICAL | 8 | 36 |
| | | HORIZONTAL | 10 | |
| | | BUKETHANDLE | 8 | |
| TOTAL | | | 100 | 100 |

Table 5: MRI Vs ARTHOSCOPY IN ANTERIOR CRUCIATE LIAG

| MRI | ARTHROSCOPY | | TOTAL |
|---|---|---|---|
| | POSITIVE | NEGATIVE | |
| Positive | 68 | 4 | 72 |
| Negative | 02 | 26 | 28 |
| Total | 70 | 30 | 100 |
| Sensitivity=97.1%;Specificity=86.6%; PPV =94.4%;NPV=92.8% ;Accuracy =94% | | | |

**Table 6: MRI Vs ARTHOSCOPY IN POSTERIOR CRUCIATE LIGAMENT TEARS**

| MRI | ARTHROSCOPY | | TOTAL |
|---|---|---|---|
| | POSITIVE | NEGATIVE | |
| POSITIVE | O7 | 01 | 08 |
| NEGATIVE | 1 | 91 | 92 |
| TOTAL | O8 | 92 | 100 |
| Sensitivity=87.50%;Specificity=98.91%; PPV =87.50%;NPV=98.91% ;Accuracy =98.00%; | | | |

**Table7: MRI Vs ARTHOSCOPY IN MEDIAL MENISCUS TEARS**

| MRI | ARTHOSCOPY | | TOTAL |
|---|---|---|---|
| | POSITIVE | NEGATIVE | |
| POSITIVE | 36 | 6 | 42 |
| NEGATIVE | 2 | 56 | 58 |
| TOTAL | 38 | 62 | 100 |
| Sensitivity=94.74%%;Specificity=90.32%; PPV =85.72%;NPV=96.5% ;Accuracy =92.00% | | | |

Table 8 : MRI Vs ARTHOSCOPY IN LATERAL MENISCUS TEARS

| MRI | ARTHOSCOPY | | TOTAL |
|---|---|---|---|
| | POSITIVE | NEGATIVE | |
| POSITIVE | 20 | 02 | 22 |
| NEGATIVE | 2 | 76 | 78 |
| TOTAL | 22 | 78 | 100 |
| Sensitivity=90.91%;Specificity=97.44%; PPV =90.91%;NPV=97.44% ;Accuracy =96% | | | |

**Table9: MRIACCURACY IN DIAGNOSING ACL TEARS ,CAMPARITIVE ANALYSIS**

| | PRESENT STUDY | Polly et al | Ha et al |
|---|---|---|---|
| SENSITIVITY | 97.1% | 100% | 96% |
| SPECIFICITY | 86.6% | 96.9% | 98% |
| ACCURACY | 94% | 97.3% | 99% |

**Table10: INCIDENCE OF TEARS IN MEDIAL AND LATERAL 9 MENISCI,CAMPARATIVEANALYSIS**

| | PRSENT STUDY | Singh JP et al | Crues et al |
|---|---|---|---|
| TOTAL NO CASES | 100 | 173 | 142 |
| MEDIAL MENISCUS TEAR | 42% | 38% | 66% |
| LATERAL MENISCUS TEARS | 22% | 29% | 33% |

**TABLE 9: INCIDENCE OF BUCKETR HANDLE TEARS IN MENISCI CAMPARATIVE ANALYSIS**

| | PRSENT STUDY | Wright et al |
|---|---|---|
| TOTAL NUMBER OF CASES | 100 | 46 |
| MM BUCKET HANDLE TEAR | 57% | 72% |
| LM BUCKET HANDLE TEAR | 42% | 15% |

**CONCLUSION:-**

Hence MRI is highly sensitive and accurate in identification of both medial and lateral menisci and anterior cruciate ligament , Posterio cruciate ligament tears . A close correlation was observed between MRI and arthroscopic diagnosis.

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