

Clinical Examination and MRI are Compared to Arthroscopy in the Diagnosis of Meniscal and Anterior Cruciate Ligament Injuries of the Knee Joint a Multi-center Study

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ABSTRACT

Introduction: Meniscal injuries are the major cause of knee instability. Medical examination of the knee joint is the first line of defense and the cheapest method of diagnosis. MRI is a painless and highly sensitive research tool that may often identify even the earliest and most subtle changes in the soft tissues. Because of its specificity and sensitivity, arthroscopy is a valuable diagnostic and therapeutic tool that requires invasive surgical procedures.

Objective: To determine the efficacy of Knee injuries to the ACL and meniscus may be diagnosed using a combination of clinical signs and arthroscopy. The second objective is to evaluate the diagnostic efficacy of MRI and arthroscopy for knee ACL and meniscus tears. Third, MRI and clinical evaluation have high diagnostic accuracy for identifying ACL and meniscus tears in the knee.

Material and Methods: A Multi center study was conducted by the Orthopedic Surgery Department of Qazi Hussain Ahmad Hospital in Nowshera, and tertiary care hospital of Pakistan. After the summary was accepted, the study was finished in one year and two months. The study determined that a sample size of 240 patients was necessary. After receiving informed permission, Clinical diagnosis of meniscal, ACL, PCL, LCL, and MCL tears, as well as lateral and medial collateral ligament tears, was performed on these individuals. These patients were evaluated with magnetic resonance imaging scans and arthroscopy. SPSS 22 was utilized to analyze the data, and arthroscopy was used as the benchmark.

Results: Two hundred and forty patients participated in the trial, with an average of 31.80693. Male patients predominate. This study found that anterior cruciate ligament injuries were the

most common. Clinical exams and arthroscopies match, with the former being more sensitive for ACL injuries (97.5% sensitivity) and the latter being more specific for ACL and Medial Meniscal injuries (100% specificity). MRI has the greatest sensitivity (95.8%) and specificity (100%). MRI has a sensitivity of 95.8% and a specificity of 100% for ACL injuries, although clinical evaluation has a sensitivity of 97.5% and a specificity of 100%.

Conclusion: We determined that in the case of knee injuries, the clinical examination was better for diagnosing cruciate ligamentous damage, whereas MRI was superior for diagnosing meniscal injury. Therefore, we may bypass MRI and go straight to arthroscopy when treating cruciate injuries. MRI and arthroscopy may be options in complex situations, including those with meniscal damage.

Keywords: Meniscal tear; magnetic resonance imaging; arthroscopy; knee joint; clinical examination.

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INTRODUCTION

Most knee internal derangements include meniscus tears. (Abbott 2003). Menisci injuries are more prevalent among 31–40-year-old males. 2.5:1 male-female ratio. Under-20 women had a substantial rise in instances." (2003) "ACL ruptures commonly cause meniscal damage (ACL). Meniscal injury rates vary by sport and sex. Acute ACL tears range from 16% to 82%, whereas chronic ACL injuries are 96%. Thus: (Kilcoyne et al., 2012) Young patients often get the ailment through sports, vehicle accidents, or house falls, making it difficult for them to engage in physically demanding activities. It is costly and crippling. Marchant, et al. (2011), 32% of 1236 patients with arthroscopically verified meniscal injuries were athletes, 38% were non-athletes, and 28% had no injury history. Getting up from a squat caused 50% of non-sporting injuries. The research found (LaPrade & Wijdicks, 2012). Physical knee examination is the most cost-effective diagnostic method. In an overloaded orthopaedic clinic, objective signs of cruciate ligament and meniscal damage may be hard to find. 2010. Some authors say that clinical examination is more accurate than MRI, while others disagree. Clinically, meniscal tears are identified with 75%–80% accuracy, whereas MRI has 88%–90% accuracy. (1997) Arthroscopy is the gold standard for detecting and treating joint disorders due to its precision and sensitivity. However, it is intrusive. MRI accurately diagnoses and treats ligamentous injuries and intra-articular illness (MRI). MRI can detect early soft tissue changes since it is non-invasive and sensitive. (2008) Behairy et al. (2009) recommended arthroscopy if MRI findings do not match clinical complaints or if the patient has a total ACL rupture needing repair. In 2009, Behairy et al. reported these findings. The clinical examination had 96.1% sensitivity, 33.3% specificity, and 73.1% diagnostic accuracy for medial meniscal damage. Similarly, lateral meniscal tear sensitivity, specificity, and diagnostic accuracy were 38% (96%), 78% (78%), and 38% (38%).

MRI had 92.3% sensitivity, 100% specificity, and 95.1% diagnostic accuracy for medial meniscal tears and 84.6%, 96.4%, and 92.6% for lateral ruptures. Per (Sharma et al., 2012). Nickinsosn observed 77% sensitivity for arthroscopy compared to clinical and MRI data. (Nicholas, 2010a) Based on the above facts, clinical tests for cruciate ligament and meniscal injury have limits and variable diagnostic accuracy. Objective indicators may not be evoked frequently, particularly in a busy orthopaedic clinic and when the patient is in pain during an acute or sub-acute presentation. Accurate diagnosis requires clinical knowledge, which is hard to quantify. MRI may identify ligamentous injuries and intra-articular disease, improving diagnosis and therapy. Since MRI is non-invasive and sensitive, it may detect early soft tissue changes. Arthroscopy is invasive yet sensitive for diagnosis and treatment. A 2008 research found (Madhusudhan et al.). Thus, this research compares MRI, clinical examination, and arthroscopy in detecting knee ACL and meniscal injuries.

Methods and Materials

Two hundred forty patients from Qazi Hussain Ahmad Hospital in Nowshera, and tertiary care hospital of Pakistan outpatient clinic participants met all inclusion criteria. Patients with consent and a clinical diagnosis of meniscal, anterior cruciate ligament, medial collateral ligament, posterior cruciate ligament, or lateral collateral ligament knee injury were evaluated. Patients get precious metals during their next appointment. After an above-the-knee tourniquet arthroscopy, orthopaedic surgeons recorded their findings with the patient's demographics. The operation continued if the patient needed further surgery. The performance captured MRI, arthroscopy, and clinical results. Orthopaedic surgeons performed a clinical examination, MRI, and arthroscopy. The researcher helped the consultant orthopaedic surgeon choose patients from the outpatient department (OPD), saw surgery, took notes, and performed the statistical analysis. Pre-surgery antibiotics and tourniquets kept the operating site sterile. Data analysis was done using SPSS 20. All Quality-of-Life variables have frequency distributions (per cent). Bar and pie charts are everywhere. The mean and standard deviation characterised a continuous variable. Operational definition testing compared MRI, clinical examination, and arthroscopy.

RESULTS

two hundred Forty patients were studied. Patients averaged 30.8069 years. Table 1 shows the patients' ages. Male participation predominated (Figure 1). ACL injuries are the most common—knee ligament injury. Table 3 presents clinical, MRI, and arthroscopy data from our study protocol. Tables 4 and 5 compare clinical examination, MRI, and arthroscopic findings of TP, TN, FP, and FN. Arthroscopy and clinical examination enhanced ACL injury diagnosis sensitivity to 97.5% and specificity to 100%. 6. MRI correlated with arthroscopic results and was the most sensitive (95.8%) and specific (100%) diagnostic for ACL injury. (Table 7).

Similar quantitative algorithms compared meniscal injuries and cruciate ligament ruptures. Meniscal damage is more consistent in the lateral menisci. Arthroscopy and MRI agreed best for acute meniscal damage ($K=0.652$, $P=0.00$), followed by degenerative injury ($K=0.420$, $P=0.00$). ACL rupture incidence did not vary significantly (table NO.8). MRI and clinical assessment differ

in senility and specificity (table No 9). Clinical assessment was almost as accurate as MRI in detecting damage in this research.

Figure 1: Gender distribution of patients.

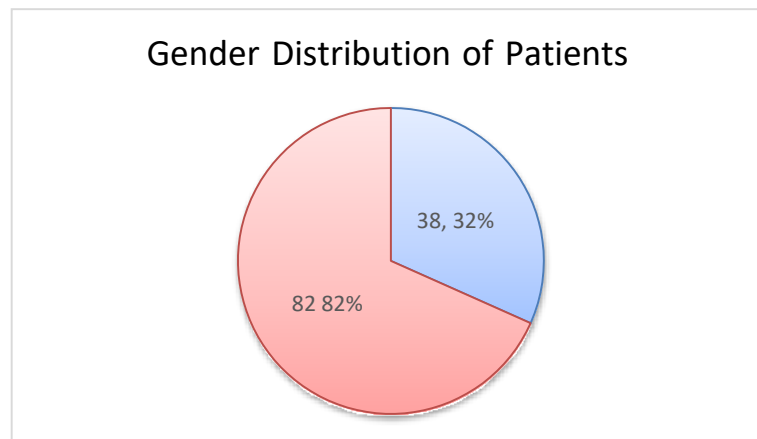


Table 1: Patients' ages across the study's period

| Group Age | Number of Patients | Percentage |
|-------------|--------------------|------------|
| 11-31 Years | 136 | 57% |
| 32-41 Years | 76 | 32% |
| 42-46 Years | 28 | 12% |
| Total | 240 | 100% |

Table 2: Findings from the Arthroscopic, Magnetic Resonance Imaging, and Clinical Assessment

| | Normal findings | Lateral Meniscal Injury | Medial Meniscal Injury | ACL Injury | PCL Injury |
|------------------------|-----------------|-------------------------|------------------------|------------|------------|
| (Clinical Examination) | 0 | 46 | 18 | 64 | 0 |
| (MRI) | 0 | 38 | 72 | 110 | 0 |
| (Arthroscopy) | 0 | 20 | 92 | 102 | 240 |

Table 3: Comparison of Clinical Exam Results to Those Obtained Via Arthroscopy

| | True Positive | True Negative | False Positive | False Negative |
|-------------------------|---------------|---------------|----------------|----------------|
| Normal Findings | 0 | 240 | 0 | 0 |
| Lateral Meniscal Injury | 10 | 202 | 9 | 0 |
| Medial Meniscal Injury | 26 | 124 | 10 | 22 |
| ACL Injury | 115 | 0 | 0 | 5 |
| PCL Injury | 0 | 240 | 0 | 0 |

Table 4: Comparing MRI and Arthroscopy Findings

| | True Positive | True Negative | False Positive | False Negative |
|------------------------|---------------|---------------|----------------|----------------|
| Normal Findings | 0 | 240 | 0 | 0 |
| Lateral Meniscal | 0 | 174 | 23 | 10 |
| Medial Meniscal Injury | 9 | 144 | 0 | 39 |
| ACL Injury | 117 | 0 | 0 | 3 |
| PCL Injury | 0 | 240 | 0 | 0 |

Table 5: Comparison of Arthroscopic and Clinical Findings

| | Sensitivity | Specificity | Negative Predictive Value | Positive Predictive Value |
|-------------------------|-------------|-------------|---------------------------|---------------------------|
| Lateral Meniscal Injury | 0% | 79.1% | 89.69% | 0% |
| Medial Meniscal Injury | 18.8% | 100% | 64.86% | 100% |
| ACL Injury | 97.5% | 100% | 100% | 100% |

Table 6: Joint Arthroscopy and Magnetic Resonance Imaging Findings

| | Sensitivity | Specificity | Negative Predictive Value | Positive Predictive Value |
|-------------------------|-------------|-------------|---------------------------|---------------------------|
| Lateral Meniscal Injury | 100% | 91.8% | 52.63% | 100% |
| Medial Meniscal Injury | 54.2% | 86.1% | 73.81% | 72.22% |
| ACL Injury | 95.8% | 100% | 0% | 100% |

Table 7: Meniscal and cruciate ligaments are in agreement.

| | [Diagnostic Examination] | [Kappa] | [Concordance] | [P-Value] |
|-----------|--------------------------------------|---------|---------------|-----------|
| (Medial) | Arthroscopy vs. MRI | 0.217 | Fair | 0.000 |
| (menisci) | vs. Clinical examination | 0.420 | Moderate | 0.000 |
| | Arthroscopy vs MRI | 0.217 | Fair | 0.000 |
| | Arthroscopy vs. Clinical examination | | | |
| (Lateral) | Arthroscopy vs MRI | 0.131 | No | 0.108 |
| (menisci) | vs Clinical examination | 0.652 | Substantial | 0.000 |
| | Arthroscopy vs MRI | 0.131 | No | 0.108 |
| | Arthroscopy vs. Clinical examination | | | |
| (ACL) | Clinical examination | 0.000 | | |

| | | | | |
|--|-------------|-------|--|--|
| | MRI | 0.000 | | |
| | Arthroscopy | 0.000 | | |

Table 8: Diagnosis of knee injuries: a comparison of magnetic resonance imaging and clinical assessment:

| (Sensitivity) | | | (Specificity) | |
|-----------------------------|-------|----------------------|---------------|----------------------|
| | MRI | Clinical examination | MRI | Clinical examination |
| (Lateral meniscus injuries) | 100% | 0% | 91.5% | 79.1% |
| (Medial meniscus Injuries) | 54.2% | 18.8% | 86.1% | 100% |
| (ACL Injuries) | 95.8% | 97.5% | 100% | 100% |

DISCUSSION

Orthopaedic specialists treat knee injuries. Orthopaedic surgeons may diagnose ligamentous knee injury using patient histories and physical exams (Navali, A.M. et al., 2013). Arthroscopy's diagnostic and treatment advantages have increased MRI use due to its broad acceptance (Muhle C. et al., 2013). This research compared clinical examination and MRI to arthroscopic outcomes in diagnosing knee ligamentous and meniscal disorders.

Chang et al. (2004) found that MRI was 92% sensitive and 87% specific for knee meniscal injury diagnosis compared to arthroscopy. Even in acute injuries, MRI assists diagnosis and may indicate surgery in this

group (Munshi et al., 2000). This study's sample size did not allow for a causal link between arthroscopy and any other variable. Physical exams and MRIs minimise knee arthroscopies by 5%. Reference: (Munk and colleagues, 1998). (Munk and colleagues, 1998). (Munk, 1998). MRI was more accurate when arthroscopy was the gold standard and less accurate when MRI was. Recent research indicated that MRI as a first-line diagnostic for knee disorders decreased the number of unsuccessful arthroscopic procedures. Magee et al. found that MRI has 89% sensitivity for meniscal lesion detection (Magee et al., 2002). They also claimed the MRI was essential for revealing knee injury-related structural alterations. Brooks and colleagues found that MRI did not reduce knee arthroscopy failures (Brooks & Morgan, 2002). MRI is 95.8% sensitive for ACL tears but only 54.2% for medial meniscus lesions. Shephard et al. observed that meniscal ligament rupture increases signal intensity, which may explain MRI's poor meniscal injury detection. However, the sensitivity is like a knee assessment (Shepard et al., 2002). Thus, MRI does not improve Meniscal rupture detection over the clinical examination. This research compared an MRI with a physical for arthroscopy. MRIs had 54.2% sensitivity for medial meniscal injuries, whereas physical exams had 18.8%. The MRI only detected 86.1 per cent of medial meniscus injuries, but the physical exam was 100% accurate. Physical examinations diagnose ACL injuries with 97.5% sensitivity and 100% specificity. MRIs detected ACL injuries with 95.8% sensitivity and 100% specificity. Clinical assessment of the anterior cruciate ligament (ACL), the most

CONCLUSION

Results from our study show that MRI is superior to clinical examination for diagnosing meniscal damage after a knee injury. Therefore, arthroscopy may be done on persons with cruciate injuries without first doing an MRI. In difficult cases or those with meniscal injury, both magnetic resonance imaging (MRI) and arthroscopy are viable choices.

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