

Original article

A Comparative Study of Accuracy of Clinical Examination, MRI & Arthroscopy Findings in Cruciate Ligament and Meniscal Injuries of the Knee

Santosh Kumar^{1*}, Arun Bansal¹

¹Associate Professor, Department of Orthopaedics,
Santosh Medical College and Hospital, Ghaziabad, UP, India.

***Corresponding author:** Dr. Santosh Kumar,
Associate Professor, Department of Orthopaedics, Santosh Medical College and Hospital, Ghaziabad,
UP, India.

ABSTRACT

Introduction: Knee is a complex joint with many components, making it vulnerable to a variety of injuries. Refinements in physical examination techniques, improved radiographic modalities, advances in rehabilitation and improved surgical techniques have contributed to an improved ability to care patients with knee Injuries. Present prospective study was conducted to assess the diagnostic accuracy of Clinical Examination, MRI and Arthroscopy findings with internal derangement of the knee.

Materials & Methods: This was an objective study in which, patients with complaints of pain and instability of knee attending to the Department of Orthopaedics, Santosh Medical College and Hospital, Ghaziabad, UP (India) were studied. More than 250 patients reported to the outpatient department between Oct 2010-Sept 2011. Of which 70 patients underwent clinical examination, MRI and Arthroscopic evaluation. The age group of these patients ranges from 12 years to 60 years. Complete history of the patient was taken. Patients were examined thoroughly. Tests used for menisci were joint line tenderness, McMurray's test, Apleys Grinding test. Applicable tests were used with respect to patient's complaints and history. Tests used for cruciate ligament assessment were anterior and posterior Drawer tests, Lachaman's test, Pivot shift test, Recurvatum external rotation tests, Quadriceps active test. Clinical diagnosis was made. MRI was taken and films were read and MRI diagnosis was made. Patients were subjected to arthroscopy and surgical diagnosis was made. All the three results were correlated.

Results: Out of 70 patients 46 were males and 24 were females. 32 patients were between 12 and 30 years. There were 38 patients between 31 to 55 years. 58 patients had history of trauma and 12 patients had history of sports injury. In all the 12 cases of isolated ACL injury and 2 cases of only PCL injury, 2

cases of both ACL & PCL injury, there was equal correlation between Clinical, MRI, Arthroscopy (table 1). In Meniscal injuries including only menisci (n= 10) and menisci + ACL (n=44). There were 44 diagnosed on arthroscopy, 7 were misdiagnosed clinically but on arthroscopy had no tear (table 1).

Conclusion: From present study, it can be concluded that for isolated ACL and PCL injuries Clinical, MRI and Arthroscopy are almost equal in diagnosing the condition. For Meniscal injuries the sensitivity was 86% and specificity was 94% by clinical examination, sensitivity was 94%, specificity was 94.5% by MRI, sensitivity was 100% and specificity was 100% for Arthroscopy. In both Meniscal and Cruciate Ligament specificity was 100% and sensitivity was 92% by clinical examination, specificity was 94% and sensitivity was 88% for MRI, sensitivity was 100% and specificity was 100% for Arthroscopy. Therefore Arthroscopy is best indicator of Cruciate Ligament as well as Meniscal injuries. The strength of correlation between MRI and arthroscopic findings confirms the value of MRI in assessing internal knee structures. However, skilled clinical examination rates similarly to MRI. It is important to consider the economic load of MRI for patients, especially in countries with poor welfare state and poor insurance coverage.

Key Words: Arthroscopy, Clinical Examination, Cruciate Ligament, Menisci, MRI.

INTRODUCTION

Knee is a complex joint with many components, making it vulnerable to a variety of injuries. Refinements in physical examination techniques, improved radiographic modalities, advances in rehabilitation and improved surgical techniques have contributed to an improved ability to care patients with knee Injuries. Because of the difficulty of obtaining an accurate clinical examination in the acute setting, the incidence of such injuries is not well understood^{1,2} and these injuries may go unrecognized until they present as a chronic problem.²⁻⁴ Early treatment of these injuries is associated with improved objective, subjective, and functional outcomes.^{3,5}

Recently, new diagnostic protocols have been developed to improve the diagnosis of knee injuries with high-resolution magnetic resonance imaging (MRI) scans.⁶⁻⁸ These new imaging protocols have been shown to be both sensitive and specific for most structures.⁶ Although injuries of the knee often involve multiple structures, detailed descriptions of combined ligament injury profiles are relatively uncommon in the literature.

Knee joint is one of the most commonly injured joints because of its anatomical structure, its exposures to external forces and the functional demands placed on it. The term "IDK" (Internal Derangement of Knee) is broadly used to describe the abnormalities of knee functions due to any cause but mostly

traumatic. The IDK includes tear of cruciate ligament and those of menisci. Anatomically no joint include as many intra-articular structures as knee joint does. They are strong but not to the extent so as to sustain violent rotation and sweep stresses at the knees.⁹ Stability of knee is mainly controlled by these static structures apart from the muscle groups around the knees.¹⁰ Hence in any injury to the knee joint it is imperative to assess the integrity of these internal structures.

In an increasingly cost-conscious medical environment, the judicious use of expensive arthroscopic versus MRI technology in the diagnosis of internal derangements of the knee has not been clearly defined. Some clinicians suggest physical examination and clinical meniscus tests, along with a carefully taken history, are the most important and cost-effective means of diagnosing meniscal injury.¹¹⁻¹³ Others have stated the routine use of MRI before arthroscopy will reduce costs and the incidence of unnecessary invasive procedures.¹⁴ If the findings of history and physical examination are sufficiently predictive, then an additional imaging study may not be necessary before proceeding with a therapeutic arthroscopy. The patient can be saved time and expense. A thorough understanding of the value of specific meniscal tests and historical elements, as well as the strengths and limitations of MRI, will help the clinician delineate these patients and decide an effective course of action.

Several new clinical tests to improve diagnosis of sagittal instability have been developed and attempts have been made to measure the displacement¹⁵. In 1980's several ligament testing devices were developed in an attempt to quantize anterior posterior displacement of knee joint. The Lachman's, Pivot shift & anterior drawer tests often vary from examiner, thus making comparisons difficult. Objective, quantitative testing devices provide opportunity to compare populations of patients more accurately. MRI is now well established as the best imaging for noninvasive evaluation of the knee,¹⁶⁻¹⁸ but the question of diagnostic and/or economic superiority has been much disputed as regards the field strength of the magnet.^{19,20} F. Rayan et al. stated that carefully performed clinical examination can give equal or better diagnosis of meniscal and ACL injuries in comparison to MRI scan. MRI may be used to rule out such injuries rather than to diagnose them.²¹

Present prospective study was conducted to assess the diagnostic accuracy of Clinical Examination, MRI and Arthroscopy findings with internal derangement of the knee.

MATERIALS AND METHODS

This was an objective study in which, patients with complaints of pain and instability of knee attending to the Department of Orthopaedics, Santosh Medical College and Hospital, Ghaziabad, UP (India) were studied. More than 250 patients reported to the

outpatient department between Oct 2010-Sept 2011. Of which 70 patients underwent clinical examination, MRI and Arthroscopic evaluation.

The age group of these patients ranges from 12 years to 60 years. Out of 70 patients 46 were males and 24 were females. Complete history of the patient was taken. Patients were examined thoroughly. Tests used for menisci were joint line tenderness, McMurray's test, Apleys Grinding test. Applicable tests were used with respect to patient's complaints and history. Tests used for cruciate ligament assessment were anterior and posterior Drawer tests, Lachaman's test, Pivot shift test, Recurvatum external rotation tests, Quadriceps active test. Clinical diagnosis was made.

MRI was taken and films were read and MRI diagnosis was made. Patients were subjected to arthroscopy and surgical diagnosis was made. All the three results were correlated.

RESULTS

Out of 70 patients 46 were males and 24 were females. 32 patients were between 12 and 30 years. There were 38 patients between 31 to 55 years. 58 patients had history of trauma and 12 patients had history of sports injury.

In all the 12 cases of isolated ACL injury and 2 cases of only PCL injury, 2 cases of both ACL & PCL injury, there was equal correlation between Clinical, MRI, Arthroscopy (table 1).

In Meniscal injuries including only menisci (n= 10) and menisci + ACL (n=44). There were 44 diagnosed on arthroscopy, 7 were misdiagnosed clinically but on arthroscopy had no tear (table 1).

So sensitivity was 86% and specificity was 94% for meniscal injuries by clinical examination. Out of 70, MRI diagnosed 64 cases properly and 3 cases were not diagnosed and 3 cases were falsely diagnosed. So specificity was 94.5% and sensitivity was 94% for meniscal injuries by MRI examination (table 2).

In both meniscal and cruciate ligament injuries 46 cases were diagnosed by clinical examination, out of which Arthroscopically 44 were diagnosed and 41 were diagnosed by MRI (table 1). So specificity was 100% and sensitivity was 92% by clinical examination. So specificity was 94% and sensitivity was 88% for MRI (table 3).

Table 1: Diagnosed as per Clinical/MRI/ Arthroscopy.

Diagnosis	Clinical	MRI	Arthroscopy
Only ACL	12	12	12
Only Menisci	08	7	10
Only PCL	2	2	2
Menisci & ACL	46	41	44
ACL & PCL	2	2	2

Table 2: Sensitivity and specificity for meniscal injuries.

	Clinical	MRI	Arthroscopy
Sensitivity	86	94	100
Specificity	94	94.5	100

Table 3: Sensitivity and specificity for both meniscal and cruciate ligament injuries.

	Clinical	MRI	Arthroscopy
Sensitivity	92	88	100
Specificity	100	94	100

DISCUSSION

70 cases were evaluated during Oct 2010-Sept 2011 in Dept. of Orthopaedics, Santosh Medical College and Hospital, Ghaziabad, UP (India). This study included the patients coming with complaints of pain & instability in the knee. They were segregated clinically for meniscal and cruciate ligament injuries. 41 cases were males with left knee being predominant. The youngest patient was twelve years and the oldest was sixty years. All the cases were evaluated clinically, MRI, and subjected to arthroscopy. Our clinical or MRI diagnostic accuracy in cruciate ligaments and meniscal injuries is similar to that reported elsewhere.²²⁻²⁴ Rubin & Paletta GA²⁵ and Blankenbaker et al²⁶ report the variation of lateral meniscus sensitivity in

MRI studies (68-86%). It is obvious that the MRI reports are highly dependent on the skills and experience of the radiologist and his/her equipment.

Our data support the claim that combined injuries may affect the diagnosis of meniscus lesions as we missed some injured menisci in our clinical examination, especially lateral ones in the group of patients with combined cruciate ligament and meniscal injuries. Also, it was in patients with combined injuries that the two examiners most often failed to reach agreement. The accuracy of diagnosis of injured menisci, or cruciate ligaments, will depend on the quality of imaging equipment and on the skills and experience of the clinical examiner, the radiologist and the arthroscopist. Assuming that

MRI study is carried out correctly and assessed by an experienced radiologist, the accuracy of MRI for meniscus diagnosis is almost equivalent to that by arthroscopy as stated by Runkel M et al.²⁷ In countries with poor health resources, it is important to consider the economic burden of MRI for patients. Therefore, it is important for an orthopaedic surgeon to choose the best MRI setting and radiologist, in order to save time and reduce patient costs.

Kocher et al.²⁸ mentioned that selective MRI does not provide an enhanced diagnostic utility over clinical examination. MRI should be reserved for cases where the clinical diagnosis is uncertain and when the input of MRI is likely to alter the treatment plan. Brooks et al.²⁹ in a prospective study, assessed the agreement between preoperative clinical/ arthroscopic and MRI/arthroscopic findings (79% versus 77% agreement, respectively) and concluded that MRI did not reduce the number of negative arthroscopic procedures. Bryan et al.³⁰ reported contradictory findings. They demonstrated that MRI could decrease the rate of surgery in knee problems, especially in those in whom surgery was already planned; furthermore, they found

that it did not increase the overall cost.

CONCLUSION

From present study, it can be concluded that for isolated ACL and PCL injuries Clinical, MRI and Arthroscopy are almost equal in diagnosing the condition. For Meniscal injuries the sensitivity was 86% and specificity was 94% by clinical examination, sensitivity was 94%, specificity was 94.5% by MRI, sensitivity was 100% and specificity was 100% for Arthroscopy. In both Meniscal and Cruciate Ligament specificity was 100% and sensitivity was 92% by clinical examination, specificity was 94% and sensitivity was 88% for MRI, sensitivity was 100% and specificity was 100% for Arthroscopy. Therefore Arthroscopy is best indicator of Cruciate Ligament as well as Meniscal injuries.

The strength of correlation between MRI and arthroscopic findings confirms the value of MRI in assessing internal knee structures. However, skilled clinical examination rates similarly to MRI. It is important to consider the economic load of MRI for patients, especially in countries with poor welfare state and poor insurance coverage.

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