

Clinical, Sonographic and MRI Assessment of Sports Injury of Knee: A Comparative Study

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ABSTRACT

Aim: To understand the relative diagnostic sensitivity, specificity and accuracy of each modality.

Introduction: Internal de-arrangement of knee requires utmost diagnostic accuracy especially in professional sports personnel's. MRI is the most advanced modality to date for such injuries and there is a trend among most of the patients and treating young doctors to order for an MRI, in almost all the injuries, obvious and occult, with the result that there is a heavy rush of workload on MRI and it is difficult to cope with the work load, resulting in a long waiting list.

Method: In view of the above situation and conflicting reports, regarding the efficiency of ultrasound and total neglect of clinical diagnosis this comparative study of clinical examination, ultrasonic diagnosis and MRI was conducted in our tertiary care centre, from March 2017 to March 2018, as a prospective double blind study.

Results: Among the 104 patients who participated in this study 106 lesions were diagnosed clinically, where in 10 lesions were false positives as confirmed by MRI, in only 96 cases. Results of ultrasound analysis were quite encouraging as it could diagnose IDK in 95 cases meaning only one case as false negative. Lateral meniscus (LM) was diagnosed clinically in 16 cases, sonographically in 17 cases and by MRI in 18 cases. Medial Meniscus (MM) was diagnosed as torn clinically in 38 cases, ultrasonographically and MRI in 36 cases. ACL was

detected as torn clinically in 32 cases while 28 and 27 by USG and MRI while as PCL was detected as torn clinically in 1 and in 2 cases by USG and MRI. Medial collateral (MC) was detected as torn clinically in 7 cases and by USG and MRI In 10 cases while as Lateral Collateral (LC) was detected as torn clinically in 2 cases while 3 by USG and MRI.

Overall, sensitivity, specificity and accuracy (SSA) of clinical examination was 75.7%, 79.6% and 78.1%. Mean SSA of ultrasound was 96.8%, 98.4% and 97.4%. The study proves that ultrasound is a reasonably sensitive, specific and accurate in expensive diagnostic tool and is underutilized, as in expert hands its results match that of MRI.

Key Words: IDK, Clinical, Ultrasonic, MRI.

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INTRODUCTION

Clinical examination used to be the mainstay for diagnosing any disorder until late seventies and its importance cannot be undermined even to date, despite there being a number of highly advanced diagnostic gadgets available.¹

Gradually, with increasing workload, especially in Government set up, there has been a tendency in young doctors to refer all patients for most advanced diagnostic tool to get a certain readymade diagnosis. This approach is also adopted in private sector to avoid litigation. For the overall well-being of the patient, it is important to spend time with the patient, listen to him patiently and do a thorough clinical examination, otherwise important findings that may be life or limb saving can be missed and Golden period of intervention may be lost. Volumes have been written

emphasizing clinical examination of the knee by McMurrays, Apley grinding, Drawer, Thessaly, Lachmann, valgus and varus tests and many other.²

Only relevant minimal tests are needed to be done to reach a clinical diagnosis. Interpretation of these tests varies individually from person to person. There is hardly any authentic report on the subject. The availability of MRI has tremendously improved the accuracy of IDK diagnosis and presently is the Gold standard in this field.³ Long waiting lists for MRI in our setup, forced us to divert many a patients for sonography and we were satisfied with the results fairly matching our provisional clinical diagnosis and ultimately being confirmed by MRI and hence this study was undertaken.

MATERIALS AND METHODS

The study was conducted on 129 patients, suspected to be having IDK, attending to the outpatient Department of Orthopaedics, Government Medical College Jammu from March 2017 to March 2018. It was a double blind involving one orthopaedic surgeon and two radiologists.

Step I: A detailed history regarding mode of trauma, treatment received if any was recorded and a thorough clinical examination was done uniformly as per the Performa for all patients. A provisional clinical diagnosis was made and noted.

Step II: All patients were referred to sinologist for sonography with no clinical details. The radiologist performed the ultrasonography using Acuson 128 with a linear array 7.5 MHz probe. The sonography was started from the front with the knee extended, then flexed to 90 degree, followed by medial, lateral and lastly in prone position to assess posterior horns and PCL.

INTERPRETATIONS

- Normal menisci were visualised as smooth, homogenous wedge shaped low echogenic structure.
- Suspicious menisci were labelled as Abnormal (nonhomogenous echo)
- Torn (inner bulging)
- ACL appear as long band extending from tibial intercondylar to femoral IC notch, elongates with thinning on dynamic stressing, labelled NORMAL. It was labelled Abnormal or TORN when it did not elongate on stressing and remained as thick structure.
- PCL was visualised as curved homogenous when NORMAL, ABNORMAL, TORN or NOT seen as the case may be. MC and

LC as thickened bands extending from tibia to femur medially or laterally.

Step III: The patient was sent for MRI on predated appointment. Again no clinical details or sonographic report. MRI was conducted by a senior consultant, using 1.5 Tesla unit with a specific knee coil and results were received as NORMAL, TORN, PARTIAL OR COMPLETE AT FEMORAL OR TIBIAL ATTACHMENT.

RESULTS

Among 129 patients, 25 did not turn up for MRI and hence were excluded and only 104 were assessed. There were 78 males and 26 females with age ranging between 18-60 years and mean age of 36.5 years. Right knee was involved in 65 cases and left in 39. The Clinical, Sonographic and MRI findings were compared for sensitivity, specificity and accuracy as given in Table I and Table II. Lateral meniscus (LM) was diagnosed as TORN clinically in 16 cases, 17 by USG and by MRI in 18 cases while medial meniscus (MM) detected as torn, clinically in 38 cases, by USG and MRI in 36 cases. ACL was detected torn clinically in 32 and by sonographic and MRI in 28 and 27 patients. PCL was detected torn clinically in 1 and by USG and MRI in 2 patients. Medial collateral (MC) was detected clinically in 7, by USG in 9 and by MRI in 10 cases. Lateral collateral (LC) was detected torn clinically in 2 and by USG and MRI in 3 cases.

106 lesions diagnosed, clinically turned out to be 95 on USG and 96 on MRI i.e. False positives were detected clinically in 10 cases and false negative by USG in 1case.

Table I: Comparative results

Lesion	CLINICAL			ULTRASOUND			MRI	
	Torn	Normal	Abnormal	Torn	Normal	Abnormal	Torn	Normal
LM	16	88	11	06	87	0	18	86
M.M	38	66	30	06	68	06	30	68
ACL	Complete	Partial	Normal					
	32	0	72	20	08	76	6	21
PCL	1	0	103	1	01	102	1	102
MC	7	0	97	4	05	95	5	94
LC	2	0	102	1	02	101	1	101

LM= Lateral Meniscus, MM= Medial Meniscus, NM= Normal Meniscus, ACL= Anterior Cruciate Ligament, PCL= Posterior Cruciate Ligament, MC= Medial Collateral Liganent, LC= Lateral Collateral Ligament

Table II: Clinical Vs Ultrasound

Structure Assessed	Sensitivity		Specificity		Accuracy	
	Clinical	Ultrasound	Clinical	Ultrasound	Clinical	Ultrasound
LM	88.8%	94.4%	98%	100%	92.3%	100%
MM	94.7%	100%	91.3%	100%	96.2%	100%
ACL	84.3%	96.4%	85.9%	98.2%	88.2%	98.3%
PCL	50%	100%	56%	100%	55.0%	100%
MC	70%	90%	70%	90%	69%	94.2%
LC	66.6%	96.4%	70%	97%	68%	98%

Mean overall sensitivity, specificity and accuracy (SSA) of Clinical examination 75.7%, 79.6% and 78.1% and Ultrasound examination 96.8%, 98.4% and 97.4%.

LM= Lateral Meniscus, MM= Medial Meniscus, NM= Normal Meniscus, ACL= Anterior Cruciate Ligament, PCL= Posterior Cruciate Ligament, MC= Medial Collateral Liganent, LC= Lateral Collateral Ligament

DISCUSSION

Ultrasonography (USG) as a diagnostic tool is gradually gaining popularity in orthopaedic field too.⁴ Although, its importance in other fields has been well documented in localising deep seated tumors and abscesses in pelvis, joints, axilla and many other inaccessible sites helping FNAC for early diagnosis. Recently, however, more and more sonologists are switching to this field. The present study aimed to compare the results of three procedures in diagnosing IDK. So far MRI has been the first choice of diagnostic tool for IDK and is considered to be the Gold standard to evaluate the results of other non-invasive investigations.⁵ Of late however similar encouraging results have been reported by many authors with sonography too.

In our study there were 75% males as compared to 25% females, because of their more outdoor life apart from RTA. The mean age was 36.5 years (range 18 to 60). The sensitivity, specificity and accuracy in lateral meniscus (LM) injury were 88.8, 98 and 92.3 percent for clinical diagnosis and it was 94.4, 100 and 100 for USG. For Medial Meniscus clinical sensitivity, specificity and accuracy were 94.7%, 91.3%, 96.2% as compared to USG as 100%, for ACL the ultrasound sensitivity, specificity and accuracy score was 96.4%, 98.2% and 98.3% respectively, whereas the clinical score of PCL was 50% and 100% with USG. A Comprehensive Comparative statement of all lesions diagnosed clinically and ultrasonographically has been shown in Table I.

Overall, mean sensitivity, specificity and accuracy of clinical examination was 75.7%, 79.6% and 78.1% and overall mean sensitivity, specificity and accuracy of ultrasound was 96.8%, 98.4% and 97.4% (Table II). Most of the studies compare ultrasound with arthroscopy or arthrography.^{6,7} Some of cadaveric and clinical studies done on efficiency of ultrasound in IDK, show sensitivity of meniscus lesions 70% to 100% and specificity from 50% to 90%.⁸⁻¹⁰ In other studies, however sensitivity was as low as 30% - 40%.¹¹ In a study conducted ultrasound assessment of IDK, was compared using arthroscopy as a gold standard but there was no clinical comparison. They reported sensitivity, specificity and accuracy of ultrasound as high as 85%, 97.3% and 94.5% respectively.¹² The sensitivity, specificity and accuracy of clinical examination was reported by Sharma et al., (2011)¹³ as 96.1%, 83.3%, 73.1% respectively for medial meniscus tear, 38.4%, 96.4% and 78.1% in lateral meniscus tear, they further concluded that clinical examination can have higher sensitivity rates but in view of low specificity and low accuracy, cannot be viewed as reliable method of diagnosis. To our knowledge, there are very few studies comparing clinical and ultrasonic assessment using MRI as a Gold Standard. Our study showed good sensitivity, specificity and accuracy ultrasonically for ACL tear which is not reported. The salient feature of the present study was that almost all structures MM, LM, ACL, PCL, M.Coll and Lat.coll, were clearly visualised by ultrasound with reasonably high rate of success, which at times are difficult even with MRI.

CONCLUSION

In our study, Ultrasonography (USG) was concluded to be a useful tool in diagnosing, all constituents of IDK with fairly high rate of sensitivity, specificity and accuracy, matching well with MRI. It was further reported that clinical examination alone cannot be the sole reliable method. The study further concluded with the fact that USG being economical and less space consuming should be the

first choice in diagnosing IDK. USG, if taken up by radiologist as a speciality by choice can share major chunk of MRI burden and can add to the learning curve.

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