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Co-relation between clinical, MRI and arthroscopic findings in meniscal injuries

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Abstract
The aim of this prospective study is to correlate clinical, magnetic resonance imaging (MRI), and arthroscopic findings in cases of meniscal tear injuries. MRI scan results and clinical diagnosis are compared against the arthroscopic confirmation of the diagnosis. Thirty patients had suspected traumatic meniscal injury. Clinical examination had better sensitivity (77.77% vs. 69.23%), predictive values, and diagnostic accuracy (87.85% vs. 87.54%) in comparison to MRI scan in diagnosis for medial meniscal tears. These parameters showed only marginal difference in lateral meniscal injuries. We conclude that carefully performed clinical examination can give equal or better diagnosis of meniscal injuries in comparison to MRI scan. MRI may be used to rule out such injuries rather than to diagnose them.

Keywords: Magnetic resonance imaging, arthroscopic findings, meniscal injuries

Introduction
The knee is most frequently injured joint and usually susceptible to traumatic injury because it is more superficial. Meniscal tears are the most knee injuries. In lesions of the knee joint, meniscus are the most frequent orthopaedic affections. Due to the recent increase on sporting activities, RTA, etc.
Clinical examination and magnetic resonance imaging (MRI) are tools commonly used in the diagnosis of meniscus tears. Lee *et al* [1] found that MRI is widely accepted as an accurate, non- invasive method in the evaluation of meniscal disorders [2-4]. MRI scanning of the knee joint has often been regarded as the non-invasively alternative to diagnostics arthroscopy. In day to day clinical practice, MRI scan is routinely used to support the diagnosis for meniscal prior to recommending arthroscopic examination and surgery. Identification of meniscal tears can be difficult to interpret and can be observer dependent as well as dependent upon the sensitivity of the scanner. Similar difficulties may exist in clinical examination as well. Our objective is to co-relation between clinical, MRI, and arthroscopic finding in the diagnosis of meniscal injuries. Review of the available literature suggests that there are number of studies looking at two out of the three diagnostic tools (clinical examination, MRI scan, and arthroscopy), so our study is designed to indentify correlation of all three methods for all cases in this study.

Material and methods
Thirty cases of traumatic meniscal injuries were identified and prospectively reviewed clinically, with MRI scan followed by arthroscopic surgery. Clinical criteria used were history, positive Mcmurray's test and tender joint line for meniscal injury. Additionally pain on hyper flexion, pain on hyper extension, Steinmann 1 sign, Steinmann 2 sign, Childress test, Apley's grinding test, Lachman test and anterior drawer test were considered to be essential for clinical diagnosis of anterior cruciate ligament injury if associated with meniscus tear.
Arthroscopic examinations were carried out as a routine procedure under spinal anaesthesia. Examination under anaesthesia was carried out once again to check for any signs of instability. Arthroscopies were performed by a consultant knee surgeon and intra operative photograph were obtained to document the diagnosis.

Record of clinical, MRI and arthroscopic finding were kept and compared. Arthroscopic findings were regarded as the gold standard.

Inclusion criteria

- Patient with knee symptoms clinically diagnosed as meniscus tear.
- Patients of either gender.
- All patients with Age of 18 years and older.
- Patient giving consent for inclusion in the study.

Excluding criteria

- Prior surgery for meniscus tears or knee pathology.
- Non ambulatory patients in critical illness or stage.
- Patients with degenerative changes or evidence of loose bodies or fractures in plain radiographs.
- Patients treated non-operatively for meniscus tear who were not willing for surgery.

Statistical analysis

Statistical analysis was used to calculate [5] sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and overall accuracy of clinical diagnosis and MRI from our study to correlate with Arthroscopic findings

Observations and results

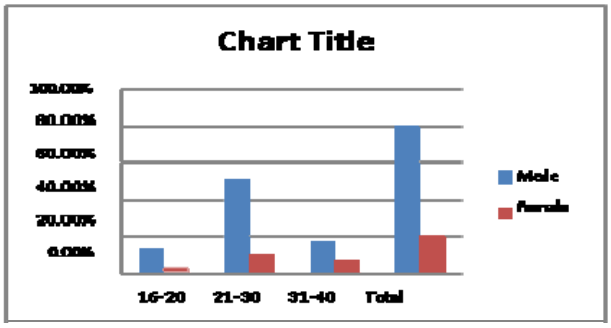
Thirty cases of meniscal injuries were identified and were prospectively reviewed with clinical examination, MRI scan and then followed by arthroscopic surgery.

Clinical criteria used were positive Apley's test, tender joint line and positive McMurray's test for meniscal injury. MRI scans of the entire patient were collected & were reported by a single radiologist, who was blinded for both clinical & arthroscopic findings. Arthroscopic examinations were carried out during definitive procedures under spinal anaesthesia.

Record of clinical, MRI and arthroscopic findings were evaluated and compared. The data was analyzed to calculate true positive, true negative, false positive and false negatives. Using these numbers the specificity, sensitivity, positive and negative predictive values were calculated with arthroscopic examination as the gold standard for comparison.

Table 1: Age wise and Gender wise distribution of patients

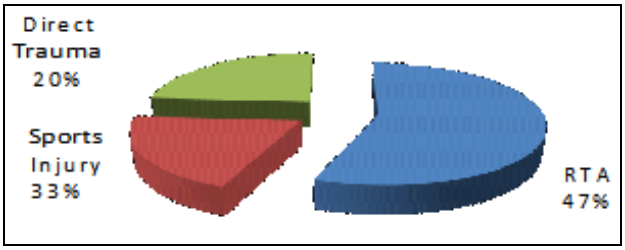
Age Group(Yr)	Male	Female	Total	Percentage (%)
16-20	4(13.33%)	1(3.33%)	5	16.66
21-30	15(50%)	3(10%)	18	60.01
31-40	5(16.66%)	2(6.66%)	7	23.33
Total	24(80%)	6(20%)	30	100.0



Most common age group involved ware between 21 to 30 years in our study.

Table 2: Distribution of Patients according to mode of injury

Mode of injury	No of patients	Percentage (%)
RTA	14	46.66
Sports Injury	10	33.33
Direct Trauma	6	20.00
Total	30	100.00



Road traffic accident was most common mode of injury in our study, accounting for about 47%

Table 3: The correlation between MRI and Arthroscopic findings for Meniscal tear3.1 Medial Meniscal Tear

		MRI		Total
		Positive	Negative	
Arthroscopy	Positive	9	0	9
	Negative	4	17	21
Total		13	17	30

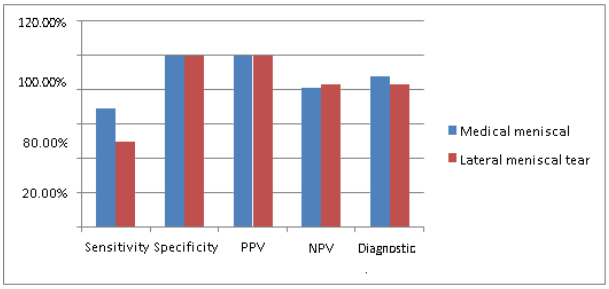
Lateral Meniscal Tear

		MRI		Total
		Positive	Negative	
Arthroscopy	Positive	0	0	0
	Negative	5	25	30
Total		5	25	30

Results of all two

%	Medial meniscal tear	Lateral meniscal tear
Sensitivity	69.23%	50%
Specificity	100%	100%
PPV	100%	100%
NPV	80.95%	83.33%
Diagnostic Accuracy	87.54%	83.33%

Table 3: The correlation between Clinical and Arthroscopic findings for Meniscal tear



Medial Meniscal Tear

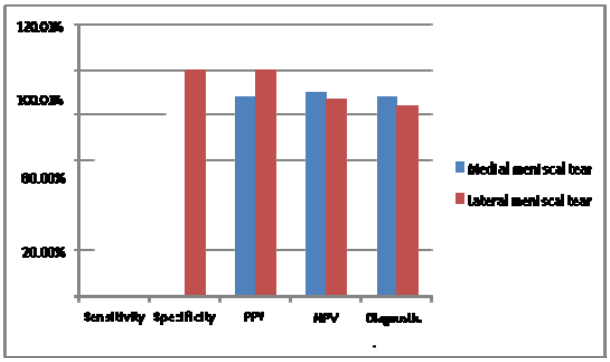
		MRI		Total
		Positive	Negative	
Arthroscopy	Positive	7	1	8
	Negative	2	20	22
Total		9	21	30

Lateral Meniscal Tear

		MRI		Total
		Positive	Negative	
Arthroscopy	Positive	0	0	0
	Negative	4	26	30
Total		4	26	30

Results of all two

%	Medial meniscal tear	Lateral meniscal tear
Sensitivity	77.77%	50%
Specificity	95.24%	100%
PPV	87.50%	100%
NPV	90.90%	86.66%
Diagnostic Accuracy	87.85%	84.16%



Results

Medial meniscal injuries

Out of 30 cases there were 9 cases where both MRI and arthroscopy were positive in confirming the diagnosis. From a total of 13 cases where MRI scan showed torn medial meniscus, 9 cases with positive arthroscopic evidence.

Clinical examination had better sensitivity (77.77%vs.69.23%) in comparison to MRI scan in diagnosis for medial meniscal tears. Similarly negative predictive values (90.90%vs.80.85%) were found to be higher in Clinical examination than MRI scan and positive predictive values (100%vs.87.50%) were found to be higher in MRI scan than clinical diagnosis for these injuries. Diagnostic accuracy was almost same for Clinical examination and MRI Scan (87.85% vs.87.54%) in medial meniscal tears.

Lateral meniscal injuries

Out of 30 cases five cases where MRI scans showed torn lateral meniscus. Arthroscopy was not positive in any cases for lateral meniscus tear. Four case where clinical examination showed torn lateral meniscus. Between clinical examination diagnosis and MRI scan diagnosis there was no difference in sensitivity (50% vs. 50%), specificity (100% vs. 100%), and Positive predictive value (100% vs. 100%), but Clinical examination had better Negative predictive value (86.66% vs. 83.33%) in comparison to MRI scan in diagnosis for these injuries. Diagnostic accuracy was almost same for Clinical examination and MRI Scan (84.16% vs. 83.33%) in lateral meniscal tears.

Discussion

Knee joint is the largest synovial joint in the body. its stability depends not only on ligaments but also on muscles surrounding it. Knee is one of the most vulnerable joint in the body for traumatic and non traumatic pathologies. Earlier clinical examination was the only modalities to examine the ligamentous injury of the knee joint. The usefulness of MRI in evaluating the knee was first recognized in the early 1980s. It has also been shown to determine the extent of an injury and help in the planning of its management. The MRI is a frequently used diagnostic modality for these internal derangements because of being non-invasive, painless and un associated with risk of radiation [6]. The accuracy, sensitivity and specificity values for knee lesions vary widely in literature.

We analysed several papers comparing clinical diagnosis with arthroscopy for the knee joint. For Mohan *et al*, in their retrospective series of 130 patients, diagnostic accuracy of clinical examination was 88% for medial meniscal tears and 92% for lateral meniscal tears; they concluded that clinical diagnosis of meniscal tears is as reliable as the magnetic resonance imaging (MRI) scan [7]. On the contrary, in prospective series by Abdon *et al*., clinical examination had only 61% accuracy for meniscal tears [8]. Rangger *et al*, studied 121 patient and concluded that MRI should be an essential diagnostic tool before arthroscopy [9]. Chang *et al*. studied findings of 148 patients with figures of 92% for sensitivity and 87% for specificity for meniscal tears [10].

Cheung *et al*, interpreted a series of 293 patients finding 89% sensitivity and 84% specificity for medial meniscus injuries [11]. For lateral meniscus, the sensitivity was 72% and specificity 93%. Barronian *et al*. found 100% sensitivity for medial meniscal tears and 73% for lateral thus finding MRI to be a reliable tool [12]. Rose *et al*. Found better diagnostic accuracy clinically than with MRI scans in a series of 100 patients [13].

Heave *et al*. [14] found that there was no significant difference between the accuracy of clinical examination and MRI with reported clinical accuracies of 72% for medical meniscal injuries. This is further confirmed by brooks *et al*. [15] who demonstrated 79% agreement between clinical diagnosis and arthroscopic findings but 77% agreement between MRI and arthroscopic finding. Their negative arthroscopy rate was 4% and this was not reduced by MRI scanning pre-arthroscopy. Our results also show that with a proper history and examination, clinical diagnosis can be as good as the MRI. Miller [16] in his prospective study of 57 knees demonstrated an overall accuracy of 80.70% for clinical diagnosis while the corresponding accuracy for MRI was 73.7%. He suggested that blind reliance on the MRI to determine.

Ryan *et al*. [17] in a prospective comparison of clinical examination, MRI, bone SPECT and arthroscopy to detect meniscal tear reported high diagnostic ability of MRI along with bone SPECT to detect meniscal tears, with a sensitivity and specificity of 80% and 71% respectively. In a prospective study reported by Imhoff *et al*. [18] the negative predictive value was 94% but the positive predictive value was only 54%. They concluded that due to a high negative predictive value, a normal MRI scan allows eliminating a meniscal lesion and so there is no need for a diagnostic arthroscopy. They suggested that due to low positive predictive value of MRI it should not be routinely used to confirm clinical diagnosis and its use should be limited to those cases where clinical examination is inconclusive. A diagnostic arthroscopy would be a better choice in those cases.

We studied 30 patients of meniscal injury by doing clinical examination, MRI scan and then, based on the findings and clinical indications, therapeutic arthroscopic procedures. In our study clinical examination had better sensitivity (77.77%) compared to MRI scan (69.23%) for diagnosing medial

meniscal tears. Similarly negative predictive values (90.90% vs. 80.95%) were found to be higher in clinical diagnosis than MRI scan diagnosis for these injuries. Diagnostic accuracy was almost same for Clinical examination and MRI Scan (87.85% vs.87.54%) in medial meniscal tears.

Out of 30 cases five cases where MRI scans showed torn lateral meniscus. Arthroscopy was not positive in any cases for lateral meniscus tear. Four case where clinical examination showed torn lateral meniscus. Between clinical examination diagnosis and MRI scan diagnosis there was no difference in sensitivity (50% vs. 50%), specificity (100% vs. 100%), and Positive predictive value (100% vs. 100%), but Clinical examination had better Negative predictive value (86.66% vs. 83.33%) in comparison to MRI scan in diagnosis for these injuries. Diagnostic accuracy was almost same for Clinical examination and MRI Scan (84.16% vs. 83.33%) in lateral meniscal tears.

Conclusion

The study finding reflect that clinical diagnosis has an equal diagnostic accuracy in compare to other diagnostic tools like MRI. When examining the patient for meniscus tear clinical diagnosis alone can used for detection of meniscal tears. Clinical methods for diagnosis of meniscal tear was found 77.77% sensitivity, 95.24% specificity, 87.50% positive predictive value and 90.90% negative predictive value, over all 87.85% accuracy for clinical diagnosis in correlation with arthroscopy. These results can be the first line of clinical screening for detection of meniscal tears and should help surgeon be aware of the meniscal tears in the knee of the injured patient thus, give the right diagnosis to proceed for right surgical procedure by indicating arthroscopy if needed.

With studies proving that history, symptoms and clinical examination alone are effective in the diagnosis of meniscus tear and injuries, we suggest that where symptoms and clinical findings are suggestive and when therapeutic intervention is already being contemplated clinical diagnosis is a better, accurate and reliable as any other diagnostic tool (MRI and Arthroscopy). The current practice of requesting MRI scans to routinely confirm the diagnosis should be altered.

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