Is MRI Essential Prior to Arthroscopic Management of Internal Derangement of the Knee?

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Background: Magnetic Resonance imaging (MRI) is a frequently used, non-invasive investigation for the diagnosis of knee meniscal and anterior cruciate ligament (ACL) injuries. This investigation is not available at our institution and is fairly expensive costing about seven thousand rupees. Patients have to be outsourced to get this investigation causing significant delay and expense. This study was designed to compare the accuracy of clinical examination and MRI by arthroscopic examination in patients with knee meniscal and ACL injuries.If clinical diagnosis could be as accurate as MRI, the need for this expensive and time consuming investigation could be avoided.

Patients and Methods: This study had prospective observational design. Thirty patients who were diagnosed clinically and by MRI to have meniscal or ACL injury and needed arthroscopic intervention, were included in the study on the basis of intention to treat. Accuracy of clinical and MRI diagnosis as had been made earlier were compared after arthroscopic examination.4 by 4 statistical table was used to determine the sensitivity, specificity, positive predictive value(PPV), negative predictive value (NPV) and accuracy of clinical and MRI diagnosis for meniscal and ACL injuries.

Results: In case of meniscal injuries, clinical examination had sensitivity of 91%, specificity of 22%, positive predictive value of 73%, negative predictive value of 50% and accuracy of 70% and MRI had sensitivity of 94%, specificity of 9%, positive predictive value of 64%, negative predictive value of 50% and accuracy of 63%. Similarly in case of ACL injuries, Clinical examination had sensitivity of 84%, specificity of 100%, positive predictive value of 100%, negative predictive value of 78% and accuracy of 90% and MRI had sensitivity of 94%, specificity of 58%, positive predictive value of 77%, negative predictive value of 87% and accuracy of 80%.

Conclusion: The accuracy of diagnosis of meniscal and ACL injuries by clinical examination and MRI were arthroscopically compared and found to be fairly matched .It is suggested that routine use of MRI just to confirm the clinical diagnosis of these injuries should be reconsidered.

Introduction

Sports related knee injuries frequently result in internal derangement of the knee causing meniscal and ACL damage. MRI is an accurate, non-invasive, liberally used investigation for the diagnosis of knee meniscal and ACL injuries.[1] This investigation is not available at our institution.We have to outsource the patients and it takes about two weeks to get it done and costs about seven thousand rupees This results in considerable delay and expense. This study was designed to check the accuracy of clinical examination in the diagnosis of these injuries and whether it can replace the need for MRI. Clinical and MRI diagnosis of meniscal and ACL injuries were arthroscopically compared. If there was not a significant difference in the results, consideration could be given to obviate the need for routine use of MRI preventing delay and saving expense.

Patients and Methods

Thirty patients, who had presented at our out patient department, and diagnosed as knee meniscal and/ or ACL injury and needed arthroscopic intervention were selected on intention to treat bases. This was a prospective observational study. There were 28 males and 2 female patients with an average age of 29 (range 18 – 44). Inclusion criteria was diagnosis of meniscal and/ or ACL injury, failure of non-surgical treatment and indication of arthroscopic intervention. Patients who benefited from non-surgical treatment, have had previous knee surgery or a fracture around the knee were excluded.Clinical diagnosis was made by an Orthopaedic surgeon with special interest and experience in sports related knee injuries. A specially designed proforma was filled to document the findings of clinical examination. This highlighted the mechanism of injury, symptoms such as site of pain around the knee, clicking, giving way, and history of immediate swelling following the injury. Examination localized tenderness, looked for effusion and 'locking'. The clinical tests applied to diagnose meniscal injury were McMurray test, Apley Grind test and Squat test. Anterior draw and lachman test were used to diagnose ACL injury.[2] Patients with relatively acute injury were given a trial of non-surgical treatment. Those diagnosed to have a meniscal and/ or ACL injury and in need of arthroscopic intervention had MRI scan.The surgeon who performed the arthroscopic examination and the proceeding procedure had made the earlier clinical diagnosis and was aware of the MRI result. Findings of the arthroscopic examination were

also documented on the prescribed proforma and were considered the 'gold standard' diagnosis. Clinical, MRI and arthroscopic diagnosis of meniscal and ACL injuries of all the patients were put in a tabulated form.

Statistical analysis was carried out using 4 by 4 Statistical Table (Table 1). Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of clinical examination to diagnose meniscal and ACL injury and of MRI to diagnose the same injuries was performed.

Table 1: *4 by 4 Statistical Table.*

	Pathology +ve	**Pathology -ve**	**Total**
Test +ve	a (true +ve)	b (false +ve)	a+b
Test –ve	c (false –ve)	d (true –ve)	c+d
Total	a+c	b+d	a+b+c+d

Sensitivity: a/a+c
Specificity: d/b+d
PPV: a/a+b
NPV: d/c+d
Accuracy: a+d/a+b+c+d.

Results

For clinical diagnoses of meniscal injury, there were 16 true positives, 10 false positives, 2 false negatives and 2 true negatives (Table 2). This meant sensitivity of 91%, specificity of 22%, positive predictive value of 73%, negative predictive value of 50% and accuracy of 70%. For clinical diagnosis of ACL injury there were 16 true positives, none false positive, 3 false negatives and 11 true negatives. This meant sensitivity of 84%, specificity of 100%, positive predictive value of 100%, negative predictive value of 78% and accuracy of 90%.

For MRI diagnosis of meniscal injury there were 18 true positives, 10 false positives, 1 false negative and 1 true negative. This meant sensitivity of 94%, specificity of 9%, positive predictive value of 64%, negative predictive value of 50% and accuracy of 63%. For MRI diagnosis of ACL injury there were 17 true positives, 5 false positives, 1 false negative and 7 true negatives. This meant sensitivity of 94%, specificity of 58%, positive predictive value of 77%, negative predictive value of 87% and accuracy of 80%.

Table 2:

	Clinical Meniscal Injury	**Clinical ACL Injury**	**MRI Meniscal Injury**	**MRI ACL Injury**
True +ve	19	16	18	17
False +ve	07	00	10	05
False –ve	02	03	01	01
True –ve	02	11	01	07
Sensitivity	91	84	94	94
Specificity	22	100	09	58
Pos Pred V	73	100	64	77
Neg Pred V	50	78	50	87
Accuracy	70	90	63	80

Discussion

MRI is being used to diagnose internal derangement of the knee almost routinely as a non-invasive investigation, and it has been suggested that the expensive MRI was being requested unnecessarily.[1,3] There is controversy regarding the relative reliability of clinical examination versus MRI for the diagnosis of knee meniscal and ACL injuries. Accuracy rates of clinical diagnosis for medial meniscus tear of 98% and of ACL rupture of 72% have been reported and no significant difference in the reliability of clinical diagnosis and that of MRI has been found.[4] Similarly, accuracy of 79% for clinical examination and 77% for MRI scan when the two modalities were compared arthroscopically has been mentioned in the literature.[5] However, in another study Dodd et al found 16 out of 58 patients to have positive clinical findings and negative arthroscopy.[1]

In our study, good correlation was found between clinical and MRI diagnosis. There was accuracy rate for clinical diagnosis of meniscal injury of 70% and ACL injury of 90%.These figures are compareable to studies highlighting the importance of the dying art of history and clinical skill in making a diagnosis in this age of overbearing high-tech investigations.[3,4,6]

The patient number of 30 in our study is small. The same Orthopaedic surgeon has performed clinical as well as arthroscopic examination. Though this reduces the chance of interobserver variability, it creates possibility of observational bias.

Conclusion

The results of this study suggest that if clinical assessment is done by an experienced Orthopaedic surgeon, MRI may not be essential to confirm the diagnosis of internal derangement of the knee and arthroscopy could be performed on the basis of sound clinical diagnosis saving the patient delay in treatment and money.

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