



ISSN: 2091-2749 (Print)  
2091-2757 (Online)

#### Correspondence

Dr. Abhishek Kumar Thakur,  
Dept. of Orthopaedics and  
Trauma Surgery, Patan  
Hospital, Patan Academy of  
Health Sciences, Lalitpur, Nepal  
Email:  
abhishekkumarthakur@pahs.edu.  
np

#### Peer Reviewers

Prof. Dr Nabees Man Singh  
Pradhan  
Patan Academy of Health  
Sciences

Asst. Prof. Dr. Ashis Shrestha  
Patan Academy of Health  
Sciences

#### Submitted

28 May 2020

#### Accepted

20 Jun 2020

#### How to cite this article

Abhishek Kumar Thakur.  
Accuracy of clinical diagnosis in  
meniscal tears. Journal of Patan  
Academy of Health Sciences.  
2020Aug;7(2):39-44.

#### DOI:

<https://doi.org/10.3126/jpahs.v7i2.31110>

## Accuracy of clinical diagnosis in meniscal tears

Abhishek Kumar Thakur  

Abhishek Kumar Thakur, Dept. of Orthopaedics and Trauma Surgery, Patan Hospital, Patan Academy of Health Sciences, Lalitpur, Kathmandu, Nepal

### Abstract

**Introduction:** Meniscal injuries of the knee are common indications for arthroscopic knee surgery. Most of the meniscal tears can be diagnosed by clinical evaluation alone. This study aims to test the accuracy of the commonly performed tests for meniscal tears in our set up.

**Method:** This was a prospective observational study of 32 symptomatic knees that underwent clinical evaluation followed by arthroscopy. The sensitivity, specificity and diagnostic accuracy of three clinical tests (McMurray's test, Apley's compression test and Joint line tenderness) were calculated against arthroscopic findings.

**Result:** Among clinical tests, maximum sensitivity (94.44%) was with Joint Line Tenderness for Medial Meniscus Tear (MMT) and minimum (54.54%) with Apley's Compression Test for Lateral meniscus Tear (LMT). Specificity was maximum (90.48%) with Joint Line Tenderness for LMT and minimum (64.28%) with Apley's Compression Test for MMT. Diagnostic accuracy was maximum (90.6%) with McMurray's test for LMT and minimum (75%) with Apley's Compression Test for MMT and LMT.

**Conclusion:** All three clinical tests (McMurray's, Apley's compression and Joint line tenderness) were found reliable for diagnosing meniscus tears. Joint Line Tenderness had the best diagnostic accuracy followed by McMurray's test.

**Keywords:** arthroscopy, diagnostic accuracy, clinical knee examination, meniscus tear

## Introduction

Meniscus injuries of the knee are common indications for knee surgery.<sup>1</sup> The incidence of meniscus injury is rising in the western countries due to increasing involvement of the people in sports and recreational activities, with the annual incidence of 60-70 per 100,000 persons. Injury to the meniscus can result in marked physical impairment. Once thought to be a vestigial organ, it is now recognized that meniscectomy often leads to a recognizable pattern of joint deterioration.<sup>2</sup> History and physical examination alone lead to the correct diagnosis in most instances.<sup>3</sup> The reported diagnostic performance of Magnetic Resonance Imaging (MRI) against arthroscopic findings have overall accuracy of 72% to 98% for meniscus tears.<sup>4-6</sup> Besides high cost, MRI results heavily depend on the operator as well as the technology.<sup>7,8</sup> It is not readily available in Nepal, especially in rural settings. Arthroscopy is a diagnostic as well as therapeutic procedure. Arthroscopic grading of meniscus pathology is reliable and reproducible.<sup>9</sup>

This study aims to test the sensitivity, specificity and diagnostic accuracy of clinical tests for meniscal injuries against arthroscopic findings.

## Method

A cross-sectional observational study of prospectively collected data was carried out in the department of Orthopedics, Universal College of Medical Sciences and Teaching Hospital (UCMS-TH), Bhairahawa from November, 2014 to July, 2016 on 32 patients with clinical diagnosis of meniscal tears.

Ethical approval was taken from the Institutional Review Committee of UCMS-TH. Informed written consent was obtained from all the patients. Inclusion criteria were unilateral knee injuries, age between 16 to 59 years as meniscus injuries are more common in young and physically active<sup>10-12</sup> and more than six weeks from injury to exclude the pain

due to sprains and strains. Exclusion criteria were presence of scars or sinuses around affected knee, history of previous surgery on same knee and who were unfit or did not wish to undergo surgical intervention.

Proper clinical history like mode of injury, specific complaints such as locking of knee and their duration was obtained prior to clinical examination. Clinical diagnosis was made based on three clinical tests – McMurray's test, Apley's compression test and Joint line tenderness. McMurray's test was considered positive when the examiner palpated an audible click in medial knee joint line during extension of the fully flexed knee and external rotation of foot for Medial Meniscus tear (MMT). The click was palpated in lateral joint line during the same maneuver with internal rotation of foot for Lateral Meniscus Tear (LMT). Apley's compression test was considered positive when the patient felt medial knee joint line pain or discomfort during exertion of strong downward pressure by examiner to the prone patient with 90° flexed knee and external rotation of foot for MMT. The pain was felt in lateral joint line with the same maneuver with internal rotation of foot for LMT. Joint line tenderness was considered positive any tenderness was elicited by examiner in either medial joint line for MMT and lateral joint line for LMT. The tests were performed by a single post-graduate resident under the supervision of a faculty (Lecturer or above with at least three years experience in field of Orthopedics).

After the clinical diagnosis of the meniscal lesions, the patients were fully explained about the diagnosis diagrammatically, along with the treatment options like conservative, arthroscopic partial meniscectomy or meniscal repair. As per hospital protocol patients were kept on regular isometric knee exercise twice to thrice a day, rest and analgesics. Patients were followed up at three weeks and six weeks. If there was no improvement by six weeks, then the arthroscopic evaluation was offered as a diagnostic as well as a therapeutic modality. Arthroscopies were performed by a single

faculty (associate professor with at least three years experience in arthroscopic surgery). During diagnostic arthroscopy, breach visible in the medial or lateral meniscal margin or structure was considered as a meniscal tear. Arthroscopy findings were considered the gold standard against which the clinical findings were compared.

The data from the clinical and the arthroscopic evaluation were recorded on pro forma. Then it was entered in MS-Excel 2007 and analysed using Statistical Package for Social Sciences (SPSS 21), to calculate the accuracy of clinical diagnosis, Table 1 and Table 2.

**Table 1. Methods of calculation for true positive and negative findings of clinical tests vs. arthroscopic findings of meniscal tears**

Clinical tests	Arthroscopic findings		Total
	Positive	Negative	
Positive	A (True Positive)	B (False Positive)	A+B
Negative	C (False Negative)	D (True Negative)	C+D
	A+C	B+D	A+B+C+D

**Table 2. Formulas for calculation for sensitivity, specificity and diagnostic accuracy of clinical tests vs. Arthroscopic findings of meniscal tears**

Sensitivity	$\frac{\text{True Positive}}{\text{True Positive} + \text{False Negative}}$	$\frac{A}{A+C}$
Specificity	$\frac{\text{True Negative}}{\text{True Negative} + \text{False Positive}}$	$\frac{D}{B+D}$
Diagnostic Accuracy	$\frac{\text{True Positive} + \text{True Negative}}{\text{True Positive} + \text{True Negative} + \text{False Positive} + \text{False Negative}}$	$\frac{A+D}{A+B+C+D}$

## Result

There were 32 patients who met our inclusion criteria. The mean age was 40.59 (range 17-59) years, one third (n=10; 31.25%) in age group of 51-60, and male 20 (62.5%) twice as common than female 12 (37.5%), right knee involvement in 18 (56.25%) and left in 14 (43.75%). There was no history of significant trauma in 12 (37.5 %) patients. Out of 32 patients, 29 (90.62%) patients who were clinically diagnosed as meniscal tears were confirmed on arthroscopy. Among 29 patients, 18 (62.06%) had medial meniscal tears and 11 (37.93%) lateral meniscal tears. Two (6.25%) patients with Anterior Cruciate Ligament (ACL) tears were found to be the simulators of meniscal tear. One (3.125%) patient was found to be completely normal.

In McMurray’s test for MMT, there were 16 true positive, four false positive, two false negative and ten true negative cases. Similarly, there were nine true positive, two false positive, one false negative and 20 true

negative cases of McMurray’s test for LMT. After calculation, McMurray’s test had a sensitivity, specificity and diagnostic accuracy of 88.88%, 71.43% and 81.25% for MMT. It had a sensitivity, specificity and diagnostic accuracy of 90%, 90.1% and 90.6% for LMT.

In Apley’s compression test for MMT, there were 15 true positive, five false positive, three false negative and nine true negative cases. There were six true positive, three false positive, five false negative and 18 true negative cases of Apley’s compression test for LMT. After calculation, Apley’s compression test had a sensitivity, specificity and diagnostic accuracy of 83.33%, 64.28% and 75% for MMT. It had a sensitivity, specificity and diagnostic accuracy of 54.54%, 85.71% and 75% for LMT.

In Joint line tenderness for MMT, there were 17 true positive, four false positive, one false negative and ten true negative cases. There were nine true positive, two false positive, two false negative and nine true negative

cases of Joint line tenderness for LMT. After calculation, Apley's compression test had a sensitivity, specificity and diagnostic accuracy of 94.44%, 71.43% and 84.37% for MMT. It had a sensitivity, specificity and diagnostic accuracy of 81.82%, 90.48% and 87.5% for LMT.

## Discussion

In our study, most patients were young adults with mean age of 40.53 years, range 17 to 59 years, peak incidence in 3<sup>rd</sup> to 6<sup>th</sup> decades. One (3.12%) patient was adolescent (15-19 years), 14 (43.75%) patients were young adults (20-40 years) and 17 (53.12%) patients were in the 40-60 years age group. These findings are consistent with other studies that also report meniscus injuries to be more common in younger and physically active patients.<sup>10-12</sup> The reason for more injuries in the young and athletic individuals could be due to repeated exposure to trauma-prone activities.

Out of the 32 patients, 20 (62.5%) were male, male to female ratio 1.67:1, similar to other studies showing higher incidence of meniscus tears in males. This could possibly be due to greater participation of male in sports and outdoor professional and recreational activities.<sup>7,13,14</sup>

In our series, right knees were involved in 18 (56.25%), similar with the findings of various other studies.<sup>7,8,14</sup> The predominance of the right dominance population could explain these findings.<sup>15</sup>

Our study found 18 (56.25%) medial meniscus tears and 11 (34.37%) lateral meniscus tears. Similar results with predominant involvement of the medial meniscus has also been reported by others.<sup>7,8,13</sup> The anatomical peculiarities of the medial meniscus have been attributed to the causes of more tears of the medial meniscus, i.e. larger in diameter, narrower in body, less mobile, not attached to cruciate ligaments, not attached to the femoral condyle and firmly attached to

the medial capsule and medial collateral ligament. Smaller diameter, more mobility and protection by the popliteus muscle and ligaments (Wrisberg and Humphrey) especially protect the lateral meniscus.<sup>16</sup>

We found two (6.25%) knees with ACL injury instead of meniscal tear. One (3.125%) knee did not have either meniscal tear or ACL injury. Degenerative changes were present in the knee probably causing the pain. None of the patients had any Posterior Cruciate Ligament (PCL) tear, discoid meniscus, meniscal cysts, chondral lesions, synovitis or plica. All of these findings are important confounding factors (cause or effect) which make the diagnosis of meniscus tears challenging.<sup>17</sup>

In a prospective study of Diagnostic Accuracy of the McMurray's test with arthroscopy and MRI with a well-matched 213 symptomatic cases and 197 asymptomatic controls, the sensitivity, specificity and diagnostic accuracy of the McMurray's test for the MMT were 48%, 94%, 78% respectively and for the LMT 65%, 86%, and 84% respectively.<sup>18</sup> The specificity in their study was 94%, higher than in our study (only 71.43%) which could be due to the difference in sample size and other demographic variations.

Clinical diagnosis (Apley's compression, McMurray and Joint-line tenderness tests) in 154 patients (age range, 13 to 87 years; mean, 41 years) compared with arthroscopic findings, 100 patients who also underwent MRI, the sensitivity, specificity and diagnostic accuracy of clinical diagnosis for MMT were 95%, 55%, and 82% respectively. And for LMT 55%, 94%, and 76% respectively. In the 54 patients with clinical examination alone without MRI, the sensitivity, specificity and diagnostic accuracy of the clinical tests for MMT were 92%, 60%, and 83% respectively and for the LMT 67%, 90%, and 80%.<sup>19</sup> Therefore, they concluded that MRI did not improve the diagnostic accuracy. They have not reported the findings separately for the Apley's compression test, but the overall

diagnostic accuracy of clinical tests match with our findings.

In a prospective evaluation of 104 male recruits with a history of trauma (age range, 18 to 20 years; mean, 19.2 years) and suspected meniscus lesions with joint-line tenderness test, all of whom underwent arthroscopy, the sensitivity, specificity, and diagnostic accuracy of the Joint-line tenderness test for the LMT were 92%, 97%, and 96%, respectively and for LMT 86%, 67%, and 74% respectively.<sup>10</sup> This study had better results for the LMT, possibly due to the highly selected sample, compared to the present study.

Some of the limitations of our study are small sample size and only one examiner was involved for clinical examination. Also, we used only non-weight bearing tests in clinical examination. Further study with a larger sample size, involvement of more examiners, with measurement of the inter- and intra-observer agreement of the clinical examination findings and use of weight bearing tests in clinical examination could further define and refine the clinical diagnosis of the meniscal tears.

## Conclusion

Our findings show that all the three clinical tests, McMurray's test, Apley's Compression Test and Joint Line Tenderness, were reliable for diagnosing meniscus tears compared to arthroscopy. These tests can be used as a first-line screening tool for diagnosing meniscal tears. Joint line tenderness was found to have the best overall diagnostic accuracy followed by McMurray's test.

## Acknowledgement

This work was part of my thesis work. I acknowledge Late Professor Dr Gyaneshwar Prasad Singh and Associate Professor Prakriti Raj Kandel for their guidance during the thesis work.

## Conflict of Interest

None

## Funding

None

## Reference

1. Goldblatt JP, Richmond JC. Knee meniscal injuries. In: O'Connor FG, Sallis RE, Wilder RP, St. Pierre P. (editors). Sports medicine: just the facts. New York: McGraw-Hill; 2005. p342-50. [PDF](#)
2. Urquhart MW, O'Leary JA, Giffin JR, Fu FH. Meniscal injuries: 1. Meniscal injuries in the adult. DeLee and Drez's Orthopaedic Sports Medicine: Principles and Practice.- Philadelphia: Saunders. 2003;2:87-96. [GoogleScholar](#) | [PDF](#)
3. Jackson JL, O'Malley PG, Kroenke K. Evaluation of acute knee pain in primary care. Ann Intern Med. 2003;139(7):575-88. [DOI](#) | [PubMed](#) | [GoogleScholar](#) | [PDF](#) | [Weblink](#)
4. Raunest J, Oberle K., Loehnert J, Hoetzing H. The clinical value of magnetic resonance imaging in the evaluation of meniscal disorders. J Bone Joint Surg Am. 1991;73(1):11-6. [PubMed](#) | [GoogleScholar](#) | [Weblink](#)
5. Stanitski CL. Correlation of arthroscopic and clinical examination with magnetic resonance imaging findings of injured knees in children and adolescents. Am J Sports Med. 1998; 26(1):2-6. [DOI](#) | [PubMed](#) | [GoogleScholar](#)
6. Kocher MS, DiCanzio J, Zurakowski D, Micheli LJ. Diagnostic performance of clinical examination and selective magnetic resonance imaging in the evaluation of intraarticular knee disorders in children and adolescents. Am J Sports Med. 2001; 29(3):292-6. [DOI](#) | [PubMed](#) | [GoogleScholar](#)
7. Fischer SP, Fox JM, Del Pizzo W, Friedman MJ, Snyder SJ, Ferkel RD. Accuracy of diagnoses from magnetic resonance imaging of the knee: a multi-centre analysis of one thousand and fourteen patients. J Bone Joint Surg Am. 1991;73(1):2-10. [PubMed](#) | [GoogleScholar](#) | [PDF](#)
8. Glashow JL, Katz R, Schneider M, Scott WN. Double-blind assessment of the value of magnetic resonance imaging in the diagnosis of anterior cruciate ligament and meniscal lesions. J Bone Joint Surg Am. 1989;71(1):113-9. [PubMed](#) | [GoogleScholar](#)

9. Dunn WR, Wolf BR, Amendola A, Andrish JT, Kaeding C, Marx RG, et al. Multirater agreement of arthroscopic meniscal lesions. *Am J Sports Med.* 2004;32(8):1937-40. DOI | [PubMed](#) | [GoogleScholar](#)
10. Eren OT. The accuracy of joint line tenderness by physical examination in the diagnosis of meniscal tears. *Arthroscopy.* 2003;19(8):850-4. DOI | [PubMed](#) | [GoogleScholar](#)
11. Stratford PW, Binkley J. A review of the McMurray test: definition, interpretation, and clinical usefulness. *J Orthop Sports Phys Therapy.* 1995;22:116-20. DOI | [PubMed](#) | [GoogleScholar](#)
12. Muellner T, Weinstabl R, Schabus R. The diagnosis of meniscal tears in athletes: a comparison of clinical and magnetic resonance imaging investigations. *Am J Sports Med.* 1997;25(1):7-12. DOI | [PubMed](#) | [GoogleScholar](#)
13. Matava MJ, Eck K, Totty W, Wright RW, Shively RA. Magnetic resonance imaging as a tool to predict meniscal reparability. *Am J Sports Med.* 1999;27(4):436-43. DOI | [PubMed](#) | [GoogleScholar](#)
14. Gilles H, Seligson D. Precision in the diagnosis of meniscal lesions: a comparison of clinical evaluation, arthrography and arthroscopy. *J Bone Joint Surg Am.* 1979;61(3):343-6. [PubMed](#) | [GoogleScholar](#)
15. Verdonk PC, Demurie A, Almqvist KF, Veys EM, Verbruggen G, Verdonk R. Transplantation of viable meniscal allograft. *J. Bone Joint Surg. Am.* 2006; 88(Suppl 1, Pt 1):109-18. DOI | [PubMed](#) | [GoogleScholar](#) | [Weblink](#)
16. Last RJ. Some anatomical details of the knee joint. *J Bone Joint Surg Br.* 1948;30B (4):683-8. DOI | [PubMed](#) | [GoogleScholar](#) | [Weblink](#)
17. Klimkiewicz JJ, Shaffer B. Meniscal surgery 2002 Update: indications and techniques for resection, repair, regeneration, and replacement. *Arthroscopy.* 2002;18(9):14-25. DOI | [PubMed](#) | [GoogleScholar](#)
18. Karachalios T, Hantes M, Zibis AH, Zachos V, Karantanas AH, Malizos KN. Diagnostic accuracy of a new clinical test (the Thessaly test) for early detection of meniscal tears. *J Bone Joint Surg Am.* 2005;87(5):955-62. DOI | [PubMed](#) | [GoogleScholar](#)
19. Rose NE, Gold SM. A comparison of accuracy between clinical examination and magnetic resonance imaging in the diagnosis of meniscal and anterior cruciate ligament tears. *Arthroscopy.* 1996;12(4):398-405. DOI | [PubMed](#) | [GoogleScholar](#) | [Weblink](#)