



Accuracy of Clinical Tests in Meniscal Tear Diagnosis Using Arthroscopy as Gold Standard

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Abstract

Introduction: Meniscal injuries are one of the most common component of internal derangement of knee leading to arthroscopic knee surgery. Good history taking and accurate clinical examination can delineate meniscal injuries in majority of cases. The aim of the present study was to test the diagnostic accuracy, sensitivity and specificity of three common diagnostic tests for meniscal tears.

Methods: A prospective observational study was done on 60 symptomatic knees who were evaluated clinically and with arthroscopy. The diagnostic accuracy, sensitivity and specificity of Joint line tenderness, McMurray’s test and Apley’s Grind Test were compared with arthroscopy.

Results: Joint line tenderness had a sensitivity of 91.2%, specificity of 80.8% and a diagnostic accuracy of 86.7% for detecting medial meniscal tear, and a sensitivity of 80%, specificity of 88.6% and diagnostic accuracy of 85% for lateral meniscus tear. McMurray’s test had a sensitivity of 88.2%, specificity of 73.1% and a diagnostic accuracy of 81.7% for detecting medial meniscal tear, and a sensitivity of 79.2%, specificity of 86.1% and diagnostic accuracy of 83.3% for lateral meniscus tear. Apley’s Grind test had a sensitivity of 90.9%, specificity of 70.4% and a diagnostic accuracy of 81.7% for detecting medial meniscal tear; and a sensitivity of 80.8%, specificity of 85.3% and diagnostic accuracy of 83.3% for lateral meniscus tear.

Conclusion: Joint line tenderness, McMurray’s test and Apley’s Grind test show reliable diagnostic accuracy for

detecting meniscus tears. They can provide sufficient information for treatment decision and can be used as screening tests for diagnosing and excluding meniscal tears. Among the clinical tests highest accuracy was for Joint line tenderness test.

Keywords: meniscus tear, clinical tests, arthroscopy, diagnostic accuracy, internal derangement knee.

Introduction

Meniscal injuries are one of the most common component of internal derangement of knee leading to arthroscopic knee surgery [1]. There is an increase in incidence of meniscus injuries due to increased involvement of people in recreational activities and sports. Meniscectomy often leads to deterioration of knee function, emphasising the importance of meniscus in knee joint kinematics [2]. Good history taking and accurate clinical examination can delineate meniscal injuries in majority of cases [3]. Typically, patients with meniscal injuries present with symptoms referable to joint line, which increases with squatting or weight bearing. A ‘pop’ or ‘clunk’ sensation may be felt by the patient on knee movements. MRI is costly and the results are heavily observer dependent and also on the sensitivity of scanner [4,5]. Felli L, et al; in their study of meniscal tears concluded that there is no differences in clinical and MRI evaluations in the diagnosis of meniscal injuries [6]. Arthroscopy is considered gold standard in detecting meniscal injuries [7].

The aim of the present study was to test the diagnostic accuracy, sensitivity and specificity of three diagnostic tests for meniscal tears – Joint line tenderness, McMurray’s test and Apley’s Grind Test.

Materials and methods

A prospective observational study was done at a tertiary care hospital from January 2023 to January 2024, after

IEC clearance, on 60 consecutive patients with meniscal tears diagnosed clinically. Inclusion criteria were closed knee injuries of patients age 15 to 60 years after four weeks of injury to rule out sprain knee. Exclusion criteria were patients with multi-ligament injury of knee, open injury, patients with osteoarthritis or rheumatoid arthritis, previous articular fractures or previous surgery of the knee. All the patients were assessed clinically for joint line tenderness, McMurray’s test and Apley Grind test.

If any tenderness was felt on medial joint line, test for medial meniscal tear was considered positive and if joint line tenderness was felt on lateral joint line, test for lateral meniscus tear was considered positive. McMurray’s test was done on supine patient with acutely flexed knee. With the thumb and index finger of examiner on joint line and the other hand on ankle, tibia is externally rotated and the knee is gradually extended to check for any palpable click in case of medial meniscus tear. Tibia internally rotated and knee is extended from flexed position to feel for click in lateral meniscus tear. Apley Grind test is done on prone patient with knee flexed and compressed, tibia is rotated externally and internally over femur. In medial meniscal tear, pain was elicited over medial joint line on external rotation, and in lateral meniscal tear, pain was elicited over lateral joint line on internal rotation. Knee arthroscopy was done as diagnostic and treatment modality in all patients. Clinical and arthroscopic findings were documented. Clinical findings were compared with the gold standard arthroscopic findings. Any discontinuity or breach of lateral or medial meniscal margins were considered as a meniscal tear, during arthroscopy. Data were entered in MS Office- Excel 2007 spreadsheet and were analysed using SPSS-V26.0

software. The sensitivity, specificity and diagnostic accuracy were evaluated separately for medial and lateral meniscus.

Results

Total 60 patients were included in the study. The mean age was 35.4 (range 15-60) years (Table 1). Males constituted 68.3% (n=41). Right knee was involved in 53.3% (n=32). Majority were sports injury related 51.7% (n=31) followed by road traffic accidents 23.3% (n=14). Fifty-five (91.7%) patients were confirmed to have meniscal tear by arthroscopy, out of the clinically diagnosed 60 patients. Anterior cruciate ligament injury was mistaken for meniscal tear in three (5%) patients. Two (3.3%) patients had only synovitis of knee in arthroscopy.

Table 1: Demography

Side	Right	32 (53.3%)	
	Left	28 (46.7%)	
Age	15- 30	26 (43.3%)	Mean= 35.4
	30- 45	19 (31.7%)	
	45- 60	15 (25.0%)	
Gender	Male	41 (68.3%)	
	Female	19 (31.7%)	
Tear laterality	Medial Meniscus	29 (52.7%)	
	Lateral meniscus	20 (36.4%)	
	Med & Lat Meniscus	6 (10.9%)	
Mechanism of injury	Road Traffic accident	14 (23.3%)	
	Sports injury	31 (51.7%)	
	Occupational injury	12 (20.0%)	
	Domestic fall	3 (5.0%)	

Table 2: True/false positivity, True/false negativity of clinical tests

Test		True Positive	True Negative	False Positive	False Negative
Joint line tenderness	Medial meniscus	31	21	5	3
	Lateral Meniscus	20	31	4	5
McMurray test	Medial meniscus	30	19	7	4
	Lateral Meniscus	19	31	5	5
Apley Grind test	Medial meniscus	30	19	8	3
	Lateral Meniscus	21	29	5	5

Joint line tenderness showed 31 true positive patients, 21 true negative, 5 false positive and 3 false negative for medial meniscus tear (table 2). Joint line tenderness had a sensitivity of 91.2% , specificity of 80.8% and a sensitivity of 80%, specificity of 88.6% and diagnostic accuracy of 85% for lateral meniscus tear diagnostic accuracy of 86.7% for detecting medial meniscal tear (table 3). For lateral meniscus tear, joint line tenderness elicited 20 true positive, 31 true negative, 4 false positive and 5 false negative values. Joint line tenderness had (table 3).

McMurray’s test showed 30 true positive patients, 19 true negative, 7 false positive and 4 false negative for medial meniscus tear (table 2). McMurray’s test had a sensitivity of 88.2%, specificity of 73.1% and a diagnostic accuracy of 81.7% for detecting medial meniscal tear. For lateral meniscus tear, McMurray’s test elicited 19 true positive, 31 true negative, 5 false positive and 5 false negative values. McMurray’s test had a sensitivity of 79.2%, specificity of 86.1% and diagnostic accuracy of 83.3% for lateral meniscus tear (table 3).

Apley’s Grind test showed 30 true positive patients, 19 true negative, 8 false positive and 3 false negative for medial meniscus tear (table 2). Apley’s Grind test had a sensitivity of 90.9% , specificity of 70.4% and a

diagnostic accuracy of 81.7% for detecting medial meniscal tear. For lateral meniscus tear, Apley’s Grind test elicited 21 true positive, 29 true negative, 5 false positive and 5 false negative values. Apley’s Grind test

had a sensitivity of 80.8%, specificity of 85.3% and diagnostic accuracy of 83.3% for lateral meniscus tear (table 3).

Table 3: Sensitivity, specificity and accuracy of clinical tests

Test		Sensitivity TP/(TP+FN)	Specificity TN/(TN+FP)	Accuracy (TP+TN)/(TP+TN+FP+FN)
Joint Line Tenderness	Medial Meniscus	91.2%	80.8%	86.7%
	Lateral Meniscus	80.0%	88.6%	85.0%
McMurray Test	Medial Meniscus	88.2%	73.1%	81.7%
	Lateral Meniscus	79.2%	86.1%	83.3%
Apley Grind Test	Medial Meniscus	90.9%	70.4%	81.7%
	Lateral Meniscus	80.8%	85.3%	83.3%

Discussion

In the present study, majority of patients were in the age group 15-30 years (n 26, 43.3%) with a mean age of 35.4 years. The results are similar to other studies, which also report higher incidence of meniscal injuries in young adults [5,6]. This may be due to high involvement of young persons in sports and other high risk activities. Majority of the patients in the study were males (n=41, 68.3%). Similar results were also reported in other studies [5,8,9]. Greater participation of males compared to females in sports and trauma prone activities may explain the higher proportion of males in the study. Right knee was involved in 32 (53.3%) patients in the study, similar to other studies [5,6,10]. This may be explained by the right dominant population. Majority (n=31, 51.7%) of injury were due to sports injuries followed by road traffic accidents (n=14, 23.3%), similar to previous studies [6,8,11,12]. This also explain the higher prevalence of males and young adults in the study.

Out of the 55 patients found to have meniscal tears in arthroscopy, medial meniscus (n=29, 52.7%) was more involved than lateral meniscus (n=20, 36.4%) in the study. Six (10.9%) patients had both medial and lateral meniscus tears. Previous studies also reported similar results [7,8,12]. Major involvement of medial meniscus could be explained by larger diameter, narrow body, and less mobility due to attachment of medial meniscus to medial collateral ligament and joint capsule. The lateral meniscus is more mobile and is also protected by popliteus muscle and ligament of Wrisberg and Humphrey.

In the present study, Joint line tenderness had a sensitivity of 91.2%, specificity of 80.8% and a diagnostic accuracy of 86.7% for detecting medial meniscal, and a sensitivity of 80%, specificity of 88.6% and diagnostic accuracy of 85% for detecting lateral meniscus tear. Eren OT, in his study involving 104 male patients concluded that joint line tenderness test for lateral meniscus is 89% sensitive, 97% specific and 96% accurate [13]. The rates were lower for medial meniscus,

86%, 67%, and 74% respectively. The difference in rates from our study may be due to selected sample (only males) in the previous study. Diagnostic accuracy for Joint line tenderness was found to be more compared to McMurray or Apley's test in our study. Konan s,et al; also reported superior result for Joint line tenderness [2]. In our study, McMurray's test had a sensitivity of 88.2% , specificity of 73.1% and a diagnostic accuracy of 81.7% for detecting medial meniscal tear, and a sensitivity of 79.2%, specificity of 86.1% and diagnostic accuracy of 83.3% for detecting lateral meniscus tear. In a retrospective study on 262 knees, Yan R et al; reported a sensitivity of 75.8%, specificity of 76.9% and accuracy of 76% for McMurray test [14]. In the present study, Apley's Grind test reported a sensitivity of 90.9%, specificity of 70.4%, and diagnostic accuracy of 81.7% for medial meniscus tears. Also reported a sensitivity of 80.8%, specificity of 85.3% and accuracy of 83.3% for lateral meniscus tears. Rinonapoli G, et al; in their study on 102 patients reported that McMurray's test had a sensitivity 79.7%, specificity 78.5%, accuracy 79.4%; Apley's test had a sensitivity 83.7%, specificity 71.4%, accuracy 80.3% [15]. The results of MRI gave similar results: sensitivity 78.3%, specificity 85.7% and accuracy 80.3%. These results are similar to our results. Also their results show that clinical test results are akin to MRI in detecting meniscal tears. Speziali A, et al; in their study on acute meniscal tears combined with anterior cruciate ligament (ACL) injury reported a specificity of 63.5% and 46.0%, sensitivity of 74.4% and 77.3% and an accuracy of 70.3% and 65.5% for medial meniscus and lateral meniscus tears respectively [16]. The low rates compared to our study may be due to associated ACL injuries in their study. Felli L, et al [6]; in their research

on comparison of clinical, MRI and arthroscopic assessments of meniscal tears concluded that there is no differences in clinical and MRI evaluations in the diagnosis of meniscal injuries.

Conclusion

The three clinical diagnostic tests, Joint line tenderness, McMurray's test and Apley's Grind test, show reliable diagnostic accuracy for meniscus tears. They can provide sufficient information for treatment decision and can be used as screening tests for diagnosing and excluding meniscal tears. Among the clinical tests highest accuracy was for Joint line tenderness test.

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