

## Mcmurray Test for Diagnosis of the Meniscal Tears

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### ABSTRACT

**Aim:** Meniscal tears are the most common injury of the knee. Tears of medial meniscus are seen more frequently as compared to lateral meniscus. Most often tears result from sports injuries where there is a twisting motion on the partially flexed, weight-bearing knee. As majority of our population resides in peripheries where access to arthroscopy and imaging modalities is difficult so we need a clinical test for evaluation of medial meniscal tears. And then this technique can be opted in our practice for early diagnosis of meniscal tears in order to take proper management for reducing morbidity of these particular patient, if its diagnostic accuracy comes out to high.

**Objective:** To determine the diagnostic accuracy of McMurray test in diagnosing medial meniscal tears, taking arthroscopy as gold standard.

**Materials and Methods:** This Cross-sectional validation study was carried out in Orthopedic Department of Medical Teaching Institute Lady Reading Hospital Peshawar from July 2021 to June 2023. In this study a total of 149 patients were observed. McMurray test was performed by the a single and same consultant and was looked for medial meniscal tear (present/absent). After this arthroscopy was done in each patient by the consultant orthopedic surgeon who has examined the patient and presence or absence of medial meniscal tear was noted. McMurray test results were compared with arthroscopy result.

**Results:** In this study mean age was 30 years with SD  $\pm$  11.35. Eighty five percent patients were male and 15% patients were female. Diagnostic accuracy of MacMurray Test findings taking arthroscopy as gold standard was analyzed as the sensitivity was 76.55%, specificity was 75%, Positive predictive value was 99.10%, Negative predictive value was 8.10%. So, the overall diagnostic accuracy was 76.51%.

**Practical Implication:** As in our setups majority of population resides in peripheries where access to arthroscopy and magnetic resonance imaging is difficult so there is a need of clinical test for diagnosing medial meniscal tears. And this technique can be opted in routine practice for early diagnosis of medial meniscal tears in order to take proper management for reducing morbidity of these particular patients after determining the sensitivity and specificity of the test.

**Conclusion:** This study concludes that the McMurray test had sensitivity 76.55%, specificity 75%, Positive predictive value 99.10%, Negative predictive value 8.10% and the diagnostic accuracy 76.51% in diagnosis of meniscal tear keeping knee arthroscopy as gold standard.

**Keywords:** Arthroscopy, Knee, McMurray test, Meniscal tear, Magnetic resonance imaging.

### INTRODUCTION

The most common injuries of the knee are meniscal tears. Tears of the medial meniscus are seen more frequently as compared to lateral meniscus, with a ratio of approximately 2:1<sup>1</sup>. In younger individuals' meniscal tears most often occur due to acute knee injuries while in older people it may be due to degenerative process. The acute tears frequently result from sports injuries where there is a twisting motion on the partially flexed, weight-bearing knee<sup>2</sup>. Tears of the medial meniscus can be diagnosed with proper detailed history, physical examination and appropriate diagnostic tests. The mechanism of injury and the onset and duration of symptoms are often clues to the diagnosis<sup>3</sup>. Arthroscopy is widely considered the gold standard in the assessment of meniscal tears, with evidence suggesting magnetic resonance imaging (MRI) is the most accurate non-invasive investigation for detecting meniscal injuries<sup>4</sup>. The diagnostic value of MRI has however been questioned, particularly when used in isolation. This, together with the high cost of MRI, means physical examination tests have a particularly important role to play in the detection of meniscal injuries in clinical practice<sup>5</sup>. Numerous such tests have been developed; however, there is on-going controversy regarding their diagnostic value<sup>5,6</sup>. Of all the meniscal tests available the McMurray test is thought to be the most widely used. This test, first described in 1940, involves the examiner applying a valgus/varus stress and external/internal rotation to the patient's knee during passive knee extension<sup>7</sup>. In a study, the prevalence of medial meniscal tear was found to be 45.16% and the sensitivity, specificity, positive predictive value, negative

predictive value and accuracy for McMurray's test for diagnosing medial meniscus tear were 54%, 79%, 68%, 67.50% and 67.74% respectively<sup>8</sup>. In another study, the McMurray test had a specificity of 91% and a sensitivity of 51%<sup>9</sup>. One more study has shown that the McMurray test had a specificity of 37% and a sensitivity of 69%. Although previously studies are available on this topic but all these studies have shown variable results, so we have conducted this study to for a uniform result about the diagnostic accuracy of McMurray test in diagnosing medial meniscal tears, taking arthroscopy as gold standard.

This study is a useful addition to the existing literature that provide us the local statistics. As in our setups majority of population resides in peripheries where access to arthroscopy and magnetic resonance imaging is difficult so there is a need of clinical test for diagnosing medial meniscal tears. And this technique can be opted in routine practice for early diagnosis of medial meniscal tears in order to take proper management for reducing morbidity of these particular patients after determining the sensitivity and specificity of the test.

### MATERIAL AND METHODS

This Cross-sectional validation study was carried out in Orthopedic Department of Medical Teaching Institute Lady Reading Hospital Peshawar from July 2021 to June 2023. In this study a total of 149 patients were observed. McMurray test was performed by the a single and same consultant and was looked for medial meniscal tear (present/absent). Non-probability, consecutive sampling technique was used in this study. Patients with clinical suspicion of

medial meniscal injury with duration of symptoms for >2 weeks have Age range of 20-60 years of either gender were included in the study while Patients with previous history of kneesurgery, Patients with open traumatic wound on knee, Patients with fracture of femur or tibia (assessed on x-ray) and Patients with non-traumatic meniscal injury were excluded from the study.

After approval from institutional ethical review committee, total number of 149 patients presented to the outpatient Orthopedic Department of Medical Teaching Institute Lady Reading Hospital Peshawar from September 2021 to August 2023, fulfilling the inclusion criteria was selected. After taking informed consent from the patient, McMurray test was performed by the a single and same consultant and was looked for medial meniscal tear (present/absent). After this arthroscopy was done in each patient by the consultant orthopedic surgeon who has examined the patient and presence or absence of medial meniscal tear was noted. McMurray test results were compared with arthroscopy result. All the data were recorded on a specially designed proforma analyzed through computer software SPSS 20.0. Age, duration of symptoms, height, weight and BMI was presented as mean and standard deviation. Gender and medial meniscal tear on McMurray test and arthroscopy (present/absent). 2x2 contingency table were used to calculate the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of McMurray test in diagnosing medial meniscal tear, taking arthroscopy as gold standard. Effect modifiers like age, gender, BMI and duration of symptoms. Post-stratification 2x2 contingency table was used to calculate the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of McMurray test in diagnosing medial meniscal tear, taking arthroscopy as gold standard.

Table 1: Post-Stratification 2x2 Contingency Table for Sensitivity and Specificity

		Medial Meniscal Tear on Arthroscopy	
		Yes	No
McMurray Test	Positive	True Positive(a)	False Positive(b)
McMurray Test	Negative	False Negative(c)	True negative(d)

Sensitivity:  $a / a+c \times 100$

Specificity:  $d / b+d \times 100$

Positive predictive value:  $a / a+b \times 100$

Negative predictive value:  $d / c+d \times 100$

Diagnostic accuracy:  $a+d / a+b+c+d \times 100$

## RESULTS

In this study age distribution among 149 patients was analyzed as 54(36%) patients were in age range 20-30 years, 47(32%) patients were in age range 31-40 years, 30(20%) patients were in age range 41-50 years, 18(12%) patients were in age range 51-60 years. Mean age was 30 years with SD  $\pm$  11.35. (as shown in Table No 1)

Gender distribution among 149 patients was analyzed as 127(85%) patients were male and 22(15%) patients were female. (as shown in Table No 2)

Duration of symptoms among 149 patients was analyzed as 86(58%) patients had duration of symptoms <1 months, 63(42%) patients had duration of symptoms >1 months. Mean duration of symptoms was 1 month with SD  $\pm$  1.38. (as shown in Table No 3)

Status of BMI among 149 patients was analyzed as 67(45%) patients had BMI  $\leq$ 25 Kg/m<sup>2</sup>, 82(55%) patients had BMI >25 Kg/m<sup>2</sup>. Mean BMI was 25 Kg/m<sup>2</sup> with SD  $\pm$  3.78. (as shown in Table No 4)

Arthroscopy findings among 149 patients were analyzed as Arthroscopy findings were positive in 145(97%) patients and was negative in 4(3%) patients. (as shown in Table No 5)

McMurray Test findings among 149 patients were analyzed as McMurray Test findings were positive in 112(75%) patients and was negative in 37(25%) patients. (as shown in Table No 6)

Diagnostic accuracy of McMurray Test findings taking arthroscopy as gold standard was analyzed as the sensitivity was 76.55%, specificity was 75%, Positive predictive value was

99.10%, Negative predictive value was 8.10%. So the overall diagnostic accuracy was 76.51%.

Stratification of diagnostic accuracy of MRI with respect to age and gender is given in table no 6.

Table 2: Age Distribution (n=149)

Age	Frequency	Percentage
20-30 years	54	36%
31-40 years	47	32%
41-50 years	30	20%
51-60 years	18	12%
Total	149	100%

Mean age was 30 years with SD  $\pm$  11.35

Table 2: Gender Distribution (n=149)

Gender	Frequency	Percentage
Male	127	85%
Female	22	15%
Total	149	100%

Table 3: Duration of Symptoms (n=149)

Duration	Frequency	Percentage
$\leq$ 1 month	86	58%
> 1 month	63	42%
Total	149	100%

Mean duration of symptoms was 1 month with SD  $\pm$  1.38.

Table 4: Basal Metabolic Index (n=149)

BMI	Frequency	Percentage
$\leq$ 25 Kg/m <sup>2</sup>	67	45%
> 25 Kg/m <sup>2</sup>	82	55%
Total	149	100%

Mean BMI was 25 Kg/m<sup>2</sup> with SD  $\pm$  3.78

Table 5: Meniscal Tears on Arthroscopy (n=149)

Arthroscopy	Frequency	Percentage
Positive	145	97%
Negative	4	3%
Total	149	100%

Table 6: Meniscal Tears on Magnetic McMurray Test (n=149)

McMurray Test	Frequency	Percentage
Positive	112	75%
Negative	37	25%
Total	149	100%

Table 7: McMurray Test vs Arthroscopic Findings (n=149)

		Arthroscopic findings		Total
		Positive	Negative	
McMurray Test	Positive	A111	B1	112
	Negative	C34	D3	37
Total		145	4	149

Sensitivity=76.55% Specificity = 75%

Positive predictive value = 99.10% Negative predictive value = 8.10%

Diagnostic accuracy = 76.51%

## DISCUSSION

The most common injury of the knee is meniscal tears. Tears of the medial meniscus are more frequent as compared to lateral meniscus, with a ratio of approximately 2:1.<sup>1</sup> In younger population meniscal tears are mostly due to acute knee injuries while in older individual it is due to degenerative condition of the knee. The acute tears frequently result from sports injuries where there is a twisting motion on the partially flexed, weight-bearing knee.<sup>2</sup> Tears of the meniscus can frequently be diagnosed with the help of proper detailed history, physical examination and appropriate investigations. Mechanism of injury, onset, duration and severity of symptoms are often clueing to the diagnosis.<sup>3</sup>

In this study mean age was 30 years with SD  $\pm$  11.35. Eighty five percent patients were male and 15% patients were female. Diagnostic accuracy of MacMurray Test findings taking arthroscopy as gold standard was analyzed as the sensitivity was 76.55%, specificity was 75%, Positive predictive value was

99.10%, Negative predictive value was 8.10%. So the overall diagnostic accuracy was 76.51%.

In another study conducted by Gupta Y et al<sup>11</sup> had reported that the prevalence of medial meniscal tear was found to be 45.16% and the sensitivity, specificity, positive predictive value, negative predictive value and accuracy for McMurray's test for diagnosing medial meniscus tear were 54%, 79%, 68%, 67.50% and 67.74% respectively.

Our study correlate with another study conducted by Mirzatolooei F et al<sup>12</sup> in which McMurray test had a specificity of 91% and a sensitivity of 51% and the overall diagnostic accuracy was 90%

In another study conducted by Goossens P et al<sup>13</sup> had reported that A total of 593 patients were included, of whom 493 (83%) had a meniscal tear, as determined by the arthroscopic examination. The Thessaly test had a sensitivity of 64% (95% confidence interval [CI]: 60%, 68%), specificity of 53% (95%CI:43%, 63%), positive predictive value of 87% (95% CI: 83%,90%),negative predictivevalueof23%(95%CI:18%,29%),andpo sitiveand negative likelihood ratios of 1.37 (95% CI: 1.10, 1.70) and 0.68(95% CI: 0.59, 0.78), respectively. The combination of positive Thessaly and McMurray tests showed a sensitivity of 53% and specificity of 62%.

Similar results were observed in another study conducted by Rinonapoli G et al<sup>14</sup> in which McMurray's test: sensitivity 79.7%, specificity 78.5%, accuracy 79.4%, positive likelihood ratio 3.7, negative likelihood ratio 0.2. Apley's test: sensitivity 83.7%, specificity 71.4%, accuracy 80.3%, positive likelihood ratio 2.9, negative likelihood ratio 0.2. The composite assessment is strictly dependent on how the discordance of the two tests is evaluated. The assessment of the clinical tests was done even in relation to medial or lateral meniscal lesion. No statistical difference was found about the length of the meniscal tear. MRI gave the following results: sensitivity 78.3%, specificity 85.7%, accuracy80.3%.

A meta-analysis conducted by Hegedus EJ et al<sup>15</sup> had examined pooled sensitivity and specificity for the McMurray test(sensitivity, 70%; specificity, 71%), the Apley test (sensitivity, 60%; specificity, 70%), and the joint-line tenderness test (sensitivity, 63%; specificity, 77%).These authors concluded that these tests are not diagnostically accurate when used in isolation. Due to lack of data, the pooled sensitivity and specificity could not be examined for the Thessaly test. This study shows comparable diagnostic accuracy for the Thessaly test used in isolation compared with the pooled sensitivity and specificity of the other meniscal tests.

## CONCLUSION

Our study concludes that the McMurray test had sensitivity 76.55%, specificity 75%, positive predictive value 99.10%, negative predictive value 8.10% and the diagnostic accuracy

76.51% in diagnosis of meniscal tear keeping knee arthroscopy as gold standard.

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