

# Accuracy of Clinical Examination and MRI for Meniscal Injuries of Knee Joint Taking Arthroscopy as the Gold Standard

MRI for Knee Joint Injuries before Arthroscopy

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## ABSTRACT

**Objective:** To determine the accuracy of clinical examination versus magnetic resonance imaging (MRI) for meniscal injuries of knee joint taking arthroscopy as the gold standard.

**Study Design:** Cross sectional study

**Place and Duration of the Study:** This study was conducted at the Department of Orthopedic and Spine Surgery from January to June 2019.

**Materials and Methods:** A total of 178 patients with knee injury were enrolled who were candidates for arthroscopy. Prior to MR I and arthroscopy, a detailed physical examination of the affected knee was done following with preliminary diagnosis. Findings of arthroscopy were taken as the definitive diagnosis and findings of the physical examination and MRI were compared.

**Results:** The mean age of the patients was 25.94±7.16. Among all those cases 119(66.5%) were male while 59(33.5%) were female cases. Meniscal injury was detected by MRI in 111(65.3%) of cases while it was undetected in 59(34.7%) of cases. On other hand meniscal injury was detected by clinical examination in 115(64.1%) and not detected in 63(35.9%) of cases. But arthroscopy detected meniscal injury in 113(63%) of cases while it remains undetected in 62(37%) of cases. Clinical examination had a sensitivity of 77% , specificity of 54% and diagnostic accuracy of 78% while MRI had the sensitivity of 86%, specificity of 73% and diagnostic accuracy of 81%.

**Conclusion:** No significant difference was observed between the accuracy of clinical examination and MRI regarding the diagnosis of meniscal tears. MRI, other than specific circumstances, is an expensive and unnecessary diagnostic test in patients with suspected meniscal pathology.

**Keywords:** Meniscal teas, arthroscopy, magnetic resonance imaging, clinical examination.

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## INTRODUCTION

Soft tissue injuries of the knee including meniscal and cruciate injuries are frequently seen by orthopedic surgeons. The meniscus is a very important structure of the knee joint. It has key functions like load transmission, shock absorption and stress reduction.<sup>1</sup>Treatment of meniscal and cruciate ligament injuries accurately is of prime importance not only for the normal function of knee but also to prevent complication like osteoarthritis.<sup>2</sup>

The overall incidence of meniscal injury in knee trauma is 76%.<sup>3</sup>In the past, injuries of the soft tissues of the knee were evaluated clinically which had its own pitfalls. Invention of MRI and arthroscopy revolutionized the diagnosis and treatment of such injuries.<sup>4</sup> Initially emphasis was placed in determining the diagnostic accuracy of MRI alone which was of course high and this lead to a false impression of requiring MRI in almost every case of suspected knee injury.<sup>5</sup>

Schurz et al. noted MRI to be more accurate in diagnosing medial and lateral meniscus injuries as compared to clinical examination (83% & 83% vs. 55% & 64% respectively) with better sensitivity (93% & 66% vs. 62% & 22% respectively) and specificity (65% & 90% vs. 45% & 78%).<sup>6</sup> Similar results were achieved by Nikolaou et al and Gupta et al.<sup>7,8</sup> Reciprocal results were however achieved by Ryan et al. However the difference was only marginal in case of lateral meniscus and cruciate tears.<sup>9</sup> Similar results were achieved by Siddiqui et al. in 2012.<sup>10</sup>

Doubt thus exists about the accuracy of clinical examination and MRI for diagnosing knee injuries. The

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purpose of this study is therefore to confirm whether clinical examination is better or at least equally accurate in knee injuries as compared to MRI which if found true will provide a quick, cheap and effective way of patient assessment in future limiting the use of MRI only in difficult cases thus reducing economic burden on the society.

**MATERIALS AND METHODS**

This cross sectional study was conducted at “Department of Orthopedic and Spine Surgery, Sughra Shafi Medical Complex, Narowal” from January to June 2019. Approval from the Institution’s Review Board was sought. A total of 178 patients of both genders aged 18-45 years and presenting with history of sports or accidental knee injury were enrolled. Informed consent was sought from all study participants. All patients with history of previous knee surgery or arthroscopy, or those who had degenerative changes on X-rays of knee joint assessed clinically were excluded. All the patients had clinical as well as MRI evaluation prior to arthroscopy. Details were recorded regarding findings on clinical examination, MRI and arthroscopy. Clinical Examination included history and examination namely suggestive symptoms (including pain, swelling, limited motion, locking, and clicking) and clinical tests (Mc Murray Test). All the data was entered into specially designed template. Findings of arthroscopy were taken as definitive diagnosis while observations of physical examination and MRI were compared subsequently. All the cases were managed by senior consultant of the unit to eliminate bias. All the collected data was analyzed using SPSS version 26.0. Numerical variables i-e age was presented by mean ±SD and range. Categorical variables i-e gender, meniscal and cruciate tear were presented as frequency and percentage. A 2x2 contingency table was generated to calculate sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of clinical examination & MRI in the detection of cruciate and meniscal injury by taking arthroscopy as gold standard.

**RESULTS**

In a total of 178 patients, mean age was 25.94±7.16 years. Among all these cases, 119 (66.5%) were male while 59(33.5%) were female. Meniscal injury was detected by MRI in 117 (65.3%) cases while it was undetected in 61(34.7%) of cases. On other hand, meniscal injury was detected by clinical examination in 115 (64.1%) cases and undetected in 63 (35.9%) cases. Arthroscopy detected meniscal injury in 113 (63%) cases while it remained undetected in 65 (37%) of cases.

It became clear by 2x2 contingency table that clinical examination has a sensitivity of 77%, specificity of 54% and diagnostic accuracy of 78% (Table No.1):

MRI had sensitivity of 86%, specificity of 69% and diagnostic accuracy of 81% (Table No.2).

**Table No.1: Meniscal injury on clinical examination keeping Arthroscopy as Gold standard**

Meniscal Injury on Clinical Examination	Meniscal Injury on Arthroscopy		Total
	Detected	Not Detected	
Detected	85 (73.9%)	30 (26.1%)	115 (100%)
Not Detected	28 (42.4%)	35 (57.6%)	63 (100%)
Total	113 (62.9%)	65 (37.1%)	178 (100%)
Sensitivity = 77%      Specificity = 54%			
PPV = 74%              NPV = 58%			
Accuracy = 78%			

**Table No.2: Diagnostic accuracy of MRI keeping arthroscopy as gold standard**

Meniscal Injury on Clinical Examination	Meniscal Injury on Arthroscopy		Total
	Detected	Not Detected	
Detected	97 (82.9%)	20 (17.0%)	117 (100%)
Not Detected	16 (26.2%)	45 (73.7%)	61 (100%)
Total	113 (62.9%)	65 (37.1%)	178 (100%)
Sensitivity = 86%              Specificity = 69%			
PPV = 83%                      NPV = 74%			
Accuracy = 78%			

**DISCUSSION**

Diagnostic arthroscopy is considered to be the only possible tool for giving an exact diagnosis in doubtful cases.<sup>11</sup> It is costly and invasive technique. Its unyielding use leads to many additional complications like injury to intra-articular structures, neurovascular lesions and infection. With the advancement of surgical techniques and arthroscopy tools, arthroscopy has evolved as surgical modality rather than a diagnostic service. We noted a male predominance among patients with meniscal injuries of knee joint as 66.8% patients were male whereas 70% of the patients were aged between of 20–40. The male predominance and majority having relatively young age shows that these injuries are more common among young males. Negative predictive value of MRI in this study is 74% meniscal tears. We had initially ruled out arthroscopy in 27/57 referred patients with the help of MRI. All this is depicting that pre-operative MRI can help preventing needless diagnostic arthroscopy among many of these cases. In another study, among these 69 cases waiting for arthroscopy, MRI ruled out lesions in 24 and helped

is removing these cases from waiting list. After nine months, only one patient was relisted for arthroscopy due to continued symptoms.<sup>12</sup> Some other researchers have also noted similar observations. Contrary to that, some researchers have not found routine usage of MRI very effective among patients of meniscal injuries. Brooks and Colleagues concluded that MRI was not found to reduce negative arthroscopic procedures among patients of meniscal injuries.<sup>13</sup> As we know that in a country like Pakistan, MRI is taken as an expensive tool for the majority but cost of arthroscopy is much higher. Some authors have also analyzed whether preoperative MRI could prove economical among patients waiting for arthroscopy and concluded that performing MRI could have saved around 680 US dollars for every single case.<sup>14</sup> We also found MRI really helpful in ruling out arthroscopy which showing the worth of this tool as found by other local researchers as well.<sup>15</sup>

Recent data also shows that clinical examination when done by an experienced examiner, can provide equal or even better diagnostic accuracy in comparison to MRI regarding evaluation of the meniscal lesions.<sup>16</sup> We feel that as arthroscopy is an invasive and quite expensive procedure, thorough clinical examination needs to be done initially and if needed, MRI should be ordered.<sup>17</sup> As for majority of the population, cost of MRI scan could be high, so clinical examination has almost equal sensitivity and specificity hence an additional financial burden of MRI can be avoided and patient can be directly offered arthroscopy. As far as limitations of this study are concerned, we had a comparatively smaller sample size so findings of this research cannot be generalized. More studies involving multiple centers and among different sets of population can further verify the findings of this study.

## CONCLUSION

No significant difference was observed between the accuracy of clinical examination and MRI regarding the diagnosis of meniscal tears. MRI, other than specific circumstances, is an costly and avoidable diagnostic tool among cases having suspected meniscal pathology.

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### Author's Contribution:

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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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