The Accuracy of Joint Line Tenderness in the Diagnosis of Meniscal Tears

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ABSTRACT

The accuracy of joint line tenderness in the diagnosis of meniscal tears was assessed in 129 knees. Arthroscopy was performed in each case to establish the diagnosis. The diagnosis was correct in 100 knees (77.5%) and incorrect in 29 (22.5%). A preoperative diagnosis of a medial meniscal tear was made in 63 knees and confirmed in 46 (73%) at arthroscopy. There were 46 true-positive, 17 false-positive, four false-negative and 62 true-negative results for the medial side. A lateral meniscal tear was suspected in 45 knees and confirmed in 39 (86.7%). Thus, 39 true-positive, six false-positive, two false-negative, and 82 true-negative interpretations were found. In this study, joint line tenderness as a test for lateral meniscal tears was accurate (93%), sensitive (95%), and specific (93%), but for medial tears the rates were lower.

Precisión del Dolor en la Línea de la Articulación en el Diagnóstico del Desgarro Meniscal

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RESUMEN

La precisión del dolor en la línea de la articulación a la hora de hacer el diagnóstico del desgarro meniscal fue evaluada en 129 rodillas. En cada uno de los casos se realizó una artroscopia a fin de determinar el diagnóstico. El diagnóstico fue correcto en 100 rodillas (77.5%) e incorrecto en 29 (22.5%). Se llevó a cabo un diagnóstico preoperatorio del desgarramiento meniscal medial en 63 rodillas, confirmado en 46 (73%) por artroscopia. Hubo 46 resultados verdadero-positivos, 17 falso-positivos, 4 falso-negativos y 62 verdadero-negativos para el lado medial. Se sospechó un desgarro meniscal lateral en 45 rodillas, y se confirmó en 39 (86.7%). Por consiguiente, se hallaron 39 interpretaciones verdadero-positivas, 6 falso-positivas, 2 falso-negativas, y 82 verdadero-negativas. En este estudio, el dolor en la línea de la articulación como prueba para el desgarro meniscal lateral fue preciso (93%), sensible (95%), y específico (93%), pero para el desgarro medial los índices fueron más bajos.

INTRODUCTION

Meniscal tears occur commonly, and yet the precise clinical diagnosis of the tear is not always possible, even for the experienced orthopaedic surgeon. A thorough patient history and physical examination are essential for the diagnosis of meniscal disease. The diagnosis can be made accurately 75% of the time on the basis of history taking alone (1, 2). In addition to a carefully taken history, the physical examination remains the standard method for confirmation of a meniscal tear.

Various physical diagnostic tests are available to assess meniscal lesions, such as evaluation of joint effusion and joint line tenderness, the McMurray test, the Apley compression test, the squat test and block to extension (3–9). Fowler and Lubliner (9) reported that the McMurray test is highly specific in detecting pathologic meniscii when combined with a block to extension. However, other studies show the limitations of the McMurray test (8, 10). The Apley compression and distraction tests correlate poorly with meniscal lesions (6, 9). The squat test is the most useful provocative manœuvre to distinguish meniscal pain from patello-femoral pain (11). Joint line tenderness is the most accurate clinical sign of a meniscal tear and is present in 77% to 86% of the cases (10, 12).

Fowler and Lubliner (9) noted a definite correlation between joint line tenderness and meniscal pathology. In their study of 161 knees, 125 patients had joint line tenderness. The sensitivity was 85% and the specificity was 29.4%. Patients with all derangements of the knee were included in

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their study. Anderson and Lipscomb (10) boasted an 87% correct diagnosis rate, but they excluded patients with anterior cruciate ligament pathology.

The correlation of joint line tenderness and meniscal lesions in patients with acute anterior cruciate ligament (ACL) tears was studied by Shelbourne *et al* (13). They noted that medial joint line tenderness was 44.9% sensitive and 34.5% specific in predicting medial meniscal injury. Lateral joint line tenderness was 57.6% sensitive and 49.1% specific in predicting lateral meniscal injuries. They concluded that the presence or absence of joint line tenderness in patients with an acute ACL tear is not a reliable criterion to predict the likelihood of an associated meniscal tear. However, the accuracy data for joint line tenderness is not available for prediction of meniscal lesions with chronic ACL injuries.

Arthroscopy of the knee is a safe and reliable method of diagnosing intra-articular pathologies and the reported accuracy exceeds 90% (14–17). Magnetic Resonance Imaging (MRI) has surpassed arthrography in popularity because of its non-invasiveness and high accuracy (93% to 98% for medial tears and 90% – 96% for lateral tears) (18).

Although joint line tenderness is one of the best known and easiest tests to perform, its accuracy has not been widely reported in the literature. In a meta-analysis, Scholten *et al* (19) reported that the accuracy of assessment of joint line tenderness in the diagnosis of meniscal tears was determined in only nine studies that met the selection criteria.

The purpose of this study was to report the accuracy, sensitivity, specificity, and predictive values of joint line tenderness in the diagnosis of medial and lateral meniscal tears.

SUBJECTS AND METHODS

From 1989 to 2004, 600 patients with suspected meniscal tears underwent arthroscopy. The charts of all 600 patients were reviewed but only 129 patients were included in the study. The inclusion criteria were a definite history of trauma, no ligamentous laxity or instability, normal plain radiographs of the knee, and knee pain or retropatellar pain even if there was no joint line tenderness. Patients 45 years and younger were included in this study. The age range was 14 to 45 years with a mean of 31.5 years. Of the 129 patients, 98 were males and 31 females. The right knee was involved in 79 patients and the left in 50 patients. The mean time delay from trauma to surgery was 19.3 months with a range from 12 days to 12 years. A thorough history and physical examination were performed on each patient. All patients were examined at least twice, once when first seen clinically and again a few days prior to surgery. The study was based on the results of the last visit prior to surgery. The author performed all clinical examinations. Each patient was examined for joint line tenderness with the knee flexed at 90°, pain on forced flexion of the knee, and the presence of a block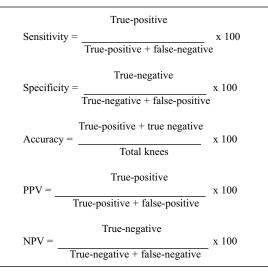 to extension. The McMurray test was also performed on all patients while the squat test was performed on the majority of patients. Only 50% of the patients had physical therapy prior to surgery. The Lachman and varus and valgus stress tests were performed with the knee flexed between 20° and 30°. Patients who tested positive were excluded from the study. Each patient signed an informed consent prior to surgery. Under anaesthesia, ligamentous stability was again evaluated.

The author performed each arthroscopic procedure. A meniscal injury was called a tear if any one of the four conditions existed:

- a defect extending vertically from the upper to lower surface of the meniscus,
- a complete detachment at the meniscal-capsular junction,
- a defect extending horizontally from the central portion of the meniscus peripherally,
- a defect extending radially from the central portion of the meniscus peripherally.

Arthroscopy is considered the gold standard for the accurate diagnosis of internal derangements of the knee, therefore the accuracy, sensitivity, specificity and positive and negative predictive values for joint line tenderness were based on arthroscopic findings. A number of definitions were used to calculate the percentages of patients with or without each lesion. A true-positive result was defined as positive joint line tenderness at the medial or lateral joint line and a corresponding meniscal tear confirmed at arthroscopy. A true-negative result was the absence of joint line tenderness and no meniscal tear at arthroscopy. The result was considered false-positive when joint line tenderness was present but no meniscal tear was found at arthroscopy. A false-negative result was defined when joint line tenderness was not present but a meniscal lesion was found. Calculation methods are shown in Table 1.

Table 1: Calculation methods of sensitivity, specificity, accuracy, positive predictive value and negative predictive value

$$\text{Sensitivity} = \frac{\text{True-positive}}{\text{True-positive + false-negative}} \times 100$$

$$\text{Specificity} = \frac{\text{True-negative}}{\text{True-negative + false-positive}} \times 100$$

$$\text{Accuracy} = \frac{\text{True-positive + true negative}}{\text{Total knees}} \times 100$$

$$\text{PPV} = \frac{\text{True-positive}}{\text{True-positive + false-positive}} \times 100$$

$$\text{NPV} = \frac{\text{True-negative}}{\text{True-negative + false-negative}} \times 100$$

PPV= Positive predictive value; NPV= negative predictive value

RESULTS

Of 129 knees, the diagnosis was correct in 100 knees (77.5%) and incorrect in 29 (22.5%). A total of 50 medial meniscal tears and 41 lateral meniscal tears were identified at arthroscopy.

A preoperative diagnosis of a medial meniscal tear was made in 63 knees and confirmed in 46 (73%) at arthroscopy. Sixty-six patients showed no medial joint line tenderness, but four had a medial meniscal tear. Thus, 46 true-positive, 17 false-positive, 4 false-negative and 62 true-negative results for the medial side were found. Of the 46 correctly diagnosed medial meniscal tears, 38 were isolated. Other pathologies included seven chondromalacia of the medial femoral condyle and one chondromalacia of the patella.

A lateral meniscal tear was suspected in 45 knees and confirmed in 39 (86.7%). Eighty-four patients showed no joint line tenderness, but two lateral meniscal tears were seen at arthroscopy. Thus 39 true-positive, six false-positive, two false-negative and 82 true-negative interpretations were found. Of the 39 correctly diagnosed lateral meniscal tears, 29 were isolated. The other pathologies included six chondromalacia of the lateral femoral condyle, two torn anterior cruciate ligaments, and two chondromalacia patellae.

DISCUSSION

DeHaven and Collins (2) reported four cases with a preoperative clinical diagnosis of meniscal tears in which ACL lesions were noted at arthroscopy. However, the test used for detecting ACL rupture and the reason why the tears were not identified by clinical examination were not mentioned in the text. The author used a Lachman Test for diagnosing ACL rupture and missed two ACL lesions that were identified under anaesthesia. Eren (20) identified six ACL lesions at anaesthesia. Clinical examination of ACL injury with a displaced bucket-handle tear may reveal a stable knee (21). This could be the main reason for missing these ACL lesions. The other possible factor was that, in the present study, the two ACL lesions which were missed were in athletic men with muscular bodies.

Four patients with chondromalacia of the medial femoral condyle and one with chondromalacia of the lateral femoral condyle were misdiagnosed as having medial meniscal tears. Three patients with chondromalacia of the lateral femoral condyle and one patient with chondromalacia of the medial femoral condyle were misdiagnosed as having tears of the lateral meniscus. The absence of nerve fibres in articular cartilage is possibly the reason chondral lesions are most often mistaken for meniscal tears.

Chondromalacia patella correlates poorly with the presence of joint line tenderness. Eren (20) found that in three patients with chondromalacia patellae, joint line tenderness was present. However, three meniscal tears were misdiagnosed as chondromalacia patella. In this study, there were three cases of chondromalacia patellae associated with

meniscal lesions. There was one meniscal tear which was misdiagnosed as chondromalacia patella.

There were six false-negative results. Four tears were in the medial meniscus, and two in the lateral meniscus. In four of these patients, the delay from trauma to surgery was two, four, five and twelve years. In the other two cases, the symptoms were four weeks and three months.

Thirteen patients with no abnormalities at arthroscopy were misdiagnosed preoperatively. Eight patients were diagnosed as having meniscal tears while five patients were suspected of having chondromalacia patellae. Five patients with unsuspected lateral meniscal tears had medial joint line tenderness.

Specificity reflects the ability of the test to determine correctly that a lesion is not present. The greater the specificity, the more likely it is that patients who do not have the lesion will be excluded by the test. In this study, joint line tenderness for the lateral side was shown to have a specificity of 93% (Table 2). Eren (20), Steinbruck and Wiehmann (6),

Table 2:   Validity of joint line tenderness is different for medial and lateral sides

Measure	Medial side	Lateral side
Sensitivity	92%	95%
Specificity	78%	93%
Accuracy	83%	93%
PPV	73%	86%
NPV	93%	97%

Abdon *et al* (3), and Boeree and Ackroyd (5) also found high rates of specificity of 97%, 91%, 95% and 87% respectively. Rates were lower for the medial side at 67%, 62%, 56%, and 68% respectively. Specificity for the medial side was 78% in this study. Sensitivity reflects the ability of a test to detect an abnormality. Eren (20), Shelbourne *et al* (13) and Abdon *et al* (3) found sensitivity rates of 86%, 44.9%, and 78% respectively for the medial side. For the lateral side, rates of 92%, 57.6% and 78%, respectively were found. The author found rates of 92% and 95% for the medial and lateral sides respectively.

Magnetic resonance imaging of the 13 knees in which arthroscopic findings were normal would have reduced the number and cost of surgeries.

The weakness of this paper is that it is a retrospective study and the analysis was by a single investigator. However, Evans *et al* (4) reported that examiner experience had little effect on the accuracy of the McMurray test which is more difficult to perform than a joint line tenderness test.

The author concludes that joint line tenderness as a test for lateral meniscal tears is accurate (93%), sensitive (95%), and specific (93%), but for medial tears the rates are lower. Further studies to evaluate the accuracy of joint line tenderness in diagnosing meniscal tears in patients aged over 45 years would be beneficial.

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