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Orthopedics | Retrospective Study

Study of the efficiency of clinical examination in the diagnosis of meniscal injuries in patients submitted to knee arthroscopy in a University hospital

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Abstract

Objective: The aim of the present study was to evaluate the efficiency of knee physical examination routinely used in orthopedic clinical practice for the diagnose of meniscal injuries. **Methods:** This study was based on a review of medical records of patients submitted to knee arthroscopy to treatment meniscal lesions clinically diagnosed in the Gaffrèe & Guinle University Hospital at the knee outpatient clinic from 2011 to 2013. For the 92 studied patient, 67 were male and 25 female. The mean age of the patients was 30.6 years, standard deviation of 9.5 years. The least evolution of symptoms time was three months and the maximum of 12 months. Fifty-seven patients had lesions of the right meniscus and 35 had left meniscus lesions. All meniscal lesions were investigated by McMurray and Apley clinical tests. For statistical analysis of the evaluation of clinical tests in relation to the videoarthroscopic examination, the following probabilities qualify the exams: False negative (FN), False positive (FP), Total False (FN + FP), Accuracy (A), Sensitivity (S), Specificity (E), Positive Predictive Value (VPP), Negative Predictive Value (VPN), Positive Likelihood Ratio (RLP), Negative Likelihood Ratio (RLN), and the Kappa coefficient of agreement. **Results:** Clinical examinations of knee injuries showed a sensitivity of 95.0% for the lateral meniscus, 100% for the medial meniscus; specificity of 72.2% for the lateral meniscus, 9.5% for the medial meniscus; determining an 77.2% accuracy for the lateral meniscus, 79.3% for the medial meniscus. The McMurray test, on a global and subgroup analysis, was shown to be a better exam than the Apley test for diagnose of meniscal injury. When evaluated by sex, Apley and McMurray tests presented better efficiency in the diagnose of meniscal lesions in male patients. The clinical examination had the same efficiency when used for diagnose of injuries on the right and left knee, when discriminating the meniscus, it was verified that both Apley and McMurray tests had proved efficient for the diagnose of lateral meniscal injury. However, when combined, improves the efficiency for diagnose of medial meniscus injuries. **Conclusion:** Clinical examination of the knee is as an effective diagnostic method for meniscal diseases involving the knee. The Apley and McMurray tests when used together has a synergistic effect and superior efficiency on of the meniscal injury diagnose.

Keywords: Meniscal Injury; Video-Arthroscopy; Apley; McMurray

Introduction

The meniscus is a fibrocartilage, in the shape of the letter "C", which rests on the upper articulated face of the tibia, providing joint congruence and promoting distribution of the applied load, serving as a shock absorber in the tibiofemoral joint. The menisci, lateral and medial, have two projections (anterior and posterior), called meniscal horns, joined by a body. The medial meniscus has a greater anteroposterior diameter than the lateral. A ligament system allows fixation without limiting mobility. The coronary ligaments unite the meniscus with the surface of the tibia. The transverse ligament joins the anterior horns of both meniscus and the tibial collateral and anterior cruciate ligaments attach to the medial meniscus [1]. Menisci were once considered to be vestigial tissue, without any function in the knee, and thus, in the past, no treatment was considered necessary. However, in recent decades, with the increase in information about the importance of menisci, many treatment protocols have been described. Treatment options range from benign neglect to repair [2]. Meniscal injuries (SCI) usually occur in patients who suffer rotational trauma to the knee under axial compression. They can occur in isolation or be associated with ligament injuries and chondral degenerative disorders. They are frequently found in orthopedic practice, with greater prevalence during sports practice [3]. As the population becomes older, the prevalence of degenerative meniscal injuries increases, presenting itself without a specific injury menicanism [4]. Meniscal injuries, especially traumatic lacerations, account for a third of all sports injuries, and for this reason, interest in the treatment of meniscal injuries has increased in the last century [2]. Clinically, the meniscal injury presents with a painful range of motion, tenderness in the joint line, joint effusion, blockage, crackling or trapping are the main symptoms of meniscus injuries. Its diagnosis consists of a good anamnesis, accurate inspection, palpation and specific tests [2]. And when necessary, complementary imaging exams, such as simple radiography of the knee, and especially magnetic resonance imaging, consolidate the assessment of joint injuries in the knees [5]. The posterior horn of the medial meniscus is the most common site of meniscus disorders, with longitudinal ruptures being the most frequent injuries [6]. It is well established in the literature that anamnesis and physical examination are directly related to the diagnosis of SCI [7], being pointed out, by Wagemakers et al. [8], as having a slightly higher value than MRI. Among the tests most used in the diagnosis of SCI, we have the McMurray and Apley test. The aim of the present study was to evaluate the efficiency of specific clinical exams (Apley and McMurray) frequently used in the diagnosis of meniscal injuries of the knee and their real diagnostic value by comparing them with the findings found in patients undergoing knee arthroscopy in a university hospital.

Method

A retrospective study was carried out based on the review of 92 medical records of patients undergoing knee arthroscopy for the treatment of meniscal injuries clinically diagnosed in the knee outpatient clinic of Hospital Universitário Gaffreè e Guinle in the period from 2011 to 2013. The 92 symptomatic patients were evaluated by only the same experienced orthopedic surgeon and member of the Brazilian Society of Knee Surgery in the Orthopedics and Traumatology service of Hospital Universitário Gaffreè e Guinle (HUGG). The sample was evaluated for gender, age, time of evolution, injury laterality, injury mechanism. The exclusion criteria were: previous knee surgery, ligament instability, osteoarthritis, and those for which the medical record data were incomplete for some reason.

Patients underwent physical examination with specific diagnostic maneuvers for meniscal injuries (McMurray and Apley tests). Physical examinations as well as data collection for all patients are standardized routines in the service, being performed in the outpatient setting and without anesthesia.

A physical examination was considered positive for the injury when at least one of the maneuvers was positive, when the patient reported pain at the time of the physical examination. The inclusion criterion in the study was positivity for the Apley test or for the McMurray test, both for the medial meniscus and for the lateral meniscus.

Arthroscopies were performed following the standard routine of the HUGG knee surgery service, with the patients in the supine position, and after aseptic and antiseptic procedures, with placement of surgical drapes. The classic parapatellar, anterolateral and anteromedial portals were used. After the placement of the optics through the lateral parapatellar portal, a routine inspection of the entire joint was performed in all cases, analyzing the medial and lateral compartments (condyles, plateaus and menisci), the intercondylum (crossed ligaments) and finally the joint patellofemoral (patellar and synovial cartilage). After inspection, when necessary, that is, when the presence of a meniscal lesion was found, surgical treatment for lesion correction was performed.

Any type of meniscal injury found during arthroscopy in the patients in the present study was considered a positive finding, regardless of the type and its classification; be radial or longitudinal, simple or complex, traumatic or degenerative, as described in the medical record. Performing both tests, it is understood that if at least one of the tests shows a positive result for the injury, the result is positive for the injury.

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The study was submitted to and approved by the Research Ethics Committee of Hospital Universitário Gaffreè & Guinle, (CAAE: 79102317.3.0000.5258).

The data obtained were filed in a spreadsheet of the MS Office-Excel 2011 program and evaluated by the IBM program, SPSS (Statistical Package for the Social Science), version 22.0. The descriptive analysis was made based on the construction of a graph, frequency distributions, crosstabs and calculation of descriptive statistics (proportions of interest and calculation of the average, median, standard deviation, coefficient of variation - CV). Distribution variability was considered low if CV <0.20, moderate if 0.20≤CV <0.40, and high if CV≥0.40. In Inferential Analysis, to check if there is a significant association between two qualitative variables, the Chi-Square Test was used, or, when this is inconclusive and appropriate, Fisher's Exact Test. In the Inferential Analysis of the Age Variable, the hypothesis of normal distribution was verified by the Shapiro-Wilk Test (SW). Since the hypothesis of normal distribution was not rejected in the groups to be compared, the comparison of the age of the patients in two independent groups, such as, for example, the female and male group, was made using the Student's t-test and the equality of variables, necessary to perform the Student's t-test without correction, was assessed by the Levene test. The maximum level of significance was 5.0%. In the statistical analysis of the efficiency of diagnostic tests, the following statistical relationships that characterize the quality and validation of a Test in relation to a gold standard test were evaluated: accuracy, sensitivity, specificity, false positive, false negative, total false, positive predictive value, negative predictive value, positive likelihood ratio and negative likelihood ratio of the diagnostic tests studied. The agreement between the clinical test under analysis and the respective and the diagnostic examination by video arthroscopy was also analyzed using Cohen's Kappa Coefficient. Details and definitions of the proposed methodology can be found in Medronho et al. (2009) (10) and Pagano, M. & Gauvreau, K. (2004) [11].

Results

This study was based on a sample of 92 symptomatic patients, of which 67 were male (72.8%) and 25 (27.2%) were female, fifty-seven patients (62.0%) reported injuries in the right side and 35 declared lesions on the left side (38.0%). In the sample of symptomatic patients, there was a significant predominance of male patients (p-value = 0.000 from the Binomial test) and injuries on the right side (p-value = 0.028 from the Binomial test). In the global evaluation of the sample, the patients ranged in age from 8 to 56 years, which resulted in an average of 30.6 years, median of 31 years and standard deviation of 9.5 years, (CV = 0.31) showing moderate variability of age. The mean and standard deviation of the age of the patients in each male and female subgroup are shown in Table 1. Age followed a normal distribution in the female and male groups (p-value = 0.308 of the Shapiro Wilk test for the female group and p-value = 0.421 of the Shapiro Wilk test for the male group) and therefore the age distributions in the two groups were compared by parametric tests that did not identify a significant difference between the variances and mean ages of patients in the female and male subgroups (Table 1).

According to video arthroscopy, only 05 (5.4%) patients had no meniscal injury, while 87 patients (94.6%) had SCI, of which 16 had lateral SCI (17.4%), 67 had medial SCI (72.8%) and 4 patients (4.3%) had both meniscus injured. Among the injured patients, there was also a significant predominance of male patients (72.4%; p-value = 0.001 of the binomial test) and of cases with affected right side (63.2%; p-value = 0.017 of the Binomial test). The age of the injured patients ranged from 8 to 56 years, resulting in an average of 30.5 years, median of 31 years and standard deviation of 9.6 years, (CV = 0.31), portraying moderate age variability. Age followed a normal distribution in the female and male groups (p-value = 0.397 from the Shapiro Wilk test for the female group and p-value = 0.466 from the Shapiro Wilk test for the male group) and therefore the age distributions in the two groups were compared by parametric tests that did not identify a significant difference between the variances and mean age of the injured patients in the female and male subgroups (Table 1).

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Table 1: Characteristics of patients

	Total Sample			Only Injured		
Variables	**n**	**(%)**	**p-value**	**n**	**(%)**	**p-value**
Meniscal Lesion	87	94,6%	-	87	100,0%	-
Lateral	16	17,4%		16	18,4%	
Medial	67	72,8%		67	77,0%	
Lateral and Medial	4	4,3%		4	4,6%	
Sex						
Female	25	27,2%	0.000[1]	24	27.6%	0.001[1]
Male	67	72,8%		63	72.4%	
Injury Laterality						
right	57	62.0%	0.028[1]	55	63.2%	0.017[1]
left	35	38,0%		32	36.8%	
Age	**Average± Standard deviation**			**Average± Standard deviation**		
Global	*30.6 ± 9.5*			30.5 ± 9.6		
Female	32.9 ± 9,1		*0.966*[2]	32.4 ± 8.9		*0.768*[2]
Male	29.7 ± 9.6		*0.147*[3]	29.7 ± 9.8		*0.245*[3]

1. p.value of the Binomial test comparing the two proportions. 2. p.value of the Levene test comparing the age variances of the female and male groups. 3. p-value of Student's t-test comparing the mean age of the female and male groups
Source: HUGG

Table 2 shows the prevalence of meniscal injury by sex and side of the injury. The p-values of Fisher's exact tests indicate that there was no significant difference between the prevalence of meniscal injury in the female and male groups and there was no significant difference between the prevalence of meniscal injury in the groups with left and right symptoms.

Table 2: Prevalence of Meniscal Injury among all surgical cases.

Group	Prevalence	p-value
Female	24/25 = 96,0%	1.000[1]
Male	63/71 = 94,0%	
Right	55/57 = 96,5%	1.000[2]
Left	32/35 = 91,4%	

1. p.value of Fisher's exact test evaluating the association between meniscal injury and sex.
2. p.value of Fisher's exact test evaluating the association between meniscal injury and side.
Source: HUGG

Table 3 shows the joint distribution of the global results, without discriminating the meniscus, from the Apley Test with the Meniscus Analysis by Videoarthroscopy. According to the videoarthroscopic examination, the prevalence of meniscus injury in the sample was 94.6% (87 patients), but the prevalence estimated by the Apley test was 88.0% (81 patients). The Apley test concluded 04 false positive cases (4.3%) and 10 (10.9%) false negative cases; the sensitivity

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was 88.5%, the specificity was 20.0% and the accuracy was 84.8%, missing the diagnosis in 15.2% of cases. Thus, the negative predictive value of the Apley test was 9.1%, and the positive predictive value of the test was 95.1%; The positive likelihood ratio was 31.1 and the negative likelihood ratio was 0.6.

Table 3: Joint result of the Apley Test with Videoarthroscopic Meniscus Analysis

Apley Test	Meniscus by Videarthroscopy		total
	No Injured	Injured	
Negative Lesion	1	10	11
Positive Lesion	4	77	81
Total	5	87	92

Source: HUGG

Table 4 shows the joint distribution of the global results, without discriminating the meniscus, from the McMurray Test with the Meniscus Analysis by Videoarthroscopy. According to the videoarthroscopic examination, the prevalence of meniscus injury in the sample was 94.6% (87 patients), but the prevalence estimated by the McMurray test was 91.3% (84 patients). McMurray's test concluded 04 false positive cases (4.3%) and 7 (7.6%) false negative cases; the sensitivity was 92.0%, the specificity was 20.0% and the accuracy was 88.0%, missing the diagnosis in only 12% of cases. Thus, the negative predictive value of the McMurray test was 95.2%, and the positive predictive value of the test was equal to 12.5% positive likelihood ratio 1.1 and the negative likelihood ratio 0.4.

Table 4: Joint result of the McMurray Test with Videoarthroscopic Meniscus Analysis.

McMurray Test	Meniscus by Videarthroscopy		total
	No Injured	Injured	
Negative Lesion	1	7	8
Positive Lesion	4	80	84
Total	5	87	92

Source: HUGG

Table 5 shows the joint distribution with the Meniscus Analysis by Videoarthroscopy of the overall results, without discriminating the meniscus, of the performance of the two tests Apley and McMurray. The result is negative if both tests are negative for the injury. According to the videoarthroscopic examination, the prevalence of meniscus injury in the sample was 87% (87 patients), but the prevalence estimated by performing the two Apley and McMurray tests was 100% (82 patients). The performance of the two tests Apley and McMurray concluded 05 false positive cases (5.4%) and none false negatives; the sensitivity was 100%, the specificity was 0% and the accuracy was 94.6%, missing the diagnosis in only 5.4% of cases. Thus, the negative predictive value and negative likelihood ratio of the performance of the 2 tests Apley and McMurray are not calculable, and the positive predictive value of the performance of the two tests was equal to 94.6%, and the positive likelihood ratio is equal to 1.0.

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Table 5: Joint result of the performance of the two tests with Videoarthroscopic Meniscus Analysis.

Apley + McMurray Test	Meniscus by Videarthroscopy		total
	No Injured	Injured	
Negative Lesion	0	0	0
Positive Lesion	5	87	92
Total	5	87	92

Source: HUGG

Table 6 and Graph 1 show a comparison of the Efficiency Statistics of the Apley and McMurray Clinical Tests in the Diagnosis of Meniscal Injury. In a global analysis, without discriminating the meniscus, the efficiency measures of the Apley and McMurray Clinical Tests tests showed small differences, with better results for the McMurray test.

Table 6: Apley and McMurray Clinical Test Efficiency Statistics for Meniscal Injury Diagnostics.

Diagnostic Test Efficiency Statistics (%)	Apley Clinical Test	McMurray Clinical Test	Apley+McMurray
Accuracy	84,8%	88,0%	94,6%
Sensitivity	88,5%	92,0%	100%
Specificity	20,0%	20,0%	0,0%
False positive	4,3%	4,3%	5,4%
False Negative	10,9%	7,6%	0,0%
Total False	15,2%	12,0%	5,4%
Positive Predictive Value	95,1%	95,2%	94,6%
Negative Predictive Value	9,1%	12,5%	nc
RVP	1,1	1,1	1,0
RVN	0,58	0,40	nc
Cohen's Kappa Coefficient of Agreement	0,51	0,58	0,77

nc: not calculable

Source: HUGG

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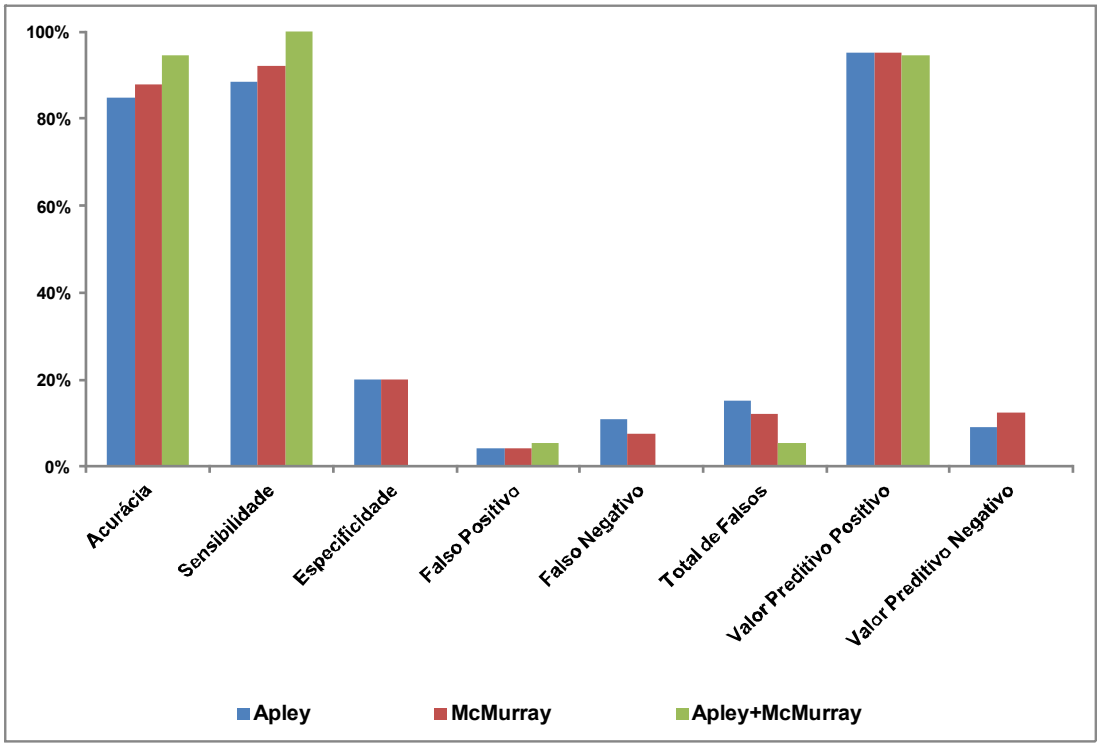
Graph 1: Efficiency of Clinical Tests for the Diagnosis of Meniscal Injury



Source: HUGG

From the studies of the cross tables like Tables 3 and 4, analysis of the efficiency of the tests by sex, laterality and by type of injured meniscus were also made. Table 7 shows a comparison of the Efficiency Statistics of the Apley and Mc-Murray Clinical Tests in the Diagnosis of Meniscal Injury, by sex. It appears that in relation to sex, the Apley and Mc-Murray tests are more efficient in diagnosing male patients compared to female patients. And for the same sex, the Mc-Murray test is more efficient than the Apley test, just as the global analysis found, without discriminating against sex.

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Table 7: Apley and McMurray Clinical Test Efficiency Statistics for Meniscal Injury Diagnoses, by patient sex.

Diagnostic Test Statisticso	Apley Clinical Test		McMurray Clinical Test	
	Female	Male	Female	Male
Accuracy	76,0%	88,1%	84,0%	89,6%
Sensitivity	79,2%	92,1%	87,5%	93,7%
Specificity	0,0%	25,0%	0,0%	25,0%
False positive	4,0%	4,5%	4,0%	4,5%
False Negative	20,0%	7,5%	12,0%	6,0%
Total False	24,0%	11,9%	16,0%	10,4%
Positive Predictive Value	95,0%	95,1%	95,5%	95,2%
Negative Predictive Value	0,0%	16,7%	0,0%	20,0%
RVP	0,8	1,2	0,9	1,2
RVN	nc	0,32	nc	0,254

nc: not calculable

Source: HUGG

For comparative purposes, the efficiency of clinical tests for the diagnosis of meniscal injury was analyzed, according to laterality. The efficiency statistics of the Apley and McMurray tests by the injury side can be seen in Table 8. The Apley test is more efficient when judging the injuries on the right side. For the McMurray test, the efficiency measures of the diagnostic tests showed small differences (maximum 5%) for the left and right sides, with better results for the left side.

Table 8: Apley and McMurray Clinical Test Efficiency Statistics for Meniscal Injury Diagnostics, by injury laterality.

Diagnostic Test Statistics	Apley Clinical Test		McMurray Clinical Test	
	Left	Right	Left	Right
Accuracy	80,0%	89,6%	88,6%	87,7%
Sensitivity	87,5%	93,7%	93,8%	90,9%
Specificity	0,0%	25,0%	33,3%	0,0%
False positive	8,6%	4,5%	5,7%	3,5%
False Negative	11,4%	6,0%	5,7%	3,5%
Total False	20,0%	10,4%	11,4%	12,3%
Positive Predictive Value	90,3%	95,2%	93,8%	96,2%
Negative Predictive Value	0,0%	20,0%	33,3%	0,0%
RVP	0,9	1,2	1,4	0,9
RVN	nc	0,25	0,19	nc

Source: HUGG

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Table 9 shows a comparison of the Apley and McMurray Clinical Test Efficiency Statistics in the Diagnosis of Meniscal Injury, discriminating the injured meniscus. It appears that the Apley and McMurray tests present almost all the best efficiency measures for the diagnosis of lateral SCI. Comparing the two tests for the same type of injury, it is observed that the accuracy of the Apley and McMurray tests are the same, and the McMurray test stands out for being slightly more sensitive than the Apley test. The performance of the two tests is only more efficient than the performance of the isolated tests to judge the lesions of the medial meniscus. To assess the lateral meniscus, the McMurray test is more accurate with greater sensitivity.

Table 9: Apley and McMurray Clinical Test Efficiency Statistics for Meniscal Injury Diagnosis, by type of injured meniscus.

Diagnostic Test Statistics	Clinical Test from Apley		Clinical Test McMurray		Apley+McMurray	
	Lateral	Medial	Lateral	Medial	Lateral	Medial
Accuracy	82,6%	76,1%	82,6%	76,1%	77,2%	79,3%
Sensitivity	90,0%	87,3%	95,0%	90,1%	95,0%	100%
Specificity	80,6%	38,1%	79,2%	28,6%	72,2%	9,5%
False positive	15,2%	14,1%	16,3%	16,3%	21,7%	20,7%
False Negative	2,2%	9,8%	1,1%	7,6%	1,1%	0,0%
Total False	17,4%	23,9%	17,4%	23,9%	22,8%	20,7%
Positive Predictive Value	56,3%	82,7%	55,9%	81,0%	54,3%	79,5%
Negative Predictive Value	96,7%	47,1%	98,3%	46,2%	98,1%	100,0%
RVP	4,6	1,4	4,6	1,3	3,4	1,1
RVN	0,12	0,33	0,06	0,35	0,06	0,00
Accuracy						

Source: HUGG

Discussion

The present study aimed to evaluate the efficiency of specific clinical examinations (Apley and McMurray) frequently used in the diagnosis of meniscal injuries of the knee and their real diagnostic value by comparing them with the findings found in patients undergoing knee arthroscopy at Hospital UniversitárioGaffrée and Guinle. A retrospective study was carried out based on the review of 92 medical records of patients undergoing knee arthroscopy for the treatment of meniscal injuries diagnosed clinically at the HUGG knee outpatient clinic. All patients were evaluated by only one experienced orthopedic surgeon and member of the Brazilian Society of Knee Surgery - SBCJ, and their data were recorded following the service's internal routine. Several provocative maneuvers have been described to trigger symptoms of an injured meniscus. They can be divided into two groups. In the first group are tests that depend on palpation to cause pain or clicks in the joint. The second group includes tests that depend on pain with rotation [12]. The present study showed that the individualized Apley and McMurray clinical tests have good statistical measures of validity, such as high sensitivity, specificity and accuracy. When both tests are performed, the efficiency in predicting the result of the diagnosis is improved with an expectation of approximately zero probability of false negative and very high sensitivity. In the present study, there was a predominance of injuries in males (72.8%) in agreement with Faustino [13] (85.9%), probably due to the fact that men play contact sports more frequently than women. The average age found was 30.5 years, similar to studies by Verdonk [14] who found 28.6 years. Kocabey et al. [15] evaluated the tests of painful palpation of the joint line. The set of McMurray, Steinmann and the Modified Apleytests showed an accuracy of 80% for the ML and 92% for the

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MM, similar to our study that obtained as results 77.2% for the MM and 79.3% for the ML in the joint use of the two tests. It should be noted that Kocabey et al. [15] had a sample of only 50 patients, slightly larger than half the sample used in the present study, 92 patients. According to A. Speziali et al. [16], the specificity of the clinical examination was 63.5 and 46.0% and the sensitivity was 74.4 and 77.3% for the medial meniscus and for the lateral meniscus, respectively. Overall, the accuracy of the clinical investigation was 70.3% for MM and 65.5% for the lateral meniscus. MRI accuracy was 76.4% for medial meniscus and 69.5% for lateral meniscus. The present study showed a specificity of 9.5% and 77.2% for the medial and lateral meniscus, respectively. Sensitivity of 100% for the medial meniscus and 95.0% for the lateral meniscus. The accuracy of the clinical examination in this study was 79.3% for the medial meniscus and 77.2% for the lateral meniscus. According to Malanga et al. [17], the wide variation in sensitivity reported in the literature (16% -58%) and specificities (77% -98%) of the McMurray test support the continued use of the McMurray test in combination with other clinical tests in patients with history suggestive of meniscal involvement. Evans et al. [18], on the other hand, taking into account only the articulation shoulder for McMurray's positivity, concluded that it has a specificity of 98% and a sensitivity of 16%. The present study disagrees with these results, as it always presents greater sensitivity and low specificity of the McMurray test.

According to J.D. Kelly [19] McMurray's maneuver proved to have a modest sensitivity for the detection of meniscal injuries with reported values ranging from 16% to 58%. However, the McMurray test is highly specific for meniscal injuries, particularly posterior horn injuries, with specificity values ranging from 77% to 98%. Consequently, this provocative test continued to be used in combination with other physical examination maneuvers to diagnose meniscus injury. Also, according to J. D. Kelly, similar to the McMurray test, the Apley test also showed to have a relatively low sensitivity (13-16%) and high specificity (80-90%). Meserve et al. [20], in their meta-analysis, showed that the Apley test has superior specificity when compared to McMurray's maneuvers and painful palpation of the joint line. However, in relation to sensitivity, Apley showed much lower values. The present study showed evidence almost always equal to or close to the specificities of the McMurray and Apley test, and in all evaluations the McMurray test showed greater sensitivity than the test and Apley, agreeing with the result by Meserve et al. [19]. Gobbo et al. [21] concluded that the set of maneuvers for meniscal injuries has good accuracy and significant value when compared with MRI, mainly to exclude other joint injuries. The Apley test being the best and specific. All isolated tests, with the exception of the Apley test, showed sensitivity greater than specificity. According to E. Ercin et al. [22] medical examiners do not have the same level of experience, leading to variable precision in the diagnosis of meniscal injuries. And depending on the results found in the anamnesis and clinical examination, the surgeon will decide whether an MRI will be necessary or whether the patient can be admitted for surgery based solely on the clinical examination. In their study, E. Ercin et al. [22], the accuracy of the clinical examination in identifying lesions in the medial meniscus was 93% for experienced surgeons and 83%, 77% and 73% for specialists in general orthopedics, senior residents and fourth-year residents, respectively. In addition, specificity, sensitivity, positive predictive values and negative predictive values were higher for the knee surgeon compared to other less experienced medical examiners [22]. Bohnsack et al. [23] concluded that an experienced examiner can properly diagnose meniscal injuries through clinical examination only. According to his study, the clinical examination performed by an experienced surgeon has 93%accuracy for diagnosing MM lesions and 80% ML lesions. In this study, the less experienced examiner (a fourth-year resident), the clinical examination showed 73% accuracy for diagnosing MM lesions and 80% for ML lesions. These results indicate that a clinical examination performed by an experienced surgeon is more valuable than an MRI examination in the diagnosis of meniscal injuries. Solomon et al. [24] further suggest that in addition to the combination of maneuvers, the inclusion of the patient's history and anamnesis findings is much more useful than the use of a single clinical test in examining the knee [24].

O'Shea et al. [5] in 1996, in a study with 156 patients with knee complaints, found an accuracy of 82% for MM and 78% for ML in the physical examination of the knee. In the present study, values very close to physical examination accuracy were found, 79.3% for MM and 77.2% for the lateral meniscus (ML).In their work, O'Shea et al. [5] emphasized that with the increase in the cost of health care, the need for expensive diagnostic studies, such as MRI, needs to be assessed. The cost of an MRI in the USA varies between US $600 to $1200 depending on the institution. In Brazil, the cost of an MRI can currently reach a minimum wage of US $100. In the end, O'Shea concludes that the use of magnetic resonance imaging as a complementary routine diagnostic exam in the clinical examination of the knee is unnecessary. Knee surgery should be based on the patient's history, physical examination and radiographs.

A.Speziali et al. [16] follows practically the same conclusion as O'Shea et al., reporting that cynical investigation can provide sufficient information for the treatment decision, and magnetic resonance imaging can be avoided as a routine diagnostic method due to several limitations present in acute injuries of the knee and should be reserved only for a restricted group of patients who have poorly understood diagnoses.

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From so many discrepancies in conclusions about the efficiency of these tests found in the literature, Wagemakers [8] concluded that the application of the tests is done in a heterogeneous way among professionals, and to reduce this variability of results, it is important that the application of the tests physicists is done by a well-trained and experienced professional for its correct execution.

Recent clinical and anatomical studies have increasingly valued the importance of physical examination as an important tool in the orthopedist's technical arsenal, referring to the need for a collective effort by the teaching community to stimulate and rescue this so valuable and inexpensive diagnostic method [25].

Conclusion

The clinical examination is an effective diagnostic method for traumatic meniscal disorders involving the knee joint. The Apley and McMurray tests used together have a synergistic and more efficient effect in the diagnosis of meniscal injuries.

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