DIAGNOSTIC ACCURACY OF PHYSICAL EXAMINATION IN COMPARISON TO ARTHROSCOPY IN KNEE INJURIES

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ABSTRACT

Background: Accurate diagnosing of knee injuries is directly linked to taking the clinical history and making a careful physical examination, in literature lot of studies has been for concordance between physical examination, MRI and arthroscopy. The aim of the study was to determine the sensitivity, specificity, accuracy and concordance of the physical examination (PE) in comparison with arthroscopy, in diagnosing knee injuries.

Method and Materials: Retrospective study of 47 patients, with evaluation and comparisons of medial joint line tenderness, Mc Murray's test for menisci and anterior and posterior drawer tests with arthroscopic findings, to determine the concordance, sensitivity, specificity and accuracy of these tests.

Results: Mc Murray's test was positive for menisci injury in 42 patients, presenting sensitivity of 100 % and 96.97%, specificity of 57.1% and 28.57% and diagnostic accuracy of 87.23% and 76.6% respectively for Medial Mensical and Lateral menisci. Anterior drawer test sensitivity was 100%, specificity of 78.26% and diagnostic accuracy of 89.36% and posterior drawer's test was positive in one patient with 100% sensitivity and specificity each.

Conclusion: Physical examination provides a precise diagnosis when done carefully by an experienced surgeon and there is best concordance between arthroscopy and physical examination. Arthroscopy should be used for treating these injuries.

INTRODUCTION

The knee joint is one of the strongest and most important joints in the human body. Important structures within the knee joint include the medial and lateral menisci, and anterior and posterior cruciate ligaments.

Various functions for the knee menisci have been described. Some of these functions can be related to the spread of synovial fluid, nutrition, neutralization of sudden blows to the knee, enhanced knee stability and function of weight-bearing knee.[1] The cruciate ligaments act as knee stabilizers and axial that rotational movements of the knee occur around them. Damage to the components within the knee joint usually occurs as a result of injuries during sports activities or from car and motorcycle accidents. Obtaining an accurate patient history and physical examination can reveal the location of acute knee injuries.[2,3]

The diagnosis is made by medical history and physical examination, and complemented by magnetic resonance imaging (MRI). Kocabey et al[4] evaluated the pain tests on palpation of the joint line (PPJL), and found that all of these tests had an accuracy of 80% for medial meniscus tear (MMT) and 92% for lateral meniscus tear (LMT). In addition, Harrison et al[5] in their study for validation of the Thessaly test, found that, when positive, sensitivity was 90.3% and specificity was 97.7%, confirmed through video arthroscopy.

Accurate diagnosing of knee injuries is directly linked to taking the clinical history and making a careful physical examination.[6] Qualified orthopedic surgeons can safely diagnose anterior cruciate ligament and meniscal injuries through physical examination, while reserving MRI for complicated and confusing cases. This practice is not recommended initially, and it impairs the surgeon's training.[4]

MRI did not have the capacity to decrease the number of negative arthroscopy procedures, given that the physical examination had concordance of 79% with the arthroscopic findings and MRI showed concordance of 77% with arthroscopy.[7]

Both the clinical examination and MRI in the diagnosis of knee injuries have high, acceptable diagnostic power although the clinical examination is slightly superior. Therefore, due to cost considerations in comparison of the clinical examination versus MRI, as the first diagnostic step in these patients, the MRI should be considered in cases of high clinical suspicion and complex injuries.[3]

Given the importance of physical examination in the diagnosis of intra-articular knee injuries and cost of MRIs to patients and as it impairs the surgeon training we have conducted the study to determine the sensitivity, specificity, accuracy and concordance of the physical examination (PE) in comparison with arthroscopy, in diagnosing knee injuries.

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MATERIALS AND METHODS

This retrospective study was conducted in orthopedic department of Medical Teaching Institute Hayatabad Medical Complex, Peshawar between June 2016 and June 2017, total of 47 arthroscopies were done during this period. We included all patients who admitted to the orthopedic department during this period that were diagnosed with either Meniscal or Cruciate ligament injuries and arthroscopy was performed.

The following patient characteristics were used as exclusion criteria: history of previous knee surgery; sequelae from fractures; presence of degenerative diseases, which could be inflammatory or primary (osteoarthritis); acute injuries (less than four weeks since the injury).

The patient data were collected from patient charts and computerized data and enquired about their symptoms, such as pain, joint effusion, episodes of instability (giving way) and episodes of joint locking.

In order to evaluate meniscal injuries, the Mc-Murray test and joint line tenderness test were used. For Anterior Cruciate ligament (ACL) injuries anterior drawer tests and pivot shift were used. For Posterior Cruciate ligament, posterior drawer test was used. We recorded the physical examination findings for all patients registered from patients charts, after which each patient's MRI was reviewed, and ligament and meniscus damage reports registered. All MRI results were reported by a radiologist specialized in this field but not formed part of the study. Patients arthroscopic surgery findings were recorded both from chart and hospital software. Using the arthroscopic findings as the final, definitive diagnosis, we compared it with the physical examination recording each as true positive, true negative, false positive and false negative for medial and lateral menisci and anterior and posterior cruciate ligaments.

The data was entered and analyzed in SPSS version 16. Sensitivity, Specificity, Negative and Positive predictive value and diagnostic Accuracy were calculated for Medial and lateral menisci, anterior and posterior cruciate ligament and pivot shift test.

RESULTS

47 patients were operated; mean age was 28.4 years with age ranges from 20-56 years. 43 patients were male and 4 were female. All patients were complaining of mild to moderate knee pain, 24 (51.1%) were complaining of locking and giving way and 4 (8.5%) presented with knee swelling. 33 patients were diagnosed medial meniscal injuries, 3 were diagnosed lateral meniscal injuries and 24 patients were diagnosed anterior cruciate ligament and one posterior cruciate ligament injury.

Mc Murray's test was positive for medial meniscal injury in 39 knees and was positive for the lateral meniscal lesions in 4 knees and arthroscopy showed in 33 medial menisci and 10 lateral menisci injuries, thus presenting sensitivity of 100%, specificity of 57.1% and diagnostic accuracy of 87.23% and sensitivity of 96.97%, specificity of 28.57% and diagnostic accuracy of 76.6% of Mc Murray's test for medial Mensical and lateral menisci respectively. (Table 1) Medial Joint Line Tenderness for medial meniscal injury was positive for 42 knees and negative for 5 knees with sensitivity of with sensitivity of 95.6%, specificity of 28.6% and diagnostic accuracy of 76.57%.

Table 1: Correlation of physical examination with arthroscopic findings

Correlation of physical examination with arthroscopy			
Physical examination and arthroscopic findings cross-tabulation in 47 knees			
	Sensitivity (%)	**Specificity (%)**	**Accuracy (%)**
Medial Meniscus	100	57.1	87.23
Lateral Meniscus	96.97	28.57	76.6
Anterior Cruciate ligament	100	78.26	89.36

Anterior cruciate ligament injuries were found in 29 knees in physical examination while arthroscopy showed 24 ACL injuries, with sensitivity of 100%, specificity of 78.26% and diagnostic accuracy of 89.36%, posterior drawer's test was positive in one patient with 100% sensitivity and specificity each and Pivot shift test was positive in 19 knees with sensitivity of 70.59%, specificity of 100% and diagnostic accuracy of 87.5%. (Table 1)

DISCUSSION

Accurate diagnosing of knee injuries is directly linked to taking the clinical history and making a careful physical examination. Ligament and meniscal injuries of the knee are generally diagnosed by orthopedic surgeons by means of physical examination and with help from MRI. In literature lot of studies have been for concordance between these modalities. In this study, the concordance between the physical examination of knee was investigated in comparison with the arthroscopic findings from the knee.

A good history with particular reference to the nature of injury and a well-performed clinical examination will in most situations indicate the underlying problem. This is improved by experience, and arthroscopy may be justified on clinical grounds alone,[7] though the accuracy of clinical diagnosis of meniscal and ligament

injuries has been varied in the literature[8,9] a thorough clinical examination carried out by an experienced examiner in most situations will indicate the nature of the intra-articular injury. Clinical examination is as accurate as MRI and MRI should be reserved for confusing and special cases.[10,11]

In our study, evaluations of knee injuries were made by means of physical examination, presented greater accuracy in relation to arthroscopy however, Solomon et al[12] concluded from analyzing the accuracy of physical examination for meniscal and ligament injuries that this might be better used for diagnosis when associated with the patient's history and use of a set of maneuvers, instead of specific maneuvers for meniscal and ligament injuries applied separately. Nilton et al[6] concluded that the physical examination presented greater accuracy in relation to arthroscopy than did MRI for ligament injuries. However, for meniscal injuries, MRI presented greater accuracy in relation to arthroscopy.

In our study, physical examination were evaluated and compared with arthroscopy. The accuracy of the physical examination for medial meniscal injuries was found to be 87.23%, for the lateral meniscus, the accuracy was 76.6% for the physical examination and for ACL injuries, the accuracy of the physical examination was found to be 89.36% as compared to Nilton et al. the accuracy of the physical examination for medial meniscal injuries was found to be 69.44%. For the lateral meniscus, the values were 79.16% for the physical examination. For ACL injuries, the accuracy of the physical examination was found to be 90.27%.

Ercin et al[13] reported that physical examinations that were performed well, by experienced surgeons using multiple maneuvers, were sufficient for making the diagnosis of meniscal injuries. Their findings were similar to the results from the present study.

Acute meniscal knee injuries can lead to instability of the joint if they are left untreated, but clinical examinations of patients' acutely injured knees can be challenging because of the pain and swelling involved. Although magnetic resonance imaging and arthroscopy are the gold standard investigations for the diagnosis of meniscal tears they cannot always be carried out in acute or emergency department settings. It is therefore essential that emergency care practitioners have good clinical examination skills to ensure safe and effective patient management, diagnosis, and outcomes, as well as the skills and knowledge required to carry out meniscal tear tests.[14] According to Majid et al arthroscopy has provided orthopedic surgeons with a highly successful tool for diagnosing and treating meniscal tears.[15]

The objective of evaluating the accuracy of physical examination in comparison with arthroscopy and MRI was the topic of a study by Venu et al.[16] They stated that physical examination alone was unsatisfactory for diagnosing knee injuries and reported that MRI and arthroscopy were concordant in 94% of the patients evaluated.

In a study by Esmaili Jah[17] conducted in Tehran on 70 patients with knee injuries, the diagnostic accuracy of both physical examination and MRI were compared with arthroscopic results. In this study, although the difference between the results of the methods was slight, in the majority of cases physical examination was superior. The final conclusion was that in the cases with normal MRI results, clinical suspiciousness and physical examination were acceptable.[4]

Navali et al[18] stated that physical examination and MRI had acceptable diagnostic power in relation to knee injuries, although physical examination was slightly superior. Thus, because of the cost, MRI should be reserved for cases in which there were doubts, or for complex injuries.

Among the limitations of the present study, it was retrospective study, small sample size, physical examinations were performed by several consultants and postgraduate trainees and though MRI was routinely performed but not formed part of the study as lack of standardization of the MRI examinations can be cited. These were performed in several imaging centers, and this may have increased the dispersion of the data. The other limitation of the study was its retrospective nature of the study and only those patients were selected for arthroscopy which had positive examination finding. The meniscal injuries were only diagnosed using the McMurray test and medial joint line tenderness. For diagnosing anterior instability, only the anterior drawer maneuvers were applied which may have diminished the rate of diagnosing these injuries. The method applied for treating these injuries, along with the long-term follow-up of these patients, was outside of the scope of the present study.

CONCLUSION

Physical examination provides a precise diagnosis when done carefully by an experienced surgeon, especially in cases of ligamentous injury. This is even capable of promoting lower healthcare costs, best concordance between arthroscopy and physical examination and arthroscopy should be used for treating these injuries. MRI should be an optional examination, rather than a routine examination.

REFERENCES

1. Canale ST. Campbell's Operative Orthopedics. 10th ed. Philadelphia: Mosby; 2003: 2345.
2. Berfeld J, Ireland ML, Wojtys EM. Pinpointing the cause of acute knee pain. Patient Care. 1997; 31: 100 – 117.)
3. Navali AM, Bazavar M, Mohseni MA, Safari B, Tabrizi A. Arthroscopic Evaluation of the Accuracy of Clinical Examination versus MRI in Diagnosing Meniscus

Tears and Cruciate Ligament Ruptures. Arch Iran Med. 2013; 16(4): 229 – 232.

4. Kocabey Y, Tetik O, Isbell W.M, Atay A, Johnson DL. The value of clinical examination versus magnetic resonance imaging in the diagnosis of meniscal tears and anterior cruciate ligament rupture. Arthroscopy. 2004; 20(7):696–700.

5. Harrison BK, Abell BE, Gibson TW. The Thessaly test for detection of meniscal tears: validation of a new physical examination technique for primary care medicine. Clin J Sport Med. 2009; 19(1):9–12.

6. Nilton OJ, Leão MJS, and Carvalho de Oliveira NH. Diagnosis of knee injuries: comparison of the physical examination and magnetic resonance imaging with the findings from arthroscopy. Rev Bras Ortop. 2015 Nov-Dec; 50(6): 712–719.

7. Brooks S., Morgan M. Accuracy of clinical diagnosis in the knee arthroscopy. Ann R Coll Surg Engl. 2002; 84(4):265–268.

8. Rose NE, Gold SM. A comparison of accuracy between clinical examination and magnetic resonance imaging in the diagnosis of meniscal and anterior cruciate ligament tears. Arthroscopy. 1996;12:398

9. Peleg BG, Elyl S, Hagai A, Nachman A, Dekel S, Arbel R. Accuracy of Magnetic Resonance Imaging of the Knee and Unjustified Surgery. Clin Orthop Relat Res. 2006; 447:100–04.

10. Miller GK. A prospective study comparing the accuracy of the clinical diagnosis of meniscus tears with magnetic resonance imaging and its effect on clinical outcome. Arthroscopy. 1996; 12:406–13.

11. Madhusudhan TR, Kumar TM, Bastawrous SS, and Sinha. A Clinical examination, MRI and arthroscopy in meniscal and ligamentous knee Injuries – a prospective study. J Orthop Surg. 2008; 3: 19.

12. Solomon D.H, Simel D.L, Bates D.W, Katz J.N, Schaffer J.L. Does this patient have a torn meniscus or ligament of the knee? Value of the physical examination. JAMA. 2001; 286(13):1610–1620.

13. Ercin E, Kaya I, Sungur I, Demirbas E, Ugras AA, Cetinus EM. History, clinical findings, magnetic resonance imaging, and arthroscopic correlation in meniscal lesions. Knee Surg Sports Traumatol Arthrosc. 2012; 20(5):851–856.

14. Doherty M, Hoskins R. Diagnosing meniscal tears in the emergency department. Emerg Nurse. 2015 Jun; 23(3):31-6.

15. Majid SAA, Memon MS, Noor SS, Soomro YH. Comparison of clinical and arthroscopic findings in meniscal tears. Pak J Surg. 2010; 26: 13 – 18.

16. Venu K.M, Bonnici A.V, Marchbank N.D.P, Chipperfield A, Stenning, Howlett D.C. Clinical examination, MRI or arthroscopy: which is the gold standard in the diagnosis of significant internal derangement in the knee? J Bone Joint Surg Br. 2003; 85(Suppl. 2):167.

17. Esmaili Jah AA, Keyhani S, Zarei R, Kalhor Moghaddam A. Accuracy of MRI in comparison with clinical and arthroscopic findings in ligamentous and meniscus injuries of the knee. Acta Orthop Belg. 2005; 71: 189 – 196.

18. Navali A.M., Bazavar M., Mohseni M.A., Safari B., Tabrizi A. Arthroscopic evaluation of the accuracy of clinical examination versus MRI in diagnosing meniscus tears and cruciate ligament ruptures. Arch Iran Med. 2013; 16(4):229–232.