



ISSN (P): 2521-3466
ISSN (E): 2521-3474
© Clinical Orthopaedics
www.orthoresearchjournal.com
2024; 8(1): 36-39
Received: 14-11-2023
Accepted: 20-12-2023

Dr. Shahan Malik
Affiliated to Govt. Hospital for
Bone and Joints Surgery, GMC,
Srinagar, Jammu and Kashmir,
India

Dr. Aiman Ahmad Wani
Affiliated to Govt. Hospital for
Bone and Joints Surgery, GMC,
Srinagar, Jammu and Kashmir,
India

Dr. Syed Sheikh Mohd Faizan
Affiliated to Govt. Hospital for
Bone and Joints Surgery, GMC,
Srinagar, Jammu and Kashmir,
India

Dr. Azad Ahmad Shah
Affiliated to Govt. Hospital for
Bone and Joints Surgery, GMC,
Srinagar, Jammu and Kashmir,
India

Corresponding Author:
Dr. Syed Sheikh Mohd Faizan
Affiliated to Govt. Hospital for
Bone and Joints Surgery, GMC,
Srinagar, Jammu and Kashmir,
India

Comparative analysis of Lachman's test versus pivot Shift test in diagnosing anterior cruciate ligament tear

Dr. Shahan Malik, Dr. Aiman Ahmad Wani, Dr. Syed Sheikh Mohd Faizan and Dr. Azad Ahmad Shah

DOI: <https://doi.org/10.33545/orthor.2024.v8.i1a.432>

Abstract

Background and Aim: The physical examination of the knee is important in diagnosing the cases of ACL tear. The Anterior Drawer test, The Lachmans test and the pivot shift test have gained special recognition and should be performed in cases of unstable knee with suspected ACL injury. It is generally accepted that the Lachmans test has the highest sensitivity and the pivot shift test has the highest specificity. This Study was carried out to find out the sensitivity and specificity of the above mentioned tests and their efficiency in our clinical setting.

Patients and Methods: This prospective cohort study was conducted at Govt. Hospital for Bones and Joints surgery, an affiliated Hospital of Government Medical College Srinagar, From June 2020 to December 2022. We included 26 patients of symptomatic ACL tear in the age group of 18-50 years. The knees were physically examined and Lachmans test and Pivot Shift test were performed and findings recorded. The physical examination findings were compared to the Arthroscopic and MRI findings. Sensitivity and specificity were calculated. Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

Results: Total 26 patients were evaluated and analysed including 25 males and 1 female. The mean age was 36.5 years. The right knee was affected in 17 (65.30%) patients and the left knee was affected in 9 (34.6%). Mode of injury was sports related in 12 (46.15%), road traffic accident in 9 (34.6%), and fall in 5 (19.23%). The Lachmans test was a sensitive test (88%) as compared to Pivot Shift (60%) in diagnosing ACL tears. We found out the specificity of pivot shift test to be 96% which was quite high as compared to the Lachmans Test 82%.

Conclusion: We were able to establish that the Pivot shift test had a high Specificity but a low sensitivity in diagnosing ACL injuries. Both the sensitivity and specificity of Lachman's test was high, albeit the specificity was less as compared to the Pivot shift test.

Keywords: Anterior cruciate ligament, lachman, pivot shift

Introduction

The knee joint is one of the most commonly injured joint in our body with the Anterior Cruciate Ligament (ACL) being the most commonly injured ligament in knee [1]. The anterior cruciate ligament stabilises the knee joint and provides an axis around which pivoting movement occurs [2]. It is composed of an anteromedial Bundle and a posterolateral bundle [3]. The anteromedial bundle restricts the anterior translation of tibia in relation to femur whereas the posterolateral bundle provides restrain to internal rotation of tibia, varus and valgus angulation and hyperextension of knee joint [3]. Several clinical tests have been described to clinically diagnose anterior cruciate ligament (ACL) injuries. The anteroposterior knee laxity is usually evaluated by physical examination using the Lachmans test [4], and the rotatory instability in ACL-injured knees is commonly examined with the pivot shift test [5]. There is no uniformity in the results published about the accuracy of these tests. Generally, it is accepted that the pivot shift test is the most specific test to diagnose ACL tears and that the Lachman test is the most sensitive [6, 7, 8]. The outcomes that have been reported regarding the accuracy of these tests lack consistency. An Ideal test should possess both high sensitivity and specificity, be easily reproducible, and applicable in both chronic and acute cases. Furthermore, it should be able to diagnose both partial and complete tears, regardless of whether anaesthetised or not, and display no inter-observer variability.

We strive to assess the diagnostic accuracy of the Lachman test and the pivot shift test performed in an outpatient setting and under anesthesia and comparing them to the MRI or arthroscopy findings. The goal of this study is to determine the sensitivity and specificity of these tests.

Patients and Methods

This prospective cohort study was conducted at Govt Hospital for Bones and Joints surgery, an affiliated Hospital of Government Medical College Srinagar, From June 2020 to December 2022 after obtaining ethical clearance of the institutional ethical committee. We included patients from age group of 20-50 years with ACL tear of the knee with or without other associated ligamentous injuries. The study was conducted on 26 patients among which 25 were males and only 1 female. The mode of injury was sports injury in 12 (46.15%), road traffic accident in 9 (34.61%), and fall in 5 patients (19.23%). Patients reported to the outpatient clinic with complains of instability, pain and swelling in 5 patients (19.23%) instability and pain 11 patients (42.3%), Instability alone 7 patients (26.92%), pain alone 3 patients (11.5%). The diagnosis of ACL tear was made from a combination of history and clinical examination and investigation. A plain anteroposterior and lateral radiograph and MRI of the involved knee were ordered in all patients. All the patients in the study subsequently underwent ACL reconstruction using hamstring autograft. The patients included in the study were examined in the outpatient department at first and thereafter physically re-examined in the operating room under anesthesia. The clinical test results were then compared to the MRI and intraoperative arthroscopic findings. A standard proforma was used in all patients where the findings of the Lachman test and pivot shift test were entered.

Tests Performed

The Lachmans Test: The patient was placed supine with the involved extremity facing the examiner. The involved extremity was positioned in slight external rotation. The knee was partially flexed to almost 15 and 20 degree. The femur was stabilized with one hand, and firm pressure was applied to the posterior aspect of the proximal tibia, which was lifted forward in an attempt to translate it anteriorly^[9]. (Figure 1)

The Pivot Shift test: The leg was lifted off the examining table, keeping the knee extended and the leg internally rotated, a valgus stress was applied to the knee around proximal fibula with the opposite hand which caused the tibia to sublux anteriorly. The knee was passively flexed slowly while maintaining valgus and internal rotation stress. As the knee was flexed past approximately 30 degrees, the iliotibial band provided the force that reduced the lateral tibial plateau on the lateral femoral condyle as it passed posterior to the center of rotation of the knee^[9]. (Figure 2)



Fig 1: The Lachmans Test Being Performed

Statistical methods

The data was entered in Microsoft (MS) Excel spreadsheet and analysed using Statistical Package for Social Sciences (SPSS) version 21.0, International Business Machines (IBM) manufacturer, Chicago, United States of America (USA). Positivity and negativity of the tests were used to calculate sensitivity, specificity.

Sensitivity

The ability of a test to identify the presence of a disease or a health condition. This was calculated by the formula, Sensitivity = True positives/ (True positives + False negatives)

Specificity

The ability of a test to identify the absence of a disease or a health condition. This was calculated by the formula, Specificity = True negatives/ (True negatives + False positives)

Results

This study included 26 patients with ACL injury, the mean age being 36.5 years. The right knee was affected in 17 (65.30%) patients and the left knee was affected in 9 (34.6%). Mode of injury was sports related in 12 (46.15%), road traffic accident in 9 (34.6%), and fall in 5 (19.23%). 2 patients were operated within 3 months of injury, 16 patients were operated within 3-6 months after the injury. 13 (50%) patients had a concomitant medial meniscus tear, 6 patients (23.07%) had a concomitant lateral meniscus tear, 2 patients (7.69%) had both menisci torn and isolated ACL tear was found in 5 patients (19.23%). (Table 1 and 2). Sensitivity of Lachmans test was found out to be 88%, whileas its Specificity was 82%. Sensitivity of pivot shift test was found out to be 60%, whileas its specificity was 96%. (Table 3). The Lachmans test was a sensitive test as compared to Pivot Shift test in diagnosing ACL tears.

Table 1: Demographic Details

Demographic Details	Stats
Age	36.5 ± 8.6 (Mean with SD)
Gender	25 Male
	1 Female

Table 2: Injury Details

Injury	Number	Percentage
Mode of Injury		
Sports Injury	12	46.15
Road Traffic Accident	9	34.6
Fall	5	19.23
Time since Injury		
<3 months	2	7.69
3-6 months	16	61.53
>6 months	8	30.76
Laterality		
Right	17	65.38
Left	9	34.6
Presentation		
Instability, Pain and Swelling	5	19.23
Instability, Pain	11	42.3
Instability alone	7	26.9
Pain alone	3	11.53
Associated Pathology		
None	5	19.23
Medial Meniscus	13	50
Lateral Meniscus	6	23.07
Both	2	7.69
Chondral Lesion	4	15.3

Table 3: Sensitivity and specificity of clinical tests

Clinical Test	Sensitivity	Specificity
Lachmans Test	88%	82%
Pivot Shift Test	60%	96%

**Fig 2:** The Pivot Shift Test being performed

Discussion

We conducted a comparison between the Lachmans test and the pivot shift test in cases of ACL tears. Our results showed that the Lachmans test was more sensitive in picking up ACL injury while as pivot shift test was highly specific. Our study's findings partially align with previous research by Deveci A *et al.*, Thapa *et al.*, and others who reported that the pivot-shift test was more specific than the anterior drawer test in diagnosing both acute and chronic ACL tears, as well as complete and partial ACL tears [10, 11]. Previous studies by Gürpınar T *et al.*, Deveci A *et al.*, Logan MC *et al.*, Kim SJ, and Kim HK found that the Lachman test was the most accurate and reliable method for diagnosing an ACL rupture, while the pivot-shift test was the least sensitive [12, 13, 14, 15]. A meta-analysis of 16 studies showed that the overall sensitivity and specificity of the while the Lachman test had sensitivity and specificity of 0.871 and 0.97, respectively [16]. Massey PA *et al.* also found that the sensitivity and specificity of Lachman test had sensitivities and specificities of 89% and 85%, respectively [17]. These results are consistent with the present study's findings for the Lachman test and the pivot shift test.

No clinical test can be a 100% sensitive and specific. Likewise the tests employed for ACL tear have the same short comings and in clinical scenario it is always better to include an armamentarium of tests defined in literature so as to pick true positives and true negatives. It would be wise to include both the Lachmans and Pivot Shift test for diagnosing ACL tears in suspected individuals.

Conclusion

We were able to establish that the Pivot shift test had a high Specificity but a low sensitivity in diagnosing ACL injuries. Both the sensitivity and specificity of Lachman's test was high, albeit the specificity was much less as compared to the Pivot shift test.

References

1. Drago JL, Braun HJ, Durham JL, Chen MR, Harris AH. Incidence and risk factors for injuries to the anterior cruciate ligament in National Collegiate Athletic Association football: data from the 2004–2005 through 2008–2009 National Collegiate Athletic Association Injury Surveillance System. *Am J Sports Med* 2012;40(5):990.
2. Mahapatra P, Horriat S, Anand BS. Anterior cruciate ligament repair- past, present and future. *J Exp. Orthop.* 2018;5(1):20.
3. Domnick C, Raschke MJ, Herbolt M. Biomechanics of the anterior cruciate ligament: Physiology, rupture and reconstruction techniques. *World J Orthop.* 2016 Feb 18;7(2):82-93. DOI: 10.5312/wjo.v7.i2.82. PMID: 26925379; PMCID: PMC4757662.
4. Torg JS, Conrad W, Kalen V. Clinical diagnosis of anterior cruciate ligament instability in the athlete. *Am J Sports Med.* 1976;4(2):84- 93.
5. Benjaminse A, Gokeler A, van der Schans CP. Clinical diagnosis of an anterior cruciate ligament rupture: a meta-analysis. *J Orthop Sports Phys Ther.* 2006;36(5):267-288.
6. Hidayat L, Triangga AF, Farkhan MA, Rahayu BF, Magetsari R. Comparison of diagnostic accuracy between clinical examination and magnetic resonance imaging (MRI) in diagnosing anterior cruciate ligament (ACL) rupture on Indonesian population. *J Med Sci.* 2021;53(2):159-68.
7. Leblanc MC, Kowalczyk M, Andruszkiewicz N, Simunovic N, Farrokhyar F, Turnbull TL, *et al.* Diagnostic accuracy of physical examination for anterior knee instability: A systematic review. *Knee Surg Traumatol Arthrosc.* 2015;23:2805-13.
8. Sobrado MF, Bonadio MB, Ribeiro GF, Giglio PN, Helito CP, Demange MK. Lever sign test for chronic ACL injury: A comparison with Lachman and Anterior Drawer tests. *Acta Ortop Bras.* 2021;29(3):132-36.
9. Campbell's Operative Orthopaedics, 14th edition, Part XIII, Sports Medicine, Page 2232.
10. Deveci A, Cankaya D, Yilmaz S, Ozdemir G, Arslantas E, Bozkurt M. The arthroscopical and radiological correlation of lever sign test for the diagnosis of anterior cruciate ligament rupture. *Springerplus.* 2015;4:830. DOI: 10.1186/s40064-015-1628-9.
11. Thappa SS, Lamichhane AP, Mahara DP. Accuracy of lelli test for anterior cruciate ligament tear. *Journal of institute of medicine august.* 2015;37;2
12. Gürpınar T, Polat B, Polat AE, Çarkçı E, Öztürkmen Y. Diagnostic accuracy of lever sign test in acute, chronic, and post reconstructive ACL injuries. *BioMed Res International.* 2019;2019:3639693.
13. Deveci A, Cankaya D, Yilmaz S, Ozdemir G, Arslantas E, Bozkurt M. The arthroscopical and radiological correlation of lever sign test for the diagnosis of anterior cruciate ligament rupture. *Springerplus.* 2015;4:830. DOI: 10.1186/s40064-015-1628-9.
14. Logan MC, Williams A, Lavelle J, Gedroyc W, Freeman M. What really happens during the Lachman test? A dynamic MRI analysis of tibiofemoral motion. *Am J Sports Med.* 2004;32(2):369-75

15. Kim SJ, Kim HK. Reliability of the anterior drawer test, the pivot shift test, and the Lachman test. *Clin Orthop Relat Res.* 1995;(317):237-42.
16. Huang W, Zhang Y, Yao Z, Ma L. Clinical examination of anterior cruciate ligament rupture: A systematic review and meta-analysis. *Acta Orthopaedica et Traumatologica Turcica.* 2016;50(1):22-31.
17. Massey PA, Harris JD, Winston LA, Lintner DM, Delgado DA, McCulloch PC. Critical analysis of the lever test for diagnosis of anterior cruciate ligament insufficiency. *Arthroscopy.* 2017;33(8):1560-1566.

How to Cite This Article

Dr. Malik S, Dr. Wani AA, Dr. Faizan SSM, Dr. Shah AA. Comparative analysis of lachman's test versus pivot shift test in diagnosing anterior cruciate ligament tear. *National Journal of Clinical Orthopaedics.* 2024;8(1):36-39.

Creative Commons (CC) License

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.