

The “Lelli’s Test”: a Screening Clinical Test for the Diagnosis of Anterior Cruciate Ligament Injury

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Abstract

Background: The anterior cruciate ligament (ACL) is a major knee stabilizing factor during both of the knee’s rotational and anteroposterior stability. ACL damage is a major injury to the knee joint. For identification of ACL injury routinely we practice Anterior drawer test, Lachman’s test and Pivot shift test. In this study we evaluate the accuracy of Lelli’s test for detecting ACL tear and compare it with MRI findings.

Methods: This study included 100 patients attending outdoor patient department at Department of orthopedics, Combined Military Hospital (CMH) Bogura from February 2022 to February 2023. aged between 20-60 years with symptoms of giving way/locking/pain. Clinical history and detail clinical assessment of knee for instability including Lelli’s test were performed by standard technique and recorded in the Performa. All patients send for MRI of knee and result were compared with Lelli’s test to assess the reliability of clinical test as screening test for ACL injury.

Results: In this study total numbers of cases were 100 with mean age was 35 ± 09 years and most of the patients were male 98(98.00%). Maximum injuries occurred on the right side 80 (80.00%). The most common cause of ACL injury was sports activities 85(85.00%) and chief complaints of giving way 82(82.00%). In this study Lelli’s test had sensitivity 94.18 % (CI 70.93-94.57) and Specificity 93.33 % (CI 79.85-97.17)

Conclusion: Lelli’s test is a simple with high sensitivity and specificity which can be used as a screening test for evaluation of ACL function in both acute and chronic knee injury.

Introduction

The anterior cruciate ligament (ACL) is a major biomechanical component of knee stabilizing factor during both of the knee’s rotational and anteroposterior stability.¹ Anterior cruciate ligament (ACL) damage is a major injury to the knee joint,² with an annual incidence of 68.6 per 100,000 person-years and.³ In the United States nearly 200,000 injuries of ACL occur per year, with an estimated 100,000 reconstructions annually.⁴

ACL injuries can be identified by a detail history of knee trauma followed by a typical physical examination finding of anterior sliding of the tibia over the femur.⁵

Anterior drawer test, Lachman’s test, pivot shift test, and the Lelli’s test are the physical exam tests for detecting ACL deficiency. Compared to the other physical examination maneuvers, the Lelli’s test is the simplest and easiest to perform regardless of who performs the test.^{6,7} Lever Sign test would be

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diagnostic for both partial and complete tears of the ACL regardless of the elapsed time from injury.⁸

For diagnosis of ACL injury arthroscopic visualization is the gold standard technique and magnetic resonance imaging (MRI) is a valid and noninvasive diagnostic method, with a specificity and sensitivity of 94–98 %.⁸

Since the Lelli's test is simple, it can be performed with high accuracy by all medical personnel, even if done by non-orthopedic providers. Our aim in this study is to measure the accuracy of the test to performed as a screening test for ACL injury.¹

Methods

This survey was carried out in CMH Bogura, a tertiary hospital of Bangladesh from February 2022 to February 2023. Total 100 patients included in this study who were attending orthopaedic outpatient department, aged between 20-60 years with knee symptoms of giving way or locking or pain following sports or non-sports injury. Clinical history and detail clinical assessment of knee for instability including Anterior drawer test, Lachman test, Pivot shift test, Lelli's test were performed by standard technique and recorded in the Performa. Lelli's test was carried out with patient in supine position, knee in full extension and heel touching the bed, clenched fist is placed

beneath the proximal calf just distal to tibial tuberosity then a gentle posterior directed thrust is applied over quadriceps tendon and we look for heel liftoff from the bed. The test is positive if there is no heel liftoff from the bed in springy manner compared to normal side. All patients send for MRL of knee and result were compared with Lelli's test finding

Ethical permission had been taken from institute keeping compliance with Helsinki Declaration for medical research involving human subject 1964. The study subjects were informed verbally about the study design, the purpose of the study and right for withdrawing themselves from the project at any time, for any reason, what so ever. Persons who gave informed written consent to participate voluntarily in the study were included in the study sample. The SPSS version 20.0 was used for data analysis.

Results

In this study total numbers of cases were 100. 35 ± 09 years was the mean age of the patients. Among them, 02% ($n=2$) were female and 98% ($n=98$) were male. Maximum injuries occurred on the right side 80 % ($n=80$). The most common cause of ACL injury was sports activities 85(85.00%) and chief complaints of patients were giving way 82(82.00%), pain 43(43.00%), locking 28(28.00%). Demographic and clinical features of the patients are given in Table I, II.

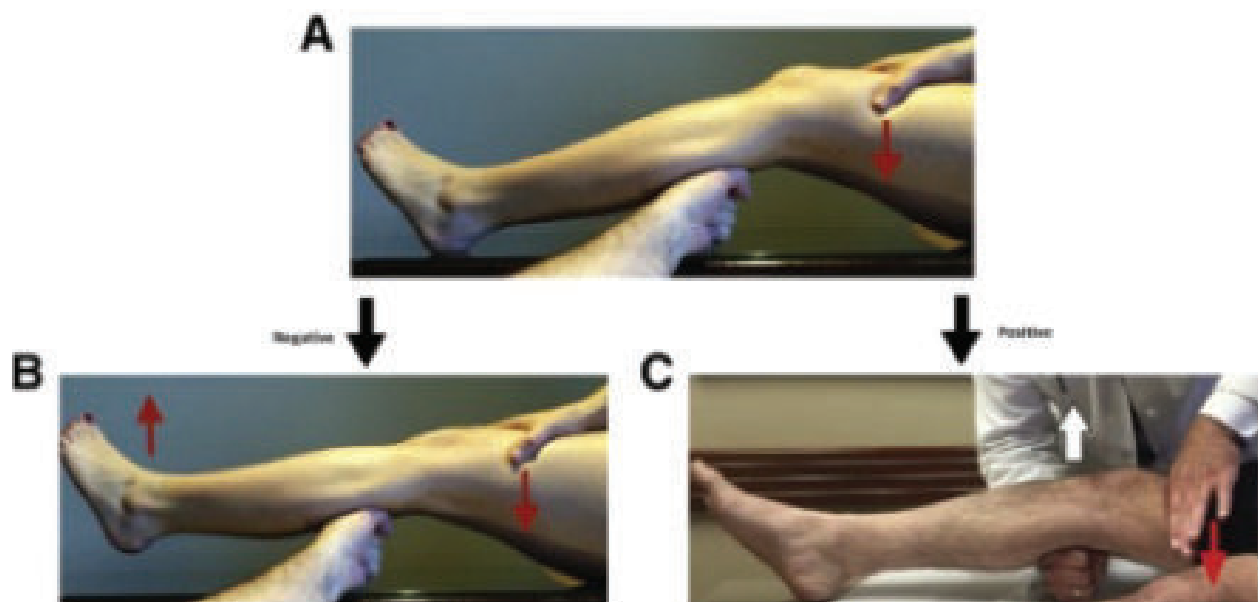


Figure - 1: (A) A photograph of the lever test setup, with the examiner's hand positioned for the test. (B) A photograph of a negative lever test, with the femur being translated posteriorly using the right hand (downward red arrow) and levering of the tibia resulting in lift-off of the heel (upward red arrow). The examiner's fist is just distal to the tibia tubercle. (C) A photograph of a positive lever test, with the femur being translated posteriorly using the left hand (downward red arrow) and translation of the proximal tibia anteriorly (white upward arrow) with no heel lift-off¹.

Table I: Demographics features of the survey respondents (n=100)

Demographic Feature			
Age		Mean $\pm$ SD	35 $\pm$ 09 yrs
Gender	Female	N(%)	2(02.00%)
	Male	N(%)	98(98.00%)
Lesion	Right	N(%)	80(80.00%)
	Lt	N(%)	20(20.00%)
Cause	Sports injury	N(%)	85(85.00%)
	Fall on slippery ground	N(%)	02(02.00%)
	Fall from height	N(%)	07(07.00%)
	Trauma	N(%)	06(06.00%)

Table II: Clinical Features of the survey respondents (n=100)

Clinical Features		
Only giving way	N (%)	37(37.00%)
Only Pain	N (%)	05(05.00%)
Only Locking	N(%)	10(10.00%)
Both giving way and pain	N(%)	30(30.00%)
Both giving way and locking	N(%)	10(10.00%)
Both locking and pain	N(%)	03(03.00%)
All symptoms including giving way, pain and locking	N(%)	05(05.00%)

Clinical diagnosis of ACL injury

Comparison of the MRI findings of ACL Tear and clinical Lelli's test findings yielded the following results shown in table-3.

Table III: Lelli's test and ACL tear

Lelli's test	MRI findings		Total	Sensitivity (CI)	Specificity (CI)
	ACL tear present	ACL tear absent			
Positive	80	1	81	94.18(70.93-94.57)	93.33(79.85-97.17)
Negative	5	14	19		
Total	85	15	100		

Lelli test had sensitivity 94.18 % (CI 70.93-94.57) and Specificity 93.33 % (CI 79.85-97.17)

Discussion

In most of the patients excess knee laxity and the joint becomes unstable is the most detectable signs after ACL rupture.⁹ Anterior drawer, the Lachman, and the pivot shift test are the three commonly applied tests to determine ACL injuries.¹⁰

In a meta-analysis of Twenty-eight studies that assessed the accuracy of clinical tests for diagnosing ACL ruptures by Benjaminse et al² with pooled sensitivity of Anterior drawer test, Lachman test, Pivot shift test 92% (CI 88-95) , 85% (CI 83-87), 24% (CI 21-27) respectively and pooled specificity 91% (

CI 87-94) ,94% (95% CI, 92-95), 98% (CI 96-99) respectively.

In this study we found Lelli test had sensitivity 94.18 % (CI 70.93-94.57) and Specificity 93.33 % (CI 79.85-97.17), which is comparable to three commonly applied tests in clinical practice to determine ACL injuries. There are limitations to the commonly applied test like for Lachman test; examiners who have small hands may face difficulties on patients with a large thigh girth². For pivot shift test patient with a chronic ACL-deficient knee is familiar with unpleasant phenomenon of pivoting and will show protective muscle action.¹¹ The accuracy of a complex test maneuver such as the pivot shift test may increase with experience thus the pivot shift test has very high specificity and low sensitivity. For Anterior drawer test the hemarthrosis and reactive synovitis may preclude knee flexion to 90°, hindering the proper performance of the test, protective muscle action of the hamstrings secondary to joint pain provides a vector force opposite to the anterior translation of the tibia and the posterior horn of the medial meniscus becomes buttressed against the posterior most margin of the medial femoral condyle and may preclude anterior translation of the tibia¹². We found Lelli's test to be least affected by those phenomenon, relatively easy to carryout in both acute and chronic knee injury situation with comparable sensitivity and specificity to those routinely applied clinical test for ACL tear. The most significant finding of this study was the perfect agreement between the outcome of the Lever Sign test and the MRI findings, regardless of whether the ACL was partially or completely ruptured and regardless of the time elapsed from the injury. MR has been shown to have a specificity and sensitivity of 94–98 % in detecting ACL injury^{2,12,13}.

Conclusion

Lelli's test is a simple with high sensitivity and specificity in comparison to those routinely practiced clinical test for ACL injury. As such it can be used as a screening test for evaluation of ACL function in both acute and chronic knee injury. But for more validity a multi-centric meta-analysis is required.

Conflict of interests: None declared.

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