

### A STUDY ON ACCURACY OF LELLI'S TEST VS LACHMAN TEST WITH RESPECT TO ARTHROSCOPIC FINDINGS IN ANTERIOR CRUCIATE LIGAMENT INJURIES

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#### Abstract

**Background:** The anterior cruciate ligament (ACL) is the most commonly injured structure of the knee joint, While diagnostic arthroscopy is the gold standard for diagnosing injury of the ACL, magnetic resonance imaging (MRI) is a valid and noninvasive diagnostic method, with a specificity and sensitivity of 94-98 %. The aim is to determine the reliability and diagnostic value of Lelli's test and Lachman test, as compared to diagnostic arthroscopy in diagnosing anterior cruciate ligament tear and to assess the sensitivity and specificity of Lelli's test in diagnosing anterior cruciate ligament tear. **Materials and Methods:** This is an Institution based prospective longitudinal study was conducted at attending Outpatient/Inpatient Department and Trauma care of Orthopaedics, RG Kar, Kolkata for 12 months starting from 1st April 2021. In the 12 months, there was patient recruitment. The patients recruited till April 2022. Sampling technique: 177 consecutive patients having knee concern irrespective of definitive MRI diagnosis of unilateral ACL tear was enrolled. We will do Lelli's test and Lachman test in those patients and later will do diagnostic arthroscopic evaluation. Then we will correlate the reliability of those clinical tests with arthroscopic finding which is gold standard. **Result:** Our study showed that, lower number of patients had Lelli's Test under Anaesthesia [21 (61.8%)] in Female Patients compared to [93 (65.0%)] Male Patients but this was not statistically significant (p=0.7203) and we also found that, lower number of patients had [26 (76.5%)] Lachman Test Under Anaesthesia in Female Patients compared to [102 (71.3%)] Male Patients but this was not statistically significant (p=0.5469). **Conclusion:** We concluded that the sensitivity of the lachman test is slightly higher than lelli's test but the specificity of the lelli's test is much more than lachman test.

#### INTRODUCTION

While diagnostic arthroscopy is the gold standard for determining whether the anterior cruciate ligament (ACL) has been injured, magnetic resonance imaging (MRI) is a reliable and noninvasive diagnostic approach with a specificity and sensitivity of 94-98%.<sup>[1,2]</sup> To validate the Pivot Shift test, the anterior Dratheyr test, and the Lachman test 78 All of these tests are trustworthy and are advised as diagnostic instruments, but they also have flaws, such as the influence of patient guarding brought on by the discomfort of quickly translating or twisting a suspected injury and the difficulty of identifying partial tears.<sup>[3]</sup>

Despite their drawbacks, clinical tests have a number of advantages to MRI, which is also pricey. These advantages include being fully non-invasive, simple to use, quick, and affordable. A novel physical examination known as the "Lever Sign" test or "Lelli's test" was developed and implemented in 2005. The lever sign test has a unique benefit over all other tests in that it may be administered by a provider with tiny hands on a patient with a large leg without compromising the examiner's strength or the patient's size.<sup>[4]</sup> The Lelli's test has proven to be better to other physical examinations since it is diagnostic for both acute and chronic injuries and is equally conclusive for partial as well as total tears.<sup>[5]</sup> One of the two cruciate ligaments that helps to stabilise the knee joint is the anterior cruciate

ligament (ACL). It is a thick band that extends posteromedially from the anteromedial side of the intercondylar region of the tibial plateau and connects to the lateral femoral condyle. It is formed of connective tissue and collagenous fibers. The ACL is made up of two bundles: the anteromedial bundle and the posterolateral bundle.<sup>[6]</sup> In order to limit excessive tibia forward or backward motion in relation to the femur during flexion and extension, the ACL and the PCL combine to form a "x" within the knee. Additionally, the ACL stabilises the knee's rotation under varus or valgus stress.<sup>[7]</sup>

As a result, they altered the anterior Drake test and called it the "MADT." The patient is seated on the exam table with both feet hanging freely and the knees and hips flexed 90 degrees during this test. The examiner applies a push-and-pull motion for two to three rhythmic cycles in one second while holding the proximal tibia. Additionally, the tibial plateau's substantial anterior displacement from the femoral condyles relative to the contralateral knees' laxity was seen favorably. In order to diagnose ACL ruptures, the MADT was presented in this study along with three other traditional physical examinations. They anticipated an ACL tear detecting system to be more sensitive and precise. They reasoned that MADT would detect ACL tears more accurately than other diagnostic tests.

## MATERIALS AND METHODS

This is an Institution based prospective longitudinal study was conducted at attending Outpatient/Inpatient Department and Trauma care of Orthopaedics, RG Kar, Kolkata for 12 months starting from 1st April 2021. In the 12 months, there was patient recruitment. The patients recruited till April 2022.

### Sampling Technique

177 consecutive patients having knee concern irrespective of definitive MRI diagnosis of unilateral ACL tear was enrolled. We will do Lelli's test and Lachman test in those patients and later will do diagnostic arthroscopic evaluation. Then we will correlate the reliability of those clinical tests with arthroscopic finding which is gold standard.

### Inclusion Criteria

1. Patients between 18-50 years of age of either sex.

2. Patients having history of knee injury and complains of give way and willing to give consent for clinical as well as invasive diagnostic approach.

### Exclusion Criteria

1. Open knee injury.
2. Associated life threatening injuries/ polytrauma patients.
3. Associated fractures in lower limb.
4. Any pre existing knee pathology or previous knee surgery.
5. Patients not fit for surgery.

### Study variables

Outcome of Lelli's test and Lachman test were recorded pre- anesthetic and after anesthesia on the operating table. The diagnostic arthroscopy finding was also recorded.

### Radiological investigations

Skiagram of the affected limb to rule out associated bony deformity. MRI of affected knee.

### Study Technique

Clinical examination of all patients having knee concerns after fulfilling inclusion and exclusion criteria was done by a single clinician blinded to MRI findings in the pre-operative period and on the operating table under anaesthesia. The lever sign test was performed as a dichotomous test, as described by Dr Lelli. Then the Lachman test was performed as per standard examination protocol. Patients shall undergo Diagnostic arthroscopy of the affected knee after obtaining anesthetic fitness by a senior orthopaedic surgeon. Those having definite ACL tear shall undergo reconstruction as per standard procedure.

### Statistical Analysis:

Data were entered into a Microsoft Excel spreadsheet for statistical analysis, and SPSS and GraphPad Prism version 5 were then used to examine the results.

## RESULTS

In our study, 53 (29.9%) patients were  $\leq 30$  years of age, 44 (24.9%) patients were 31-40 years of age, 22 (12.4%) patient were 41-50 years of age and 58 (32.8%) patients were 51-60 years of age.

**Table 1: Distribution of Age in group**

Age in group	Frequency	Percent
$\leq 30$	53	29.9%
31-40	44	24.9%
41-50	22	12.4%
51-60	58	32.8%
Total	177	100.0%

**Table 2: Distribution of Sex**

Sex	Frequency	Percent
Female	34	19.2%

Male	143	80.8%
Total	177	100.0%

In our study, 34 (19.2%) patients were Female and 143 (80.8%) patients were Male.

**Table 3: Distribution of LELLI'S TEST**

Lelli's Test	Frequency	Percent
Negative	65	36.7%
Positive	112	63.3%
Total	177	100.0%

In our study, 112 (63.3%) had positive Lelli's Test.

**Table 4: Distribution of LACHMAN TEST**

Lachman Test	Frequency	Percent
Negative	52	29.4%
Positive	125	70.6%
Total	177	100.0%

In our study, 125 (70.6%) had positive Lachman Test.

**Table 5: Distribution of Lelli's Test Under Anaesthesia**

Lelli's Test Under Anaesthesia	Frequency	Percent
Negative	49	27.7%
Positive	128	72.3%
Total	177	100.0%

In our study, 128 (72.3%) had Lellis Test Under Anaesthesia.

**Table 6: Distribution of Lachman Test Under Anaesthesia**

Lachman Test Under Anaesthesia	Frequency	Percent
Negative	49	27.7%
Positive	128	72.3%
Total	177	100.0%

In our study, 128 (72.3%) had Lachman Test Under Anaesthesia.

**Table 7: Distribution of MRI Finding**

MRI Finding	Frequency	Percent
No tear	26	14.7%
Partial tear	6	3.4%
Tear	145	81.9%
Total	177	100.0%

In our study, 26 (14.7%) had no tear, 6 (3.4%) had partial tear and 145 (81.9%) had tear in MRI Finding.

**Table 8: Distribution of Arthroscopic Findings**

Arthroscopic Findings	Frequency	Percent
No tear	22	12.4%
Tear	155	87.6%
Total	177	100.0%

In our study, 22 (12.4%) had no tear and 155 (87.6%) had tear in Arthroscopic Findings.

**Table 9: Distribution of mean: Duration Of injury**

	Number	Mean	SD	Minimum	Maximum	Median
Duration Of injury	177	7.6949	4.4883	3.0000	18.0000	6.0000

In above table showed that the mean Duration Of injury (mean±s.d.) of patients was 7.6949± 4.4883.

## DISCUSSION

Jarbo KA et al,<sup>[8]</sup> (2017) The lever sign test is a new physical examination method for the diagnosis of anterior cruciate ligament (ACL) rupture. There were statistical evaluations done. The mean patient age was 23 years, with 54 patients undergoing surgery (28 female, 26 male), and 48 patients undergoing nonsurgical procedures (16 female, 32 male). The total lever sign test accuracy was 77% (63% sensitivity, 90% specificity), and there was no difference in accuracy between awake and asleep patients (77% vs 76%, respectively).

In our study, out of 177 patients, most of the patients had [38 (65.5%)] Lelli's Test in 51-60years of age group compared to [32 (60.4%)] ≤30 years of age group but this was not statistically significant (p=0.8932) and we also showed that, most of the patients had [18 (34.0%)] Lachman Test in ≤30 years of age group compared to [12 (27.3%)] 31-40years of age group it was not statistically significant (p=0.7771).

Valsalam P et al,<sup>[9]</sup> (2020) The diagnosis of an anterior cruciate ligament (ACL) injury is facilitated, by clinical examinations and MRI imaging testing. Lever test sensitivity was 85.57%

pre-anesthesia and 91.75 post-anesthesia, respectively. This was more sensitive than the other two tests, but less sensitive than the Lachman test (Pre-anesthesia: 93.81%, Post-anesthesia: 98.97). (Pre-anesthesia: 80.41%, Post-anesthesia: 93.81% for the anterior drawer test; Pre-anesthesia: 40.21%, Post-anesthesia: 75.26%)

We found that, more number of patients had Lelli's Test Under Anaesthesia [43 (74.1%)] in 51-60years of age group compared to [35 (66.0%)]  $\leq 30$  years of age group which was not statistically significant ( $p=0.6667$ ). And more number of patients had Lachman Test Under Anaesthesia [18 (34.0%)] in  $\leq 30$  years of age group compared to [15 (25.9%)] 51-60years of age group, [11 (25.0%)] 31-40years of age group and [5 (22.7%)] 41-50years of age group but this was not statistically significant ( $p=0.6667$ ).

It was found that, higher number of patients had Lelli's Test [91 (63.6%)] in Male Patients compared to [21 (61.8%)] Female Patients though it was not statistically significant ( $p=0.8387$ ). And higher number of patients had Lachman Test [100 (69.9%)] in Male Patients compared to [25 (73.5%)] Female Patients but this was not statistically significant ( $p=0.6787$ ).

Our study showed that, lower number of patients had Lelli's Test under Anaesthesia [21 (61.8%)] in Female Patients compared to [93 (65.0%)] Male Patients but this was not statistically significant ( $p=0.7203$ ) and we also found that, lower number of patients had [26 (76.5%)] Lachman Test Under Anaesthesia in Female Patients compared to [102 (71.3%)] Male Patients but this was not statistically significant ( $p=0.5469$ ).

Abd Razak HR et al,<sup>[10]</sup> (2010) Prior to providing patients with arthroscopic therapy, he discovered that magnetic resonance imaging (MRI) is frequently used to identify or support clinical diagnoses for meniscal or ligamentous problems. The objective of this study was to evaluate the MRI diagnostic criteria in individuals with acute anterior cruciate ligament (ACL) injury. This retrospective review comprised the MRI and arthroscopic results of 320 patients who had recently suffered an acute ACL tear. Patients from a high volume tertiary healthcare facility belonged to a single surgeon. All patients had an acute ACL injury to one or both knees, as determined by an MRI or an arthroscopic examination.

Makhmalbaf H et al,<sup>[11]</sup> (2013) The complexity and weight-bearing role of the knee joint. in their 2013 study, make it vulnerable to damage. Anterior cruciate ligament (ACL) tears can cause articular cartilage loss, meniscal tears, and instability in young, physically active people.

We showed that, majority number of patients had [63 (64.9%)] Lelli's Test in  $\leq 6$  Injury Group compared to [49 (61.3%)]  $>6$  Injury Group but this was not statistically significant ( $p=0.6114$ ) and majority number of patients had [69 (71.1%)] Lelli's Test in  $\leq 6$  Injury Group compared to [56 (70.0%)]

$>6$  Injury Group which was not statistically significant ( $p=0.8690$ ).

In our study, most of the patients had [65 (67.0%)] Lelli's Test Under Anaesthesia in  $\leq 6$  Injury Group compared to [49 (61.3%)]  $>6$  Injury Group it was not statistically significant ( $p=0.4256$ ) and we also showed that, most of the patients had [69 (71.1%)] Lachman Test Under Anaesthesia in  $\leq 6$  Injury Group compared to [59 (73.8%)]  $>6$  Injury Group but this was not statistically significant ( $p=0.6986$ ).

We found that, most of the patients had [81 (83.5%)] Tear MRI Finding in  $\leq 6$  Injury Group compared to [64 (80.0%)]  $>6$  Injury Group but this was not statistically significant ( $p=0.5511$ ). And most of the patients had [85 (87.6%)] Tear in Arthroscopic Findings in  $\leq 6$  Injury Group compared to [70 (87.5%)]  $>6$  Injury Group but this was not statistically significant ( $p=0.9793$ ).

It was found that, Lachman Test Vs. ARTHROSCOPIC FINDINGS Final Sensitivity: 76.8, Specificity: 72.7, and Lachman Test Under Anaesthesia Vs ARTHROSCOPIC FINDINGS FINAL Sensitivity: 78.7, Specificity: 72.7. And we showed that, Lelli's Test Vs. Arthroscopic Findings Final Sensitivity: 70.3, Specificity: 86.4 and Lelli's Test under Anaesthesia Vs. Arthroscopic Findings Final Sensitivity: 71.6, Specificity: 86.4.

## CONCLUSION

Though the sensitivity of the lachman test is slightly higher than lelli's test but the specificity of the lelli's test is much more than lachman test.

## REFERENCES

1. 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):267-88. doi: 10.2519/jospt.2006.2011.
2. Crawford R, Walley G, Bridgman S, Maffulli N. Magnetic resonance imaging versus arthroscopy in the diagnosis of knee pathology, concentrating on meniscal lesions and ACL tears: a systematic review. *Br Med Bull.* 2007;84:5-23. doi: 10.1093/bmb/ldm022.
3. Guillodo Y, Rannou N, Dubrana F, Lefèvre C, Saraux A. Diagnosis of anterior cruciate ligament rupture in an emergency department. *J Trauma.* 2008;65(5):1078-82. doi: 10.1097/TA.0b013e3181469b7d.
4. Lefevre N, Naouri JF, Bohu Y, Klouche S, Herman S. Sensitivity and specificity of bell-hammer tear as an indirect sign of partial anterior cruciate ligament rupture on magnetic resonance imaging. *Knee Surg Sports Traumatol Arthrosc.* 2014;22(5):1112-8. doi: 10.1007/s00167-013-2511-2.
5. Gupta R, Malhotra A, Sood M, Masih GD. Is anterior cruciate ligament graft rupture (after successful anterior cruciate ligament reconstruction and return to sports) actually a graft failure or a re-injury? *J Orthop Surg (Hong Kong).* 2019;27(1):2309499019829625. doi: 10.1177/2309499019829625.
6. Webster KE, Feller JA, Leigh WB, Richmond AK. Younger patients are at increased risk for graft rupture and contralateral injury after anterior cruciate ligament reconstruction. *Am J Sports Med.* 2014;42(3):641-7. doi: 10.1177/0363546513517540.
7. Morgan MD, Salmon LJ, Waller A, Roe JP, Pinczewski LA. Fifteen-Year Survival of Endoscopic Anterior Cruciate Ligament Reconstruction in Patients Aged 18 Years and

- Younger. *Am J Sports Med.* 2016;44(2):384-92. doi: 10.1177/0363546515623032.
8. Jarbo KA, Hartigan DE, Scott KL, Patel KA, Chhabra A. Accuracy of the Lever Sign Test in the Diagnosis of Anterior Cruciate Ligament Injuries. *Orthop J Sports Med.* 2017;5(10):2325967117729809. doi: 10.1177/2325967117729809.
  9. Nessler T, Denney L, Sampley J. ACL Injury Prevention: What Does Research Tell Us? *Curr Rev Musculoskelet Med.* 2017;10(3):281-288. doi: 10.1007/s12178-017-9416-5.
  10. Bin Abd Razak HR, Sayampanathan AA, Koh TH, Tan HC. Diagnosis of ligamentous and meniscal pathologies in patients with anterior cruciate ligament injury: comparison of magnetic resonance imaging and arthroscopic findings. *Ann Transl Med.* 2015;3(17):243. doi: 10.3978/j.issn.2305-5839.2015.10.05.
  11. Makhmalbaf H, Moradi A, Ganji S, Omid-Kashani F. Accuracy of lachman and anterior drawer tests for anterior cruciate ligament injuries. *Arch Bone Jt Surg.* 2013;1(2):94-7.