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Influence of Lateral Meniscus Posterior Root and Kaplan Fiber Tears in the ACL-Injured Knee and of a Combined Lateral Meniscus Posterior Root Repair with Lateral Extra-Articular Tenodesis in the ACL Reconstructed Knee

ACL Study Group Meeting 2026

Wybren van der Wal

Ziekenhuis Gelderse Vallei
Het ziekenhuis voor voeding, bewegen en slaap

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Disclosures

Research Grants: Arthrex, Annafonds

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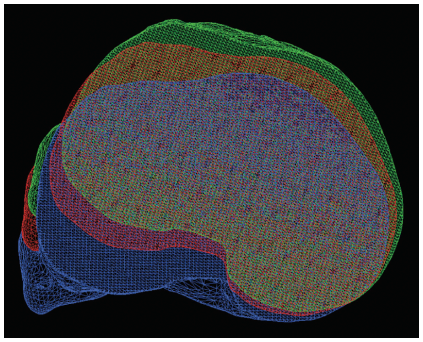
Arthroscopy
The Journal of Arthroscopic and Related Surgery

Biomechanical consequenses of a tear of the posterior root of the lateral meniscus

Significant increase in:

- **Anterior tibial translation during pivot shift in ACL deficient knees compared with ACL-deficient knees with an intact LMPR**
- **Tibial internal rotation in ACL-deficient knees compared with ACL-deficient knees with an intact LMPR**



SYSTEMATIC REVIEW

Cited in Scopus: 21

Meniscal Tears, Posterolateral and Posteromedial Corner Injuries, Increased Coronal Plane, and Increased Sagittal Plane Tibial Slope All Influence Anterior Cruciate Ligament–Related Knee Kinematics and Increase Forces on the Native and Reconstructed Anterior Cruciate Ligament: A Systematic Review of Cadaveric Studies

Arthroscopy, Vol. 38, Issue 5, p1664–1688.e1, Published online: December 6, 2021

Wybren A. van der Wal, Diederik T. Meijer, Roy A.G. Hoogeslag, Robert F. LaPrade

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Arthroscopy
The Journal of Arthroscopic and Related Surgery

Biomechanical consequenses of anterolateral corner injury

- **The ITB acts as main secondary stabilizer to the ACL and helps to resist both internal rotation and internal rotation during the pivot shift.**

SYSTEMATIC REVIEW

Cited in Scopus: 8

The Iliotibial Band is the Main Secondary Stabilizer for Anterolateral Rotatory Instability and both a Lemaire Tenodesis and Anterolateral Ligament Reconstruction Can Restore Native Knee Kinematics in the Anterior Cruciate Ligament Reconstructed Knee: A Systematic Review of Biomechanical Cadaveric Studies

Arthroscopy, Vol. 40, Issue 2, p632–647.e1, Published online: May 17, 2023

Wybren A. van der Wal, Diederik T. Meijer, Roy A.G. Hoogeslag, Robert F. LaPrade

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Why this study?

The American Journal of Sports Medicine
AOSSM American Orthopaedic Society for Sports Medicine

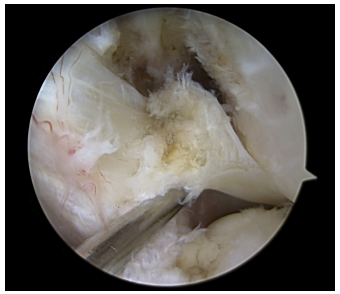
KSSTA Knee Surgery Sports Traumatology Arthroscopy

- **Persisent knee anterolateral rotatory instability (ALRI) may persist after ACL reconstruction**
- **LMPR tears occur in up to 16% of patients with ACL injuries**

› Knee Surg Sports Traumatol Arthrosc. 2021 Sep;29(9):3059-3067.
doi: 10.1007/s00167-020-06352-3. Epub 2020 Nov 9.

Medial meniscus ramp and lateral meniscus posterior root lesions are present in more than a third of primary and revision ACL reconstructions

Amanda Magosch [1], Caroline Mouton [1 2], Christian Nührenbörger [1 2], Romain Seil [3 4 5]



- **Reported incidence of Kaplan fiber injury: 21- 60% in MRI studies, 93% in explorative study**

› Knee Surg Sports Traumatol Arthrosc. 2022 Jan;30(1):176-183.
doi: 10.1007/s00167-021-06543-6. Epub 2021 Apr 1.

Anterolateral complex injuries occur in the majority of 'isolated' anterior cruciate ligament ruptures

Ganesh Balendra [1], Lukas Willinger [2], Vishal Pai [1], Adam Mitchell [1], Justin Lee [1], Mary Jones [1], Andy Williams [3]

› Am J Sports Med. 2020 Nov;48(13):3194-3199. doi: 10.1177/0363546520956302.
Epub 2020 Sep 24.

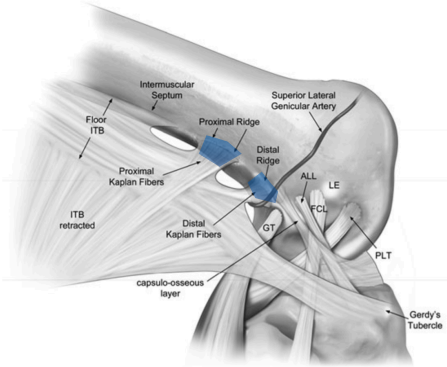
The Incidence of Kaplan Fiber Injury Associated With Acute Anterior Cruciate Ligament Tear Based on Magnetic Resonance Imaging

Niv Marom [1], Harry G Greditzer 4th [2], Michael Roux [2], Daphne Ling [1 3], Caroline Boyle [1], Andrew D Pearle [1], Robert G Marx [1]

› Am J Sports Med. 1993 Jan-Feb;21(1):55-60. doi: 10.1177/036354659302100110.

How iliotibial tract injuries of the knee combine with acute anterior cruciate ligament tears to influence abnormal anterior tibial displacement

- **Anterolateral corner reconstruction significantly reduces ALRI**



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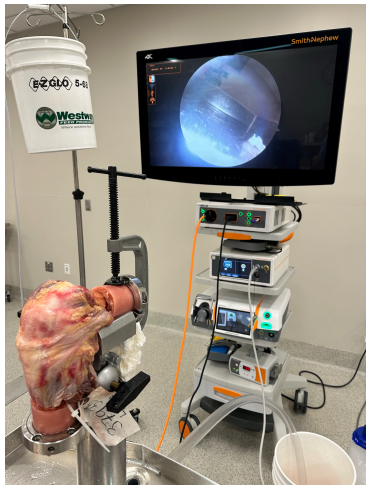
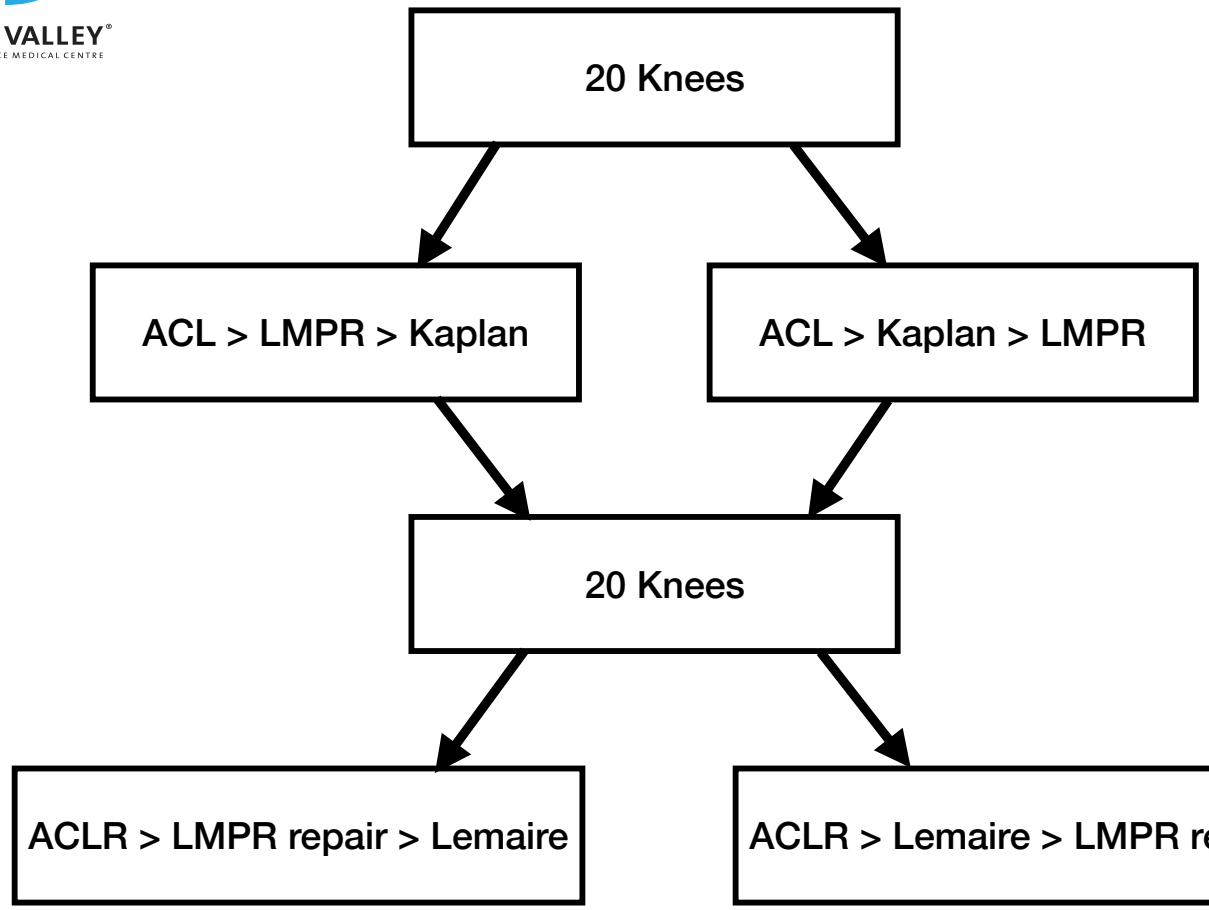
Purpose

- To determine the biomechanical effects of LMPR and Kaplan fiber tears in ACL-deficient knees and assess the impact of LMPR repair, Lemaire tenodesis, or both, after ACLR



Methods

- Ten paired knees
- Six degrees of freedom robotic system
- Tibial IR measurements (5Nm)
- Pivot shift measurements (5Nm IR, 5Nm valgus, 90N ATT)
- 0-90 degrees testing, at 15 degrees increments



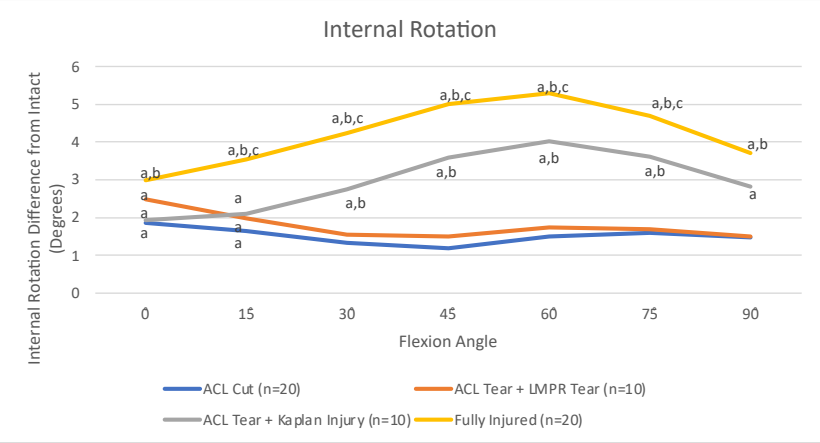
Dissection Randomization

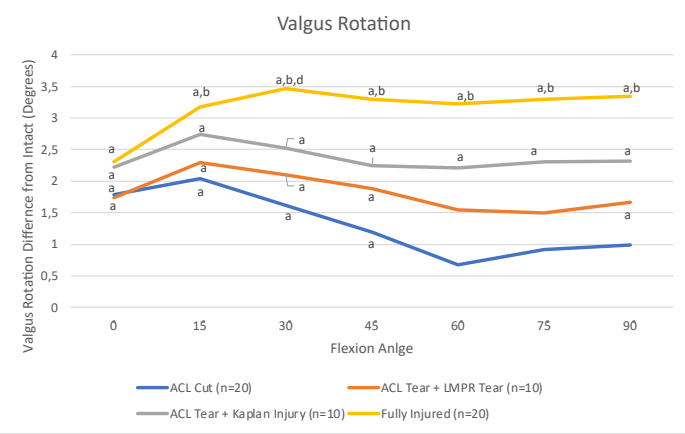
Reconstruction Randomization

Results: dissection

- Both LMPR and Kaplan fibers act as secondary stabilizers to isolated IR and overall pivot shift loading in ACL deficient knee, except LMPR to IR during pivot shift
- Additive effect of Kaplan fiber injury to ACL deficient and LMPR tear knee state for isolated IR and coupled IR and ATT during pivot shift
- Additive effect of LMPR tear to ACL deficient and Kaplan fiber deficient knee state for valgus during pivot shift at 30 degrees

Results: dissection





Results: Reconstruction

- **Knee situation: ACL cut, LMPR cut, Kaplan fibers cut —> ACL reconstruction**
- **ACLR alone did not fully restore stability, with significant residual increases in isolated IR, coupled IR, coupled ATT, and coupled valgus rotation during pivot shift (at almost all flexion angles)**

Results: Reconstruction

- **Knee situation: ACL reconstructed, LMPR cut, Kaplan fibers cut**

- **Adding a LET to the ACLR and LMPR deficient knee state restored knee stability for isolated IR, coupled IR during a pivot shift, and coupled ATT during pivot shift, but not for coupled valgus rotation during pivot shift compared to the intact knee state**

Results: Reconstruction

- **Knee situation: ACL cut, LMPR cut, Kaplan fibers cut —> ACL reconstruction**
- **Adding LMPR repair to the ACLR and Kaplan fiber deficient knee state restored coupled valgus rotation compared to the intact knee state**

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LMPR and Kaplan fibers both need to be addressed to restore knee stability in knees with ACL, LMPR, and Kaplan fiber injuries

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Techniques

- **ACL reconstruction Arthrex all-inside, quadrupled semi-tendinosis graft**
- **Modified Lemaire, fixation with Arthrex Fibertak**
- **LMPR Arthrex Sutureloc repair technique**

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Sutureloc Repair Technique

- 8 LMPR repair failures at post testing arthroscopic evaluations

- Cadaveric bone
- frail repair at time zero
- hars robotic testing conditions against biological healing in clinical conditions

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Discussion

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