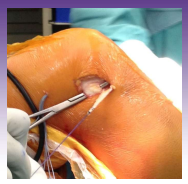
CHICAGO SPORTS MEDICINE SYMPOSIUM 2018
WORLD SERIES OF SURGERY

FOWLER KENNEDY stay active

Extra-Articular Augmentation: *What's the evidence?*



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Disclosures

FOWLER KENNEDY stay active

- Research Support
  - Canadian Foundation for Innovation
  - ISAKOS/OREF
  - Musculoskeletal Transplant Foundation
  - Canadian Institute for Health Research
  - Arthritis Society
  - Ontario Research Fund
  - American Orthopedic Society for Sports Medicine
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  - Arthrex Inc.
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  - Ossur Inc.
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  - Joint Restoration Foundation

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Overview

FOWLER KENNEDY stay active

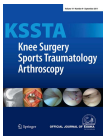
- Extra-Articular Augmentation
  - What we know
  - What we think we know
  - What we don't know

Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-018-5072-6

KNEE

The anterolateral complex of the knee: results from the International ALC Consensus Group Meeting

Alan Getgood[1] · Charles Brown[2] · Timothy Lording[3] · Andrew Amis[4] · Steven Claes[5] · Andrew Geeslin[6] · Volker Musahl[7] on behalf of ALC Consensus Group



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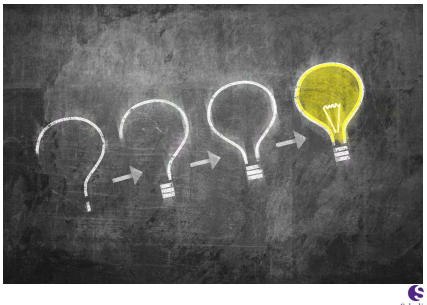
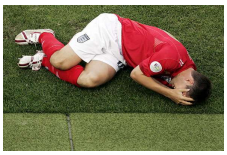
What we know.....



ACL reconstruction has room to improve

- Persistent Rotational Laxity.....Pivot Shift
  - Prodromos et al. 2005 meta-analysis
    - normal stability rates
      - 77% of the hamstring reconstructions
      - 66% of patella tendon reconstructions
  - Mohtadi et al. meta-analysis
    - No differences in subjective clinical outcomes between hamstrings and patella tendon grafts
    - positive pivot shift
      - 22% hamstring
      - 16% patella tendon
  - Ayeni et al. 2012 systematic review
    - Pivot shift correlates with clinical outcome

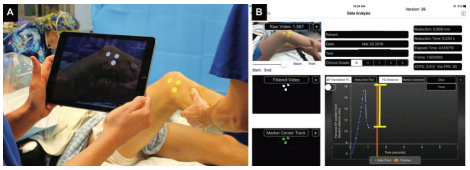


- High failure rates in young athletes
  - Webster & Feller
    - Up to 30% contra-lateral or ipsilateral re-injury

High grade AL laxity is not just an ACL injury

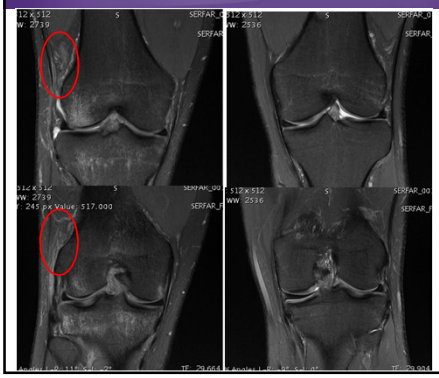
The Influence of Meniscal and Anterolateral Capsular Injury on Knee Laxity in Patients With Anterior Cruciate Ligament Injuries

Volker Musahl,*† MD, Ata A. Rahnemai-Azar,† MD, Joanna Costello,† MD, Justin W. Arner,† MD, Freddie H. Fu,† MD, DSc(Hon), DPS(Hon), Yuichi Hoshino,§ MD, PhD, Nicola Lopomo,|| PhD, Kristian Samuelsson,¶ MD, PhD, and James J. Irrgang,† PhD, PT, ATC, FAPTA
Investigation performed at the Department of Orthopaedic Surgery, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA

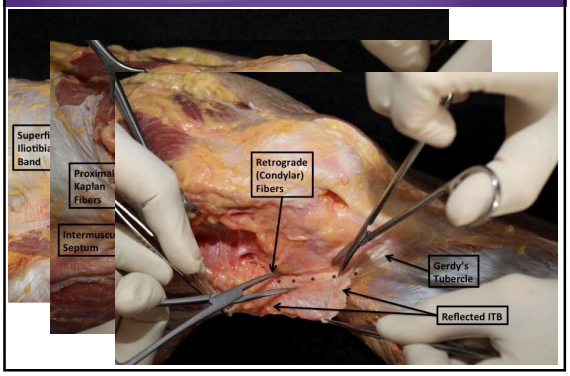


- Concomitant injury to the ALC, medial meniscus, or lateral meniscus is associated with increased knee rotatory laxity

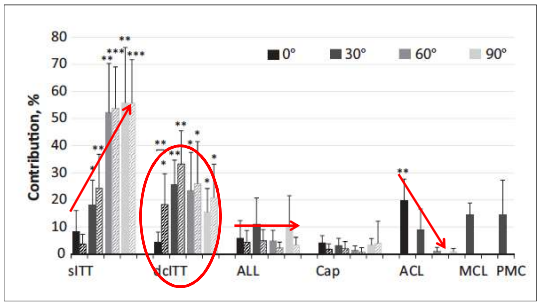
Is there such a thing as an isolated ACL injury?



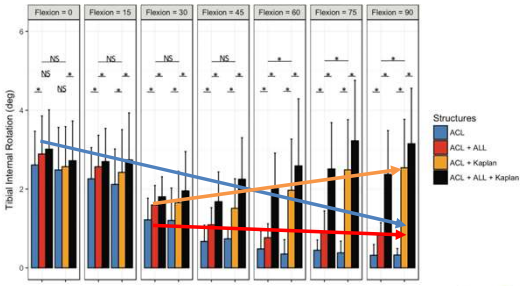
Biomechanical studies demonstrate the importance of the ALC



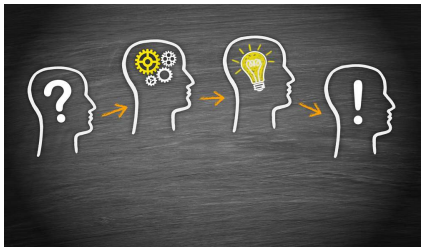
Contributions to Control of Internal Rotation (Kittl et al. AJSM)



Kaplan fibre attachment to ITB has greater role than ALL (Geeslin et al. AJSM)



What we think we know……

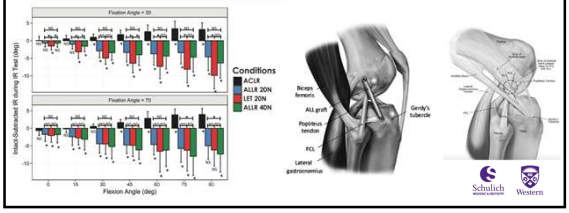


Biomechanical Studies of ALC Reconstruction?

Anterolateral Knee Extra-articular Stabilizers

A Robotic Study Comparing Anterolateral Ligament Reconstruction and Modified Lemaire Lateral Extra-articular Tenodesis

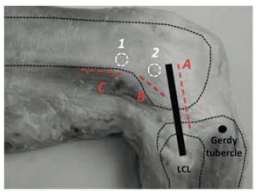
Andrew G. Geeslin,* MD, Gilbert Moatshe,*†‡ MD, Jorge Chahla,* MD, PhD, Bradley M. Kruckeberg,* BA, Kyle J. Muckenhirn,* BA, Grant J. Doman,* MSc, Ashley Coggins,* BS, Alex W. Brady,* MSc, Alan M. Getgood,§ MD, Jonathan A. Godin,* MD, MBA, and Robert F. LaPrade,*†¶ MD PhD
Investigation performed at Steadman Philippon Research Institute, Vail, Colorado, USA

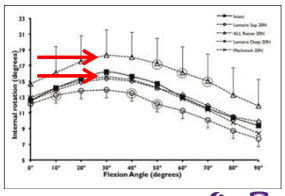


Biomechanical Studies of ALC Reconstruction?

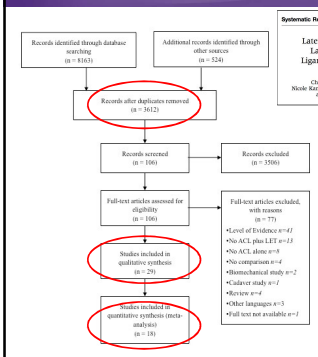
Biomechanical Comparison of Anterolateral Procedures Combined With Anterior Cruciate Ligament Reconstruction

Eivind Inderhaug,*† MD, PhD, Joanna M. Stephen,*† PhD, Andy Williams,‡ FRCS(Orth), FFSEM, and Andrew A. Amis,*§ FREng, DSc(Eng)
Investigation performed at Imperial College London, London, UK





ACL augmentation with LET reduces Pivot Shift



Systematic Review

Lateral Extra-articular Tenodesis Reduces Rotational Laxity When Combined With Anterior Cruciate Ligament Reconstruction: A Systematic Review of the Literature

Christopher E. Hewison, B.Sc.(Kin), Michael N. Tran, M.D., F.R.C.S.C., Nicole Kaniki, A.T.C., M.Sc., Aliya Remtulla, B.Sc.(Kin), M.Sc., Dianne Bryant, Ph.D., and Alan M. Getgood, M.Phil., M.D., F.R.C.S.(Tr&Orth), Dip.S.E.M.

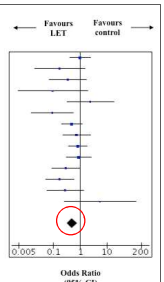
- Databases
  - PubMed, Medline OVID, Embase, CINAHL, Scopus, SPORTSDiscus, Web of Science, Cochrane Library, and Dissertations and Theses
- Search terms
  - "extraarticular," "extra articular," "extra-articular," "lateral plasty," "lateral-plasty," tenodesis," "procedure," "augment," "technique," "reconstruction," "Lemaire," "Losee," "MacIntosh," "Ellison," "Andrews," and "Hughston"
- 5 Languages
  - English, French, Spanish, German, Italian

ACL augmentation with LET reduces Pivot Shift

Study	ACL plus LET # of events	ACL plus LET Sample size	ACL alone # of events	ACL alone Sample size	Odds Ratio (95% CI)
Anderson et al.[2]	11	34	22	68	1.00 (0.41 to 2.41)
Barrett et al.[5]	1	32	6	38	0.17 (0.02, 1.51)
Dejour et al.[10]	2	25	10	50	0.35 (0.07 to 1.73)
Goertzen et al.[19]	0	32	3	24	0.09 (0.00 to 1.92)
Hefti et al.[23]	2	23	2	52	2.38 (0.31 to 18.04)
Kerschbaumer et al.[27]	2	37	5	13	0.09 (0.01 to 0.56)
Noyes et al.[43]	10	40	26	64	0.49 (0.20 to 1.17)
O'Brien et al.[44]	7	48	6	32	0.74 (0.22 to 2.45)
Roth et al.[51]	21	43	27	50	0.81 (0.36 to 1.84)
Strum et al.[55]	6	43	13	84	0.89 (0.31 to 2.52)
Trichine et al.[57]	4	55	11	52	0.29 (0.09 to 0.99)
Vadala et al.[59]	5	27	16	28	0.17 (0.05 to 0.58)
Zaffagnini (2006) et al.[64]	2	25	12	50	0.28 (0.06 to 1.34)
Zaffagnini (2008) et al.[63]	2	35	0	37	5.60 (0.26 to 120.80)
Overall	75	499	159	642	0.50 (0.32 to 0.78)

Heterogeneity: $I^2 = 34\%$

Test for overall effect: $Z = 3.06$ ($P = 0.002$)



- No difference in KT1000 or IKDC

Should an anterolateral reconstruction be performed clinically?

- **The Stability Study**
- **ISAKOS/OREF 2014 Research Grant**
- **'Multicenter Randomized Clinical Trial comparing Anterior Cruciate Ligament Reconstruction With and Without Lateral Extra-articular Tenodesis in Individuals Who Are At High Risk of Graft Failure'**

- **Started January 2014**
- **9 Centers across Canada and Europe**
- **Hypothesis**
  - The addition of LET to ACLR will reduce graft failure in patients deemed to be at high risk of graft failure

Methods

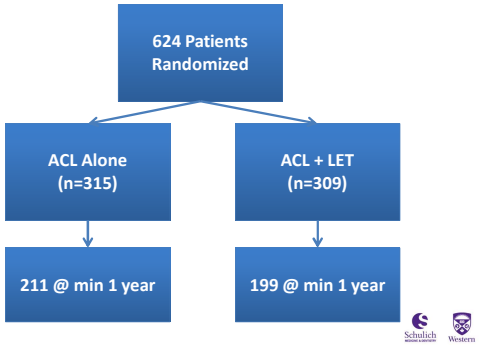
- Inclusion Criteria
  - ACL deficient knee
  - Skeletally mature to 25 years of age
  - *2 or more of:*
    - Competitive pivoting sport
    - Gr 2+ pivot or greater
    - Generalized ligamentous laxity (Beighton Score 4+) or genu recurvatum > 10°

- Randomization
  - Permuted block sizes of two and four in a one-to-one ratio by a computer
  - Stratification
    - surgeon, gender, meniscal repair changing rehab

Stability Study

- Primary Outcome: **GRAFT FAILURE**
  - Symptomatic instability requiring revision ACLR **OR** asymmetric positive pivot shift
  - Sample size: 300 patients per group (n=600)
    - Group 1: ACLR alone (Hamstring autograft)
    - Group 2: ACLR plus LET (Modified Lemaire)
- Secondary Outcome Measures:
  - ACL QoL, KOOS, Marx, IKDC, EQ-5D, ROM, Radiographs, return to sport, functional assessment, 3D motion analysis (DVJ), qMRI
- Blind assessments: Baseline, 3, 6, 12 & 24 months

CONSORT Flowchart



Demographics

Demographic Characteristic	Group 1: ACL Alone (n=315)	Group 2: ACL plus LET (n=309)	p-value
Sex, n (%) Male	148 (48)	145 (47)	0.88
Mean Age ± SD (yrs)	18.8 ± 3.3	19.0 ± 3.6	0.48
Mean Height ± SD (cm)	173.2 ± 9.4	172.3 ± 9.5	0.75
Mean Weight ± SD (kg)	72.6 ± 14.9	72.3 ± 14.9	0.92
BMI ± SD (kg/m^2)	21.4 ± 3.7	21.2 ± 3.9	0.35
Mean time from injury to surgery ± SD (mos)	7.9 ± 19.0	8.9 ± 16.4	0.64
Operative Limb, n (%) Dominant	178 (57)	163 (53)	0.42

Primary Outcome

- Graft failure
  - ACL only = 11/211
  - ACL + LET = 4/199
  - relative risk (RR) of 0.39(95%CI 0.12 to 1.19, p=0.10)
  - (not significant but favors LET)
- Asymmetric pivot shift
  - ACL = 78/211
  - LET = 43/199 for a RR of 0.58 (95%CI 0.42 to 0.80, p=0.001)
  - Fragility Index (FI) =13 (favors LET)

Stability Summary

- Early results suggest potential beneficial effect of LET in reducing graft failure
  - Currently underpowered
- Needs to be balanced against delayed functional recovery and potential increase in minor complications
  - LET clearly not indicated for everyone
- Need to wait until the two year outcome when we can make recommendations with confidence

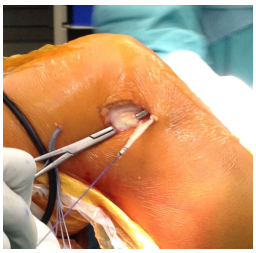
What we don't know…..

ALC Consensus Meeting: Watford UK, October 2017

- **Clinical evidence is currently lacking to support clear indications for lateral extra-articular procedures as an augmentation to ACL reconstruction**
- **Appropriate indications may include:**
  - **Revision ACL**
  - **High Grade Pivot Shift**
  - **Generalized ligamentous laxity/Genu recurvatum**
  - **Young patients returning to pivoting activities**

My Indications for LET?

Modified Lemaire LET



Vumedi.com: Getgood

- Indications
  - Revision
    - where no other significant pathology needs to be addressed
  - Primary
    - High risk individuals with grade 2/3 pivot
      - <20 yrs old
      - GLL
      - Recurvatum
      - Pivoting sport
- No significant adverse events

Summary

- ACL rupture is NOT an isolated injury
- Persistent anterolateral rotatory laxity is associated with poor patient reported outcomes
- High failure rates of ACLR in young active population using contemporary techniques
- LET may reduce anterolateral rotatory laxity and may reduce ACL reconstruction failure
- Await final results of primary outcome of Stability study to determine is LET is efficacious in improving rotational laxity
- Indications have to be further defined

Thank you!

STABILITY Group

- Dr Bob Litchfield
- Dr Dianne Bryannt
- Dr Kevin Willits
- Dr Pete MacDonald
- Dr Mark Heard
- Dr Laurie Hiemstra
- Dr Greg Buchko
- Dr Davide Bardana
- Dr Devin Petersen
- Dr Bob McCormack
- Dr Trevor Stone
- Dr Dory Boyer
- Dr Darius Viskontas
- Dr Peter Verdonk
- Dr Koen Laggae
- Dr Geert DeClerq
- Mr Tim Spalding
- Mr Pete Thompson
- Stacey Wanlin
- Chris Hewison
- Andrew Firth
- Ryan Pinto
- Sheila Mcrae
- Alexandra Legary
- Sarah Kerslake
- Mauri Zomar
- Nicole Simunovic
- Fiona Howells
- Kristien Vuylsteke