Trends in the Treatment of ACL Tears in 2025

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Disclosures

No financial or clinical disclosures.

Outline - ACL Injuries in 2025

- ACL Repair Clinical Progression and Background
- Trends in ACL Reconstruction (ACLR)
- Outcomes of primary suture repair vs. Enhanced ACL Repair (BEAR)
- The BEAR in 2025
- Anterolateral rotatory stabilizing procedures options
- Indications for Lateral Extra-Articular Tenodesis (LET) procedure along side ACLR

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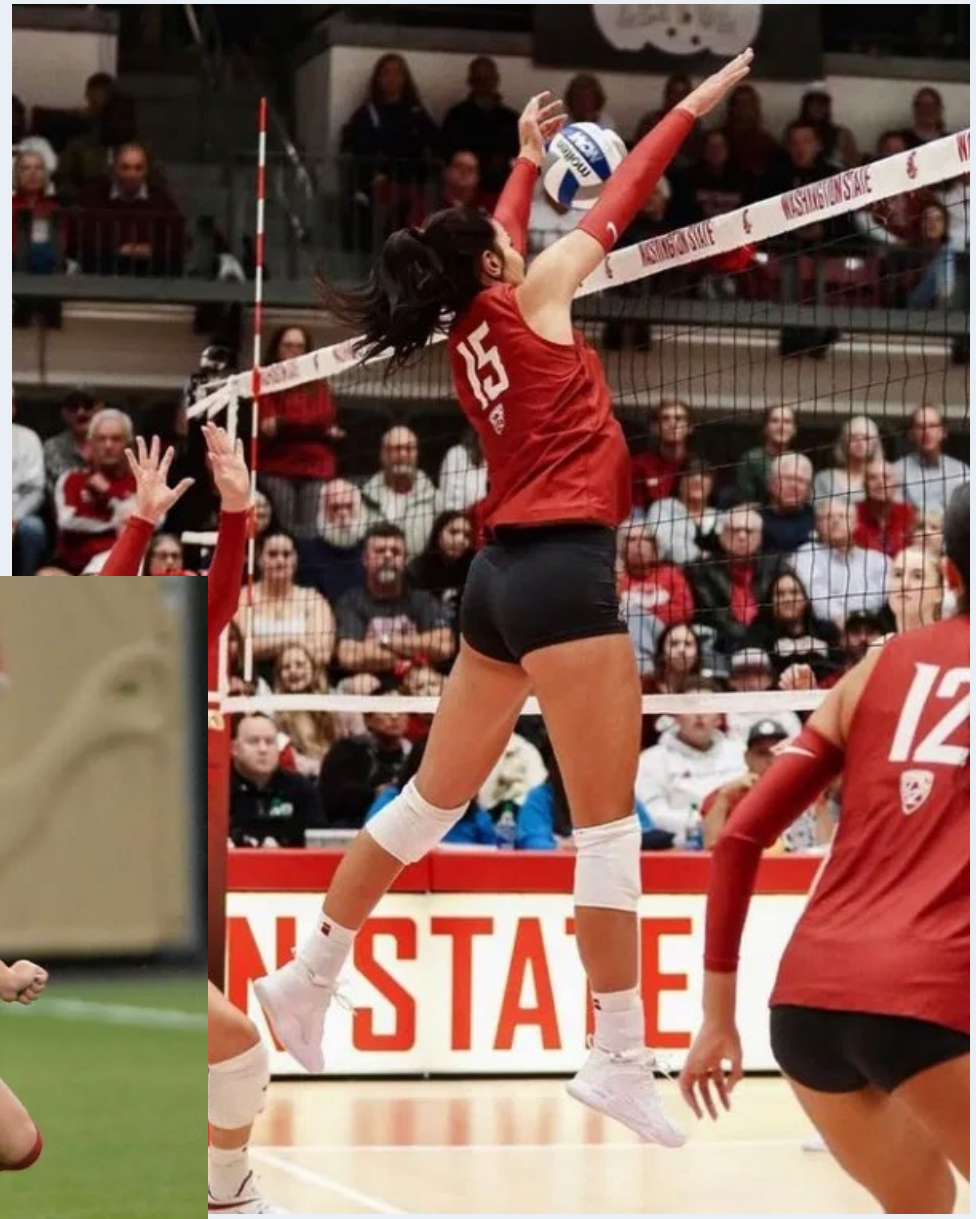
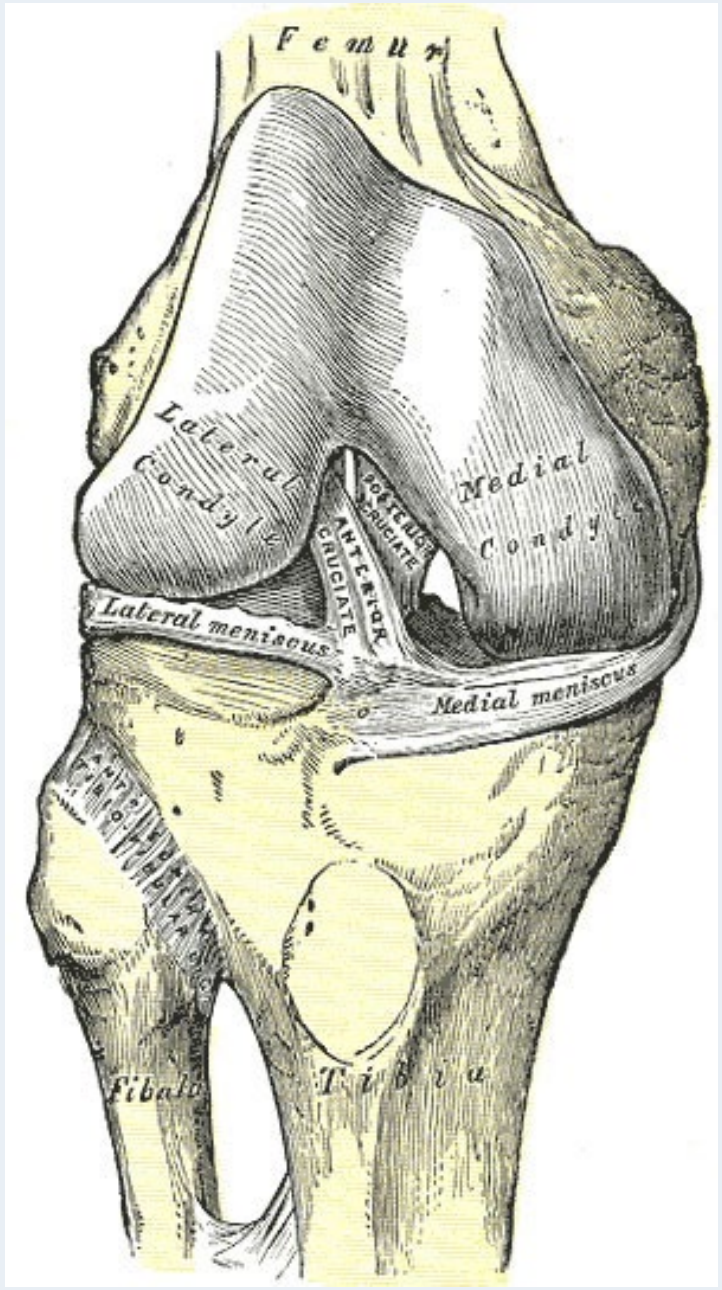
ACL Tears

Background

- One of the most common knee injuries in sport.
- 70% of all ACL injuries are non-contact injuries. (MOON)
  - Deceleration
  - Landing
  - Cutting
  - Pivoting
- Increased risk associated with…
  - Dynamic sports
  - Increased static valgus alignment
  - Ages 15-25
  - Females
  - Increased posterior tibial slope
  - Revision ACL patients have 50% incidence of advanced osteoarthritis 10 years post – surgery - (MARS)



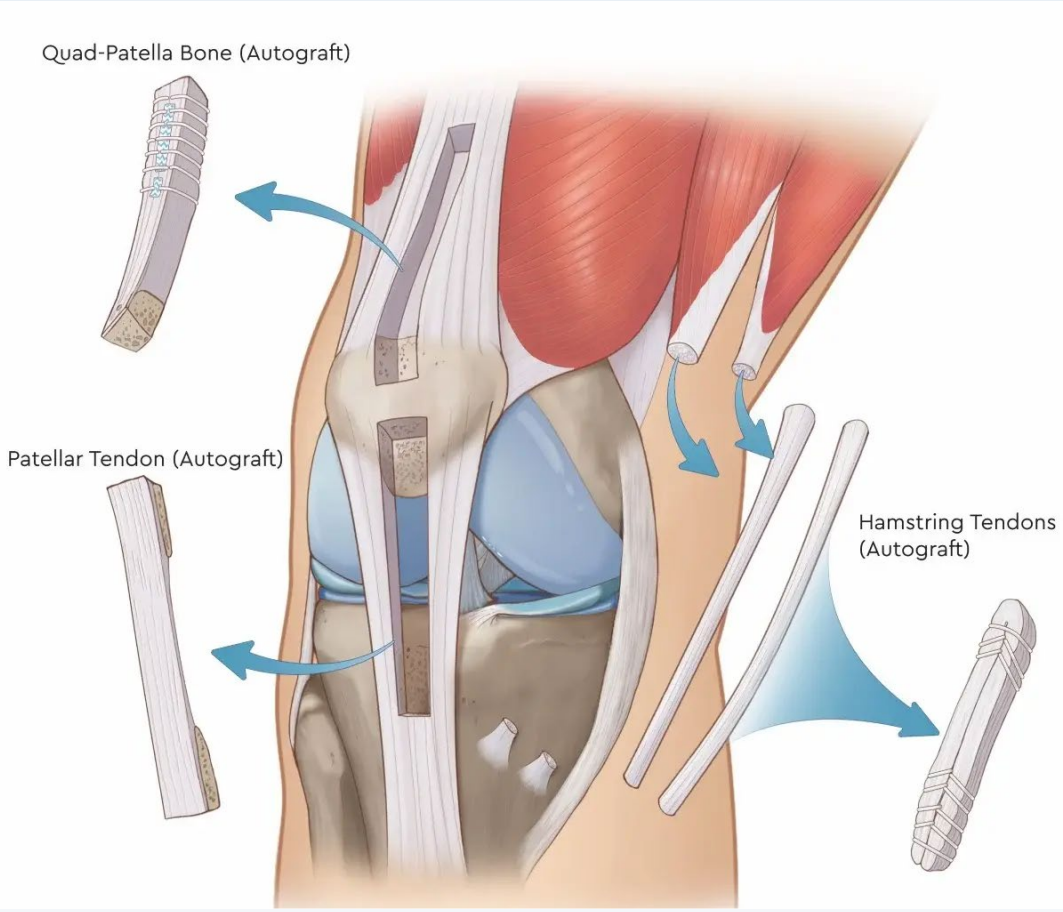


ACL Tears

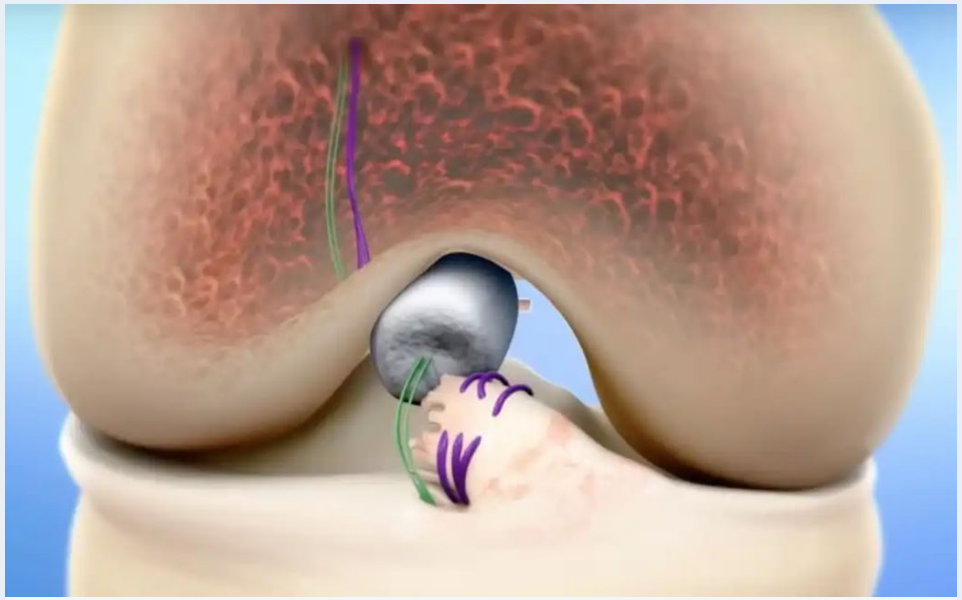
The ongoing discussion…

- The first successful suture repair by Robson in1895
- Popularized in the 1970's and 80's
- Due to failure rates as high as 90% Anterior Cruciate Ligament Reconstruction emerged as gold standard in the 1990's.
- Anterolateral stabilizing procedures introduced in 1990's
- Repair reintroduced by Micheli and Murray with "bridging" in the 2000's

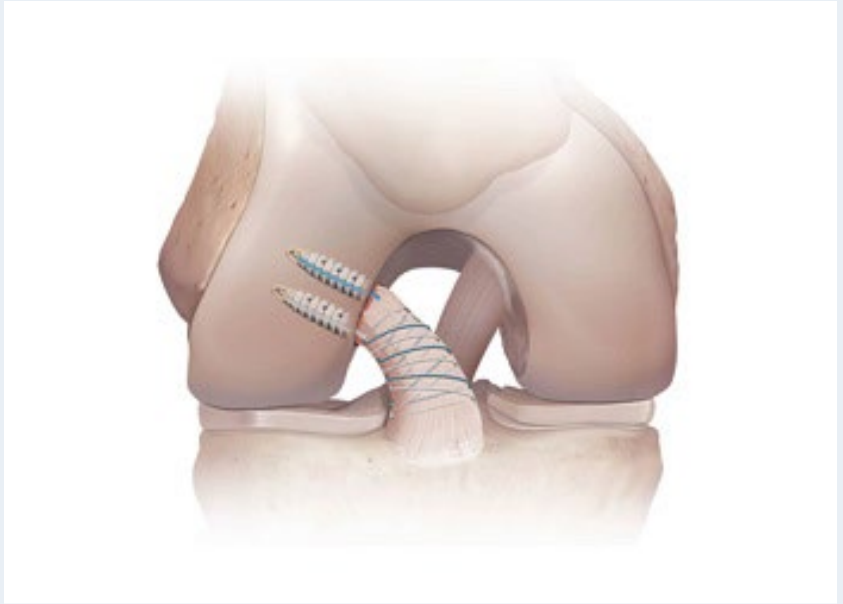
Surgical Treatment Options



ACL Reconstruction (3 Graft Types)

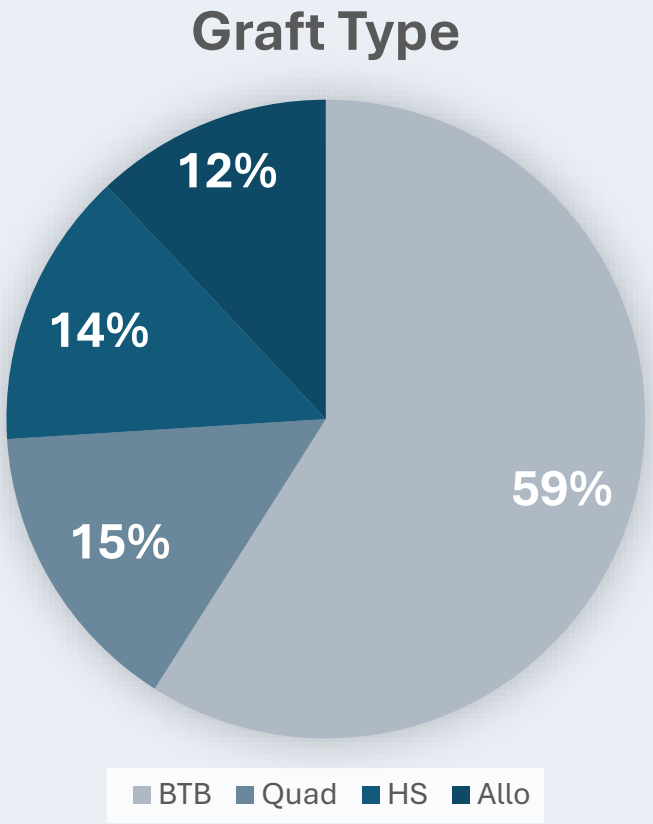


Bridge Enhanced ACL Repair - BEAR



Primary ACL Suture Repair

Trends in ACL Reconstruction



Original Research

Trends in Anterior Cruciate Ligament Reconstruction Techniques and Postoperative Care Among Leaders in the Field

A Survey of the Herodicus Society

Ian D. Engler,[*†‡] MD, Michael A. Fox,[†] MD, Andrew J. Curley,[†] MD, Damaris S. Mohr,[§] PA-C, Sahil Dadoo,[†] MD, Justin W. Arner,[§] MD, Volker Musahl,[†] MD, and James P. Bradley,[§] MD
Investigation performed at University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA

(Engler et al., 2024)

Trends in ACL Reconstruction Cont.

- Ongoing discussion on what graft type to use
  - Patellar tendon/quadriceps/hamstring
- Role of primary suture repairs?

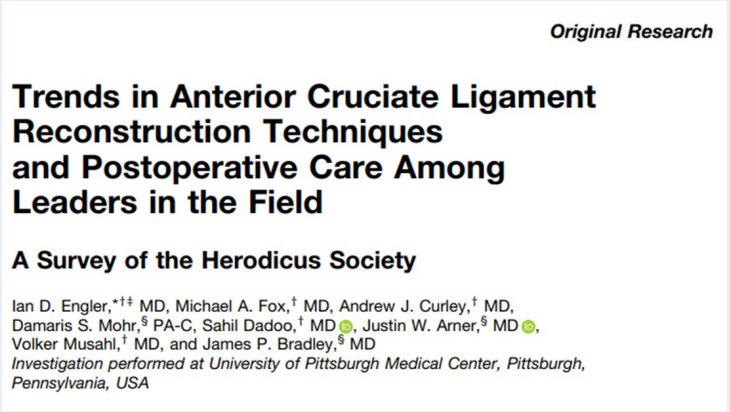


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TABLE 4
Survey Studies of ACLR Since 2016[a]

Year	Authors	Participants	Preferred Graft	Tunnel Drilling	Femoral Fixation	Tibial Fixation	IS Screw Type	AL Augment	CPM	RTP
2016	Grassi et al[18]	SIGASCOT (Italy)	HS 81%	NR	NR	NR	NR	NR	NR	6-8 months 69%
2016	Vaishya et al[38]	DAS (India)	HS 83%	AM 90%	Button 94%	IS 96%	Bio 97%	NR	NR	NR
2017	Budny et al[4]	AOSSM and AANA (US)	HS 45%, BPTB 41%	AM 61%	BPTB: IS 79% ST: Button 79%	BPTB: IS 98% ST: IS 41%	NR	NR	23%	6-9 months 66%
2021	Sherman et al[34]	ACL Study Group (International)	HS 53%, BPTB 36%	AM 73%	Button 50%	IS 50%	NR	Rare/never 54%	NR	6-8 months 44%
2023	Tuca et al[37]	ISAKOS (Intl)	HS 80%	AM 79%	BPTB: IS 93% ST: Button 83%	BPTB: IS 95% ST: IS 77%	BPTB: Metal 49% ST: Bio 81%	Never 45%	NR	9 months 33%
2024	Engler et al, this study	Herodicus (US+)	BPTB 59%, Quad 15%	AM 67%	BPTB: IS 79% ST: Button 80%	BPTB: IS 77% ST: IS 78%	Nonmetal 55%	Rare/never 64%	17%	7-9 months 26%

(Engler et al., 2024)

Primary ACL Suture Repair

Failure rates as high as…

Primary arthroscopic ACL repairs with suture tape augmentation result in unacceptably high failure rates

Original Research

Failure Rates After Anterior Cruciate Ligament Repair With Suture Tape Augmentation in an Active-Duty Military Population

Christian A. Cruz,*† MD, Brian J. Mannino,† MD, Connor B. Venrick,† MD, Rebecca N. Miles,‡ BS David R. Peterson,† MD, Liang Zhou,† MD, Kyong S. Min,† MD, and Craig R. Bottoni,† MD

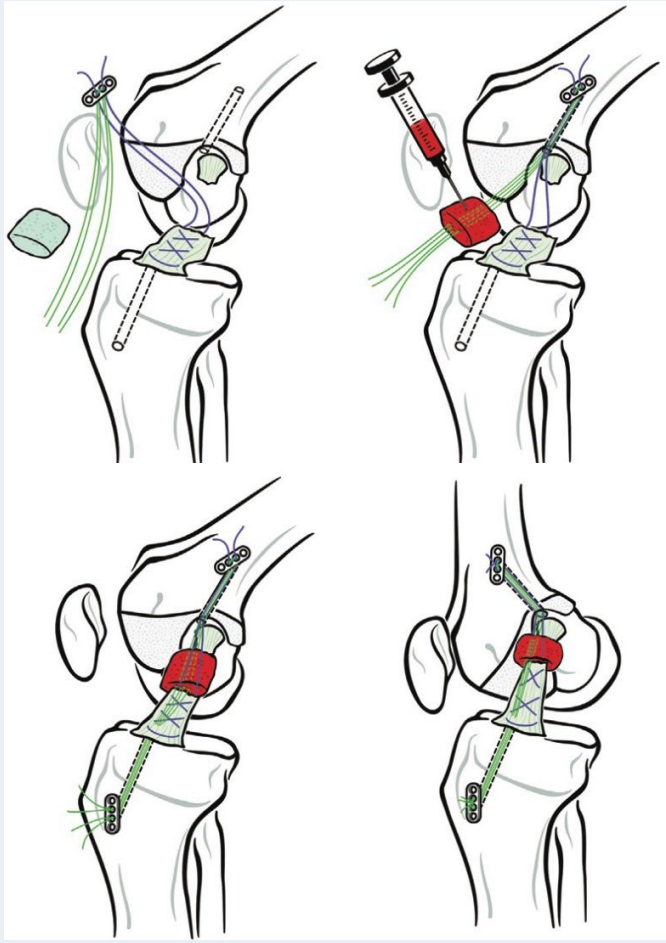
Investigation performed at Tripler Army Medical Center, Honolulu, Hawaii, USA

Cruz, C. A., Mannino, B. J., Venrick, C. B., Et al. (2023)

Enhanced Anterior Cruciate Ligament Repair (BEAR)

What is it? Why does it work?

- Preserves native of ACL tissue to bridge the torn ends of the remaining tissue
- The ACL has ability to heal but needs a provisional scaffold
- BEAR implant provides the scaffold for a patient's blood to create a clot and resist degradation
- By 8 weeks, the BEAR Implant is replaced with native cells, collagen and blood vessels.



"Bridge-enhanced anterior cruciate ligament restoration (BEAR) combines suture repair of the anterior cruciate ligament (ACL) with an extracellular matrix implant plus autologous blood to facilitate native ACL healing." (Fleming et al., 2024)

BEAR Outcomes

- Outcomes non-inferior to ACLR at two-year post operatively.
- Early findings show that this is significantly improved compared to ACL suture only repairs
- Increased patient satisfaction and readiness to return to sport.

- BEAR ACL similar in size to non-injured ACL.
- Restores native tissue no need for additional harvesting patient tissue for graft or wound sites.
- BEAR ACL similar graft strength of hamstring autograft.
- Faster recovery of muscle strength.

BEAR Registry

My Practice

Nine Patients

- First BEAR: March 2023 (22 months)

Patient Demographics

- Ages 17-60 y.o. (Mean 32.4)
- All Female - All doing well.

Outcomes

- 1 Year: 0% retear rate 0/9 (One lost to follow up)

Across the Nation

- Duke (NC)
- Advent Health (FL)
- Steamboat (CO)
- Victory Sports (NY)
- Virtua Health (NJ)
- HHS (NY)

100 Patients at 1-year

Patient Demographics

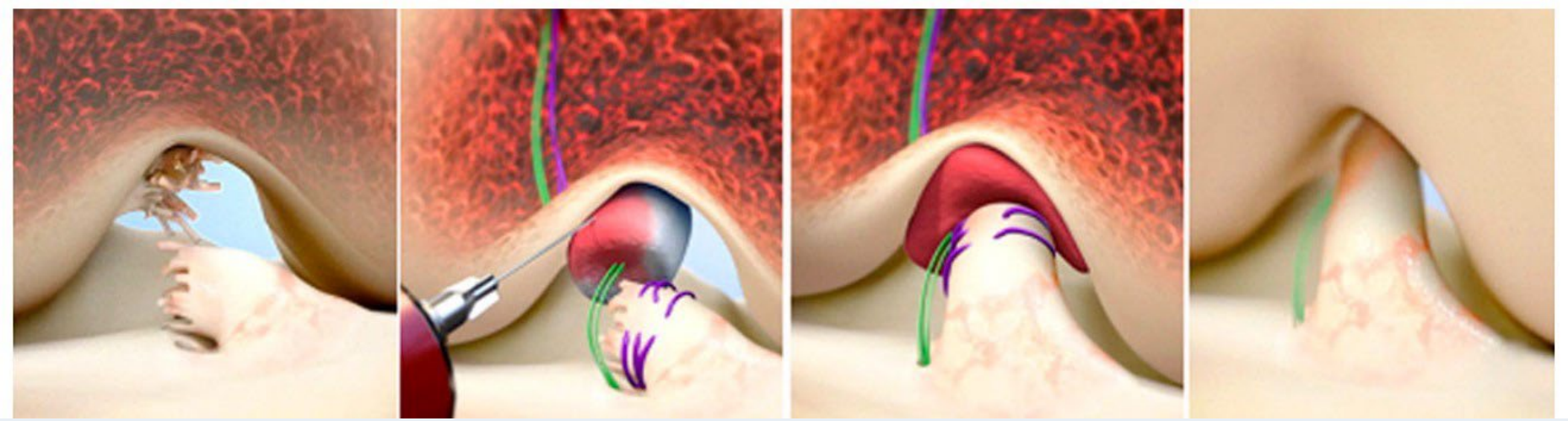
- Ages 8-70 y.o. (Mean 31)
- 67% Female 33% Male

Outcomes

- 1 year: 0% retear rate 0/100
- 2 year: 3% retear rate 1/29

BEAR Limitations

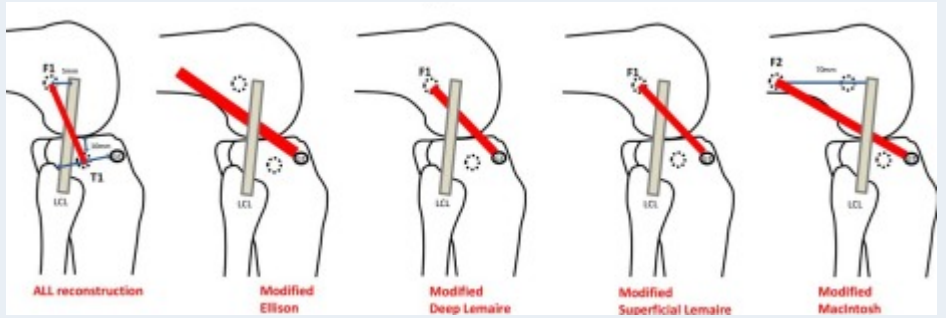
- Small cohorts beyond 6 years mark
- The optimal rehabilitation procedure following the BEAR procedure is unknown.
- What this means for young patients and return to high levels of play?



Anterolateral Rotatory Stabilization

What is it? What techniques exist?

- Anterolateral Ligament Reconstruction (ALLR)
- Lateral Extra-Articular Tenodesis (LET)
- McIntosh
- Ellison
- Asher Coker Technique



Lateral extra-articular tenodesis (LET) Procedure

Rationale

- ACLR stabilize A/P translation
- ACLR incompletely stabilizes internal rotation
- *Indications*
- Revision ACL Reconstruction
- Hyper-extension / Recurvatum
- Soft Tissue ACL Graft (Hamstring)
- Significant Meniscal Deficiency
- “High risk” patients
- Increased sagittal tibia slope

TABLE 2
Descriptive Characteristics of Anterolateral Augmentation Use and Technique During ACLR[a]

	Total Respondents (n = 69)	
	Anterolateral Augmentation Use	
Response	Primary ACLR	Revision ACLR
Always	0 (0.0)	7 (10.1)
Often	7 (10.1)	21 (30.4)
Sometimes	18 (26.1)	22 (31.9)
Rarely	27 (39.1)	9 (13.0)
Never	17 (24.6)	10 (14.5)
	Anterolateral Augmentation Technique	
LET	46 (66.7)	
ALLR	10 (14.5)	
Other	2 (2.9)	
None	10 (14.5)	

[a]Data are presented as n (%). ACLR, anterior cruciate ligament reconstruction; ALLR, anterolateral ligament reconstruction; LET, lateral extra-articular tenodesis.

(Engler et al., 2024)

Biomechanics

What it does

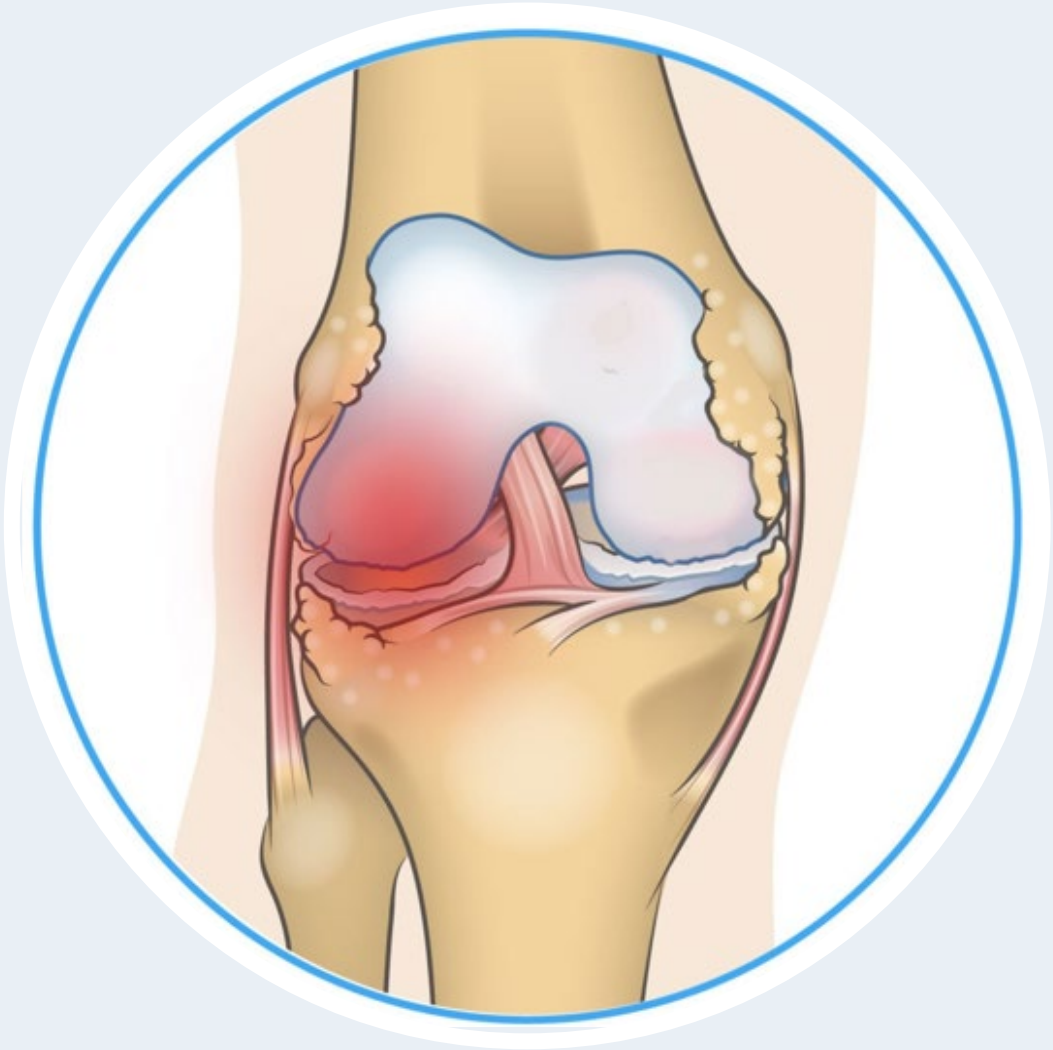
- Decreases rotary forces
- Reduced the rate of reinjury
- Overload lateral compartment?
  - Increased possibility of arthrosis

Table 4. Group-wise Comparison of Tibial Internal Rotation During Application of 5-Nm Internal Rotation Torque

	Difference in Internal Rotation		
Knee State Comparison	Mean, °	SD, °	*P* Value
ACL deficient vs intact knee	4.01	1.7	<.001
ACL and ALL deficient vs intact knee	6.27	2.25	<.001
ACL and ALL deficient vs ACL deficient	2.22	0.92	<.001
ACLR vs intact knee	1.99	1.06	<.001
ACLR and LET vs intact knee	−0.1	1.26	.999
Combined ACLR and ALLR vs intact knee	0.07	1.15	.677
Combined ACLR and ALLR vs combined ACLR and LET	−0.11	1.11	.998

ACL, anterior cruciate ligament; ACLR, anterior cruciate ligament reconstruction; ALL, anterolateral ligament; ALLR, anterolateral ligament reconstruction; LET, Lemaire lateral extra-articular tenodesis; SD, standard deviation.

(Delaloye et al., 2020)



LET Complications and Limitations

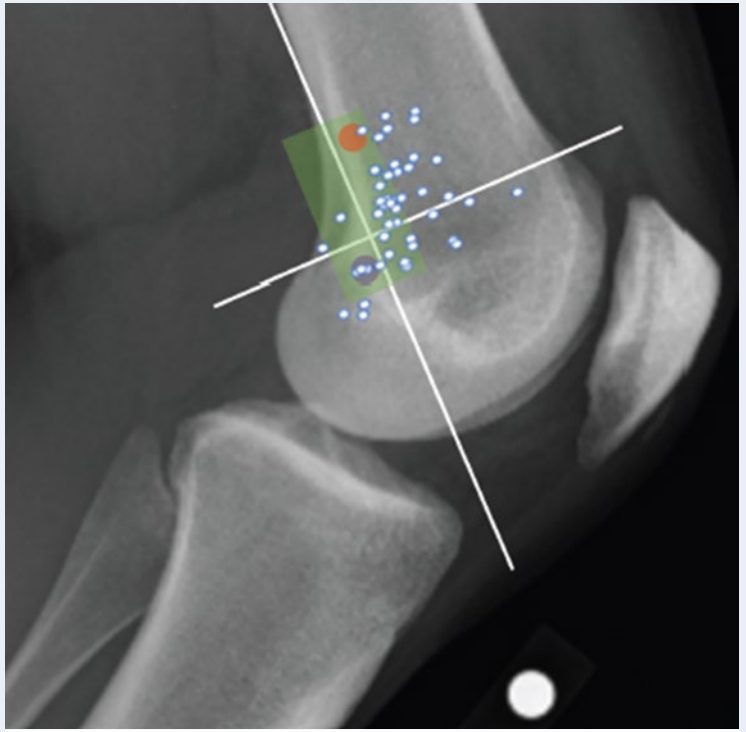
Limitations

- Heterogeneity of literature
- Slows post-operative progression

Complications

- Stiffness
- Prolonged quadriceps weakness
- Additional surgery time (with inherent risks)

Is it needed?



(Kanakamedala et al., 2024)

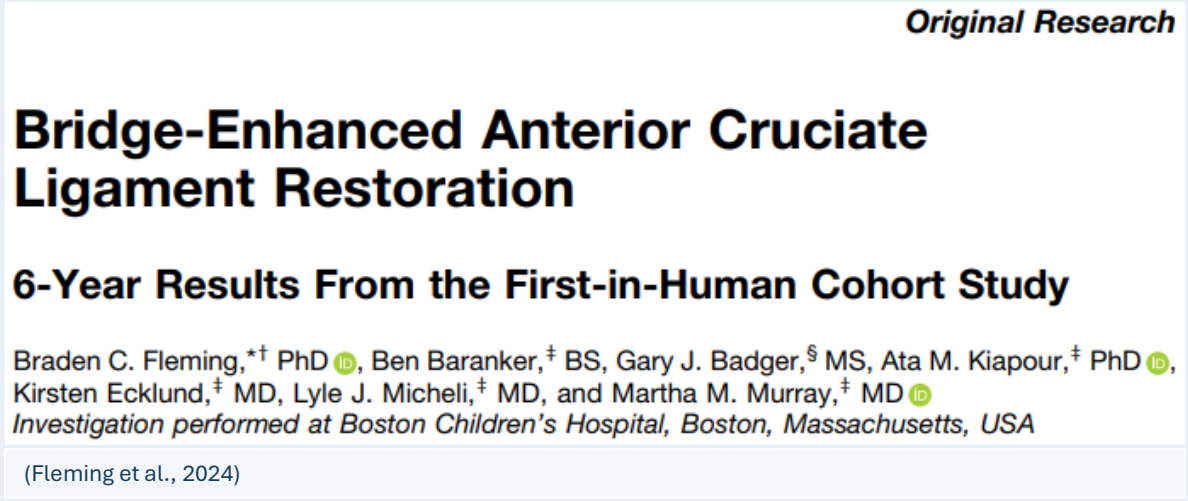
When to use a BEAR and or LET procedure in 2025?

BEAR

- Potential to compete with ACL reconstruction as gold standard in selected cases?
- Currently offered all pt <7 wks
- Indications expanding age range (8-70)

LET Procedure

- Revision ACL reconstruction
- Hyper elasticity
- Increased sagittal tibial slope
- Young elite athlete



Original Research

Bridge-Enhanced Anterior Cruciate Ligament Restoration

6-Year Results From the First-in-Human Cohort Study

Braden C. Fleming,*† PhD, Ben Baranker,‡ BS, Gary J. Badger,§ MS, Ata M. Kiapour,‡ PhD, Kirsten Ecklund,‡ MD, Lyle J. Micheli,‡ MD, and Martha M. Murray,‡ MD

Investigation performed at Boston Children's Hospital, Boston, Massachusetts, USA

(Fleming et al., 2024)

Conclusion

Bridge enhance ACL repair – (BEAR)

An option to be considered in 2025.

Lateral extra-articular tenodesis – (LET)

Increasingly utilized as an adjunct in the high-risk patient.

Questions?
Thank you!

Edwin Tingstad, MD, FAAOS

Contact: tingstad@inlandortho.net

Resources

The MOON Knee Group ACL Research Network

- https://acltear.info

The MOON Knee Group ACL Research Network

Sources

Cruz, C. A., Mannino, B. J., Venrick, C. B., Miles, R. N., Peterson, D. R., Zhou, L., Min, K. S., & Bottoni, C. R. (2023). Failure Rates After Anterior Cruciate Ligament Repair With Suture Tape Augmentation in an Active-Duty Military Population. *Orthopaedic journal of sports medicine*, 11(2), 23259671221142315. https://doi.org/10.1177/23259671221142315

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Thank You