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The Anterior Cruciate Ligament

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www.kneedoctor.com.au

www.orthosports.com.au

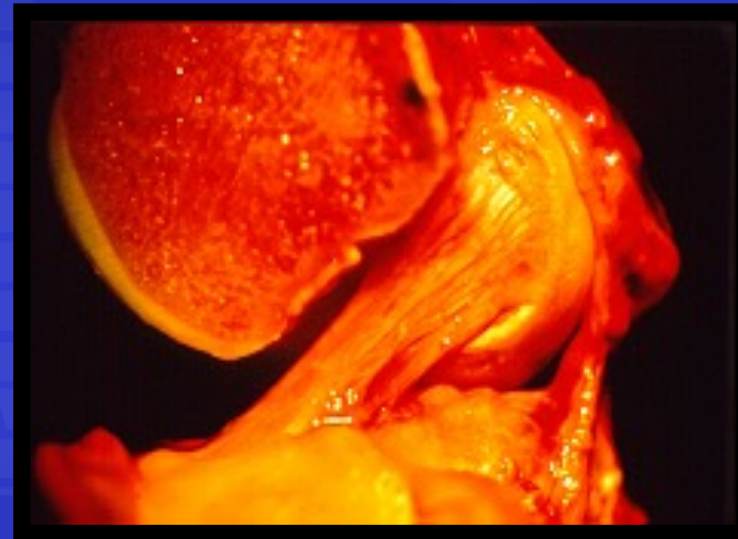


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What's New in ACL Reconstruction

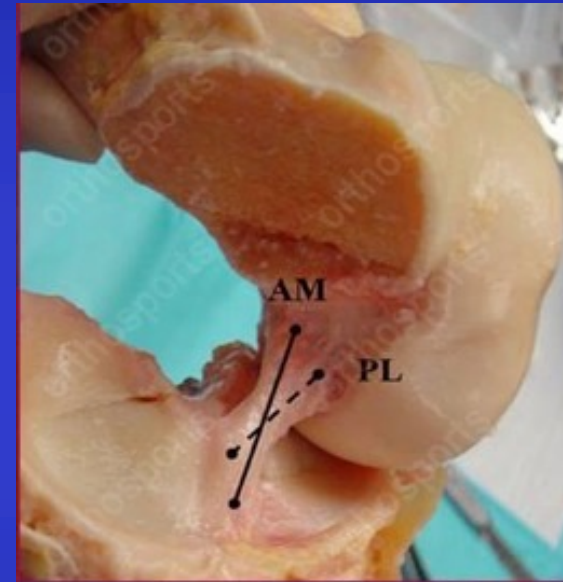


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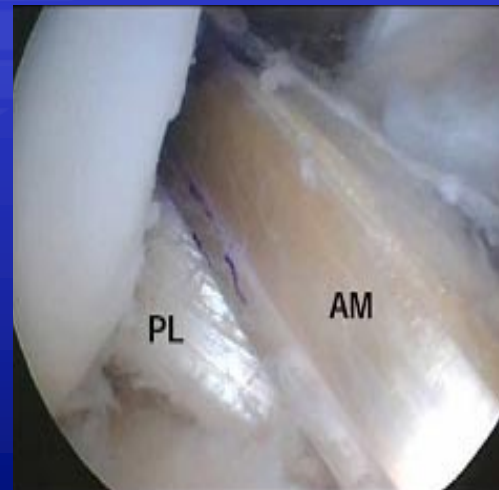
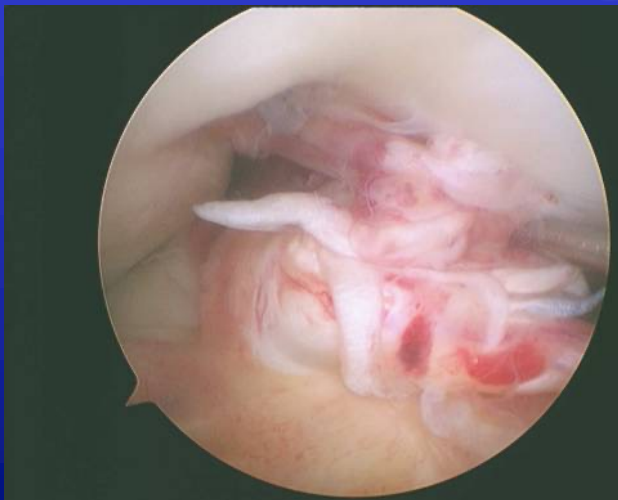
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- History
- Examination
- Investigations
- Repair
- Graft Choice
- Age
- Timing
- Extra-articular
- Rehabilitation



Incidence

- 0.38/100 people per year
- 1.2 ACL tears per 1000 skier-days
 - *Feagin et al. CORR 216, 1987*
- 61,000 Reconstructions in 1993
- **Estimated to be > 250, 000 now**



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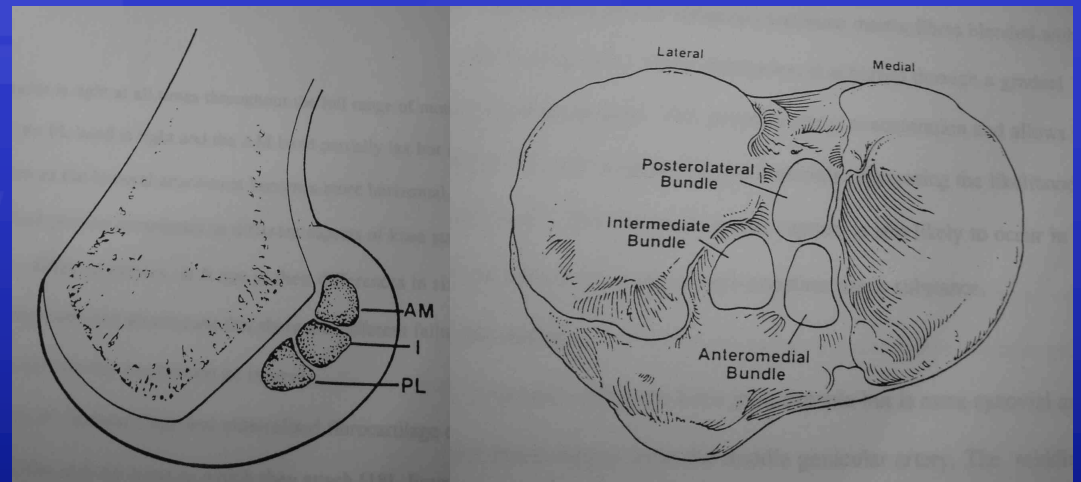
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History – nothing new

- Valgus external rotation injury over planted foot

Or

- Quadriceps active mechanism



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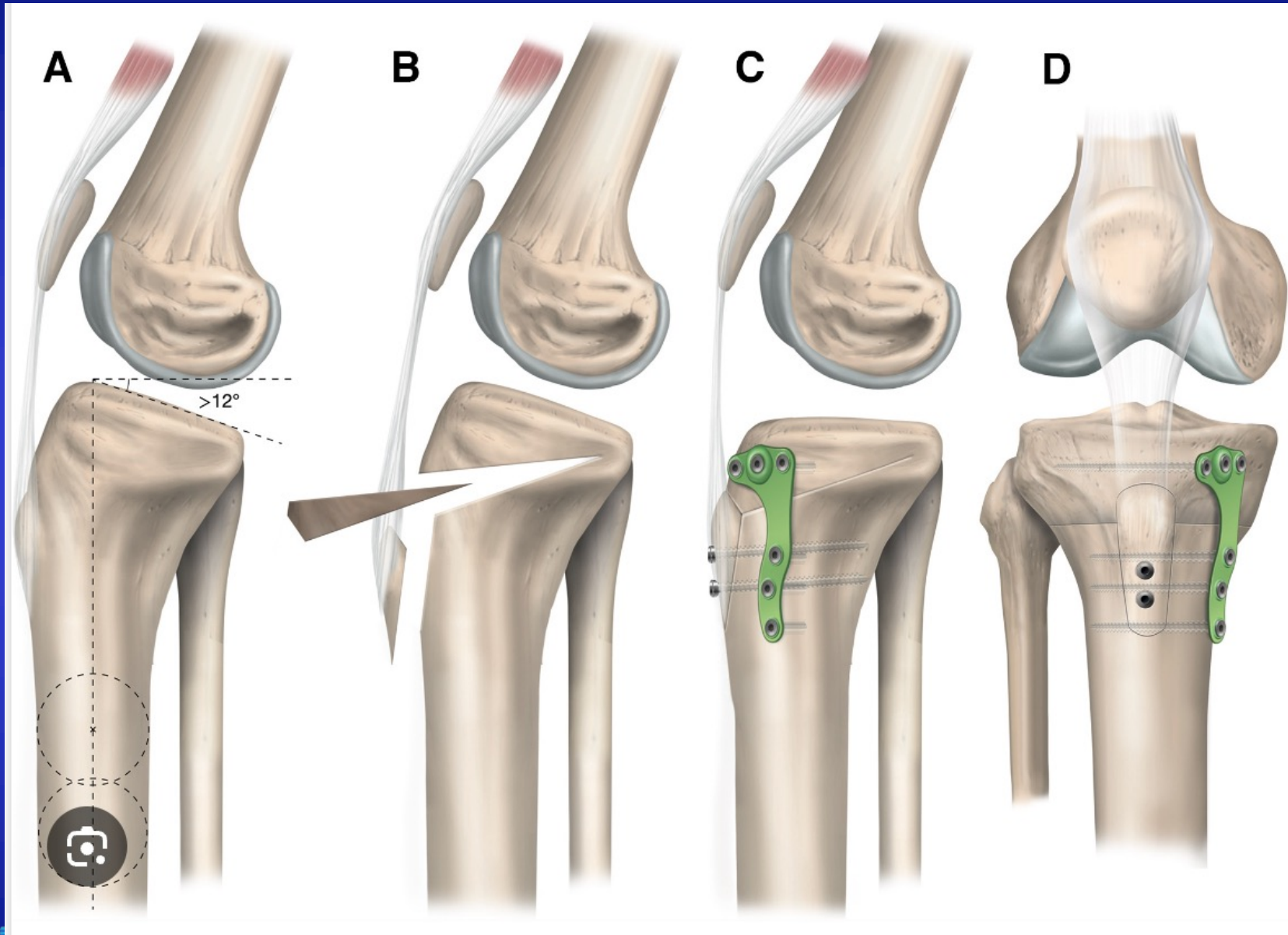
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Clinical Examination

- Anterior Drawer
- Lachmann
- Pivot shift (8 different descriptions)
- Beware of the varus knee
 - HTO Required
- Beware Tibial Slope in Revisions
 - HTO Required





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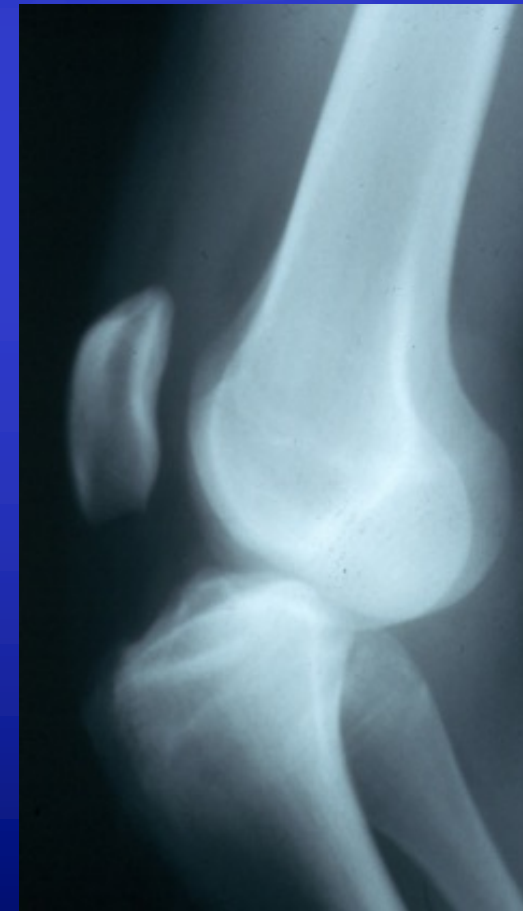
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Investigations

- Xray
 - Dislocation
 - Intra articular fracture
 - Segond fracture
 - Alignment
 - Other changes
- MRI still the gold standard



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MRI



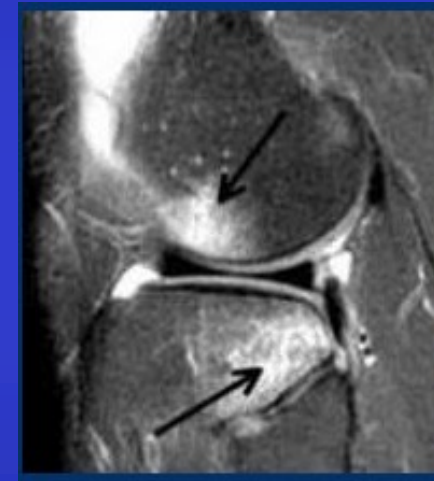
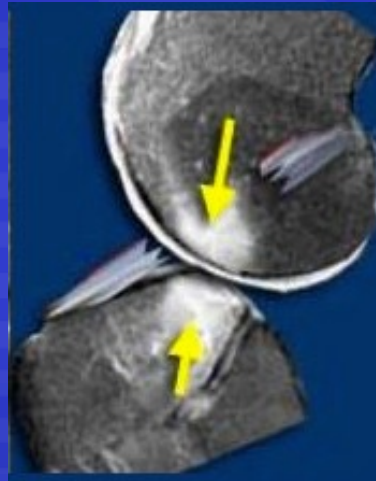
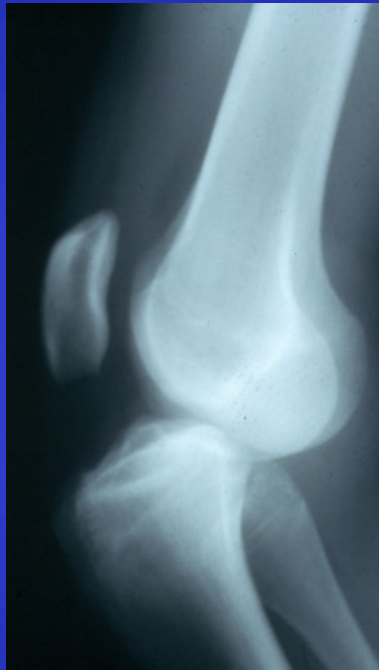
Sagittal



Coronal

<https://orthosports.com.au/pdf-download/Imaging-for-Acute-ACL-Injuries.pdf>

Bone bruising from dislocation



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ACL Repair

- Not New

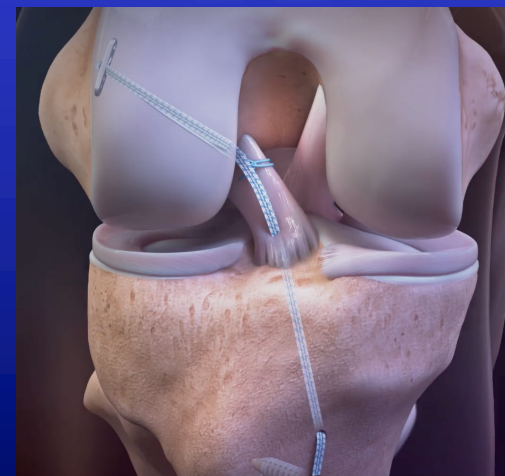
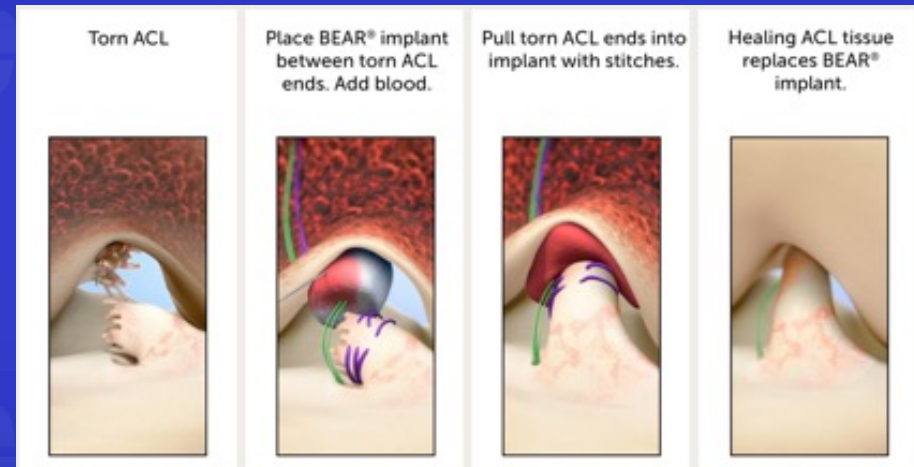
- Mayo Robson AW. Suture of the crucial ligaments. Lancet. 1902;160:1722.



- BEAR

- Bridge Enhanced ACL Repair

- Direct Repair



ron Sher
Surgery

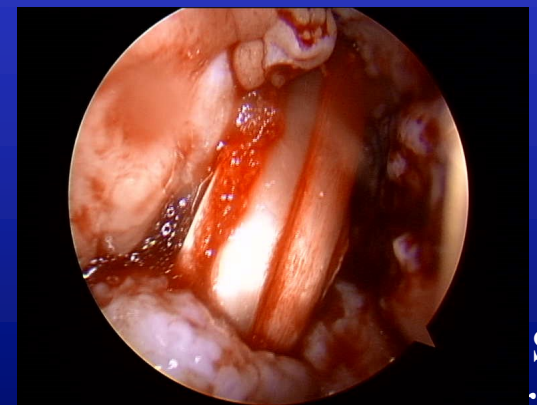


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Graft sources – a bit new

- Autograft
 - HT, PT, Quads, Contralateral leg
- Allograft
 - MUST use non irradiated
 - Possible infection risk
- Augmentation Devices
 - LARS
 - ~~NOT~~ use inside the knee



What About No Surgery?

- Sedentary individuals
- Rare high level
- Willing to modify

- Do NOT trial the knee
- Do NOT delay to end of season



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Bracing Protocols



Age of the patient

- Mean Age 29
- 200% increase >40 yrs

Review Article

Management of Anterior Cruciate Ligament Injuries in Adults Aged >40 Years

J Am Acad Orthop Surg 2018;26:
553-561

DOI: 10.5435/JAAOS-D-16-00730

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Healing related to Age

- Stem cells in the ACL decrease with age
- 40yrs
 - Disoriented collagen fibres
 - Ligament sheath inflammation
 - Altered tissue water/collagen content

Table 2

Effect of Age on ACL Biology

ACL Biology	Effect of Age
Healing potential	↓
Mesenchymal stem cells (number of)	↓
Growth factor receptors (number of)	↓
Cellular metabolic activity	↓
Collagen production and organization	↓
Apoptotic rate	↓
Ligament sheath inflammation	↑
Muroid degeneration	↑
Cyst formation	↑

ACL = anterior cruciate ligament



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Patients aged >40 yrs

- Menisci / Cartilage more susceptible to injury
- Higher risk of:
 - Subsequent meniscal tears
 - Arthritis
 - TKR
- Do not 'trial' non surgical treatment if returning to sport
 - Probably at even higher risk.



Patients aged >40 yrs

- Allograft re-tear rate
 - 2% > than autograft
 - (15% higher risk for 14 year old)
- Higher risk of patella fracture
- Higher risk of PT rupture
- Lower KOOS preop but improved ++ post op



Timing of Surgery

- 'Safer' to wait for quiescent joint
- 50-90% cartilage or meniscal injury with delays
 - Increase by 1% per month
- 12wk delay leads to 8-19% more medial meniscal tears
- 52 wk delay more and worse chondral injuries
 - (In active non – copers)

Review Article

Meniscal and Chondral Pathology
Associated With Anterior Cruciate
Ligament Injuries

J Am Acad Orthop Surg 2019;27:
75-84

DOI: 10.5435/JAAOS-D-17-00670

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Return to Sports: A Risky Business? A Systematic Review with Meta-Analysis of Risk Factors for Graft Rupture Following ACL Reconstruction

Systematic Review | [Open access](#) | Published: 24 August 2022

Volume 53, pages 91–110, (2023) [Cite this article](#)

- 133,000 pts
 - Higher Tegner activity level
 - Increased tibial slope
 - Lower psychological readiness to return to sport
 - Early surgery (< 12 vs \geq 12 months)
 - RTS (pre-injury level)
 - Family history of ACL injury

all associated with increased odds of graft rupture.



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Tegner score (>7 higher risk)

10. Competitive sports Soccer—national or international level	Recreational sports Jogging on uneven ground ≥ 2 times weekly
9. Competitive sports Soccer—lower divisions Ice hockey Wrestling Gymnastics	Work Heavy labor (eg, building, forestry)
8. Competitive sports Bandy Squash or badminton Athletics (jumping) Down-hill skiing	4. Recreational sports Bicycling Cross-country skiing Jogging on even ground ≥ 2 times weekly
7. Competitive sports Tennis Athletics (running) Motocross Handball, basketball Orienteering	Work Moderately heavy work (eg lorry driving)
Recreational sports Soccer Bandy, ice hockey Squash Athletics (jumping) Cross-country track Orienteering	3. Competitive and recreational sports Swimming Walking in rough forest terrain
6. Recreational sports Tennis or badminton Handball or basketball Downhill skiing Jogging, at least 5 times weekly	Work Light labor
5. Competitive sports Bicycling Cross-country skiing	2. Work Light work Walking on uneven ground
	1. Work Sedentary work Walking on even ground
	0. Sick leave or disability pension because of knee problems



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MARX SCALE (ENGLISH VERSION)

Please indicate how often you performed each activity in your healthiest and most active state, in the past year. Kindly put a (☑) mark on the appropriate space after each item.

	Less than one time in a month	One time in a month	One time in a week	2 or 3 times in a week	4 or more times in a week
Running: running while playing a sport or jogging	0	1	2	3	4
Cutting: changing directions while running	0	1	2	3	4
Deceleration: coming to a quick stop while running	0	1	2	3	4
Pivoting: turning your body with your foot planted while playing sport; For example: skiing, skating, kicking, throwing, hitting a ball (golf, tennis, squash), etc.	0	1	2	3	4



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Knee Surgery, Sports Traumatology, Arthroscopy (2023) 31:2983–2997
<https://doi.org/10.1007/s00167-023-07311-4>

KNEE

The anterior cruciate ligament injury severity scale (ACLISS) is an effective tool to document and categorize the magnitude of associated tissue damage in knees after primary ACL injury and reconstruction

Romain Seil^{1,2,3}  · Charles Pioger^{1,4} · Renaud Siboni^{1,5} · Annunziato Amendola⁶ · Caroline Mouton^{1,2}

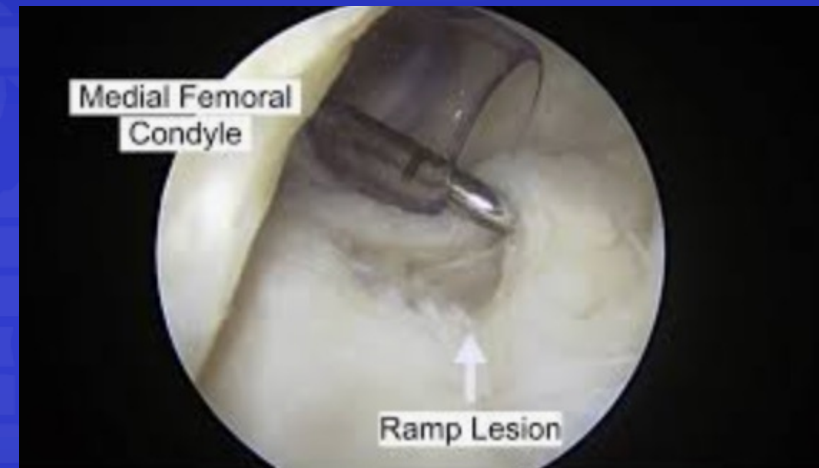
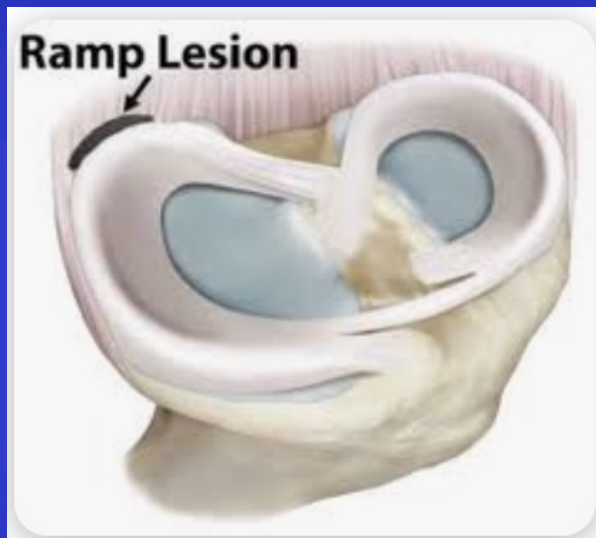


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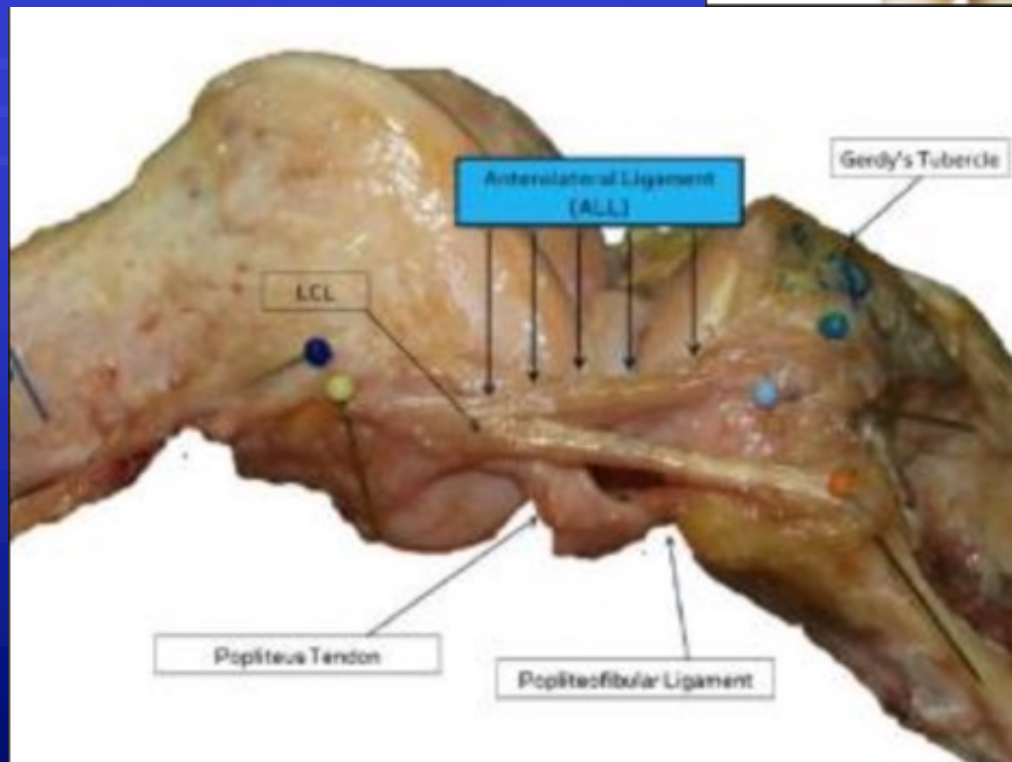
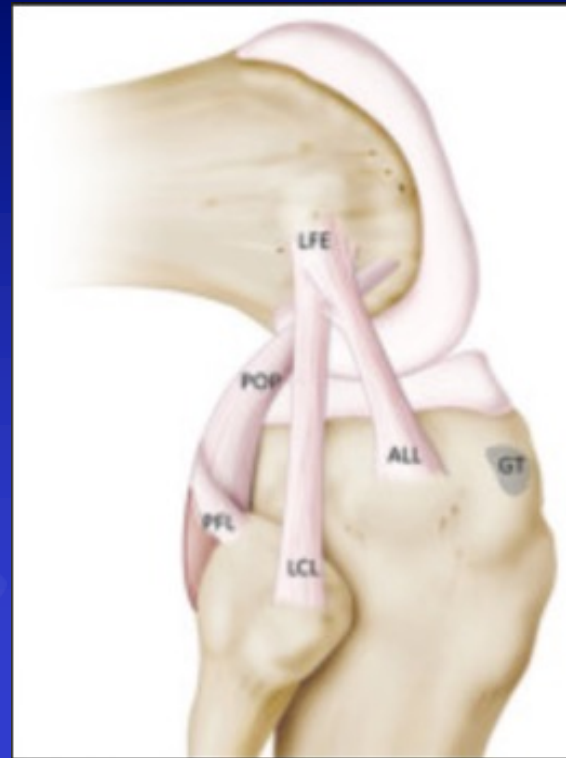
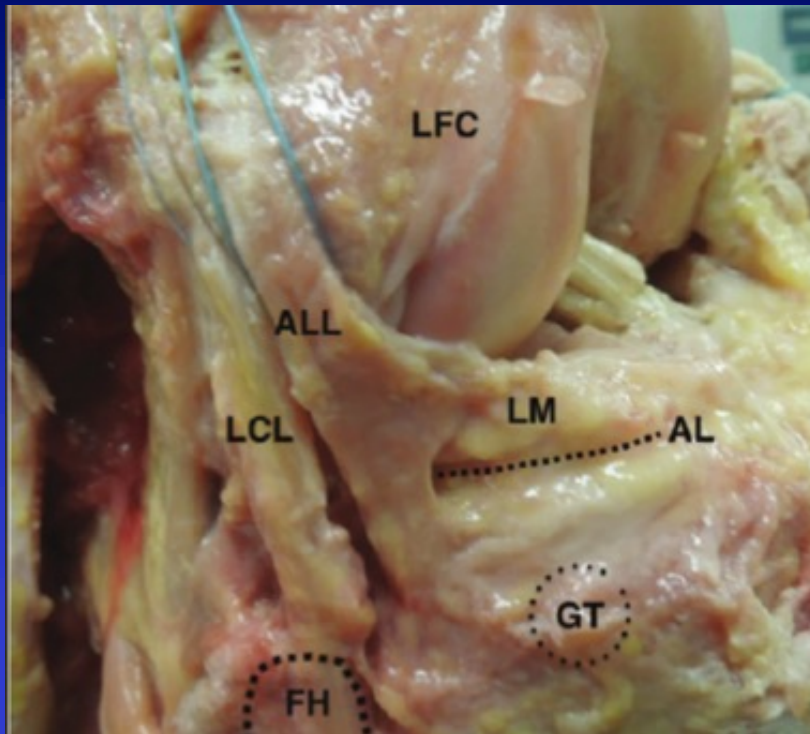
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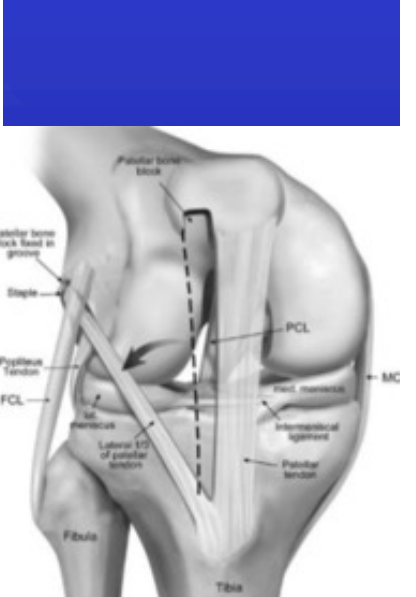
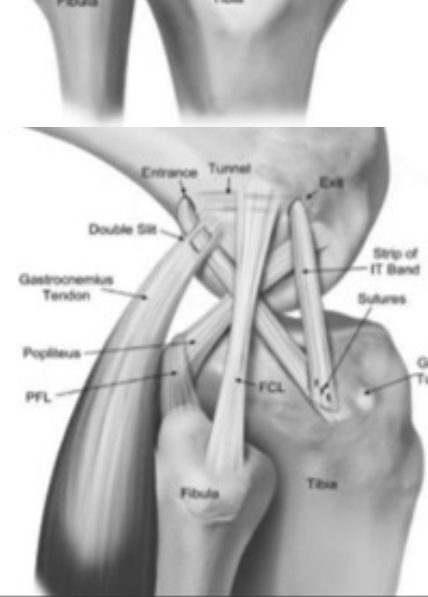
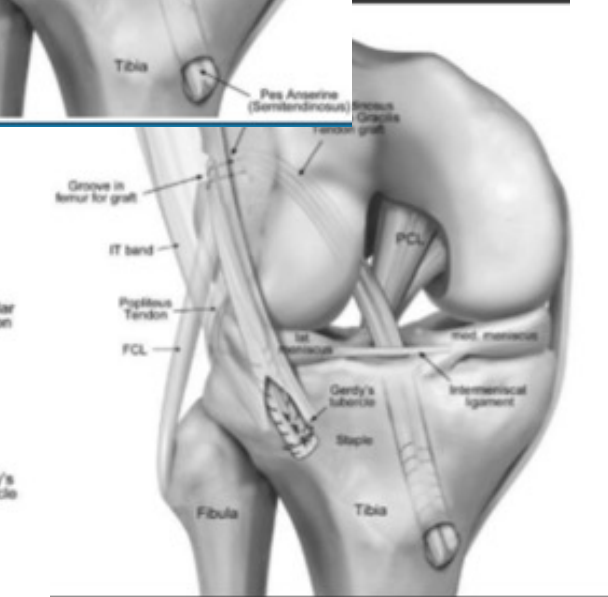
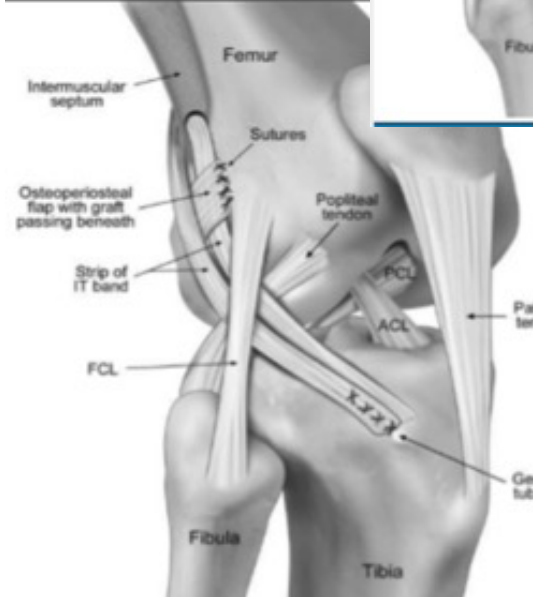
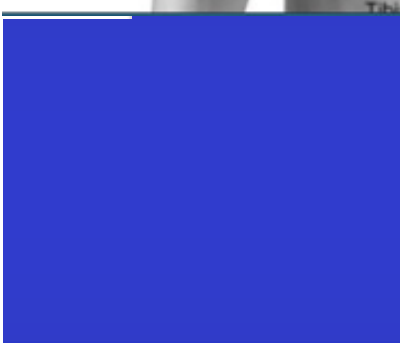
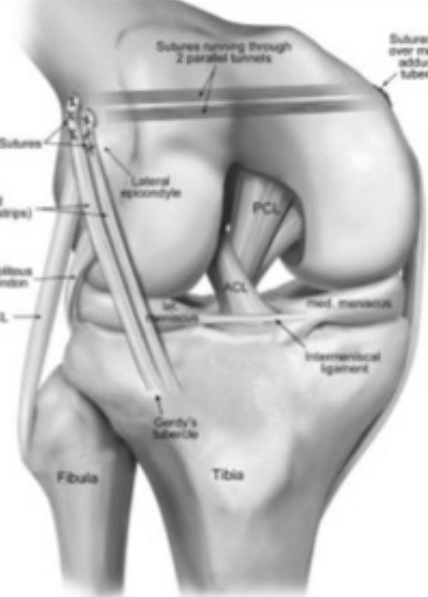
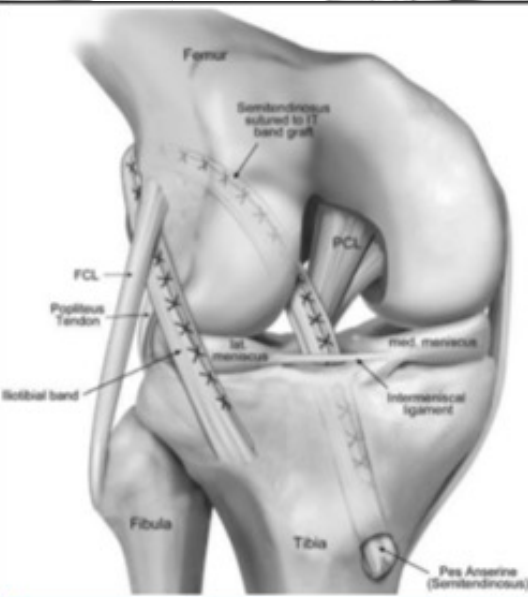
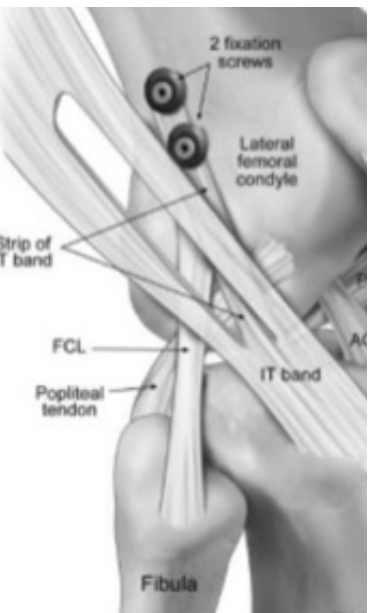
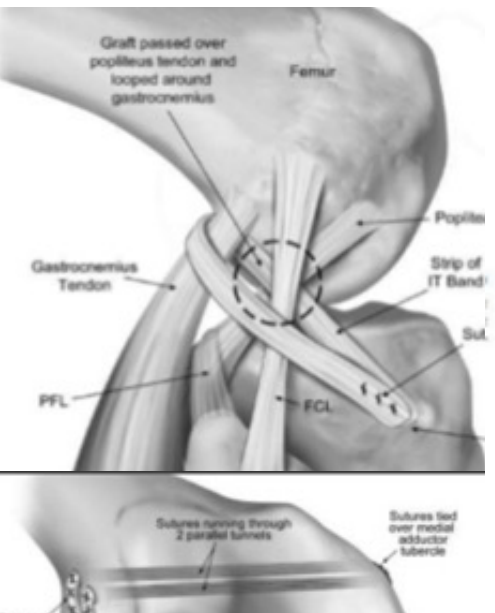
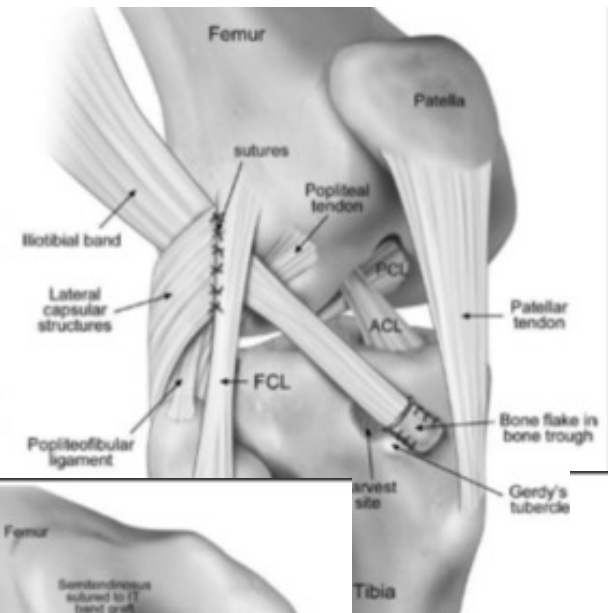
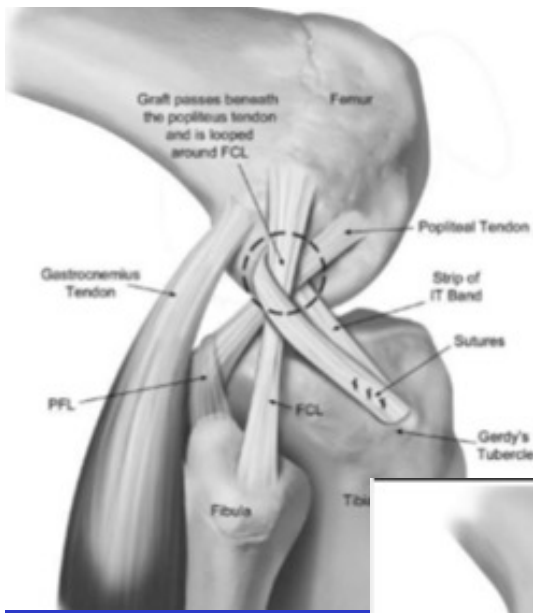
Meniscal Tears



Secondary restraints in ACL reconstruction: State-of-the-art

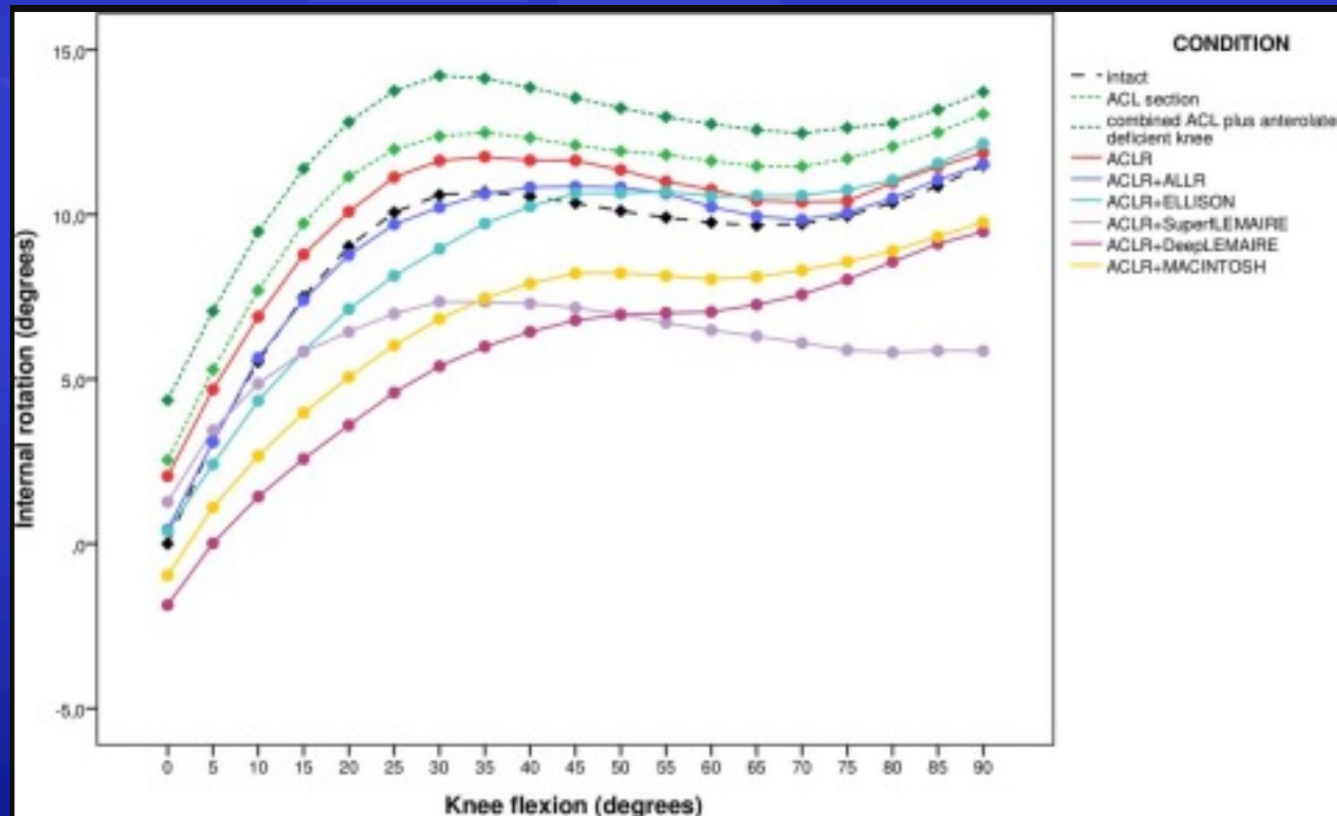
Adnan Saithna^{a,b,*}, Camilo Partezani Helito^{c,d}, Hamid Rahmatullah Bin Abd Razak^{e,f},
Riccardo Cristiani^{g,h}





> J ISAKOS. 2021 Mar;6(2):74-81. doi: 10.1136/jisakos-2019-000360. Epub 2020 Nov 24.

Different anterolateral procedures have variable impact on knee kinematics and stability when performed in combination with anterior cruciate ligament reconstruction



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'Indications' for adding LET

- < 25 yrs old
- Hyperlaxity
- Injury to the ALL seen on MRI
- Second fracture
- Pivot-shift grade III
- Lateral femoral notch sign
- Ongoing instability with a technically successful ACL reconstruction
- Elite Athletes
- Revision surgery
- ?Medial Meniscal Repair



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Return to Sport Criteria

- No effusion
- No pain
- Full range of motion
- Good proprioception (hop and turn)
- 90% quads strength
 - HT to Quads Ratio???
- Minimal wasting (no more than 1 cm)
- Complete 2 consecutive training sessions
- Confidence

- Time



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Likelihood of ACL graft rupture: not meeting six clinical discharge criteria before return to sport is associated with a four times greater risk of rupture **FREE**

 Polyvios Kyritsis¹, Roald Bahr^{1, 2}, Philippe Landreau¹, Riadh Miladi¹, Erik Witvrouw^{1, 3}

Correspondence to Dr Polyvios Kyritsis, Aspetar Orthopaedic and Sports Medicine Hospital, P O Box 29222, Doha, Qatar;
polyvios.kyritsis@aspetar.com

- (1) not meeting all six of the discharge criteria before returning to team training
- (2) decreased hamstring to quadriceps ratio of the involved leg at 60°/s



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SYSTEMATIC REVIEW


Return to Sports: A Risky Business? A Systematic Review with Meta-Analysis of Risk Factors for Graft Rupture Following ACL Reconstruction

Anna Cronström^{1,2}  · Eva Tengman¹ · Charlotte K. Häger¹

- NO relationship for re-rupture
 - Single Hop
 - Triple Hop (distance)
 - Hamstring and quadriceps peak torque



Activity and functional readiness, not age, are the critical factors for second anterior cruciate ligament injury — the Delaware-Oslo ACL cohort study

Hege Grindem ^{1,2} Lars Engebretsen,^{1,3} Michael Axe,^{4,5} Lynn Snyder-Mackler,⁴ May Arna Risberg^{3,6}

- Younger athletes more than twice as frequently returned to level I sports within the first postoperative year — a factor that increased the second ACL injury rate six times
- Passing RTS criteria was associated with a 92% lower second ACL injury rate in this young cohort



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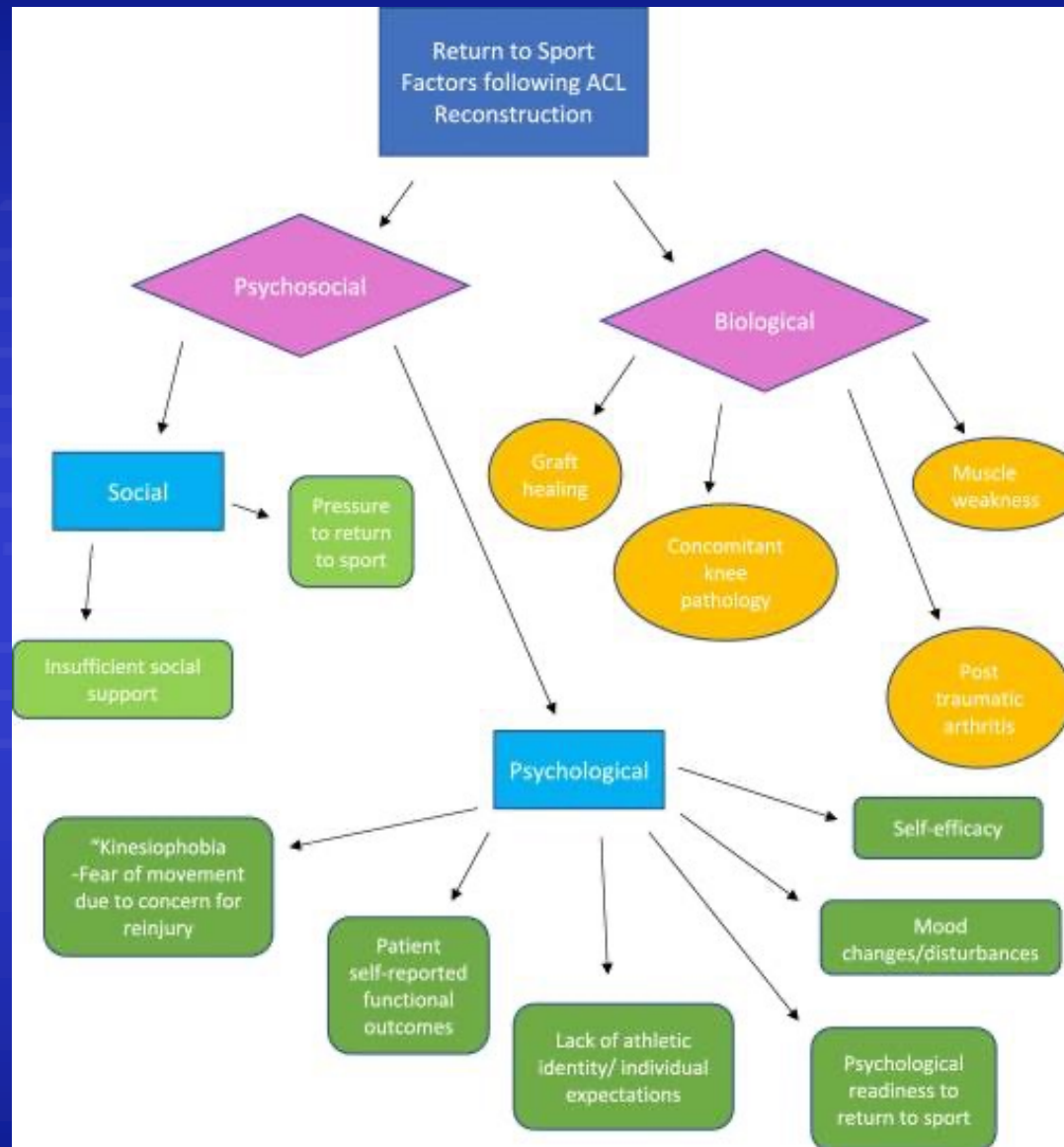
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> [Int J Sports Phys Ther.](#) 2022 Apr 1;17(3):334-346. doi: 10.26603/001c.33151. eCollection 2022.

Effect of Low-Load Blood Flow Restriction Training After Anterior Cruciate Ligament Reconstruction: A Systematic Review

Baris B Koc ¹, Alexander Truyens ¹, Marion J L F Heymans ², Edwin J P Jansen ¹,
Martijn G M Schotanus ³





Curr Rev Musculoskelet Med. 2022 Jun; 15(3): 170–179.

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Published online 2022 Apr 6. doi: [10.1007/s12178-022-09752-9](https://doi.org/10.1007/s12178-022-09752-9)

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