

Meniscus Repair Scientific Update



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An increase in published orthopedic literature regarding meniscus function, pathology, and repair is leading to increased understanding of the importance of meniscal preservation. The meniscus is a fibrocartilaginous structure in each compartment of the knee that aids with dispersing compressive forces. Multiple pathologies, such as direct trauma, overuse, previous injury, and increased age, can lead to meniscus damage.

Advancements in technology and innovation have produced better techniques and instrumentation for meniscus repair. This document summarizes published studies that describe the meniscus anatomy, biomechanical data, surgical techniques, and clinical data.

All-Inside Meniscus Repair

About 10 years ago, the standard for meniscus surgery was to resect all the damaged tissue from the joint, causing more damage to the knee. Studies show that meniscus repair is crucial to maintaining the well-being of the whole knee joint. An all-inside technique seems to allow for the most anatomic repair with the greatest preservation of surrounding soft tissues. Below are recent studies demonstrating the advantages of all-inside meniscus repair.

[Tips and pearls for all-inside medial meniscus repair.](#) *Arthrosc Tech.* 2019;8(2):e131-e139. doi:10.1016/j.eats.2018.10.009

- The medial meniscus is one of the most commonly injured structures in the knee, and management of meniscus tears is a key issue for whole knee joint well-being.
- An all-inside technique seems to allow for the most anatomic repair with the greatest preservation of surrounding soft tissues.
- Study shows that there are no technical limitations for all-inside meniscal repairs with nonabsorbable sutures.

[Clinical outcomes of inside-out meniscal repair according to anatomic zone of the meniscal tear.](#) *Orthop J Sports Med.* 2019;7(7):2325967119860806. doi:10.1177/2325967119860806

- Patient-reported outcomes improved significantly at a minimum of 2 years after inside-out meniscal repair, regardless of the vascular zone of the meniscal tear.
- “Inside-out meniscal repair is recommended for potentially repairable meniscal tears in all 3 vascular zones.”

Steadman JR,
Matheny LM,
Singleton SB,
et al

[Meniscus suture repair: minimum 10-year outcomes in patients younger than 40 years compared with patients 40 and older.](#) *Am J Sports Med.* 2015;43(9):2222-2227. doi:10.1177/0363546515591260

- This study compared meniscus repair failure rates and functional outcomes between patients under 40 years of age and those who were older than 40 years at the time of the procedure.
- Repair failure rate was not different between the two groups.
- Lysholm, Tegner, and patient satisfaction scores were evaluated and demonstrated patients in both groups had high function and high patient satisfaction an average of 16 years following meniscus repair.

Rothermel SD,
Smuin D,
Dhawan A

[Are outcomes after meniscal repair age dependent? a systematic review.](#) *Arthroscopy.* 2018;34(3):979-987. doi:10.1016/j.arthro.2017.08.287

- This was an analysis of previously published data comparing patients younger than 40 years and older than 40 years undergoing meniscus repair.
- Results reveal that no significant difference exists when evaluating failure rate for meniscus repair.

Masoudi A,
Beamer BS,
Harlow ER,
et al

[Biomechanical evaluation of an all-inside suture-based device for repairing longitudinal meniscal tears.](#) *Arthroscopy.* 2015;31(3):428-434. doi:10.1016/j.arthro.2014.08.027

- The purpose of the paper is to compare all-inside repair, inside-out suture repair, and all-inside anchor-based repair.
- Longitudinal tears were created in 36 frozen porcine menisci.
- All-inside suture repair and inside-out repair showed significantly higher loads-to-failure than the all-inside suture-based repair. All-inside and inside-out repairs did not exhibit different displacement values.

Uchida R,
Horibe S,
Shiozaki Y,
Shino K

[All-inside suture repair for isolated radial tears at the midbody of the lateral meniscus.](#) *Arthrosc Tech.* 2019;8(12):e1451-e1456. doi:10.1016/j.eats.2019.07.032

- In young athletes, radial tear of the midbody on the lateral meniscus is most common.
- Meniscectomy has been considered a first-line treatment for this type of tear; however, this causes degenerative change.
- A better treatment option is a transcapsular suture technique or an all-inside suture repair technique.
- All-inside repair using a SutureLasso™ suture passer with 2-0 FiberWire® suture is an easier and a less invasive repair technique.



Kurzweil PR,
Lynch NM,
Coleman S,
Kearney B

[Repair of horizontal meniscus tears: a systematic review.](#) *Arthroscopy.* 2014;30(11):1513-1519. doi:10.1016/j.arthro.2014.05.038

- This was a review of published outcomes of repaired horizontal cleavage tears and tested the hypothesis that surgically repaired horizontal cleavage tears have an unacceptably low rate of success.
- Nine previously published articles totaling 98 repairs of horizontal tears met inclusion criteria.
- The 76% success rate for horizontal repairs disproved the hypothesis and supported repair of horizontal cleavage tears.
- There was a 68% success rate for vertical tears.
- There was an 84% success rate for bucket-handle tears.

Beamer BS,
Walley KC,
Okajima S,
et al

[Changes in contact area in meniscus horizontal cleavage tears subjected to repair and resection.](#) *Arthroscopy.* 2017;33(3):617-624. doi:10.1016/j.arthro.2016.09.004

- This study compared tibiofemoral contact pressure and contact area with a horizontal cleavage tear versus meniscal repair, partial meniscectomy, and subtotal meniscectomy.
- Horizontal cleavage tears increased contact pressure 70%.
- Circumferential suture repair restored peak contact pressures and areas to within 15% of baseline.
- Partial and subtotal meniscectomy significantly reduced contact area and increased contact pressure.

Moatshe G,
Cinque ME,
Godin JA,
Vap AR,
Chahla J,
LaPrade RF

[Comparable outcomes after bucket-handle meniscal repair and vertical meniscal repair can be achieved at a minimum 2 years' follow-up.](#) *Am J Sports Med.* 2017;45(13):3104-3110. doi:10.1177/0363546517719244

- This was a comparison of outcomes following bucket-handle repairs and vertical meniscal repairs using a stacked vertical suturing technique.
- Patients experience improved results and low failure rates with the repair of bucket-handle tears using a stacked vertical suture technique.
- Improved results and low failure rates were achieved using the same surgical technique to address vertical meniscus tears.

Beamer BS,
Masoudi A,
Walley KC,
et al

[Analysis of a new all-inside versus inside-out technique for repairing radial meniscal tears.](#) *Arthroscopy.* 2015;31(2):293-298. doi:10.1016/j.arthro.2014.08.011

- The purpose of the study was to compare gap formation, strength, and stiffness for all-inside compared to inside-out suturing techniques.
- All-inside repairs resulted in significantly lower displacement and higher load-to-failure strength.
- The failure mode for all-inside repairs was suture breakage (suture failure) compared to tissue pull-through (tissue failure) in inside-out repairs.
- The significance of the study is that the biomechanical properties of the all-inside technique are superior to the inside-out technique.



Gilat R,
Agar G,
Shohat N,
Dahan M,
Beer Y,
Lindner D

[Avoiding injury to the popliteal neurovascular bundle in all-inside suturing of the posterior horn of the lateral meniscus: an a magnetic resonance imaging assessment of portal selection and safety.](#) *Arthroscopy.* 2020;36(2):492-498. doi:10.1016/j.arthro.2019.08.041

- This study assessed the risk of injury to the popliteal neurovascular bundle (PNVB) while suturing the posterior horn of the lateral meniscus (PHLM).
- All-inside suturing of the PHLM was simulated using magnetic resonance imaging of 60 knees.
- Of 1200 measurements performed, the simulated suturing trajectory transected the PNVB 28% of the time.
- All-inside suturing of the PHLM at 0 mm from the PCL is safer with a more lateral portal. Beyond 3 mm from the PCL, a more medial portal carries a lower risk to PNVB.

Toman CV,
Dunn WR,
Spindler KP,
et al

[Success of meniscal repair at anterior cruciate ligament reconstruction.](#) *Am J Sports Med.* 2009;37(6):1111-1115. doi:10.1177/0363546509337010

- This was a MOON (Multicenter Orthopedic Outcomes Network) case study examining meniscal repair with ACL reconstruction success at 2-year follow-up.
- There is an estimated 90% clinical success rate of meniscal repair at 2-year follow-up when the meniscus is repaired at the time of an ACL reconstruction.
- “Meniscal repair is a successful procedure in conjunction with anterior cruciate ligament reconstruction.”

Phillips M,
Rönblad E,
Lopez-Rengstig L,
et al

[Meniscus repair with simultaneous ACL reconstruction demonstrated similar clinical outcomes as isolated ACL repair: a result not seen with meniscus resection.](#) *Knee Surg Sports Traumatol Arthrosc.* 2018;26(8):2270-2277. doi:10.1007/s00167-018-4862-1

- This was a retrospective study comparing knee injury and osteoarthritis outcome scores and EuroQol-5D subscale scores at 2-year follow-up for patients who had an ACL reconstruction and simultaneous meniscal treatment.
- ACL reconstruction with meniscus resection resulted in worse clinical outcomes when compared to ACL reconstruction with meniscus repair.
- Meniscus repair may provide greater clinical outcomes compared to meniscus resection when treating a repairable meniscal tear that presents along with an ACL tear.

Rosso C,
Kovtun K,
Dow W,
et al

Inside-Out and Outside-In Meniscus Repair

Although all-inside meniscus repair has evolved significantly and has gained in popularity, inside-out and outside-in repairs are still a convenient and reproducible repair option. Today's devices address most tear patterns and the ability to deliver flat suture with small needles. See the studies below for current technique demonstrations and study results.

[Comparison of all-inside meniscal repair devices with matched inside-out suture repair.](#) *Am J Sports Med.* 2011;39(12):2634-2639. doi:10.1177/0363546511424723

- This was a comparison of all-inside meniscal repairs to inside-out repairs to determine biomechanical differences.
- All-inside repairs demonstrated significantly higher initial displacement than the other methods
- Inside-out repairs demonstrated the highest load-to-failure and were significantly higher than the all-inside devices.
- Inside-out suture repairs offer surgeons the best overall biomechanical characteristics.

Cinque ME,
DePhillipo NN,
Moatshe G,
et al

[Clinical outcomes of inside-out meniscal repair according to anatomic zone of the meniscal tear.](#) *Orthop J Sports Med.* 2019;7(7):2325967119860806. doi:10.1177/2325967119860806

- This study examined the outcomes of inside-out repair in all 3 meniscal vascularity zones.
- Patients who underwent inside-out meniscus repair demonstrated significant improvements on subjective outcome measures at a 2-year follow-up, regardless of the meniscal tear zone.
- Inside-out meniscal repair is recommended for potentially reparable meniscus tears in all 3 vascular zones.

Root Repair

With the advancements in arthroscopic techniques, tears in the posterior root of the meniscus are becoming increasingly recognized. If not repaired, root tears can cause further damage to the joint and increase the rate of arthritis. Below are recent studies determining the benefits and biomechanical effects from repairing the meniscal root.

Lee JH,
Lim YJ,
Kim KB,
Kim KH,
Song JH

[Arthroscopic pullout suture repair of posterior root tear of the medial meniscus: radiographic and clinical results with 2-year follow-up.](#) *Arthroscopy.* 2009;25(9):951-958. doi:10.1016/j.arthro.2009.03.018

- Twenty-six patients received arthroscopic posterior medial root repair using a transtibial technique and a minimum of 2-year follow-up of clinical and radiographic evaluation along with 10 second-look arthroscopies.
- Upon second-look arthroscopies of 10 randomly selected patients, it was determined that all menisci had healed completely, and no additional chondral lesions were noted.
- Hospital for Special Surgery clinical scores improved from 61.1 preoperatively to 93.8 at final follow-up. Lysholm knee scores were 93.1 at final follow-up from 57 preoperatively.
- The authors concluded that arthroscopic transtibial repair technique of patients that are symptomatic is an effective treatment of posterior medial meniscus root tears.



Forkel P,
von Deimling C,
Lacheta L,
et al

[Repair of the lateral posterior meniscal root improves stability in an ACL-deficient knee.](#) *Knee Surg Sports Traumatol Arthrosc.* 2018;26(8):2302-2309. doi:10.1007/s00167-018-4949-8

- This was a human cadaveric study of 8 knees looking at 5 different scenarios: intact, ACL cut, ACL cut and lateral meniscus posterior root tear, ACL cut and lateral meniscus posterior root tear and transection of meniscal femoral ligament, and ACL cut with lateral meniscus posterior root tear.
- Lateral meniscus posterior root tear increased internal tibial instability compared to an ACL-insufficient knee.
- Lateral meniscus posterior root repair significantly decreases internal tibial rotation in an ACL-deficient knee.
- Repair a lateral posterior meniscus root tear along with ACL reconstruction can improve rotational stability.

Kennedy MI,
Strauss M,
LaPrade RF

[Injury of the meniscus root.](#) *Clin Sports Med.* 2020;39(1):57-68. doi:10.1016/j.csm.2019.08.009

- This study found medial posterior root tears are more common (52%) than lateral posterior root tears (41%).
- Disruption of root tears often lead to meniscus extrusion and failure of load distribution.
- Increased contact pressure and stresses are incurred with posterior root disruption.
- The absence of lateral posterior meniscus attachment results in greater strain placed on ACL and increased anterior tibial translation and internal rotation.
- Medial posterior meniscus horn detachment increases medial compartment contact pressures and alters load distribution.
- Proper anatomic root repairs restore knee stability and joint loading.
- Patients with no to mild osteoarthritis (OA) have significantly improved outcomes following posterior root repair and stall the progression of OA.

LaPrade RF,
LaPrade CM,
Ellman MB,
Turnbull TL,
Cerinara AJ,
Wijdicks CA

[Cyclic displacement after meniscal root repair fixation: a human biomechanical evaluation.](#) *AM J Sports Med.* 2015;43(4):892-898. doi:10.1177/0363546514562554

- This was a cadaveric study comparing 4 different suture configurations for meniscal root repair.
- The authors evaluated root repairs using a two-simple suture (TSS) technique, a modified Mason-Allen (MMA) suture technique, a single double-locking loop (S-DLL) technique, and a double double-locking loop (D-DLL) technique.
- Following 1000 cycles of each specimen, displacement was measured and revealed that the TSS technique displaced the least, followed by the MMA, D-DLL and S-DLL techniques.
- The authors concluded that the TSS fixation is sufficient at resisting displacement and demonstrates ultimate failure loads above currently accepted thresholds.



Chung KS,
Ha JK,
Yeom CH,
et al

[Comparison of clinical and radiologic results between partial meniscectomy and refixation of medial meniscus posterior root tears: a minimum 5-year follow-up.](#) *Arthroscopy*. 2015;31(10):1941-1950. doi:10.1016/j.arthro.2015.03.035

- In this study, 57 patients were followed for a minimum of 5 years following partial meniscectomy and medial meniscus posterior horn repair.
- Clinical assessments included Lysholm scores and IKDC scores.
- Radiological assessments were evaluated using Kellgren-Lawrence (K-L) grading and joint space evaluation.
- Repair group had significantly better clinical results when compared to meniscectomy group and showed less K-L grade progression and less joint narrowing.
- Of meniscectomized knees, 3% received a total knee arthroplasty within 5 years while none of the repair group received a total knee arthroplasty.
- The authors concluded that a meniscus root repair was more effective at 5-year follow-up compared to a meniscectomy.

Harner CD,
Mauro CS,
Lesniak BP,
Romanowski JR

[Biomechanical consequences of a tear of the posterior root of the medial meniscus. surgical technique.](#) *J Bone Joint Surg Am*. 2009;91(2):257-270. doi:10.2106/JBJS.I.00500

- This was a human cadaveric study at the University of Pittsburgh comparing an intact medial meniscus, a posterior root tear of the medial meniscus, a transtibially repaired posterior root tear, and total meniscectomy.
- An axial load of 1000 N was applied to the specimen and contact pressures measured at knee flexion angles of 0°, 30°, 60° and 90°.
- Contact pressures increased 25% in the specimen with a medial meniscus posterior root tear.
- The transtibially repair group demonstrated restored normal peak contact pressures and restored joint biomechanics.
- Peak contact pressures in the lateral compartment along with increases in external rotation and lateral tibial translation were observed with medial root disruption.
- Contact pressures, external rotation, and lateral translation all returned to normal levels following posterior horn medial meniscus repair.

LaPrade CM,
Foad A,
Smith SD,
et al

[Biomechanical consequences of a nonanatomic posterior medial meniscal root repair.](#) *Am J Sports Med*. 2015;43(4):912-920. doi:10.1177/0363546514566191

- Nonanatomical posterior medial root repair did not restore contact area of mean contact pressures to that of the intact knee or when compared to an anatomical repair.
- Anatomic repair of the posterior medial meniscus horn decreased contact area by only 17% compared to 44% decrease of contact area when nonanatomically repaired.
- Contact pressures of a nonanatomically repaired posterior medial root repair increased by 67% compared with an intact posterior medial meniscus root.



Krych AJ,
Bernard CD,
Kennedy NI,
et al

[Medial versus lateral meniscus root tears: is there a difference in injury presentation, treatment decisions, and surgical repair outcomes?](#) *Arthroscopy*. 2020;36(4):1135-1141. doi:10.1016/j.arthro.2019.11.098

- The purpose of this journal article was to use demographic characteristics, radiographic findings, treatment decisions, clinical outcomes, and risk factors to compare medial and lateral meniscus root tears.
- A retrospective review was performed to identify patients with symptomatic, medial, or lateral meniscus posterior root tears with a minimum 2-year follow-up.
- Of the 141 root tears that were identified, 109 were medial meniscus root tears and 30 were lateral meniscus root tears.
- The authors concluded that when compared to MMRTs, LMRTs occur in younger male patients with lower body mass index, less cartilage degeneration, less extrusion on MRI, and more commonly with a ligament injury.
- The authors also concluded that LMRTs may have better results after repair, suggesting that differences in injury and patient characteristics may contribute to differences in these outcomes.

Transplant

Meniscal transplantation is a valid treatment option for patients who have failed conservative management and meniscectomies. In patients with persistent pain, transplantation may help alleviate symptoms and delay osteoarthritis. Below are recent studies highlighting clinical outcomes from meniscus transplants.

Heckman TP,
Barber-Westin SD,
Noyes FR

[Meniscal repair and transplantation: indications, technique, rehabilitation, and clinical outcome.](#) *J Orthop Sports Phys Ther*. 2006;36(10):795-814. doi:10.2519/jospt.2006.2177

- The purpose of this study was to provide current knowledge regarding the indications, operative techniques, rehabilitation programs, and clinical outcomes of meniscus repair and transplantation procedures.
- Meniscal transplantation is a valid treatment option for patients who have undergone meniscectomy and have related tibiofemoral joint pain or in whom articular cartilage deterioration in the meniscectomized compartment is present.

Southworth TM,
Naveen NB,
Tauro TM,
Chahla J,
Cole BJ

[Meniscal allograft transplants.](#) *Clin Sports Med*. 2020;39(1):93-123. doi:10.1016/j.csm.2019.08.013

- There are several different techniques used in meniscal allograft transplantation, which are broadly categorized into using bony fixation (using bone plugs or a bridge-in-slot technique) and soft-tissue fixation.
- Outcomes in patients with meniscal allograft transplantation are promising, with long-term favorable graft survival rates in patients undergoing isolated procedures and with concomitant anterior cruciate ligament reconstruction or a cartilage preservation procedure.



Ramp Lesion

Ramp lesions are longitudinal tears of the peripheral capsular attachment of the posterior horn medial meniscus at the meniscocapsular junction. The studies below better define the anatomic structure and operative care for ramp lesions.

Kim SH,
Seo HJ,
Seo DW,
Kim KI,
Lee SH

[Analysis of risk factors for ramp lesions associated with anterior cruciate ligament injury.](#)

Am J Sports Med. 2020;48(7):1673-1681. doi:10.1177/0363546520918207

- A total of 275 patients undergoing anterior cruciate ligament reconstruction between June 2011 and March 2019 were included in this study.
- Overall, 95 patients (34.5%) were confirmed as having a ramp lesion.
- “The most important findings were that patients with ACL-injured knees with ramp lesions had a higher varus alignment ($>3^\circ$), a steeper medial tibial and meniscal slope, gradual lateral tibial slope, an increased asymmetry of medial-to-lateral slope, a higher incidence of bone contusion on the MTP, and ≥ 3 months from injury to surgery, as compared with patients with isolated ACL injuries.”

DePhillipo NN,
Moatshe G,
Chahla J,
et al

[Quantitative and qualitative assessment of the posterior medial meniscus anatomy: defining meniscal ramp lesions.](#) *Am J Sports Med.* 2019;47(2):372-378. doi:10.1177/0363546518814258

- Ramp lesions are tears at the posterior meniscocapsular junction and/or tears of the posterior meniscotibial ligament.
- They have a reported incidence of 16% to 24% for all ACL tears.
- The purpose of this study was to improve the understanding of ramp lesions' importance in tears localized at the posterior horn medial meniscus and the anatomic approach to their treatment.
- The findings provide anatomic foundation for an improved understanding of the meniscocapsular and meniscotibial attachments of the posterior horn medial meniscus.

Balazs GC,
Greditzer HG 4th,
Wang D,
et al

[Ramp lesions of the medial meniscus in patients undergoing primary and revision ACL reconstruction: prevalence and risk factors.](#) *Orthop J Sports Med.* 2019;7(5):2325967119843509. doi:10.1177/2325967119843509

- The purpose of the study was to identify the prevalence of, and risk factors for, ramp lesions in patients undergoing ACL reconstruction.
- Of the 372 patients included in the study, 42% had ramp lesions.
- The presence of bone marrow edema of the posteromedial tibia, a contact injury mechanism, or a lateral meniscal tear should alert surgeons to the potential presence of a medial meniscal ramp lesion.



Alessio-Mazzola M,
Lovisolò S,
Capello AG,
et al

[Management of ramp lesions of the knee: a systematic review of the literature.](#) *Musculoskelet Surg.* 2019;10.1007/s12306-019-00624-z. doi:10.1007/s12306-019-00624-z

- This was a systematic review to evaluate the current literature and to assess the clinical outcomes following meniscal ramp lesion treatment and ACL reconstruction.
- The review included 7 studies with 509 total patients.
- Treatment failure occurred in 8.3% of patients receiving ACL repair and ramp lesion treatment, showing this is a reliable repair.
- While the repair resulted in good clinical results and low failure rate, more studies evaluating the long-term outcomes are needed.

Negrín R,
Reyes NO,
Iñiguez M,
Pellegrini JJ,
Wainer M,
Duboy J

[Meniscal ramp lesion repair using an all-inside technique.](#) *Arthrosc Tech.* 2018;7(3):e265-e270. doi:10.1016/j.eats.2017.09.001

- The most commonly used techniques are all-inside sutures, including the use of curved suture hooks through the posteromedial portal. A Meniscal Cinch™ II or FiberStitch™ implant could be used for this application as well.
- Advantages of the all-inside technique include:
 - Correct meniscotibial ligament and meniscal fixations
 - Direct visualization of the meniscus, meniscotibial ligament, device, and anchors
 - Biomechanically stronger

Naendrup JH,
Pfeiffer TR,
Chan C,
et al

[Effect of meniscal ramp lesion repair on knee kinematics, bony contact forces, and in situ forces in the anterior cruciate ligament.](#) *Am J Sports Med.* 2019;47(13):3195-3202. doi:10.1177/0363546519872964

- The purpose was to determine the effects of ramp lesion and ramp lesion repair on knee kinematics.
- Nine human cadaveric knee specimens were tested using a 6° of freedom robotic testing system.
- Compared with intact knees, knees with a ramp lesion repair had significantly reduced anterior translation at flexion angles from full extension to 40° in response to a 90 N anterior load.
- A significant decrease in the in situ forces in the ACL after ramp repair was detected.

DePhillipo NN,
Engelbrechtsen L,
LaPrade RF

[Current trends among US surgeons in the identification, treatment, and time of repair for medial meniscal ramp lesions at the time of ACL surgery.](#) *Orthop J Sports Med.* 2019;7(2):2325967119827267. doi:10.1177/2325967119827267

- An electronic questionnaire was sent to 91 directors of orthopedic sports medicine fellowship training programs who are currently performing ACL reconstruction surgery.
- 86% of respondents reported routinely checking for a medial meniscal ramp lesion via inspection of the posteromedial meniscocapsular junction during an ACL reconstruction.
- 66.7% cited using an all-inside repair technique.
- This information may be useful for current orthopedic surgeons to advance their practice according to current trends surrounding ACL reconstruction and medial meniscal ramp repair.



Sonnery-Cottet B,
Serra Cruz R,
Vieira TD,
Goes RA,
Saithna A

[Ramp lesions: an unrecognized posteromedial instability?](#) *Clin Sports Med.* 2020;39(1):69-81.
doi:10.1016/j.csm.2019.08.010

- Ramp lesions are common but frequently underrecognized in the ACL-injured knee.
- This article is a great summary of both preoperative MRI and arthroscopic evaluation via classic anterior portals.
- Failure to recognize and repair ramp lesions is associated with persistent anterior and rotational knee laxity.
- Suture repair of these lesions, via a posteromedial portal, can restore normal biomechanics and is associated with excellent clinical outcomes.