



The number of publications in orthopedic literature has increased in regards to meniscus function, pathology, and repair, leading to an increased understanding of the importance for meniscal preservation. The meniscus is a fibrocartilage structure in each compartment of the knee that aids with dispersing compressive forces. There are multiple pathologies leading to meniscus damage such as direct trauma, overuse, previous injury, or increased age.

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

Beamer BS,
Kempland WC,
Okajima S,
Manoukian OS,
Perez-Viloria M,
DeAngelis JP,
Ramappa AJ,
Nazarian A

Kurzweil PR,
Lynch NM,
Coleman S,
Kearney B

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

Steadman JR,
Matheny LM,
Singleton SB,
Johnson NS,
Rodkey WG,
Crespo B,
Briggs KK

Meniscus Repair

Changes in contact area in meniscus horizontal cleavage tears subjected to repair and resection. *Arthroscopy*. 2016;33(3):617-624. doi:10.1016/j.arthro.2016.03.004.

- 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

Repair of horizontal meniscus tears: a systematic review. *Arthroscopy*. 2014;30(11):1513-1519. doi:10.1016/j.arthro.2015.05.038.

- Review of published outcomes of repaired horizontal cleavage tears and test hypothesis that surgically repaired HCTs have an unacceptably low rate of success
- Nine (9) previously published articles totaling 98 repairs of horizontal tears met inclusion criteria
- 76% success rate for horizontal repairs disproving hypothesis and supporting repair of HCTs
- 68% success rate for vertical tears
- 84% success rate for bucket-handle tears

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

- 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

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

- 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 2 groups
- Lysholm, Tegner, and patient satisfaction scores were evaluated and indicated 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.

- Analysis of previously published data comparing patients undergoing meniscus repair under age 40 and above age 40
- Results reveal that no significant difference exists when evaluating failure rate for meniscus repair

Meniscus Root Repair

Krych AJ,
Johnson NR,
Wu IT,
Smith PA,
Stuart MJ

A simple cinch is superior to a locking loop for meniscus root repair: a human biomechanical comparison of suture constructs in a transtibial pull-out model. [Published online ahead of print July 26, 2017]. *Knee Surg Sports Traumatol Arthrosc*. 2017. doi:10.1007/s00167-017-4652-1.

- Human cadaveric biomechanical study comparing simple cinch stitch to a locking loop stitch for meniscus root repair
- Simple cinch stitch had significantly less cyclic displacement and similar load to failure as compared to locking loop stitch
- Locking loop stitch requires multiple passes through meniscus tissue which could lead to increased weakness of the meniscus

LaPrade CM,
LaPrade MD,
Turnbull TL,
Wijdicks CA,
LaPrade RF

Biomechanical evaluation of the transtibial pullout technique for posterior medial meniscal root repairs using 1 and 2 transtibial bone tunnels. *Am J Sports Med*. 2015;43(4):899-904. doi:10.1177/0363546514563278.

- Study proposes that 2 transtibial tunnels provide superior biomechanical advantages compared to a single bone tunnel
- Results showed that both techniques provided similar biomechanical properties

Chung KS,
Noh JM,
Ha JK,
Ra HJ,
Park SB,
Kim HK,
Kim JG

Survivorship analysis and clinical outcomes of transtibial pull-out repair for medial meniscus posterior root tears: a 5-to-10-year follow-up study. *Arthroscopy*. 2018;34(2): 530-535. doi:10.1016/j.arthro.2017.08.266.

- 91 patients included with a mean follow-up duration of 7 years
- Lysholm scores improved significantly from 51.8 preoperatively to 83 at final follow-up
- Transtibial pullout repair demonstrated a high clinical survival rate and patients showed clinical improvements

RAMP Lesions

Chahla J,
Dean CS,
Moatshe G,
Mitchell JJ,
Cram TR,
Yacuzzi C,
LaPrade RF

Meniscal ramp lesions: anatomy, incidence, diagnosis and treatment. *Orthop J Sports Med*. 2016;4(7):1-7. doi:10.1177/2325967116657815.

- Ramp lesions occur as a disruption of the meniscotibial ligaments of the posterior horn of the medial meniscus
- Injury is reported as being present in 9%-17% of ACL tears
- Ramp lesions do not always present on an MRI therefore arthroscopic evaluation is preferred

Thaunat M,
Jan N,
Fayard JM,
Kajetanek C,
Murphy CG,
Pupim B,
Gardon R,
Sonnery-Cottet B

Repair of meniscal ramp lesions through a posteromedial portal during anterior cruciate ligament reconstruction: outcome study with a minimum 2-year follow-up. *Arthroscopy*. 2016;32(11):2269-2277. doi:10.1016/j.arthro.2016.02.026.

- One hundred thirty-two (132) patients met the inclusion criteria and the mean follow-up time was 27 months
- IKDC scores increased 21 points at last follow-up when compared to preoperative scores
- Conclusion of study demonstrates arthroscopic meniscal repair of ramp lesions during ACL reconstruction provided a high rate of meniscus healing at the level of the tear

