



InternalBrace™ Technique: Knee Applications

A review of the design rationale, techniques, and outcomes

The *InternalBrace* procedure, which has been proven to be efficacious,¹ can be applied in various ways throughout the knee. This augmentation helps prevent excess range of motion during the healing phase and may reduce the chances of secondary injury.^{2,3}

In the setting of ACL reconstruction, the *InternalBrace* procedure helps protect against various modes of failure including creep and irreversible stretch, traumatic tearing, and slippage of the tendon-bone interface.^{4,5} The *InternalBrace* technique may also help protect small and vulnerable hamstring ACL reconstruction grafts from these modes of failure.^{4,5}

Use the *InternalBrace* procedure to augment collateral ligament repairs and reconstructions and provide improved biomechanics, including greater stiffness and maximum load.⁶ Anatomic repair with augmentation may allow for early treatment using native tissues while still providing a biomechanical environment conducive to early rehabilitation and motion.² Compared to reconstruction techniques, there are several additional benefits of augmenting collateral ligament repairs including smaller drill holes and implants, no harvest-site morbidity with allograft, and no risk of tunnel convergence in multiligament procedures.

In Vivo Citations: Clinical Outcomes

[Reduced incidence of revision anterior cruciate ligament reconstruction with internal brace augmentation.](#) *Orthop J Sports Med.* 2023;11(7):23259671231178026. doi:10.1177/23259671231178026

- Revision rates and patient-reported outcomes were evaluated in patients who underwent primary ACL reconstruction with or without the *InternalBrace* technique.
- In this level III retrospective study, 200 patients who underwent primary ACL reconstruction with either a quadriceps tendon (QT), bone-patellar tendon-bone (BTB), or hamstring tendon (HT) autograft were matched in a 1-to-1 cohort of patients who were treated with the *InternalBrace* technique and patients who were not.
- Patients between 13 and 39 years old with a minimum 2-year follow-up were included.

Takeaway

Patients who received an ACL reconstruction using the *InternalBrace* technique experienced a significantly lower revision rate (1%) and similar patient-reported outcomes compared to patients who received an ACL reconstruction alone (8%).

The *InternalBrace* surgical technique is intended only to augment the primary repair/reconstruction by expanding the area of tissue approximation during the healing period and is not intended as a replacement for the native ligament. The *InternalBrace* technique is for use during soft tissue-to-bone fixation procedures and is not cleared for bone-to-bone fixation.

Smith PA,
Daniel AV,
Wijdicks CA



Smith PA,
Daniel AV

[Primary all-soft tissue quadriceps tendon autograft anterior cruciate ligament reconstruction with suture tape augmentation resulted in satisfactory patient outcomes and a low graft failure rate in high school and collegiate athletes.](#) *Arthroscopy*. Published online March 20, 2024. doi:10.1016/j.arthro.2024.02.047

- This retrospective case series evaluated patient outcomes in skeletally mature high school and college athletes after primary ACL reconstruction using an all-soft-tissue QT autograft augmented with suture tape.
- A total of 60 athletes with a mean age of 16 years and average final follow-up of 37 months were included.

Takeaway

Patients demonstrated promising postoperative outcomes, **most notably the 0% rerupture rate**. Additionally, at 7.5 months 90% of patients had returned to an equivalent level of competition, 80% of whom returned to pivoting sports.

MacKay GM,
Wilson WT,
Kennedy MJ,
MacLeod D,
Hopper GP

[Outcomes of anterior cruciate ligament reconstruction with independently tensioned suture tape augmentation at 5-year follow-up.](#) *Am J Sports Med*. 2023;51(14):3658-3664. doi:10.1177/03635465231207623

- Clinical outcomes in patients undergoing primary ACL reconstruction with suture tape augmentation were evaluated at 2 and 5 years.
- This prospective case series included 97 highly active patients with a mean age of 34. ACL reconstruction was performed with either an HT or a BTB autograft and both were reinforced with internal bracing.
- **At a mean of 5 years, only 1 graft failure was documented (1.1% retear rate), which occurred in an adolescent martial arts athlete at 6-months post-op.**

Takeaway

The authors concluded that ACL reconstruction with suture tape augmentation is a safe and promising technique, potentially lowering the risk of reinjury following a return to sports.

Smith PA,
Daniel AV

[Less subsequent revision anterior cruciate ligament \(ACL\) reconstruction following primary bone-patellar tendon-bone ACL reconstruction with suture tape augmentation-a retrospective comparative therapeutic trial with 5-year follow-up.](#) *Arthroscopy*. Published online February 3, 2024. doi:10.1016/j.arthro.2024.01.019

- Retrospective case series comparing patient outcomes following primary ACL reconstruction with traditional BTB autograft to BTB autograft with suture tape augmentation (STA).
- 114 young, active patients (mean age <19 years) received equivalent adjustable-loop fixation devices (Arthrex BTB TightRope® implant) assembled with or without 2 mm FiberTape® suture (52 with; 62 without).
- **At a minimum 5-year final follow-up, BTB with STA resulted in 0 retears, while isolated BTB had 5.**

Takeaway

Both groups demonstrated a similar return to sports (89% at 7.1 months with STA and 87% at 7.5 months without). In the STA group, 87% of patients participated in high-risk sports compared to 81% in the isolated BTB group.



Smith PA,
Daniel AV,
Stensby JD,
Cook CS,
Wijdicks CA

[Quadriceps tendon autograft ACL reconstruction with suture tape augmentation: safe results based on minimum 2-year follow-up MRI.](#) *Orthop J Sports Med.* 2024;12(4):23259671241239275. Published 2024 Apr 11. doi:10.1177/23259671241239275

- The authors investigated the clinical and radiographic effects of suture tape augmentation with all-soft-tissue QT autograft (QTA) for ACL reconstruction.
- This case series included 25 patients with a mean age of 19.9 years who underwent QTA ACL reconstruction with independent suture tape augmentation.

Takeaway

No adverse intra-articular side effects were observed on MRI at ≥1-year post-op. All patients demonstrated completely intact grafts, along with ACL signal intensity/PCL signal intensity ratios (APR) and MRI Osteoarthritis Knee Score (MOAKS) comparable to those previously described following traditional ACL reconstruction.

Burton DA,
Schaefer EJ,
Shu HT,
Bodendorfer BM,
Argintar EH

[Primary anterior cruciate ligament repair using suture tape augmentation: a case series of 29 patients with minimum 2-year follow-up.](#) *Arthroscopy.* 2021;37(4):1235-1241. doi:10.1016/j.arthro.2020.11.034

- The purpose of this study is to evaluate both clinical and patient-reported outcomes following primary ACL repair with suture tape augmentation.
- In this Level IV prospective case series, patients with an average age of 32.2 ± 7.2 years and a proximal tear of the ACL who underwent primary ACL repair with a minimum 2-year follow-up were included.

Takeaway

Primary surgical repair of proximal ACL tears using suture tape augmentation results in a low rate of revision surgery, which 2 of 29 (6.9%) patients required.

Connolly PT,
Zittel KW,
Panish BJ,
Rigor PD,
Argintar EH

[A comparison of postoperative pain between anterior cruciate ligament reconstruction and repair.](#) *Eur J Orthop Surg Traumatol.* 2021;10.1007/s00590-020-02859-0. doi:10.1007/s00590-020-02859-0

- This comparison included 36 ACL repair patients and 71 ACL reconstruction patients.
- The mean visual pain score was significantly lower for ACL repair patients compared to ACL reconstruction patients.

Takeaway

Patients who underwent ACL repair experienced less short-term postoperative pain and were prescribed fewer narcotics compared to patients who underwent ACL reconstruction.



[Independent suture tape reinforcement of tripled smaller-diameter and quadrupled grafts for anterior cruciate ligament reconstruction with tibial screw fixation: a biomechanical full construct model.](#) *Arthroscopy*. 2020;36(2):481-489. doi:10.1016/j.arthro.2019.06.036

- This study compared the effect of high-strength suture tape reinforcement (using the *InternalBrace*™ procedure) on dynamic elongation, stiffness behavior, and ultimate failure load in comparison to standard ACL reconstruction with small-diameter soft-tissue grafts.
- Tripled small-diameter and standard quadrupled tendon grafts were tested with and without suture tape reinforcement using an adjustable-loop device (ALD) for femoral fixation and an interference screw for tibial fixation.
- Tripled constructs performed significantly worse than quadrupled constructs at higher loads. Reinforcement with suture tape significantly reduced total elongation in both the tripled and quadrupled groups. Failure loads were also significantly improved in the suture-augmented groups.

Takeaway

The authors concluded that suture tape reinforcement for ACL reconstruction may provide an option for protecting autografts and allografts against irreversible lengthening during the maturation and remodeling phases of healing.

[Suture augmented versus standard anterior cruciate ligament reconstruction: a matched comparative analysis.](#) *Arthroscopy*. 2019;35(7):2114-2122. doi:10.1016/j.arthro.2019.01.054

- Authors compared outcomes between anterior cruciate ligament reconstruction (ACLR) using hamstring grafts with and without suture augmentation (SA).
- “Patients who underwent ACLR with hamstring autografts or allografts with a minimum 2-year follow-up were reviewed.”
- “Postoperative average daily (0.60 ± 1.25 vs 1.66 ± 1.90) and maximum daily pain (1.57 ± 1.83 vs 3.35 ± 2.28) were significantly lower for the SA group ($P < .014$). SA was significantly correlated with improved time to return to preinjury activity level (9.17 ± 2.06 vs 12.88 ± 3.94 months; $P = .002$) and percentage of preinjury activity level ($93.33\% \pm 13.22\%$ vs $83.17\% \pm 17.69\%$; $P = .010$). There was a trend toward improved rate of return to preinjury activity level for SA.”

Takeaway

Compared to standard hamstring ACLRs, the authors found suture-augmented hamstring ACLRs to be associated with improved PROMs, less pain, and a higher percentage of and earlier return to preinjury activity level without evidence of overconstraint.

Mackay GM,
Heusdens CHW,
Hopper GP,
Dossche L,
Roelant E

[Anterior cruciate ligament repair with independent suture tape reinforcement: a case series with 2-year follow-up.](#) *Knee Surg Sports Traumatol Arthrosc.* 2019;27(1):60-67. doi:10.1007/s00167-018-5239-1

- Forty-two patients with an acute ACL rupture and subsequent repair with independent suture tape reinforcement were followed for a minimum 2-year period.
- Patients with midsubstance tears, distal ruptures, poor tissue quality, retracted remnants, or multiligament injuries were excluded.
- Significant improvements in KOOS, VAS-pain, and VR-12 physical scores and a significant decrease of the Marx activity scale in comparison to pre-op scores were demonstrated. Two of the 42 patients (4.8%) reported a rerupture.

Takeaway

This study confirms that ACL repair with this technique is a viable treatment option for patients with acute, nonretracted proximal ACL ruptures of good tissue quality.

Smith PA,
Bradley JP,
Konicek J,
Bley JA,
Wijdicks CA

[Independent suture tape internal brace reinforcement of bone–patellar tendon–bone allografts: biomechanical assessment in a full-ACL reconstruction laboratory model.](#) *J Knee Surg.* 2020;33(10):1047-1054. doi:10.1055/s-0039-1692649

- This study evaluated the effects of an *InternalBrace*™ repair on the biomechanical properties of ACL reconstruction in a full-construct experimental model.
- “Three groups (n=10 each) were tested in a full-construct porcine-bone model with human bone-patellar tendon-bone allografts using different reconstruction techniques: interference screw fixation on femur and tibia (S-S group), adjustable-loop device (ALD) fixation on the femur with tibial interference screw without suture tape (ALD-S group), and with internal brace (ALD-S-IB group).”
- “The ALD-S-IB group (2.9 ± 0.8 mm) displaced significantly less than the ALD-S (4.2 ± 0.9 mm; $p=0.015$) and S-S group (4.3 ± 1.1 mm; $p=0.017$). No significant difference was found between the ALD-S and the S-S group. Construct stiffness was significantly higher for the ALD-S-IB group (156 ± 23 N/mm) and the ALD-S group (122 ± 28 N/mm) than for the S-S group (104 ± 40 N/mm; $p=0.003$ and $p=0.0042$), but there was no significant difference between both ALD groups.”

Takeaway

The authors concluded that these results indicate that using the *InternalBrace* technique with BTB grafts in ACL reconstruction improve construct biomechanics, which has clinical implications regarding initial construct stability.



Mackay G,
Anthony IC,
Jenkins PJ,
Blyth M

[Anterior cruciate ligament repair revisited. Preliminary results of primary repair with internal brace ligament augmentation: a case series.](#) *Orthop Muscul Syst.* 2015;4(2):1000188. doi:10.4172/2161-0533.1000188

- Authors aimed to assess outcomes and complications of ACL repair using the *InternalBrace*[™] procedure at a minimum follow-up of 1 year.
- Sixty-eight consecutive patients who underwent ACL repair using the *InternalBrace* procedure were followed for a minimum 1-year follow-up. KOOS and WOMAC scores were collected at set time points using an online outcomes system.
- Improvement was observed in all KOOS and WOMAC domains, with the greatest improvement occurring in the first 3 months.

Takeaway

This study demonstrates that the ACL repair using the *InternalBrace* procedure is comparable with early ACL reconstruction results. There were 4 reinterventions, including one for rerupture.

In Vitro Citations: Biomechanical Validation

[Suture augmentation of a four-strand semitendinosus graft improves time-zero biomechanical properties.](#) *Arthroscopy.* 2024;40(1):124-132. doi:10.1016/j.arthro.2023.06.020

- A full-construct cadaveric model was used to evaluate the impact of independently tensioned suture augmentation on HT autograft biomechanics.
- 24 human semitendinosus (ST) grafts were divided evenly and prepared in 1 of 3 ways: quadrupled ST, quadrupled ST and 1.3 mm SutureTape, and quadrupled ST and 2 mm FiberTape[®] suture.

Takeaway

Both suture augmented groups demonstrated superior loads to failure and significantly less elongation than the isolated ST group. Particularly, grafts reinforced with 2 mm FiberTape suture had the most favorable biomechanical profile.

[Suture tape augmentation improves the biomechanical performance of bone-patellar tendon-bone grafts used for anterior cruciate ligament reconstruction.](#) *Arthroscopy.* 2021;37(11):3335-3343. doi:10.1016/j.arthro.2021.04.053

- In this study, the authors used human BPTB grafts (10 mm × 20 mm bone plugs on both sides) to reconstruct the ACL in juvenile porcine knees. Both groups used 8 mm-diameter biocomposite interference screws for fixation in the femur and tibia.
- The augmentation group differed from the control in that a FiberTape[®] suture for the *InternalBrace* technique was fixed independent of the graft using a TightRope[®] button on the femur and a SwiveLock[®] anchor on the tibia prior to fixation of the graft.

Takeaway

Suture tape augmentation resulted in statistically significant improvements of time-zero biomechanical properties in terms of increased stiffness (104% increase) and ultimate failure load (57% increase) while not negatively affecting cyclic elongation, which may reduce the graft failure rate in a clinical setting.

Lamplot JD,
Wallace GJ,
Thompson JD,
Diekfuss JA,
Champagne AA,
Myer GD,
Kaiser J

Matava MJ,
Koscso J,
Melara L,
Bogunovic L



van Eck CF,
Nakamura T,
Price T,
Linde M,
Smolinski P

[Suture tape augmentation improves laxity of MCL repair in the ACL reconstructed knee.](#) *Knee Surg Sports Traumatol Arthrosc.* 2021;29(8):2545-2552. doi:10.1007/s00167-020-06386-7

- This study compared the biomechanical effects of MCL repair with suture tape using the *InternalBrace*™ procedure to standalone MCL suture repair in the setting of a concomitant ACL reconstruction using a six-degrees-of-freedom robotic system.
- Compared to isolated MCL repair, MCL repair with suture tape augmentation demonstrated improved valgus and external rotation laxity without evidence of overconstraint on the joint.

Takeaway

The authors note that these findings suggest that including MCL repair with suture tape augmentation in a combined ACL-reconstruction-MCL-repair procedure may result in lower failure rates and less residual laxity, shorter immobilization times, and faster return to play.

Bachmaier S,
Smith PA,
Bley J,
Wijdicks CA

[Independent suture tape reinforcement of small and standard diameter grafts for anterior cruciate ligament reconstruction: a biomechanical full construct model.](#) *Arthroscopy.* 2018;34(2):490-499. doi:10.1016/j.arthro.2017.10.037

- This study compared dynamic elongation, stiffness, and ultimate load of standard and small grafts with and without suture tape reinforcement (using the *InternalBrace* procedure).
- Suture reinforcement of a small-diameter graft significantly reduced dynamic elongation (38%). A 15% decrease in dynamic elongation was also observed in a standard-diameter graft. The ultimate load of the small and standard grafts improved by 64% and 40% when compared to their respective controls.

Takeaway

The authors concluded that independent suture tape reinforcement (using the *InternalBrace* procedure) of soft-tissue grafts for ACLR leads to significantly reduced elongation and higher ultimate load. The suture tape reinforcement technique may decrease the risk of graft tears, particularly when a small graft is used.

Gilmer BB,
Crall T,
DeLong J,
Kubo T,
Mackay G,
Jani SS

[Biomechanical analysis of internal bracing for treatment of medial knee injuries.](#) *Orthopedics.* 2016;39(3):e532-e537. doi:10.3928/01477447-20160427-13

- The authors evaluated posteromedial anatomic repair with *InternalBrace* ligament augmentation and compared it with the intact state, repair alone, and allograft reconstruction.
- Three groups of 9 cadaveric, fresh-frozen matched pairs (54 knees) were tested to failure at 30° under valgus load in a biomechanical testing apparatus.

Takeaway

The authors concluded that posteromedial knee repair with *InternalBrace* ligament augmentation is superior to repair alone and similar to allograft reconstruction for all parameters measured. They also eliminated the concern of overconstraint of the medial knee in the *InternalBrace* ligament repair group.



Soreide E,
Denbeigh JM,
Lewallen EA,
Thaler R,
Xu W,
Berglund L,
Yao JJ,
Martinez A,
Nordsletten L,
van Wijnen AJ,
Kakar S

In Vivo Citations: Translational Research

[In vivo assessment of high-molecular-weight polyethylene core suture tape for intra-articular ligament reconstruction.](#) *Bone Joint J.* 2019;101-B(10):1238-1247. doi:10.1302/0301-620X.101B10.BJJ-2018-1282.R2

- Eighteen rabbits underwent bilateral ACL reconstruction with autograft, FiberTape® suture, or FiberTape suture-augmented autograft.
- At eight weeks, both FiberTape suture alone and FiberTape suture-augmented autograft demonstrated improved ultimate load to failure, elongation, and energy absorption when compared with autograft. FiberTape suture samples also demonstrated increased bone mineral density in the bone tunnel.

Takeaway

The authors concluded that FiberTape suture increases the biomechanical performance of intra-articular ligament reconstructions in a verified rabbit model at eight weeks. Additionally, FiberTape suture did not demonstrate any deleterious effects, such as adversely affecting bone tunnel healing or invoking a prolonged elevation in inflammation.

Smith PA,
Bozynski CC,
Kuroki K,
Henrich SM,
Wijdicks CA,
Cook JL

[Intra-articular biocompatibility of multistranded, long-chain polyethylene suture tape in a canine ACL model.](#) *J Knee Surg.* 2019;32(06):525-531. doi:10.1055/s-0038-1655765

- The authors sought to assess the intra-articular use of a nonabsorbable braided suture tape for its biocompatibility when implanted next to the native ACL in a canine model.
- No severe inflammatory or immune responses, bony erosions, or premature OA development were noted during the 6-month study period, even in a “worst-case” scenario model.
- “The hypothesis was accepted as study results support the biocompatibility of suture tape in the canine knee.”

Takeaway

Results of this study support the biocompatibility and safety of intra-articular suture tape for augmentation of ACLR or repairs.

Cook JL,
Smith P,
Stannard JP,
Pfeiffer F,
Kuroki K,
Bozynski CC,
Cook C

[A canine arthroscopic anterior cruciate ligament reconstruction model for study of synthetic augmentation of tendon allografts.](#) *J Knee Surg.* 2017;30(7):704-711. doi:10.1055/s-0036-1597618

- The study objective was to describe and validate a translational canine model for all-inside ACL reconstruction (ACLR) using a quadriceps tendon allograft with internal brace (QTIB).
- Results suggest that a QTIB construct used in ACLR can provide sustained knee stability and function without the development of premature OA in a valid preclinical model.

Takeaway

The authors concluded that the configuration of the QTIB prevented early failure, allowed for direct, four-zone graft-to-bone healing, and functional graft remodeling while avoiding problems noted with use of all-synthetic grafts.



Root C,
Braman M,
Srinivas M,
Ringenberg J,
Long R,
Morey T,
Vopat M,
Vopat B

Systematic Review/Meta-Analysis

[Suture tape augmentation of posterior cruciate ligament reconstruction shows improved biomechanical stability with equivalent outcome and complication rates: a scoping review.](#) *Arthroscopy*. Published online March 25, 2024. doi:10.1016/j.arthro.2024.03.025

- This systematic review summarized 6 technical, animal, biomechanical, and clinical studies evaluating the efficacy of STA for PCL reconstruction.
- Biomechanical advantages of grafts with STA were identified, including significant reduction in posterior tibial slope, 45% to 58% decrease in total elongation and increased load to failure.
- Clinically, PCL reconstructions with STA resulted in improved or equivalent patient-reported outcomes with no difference in complication rate compared to standard PCL reconstruction.

Takeaway

The authors concluded that STA in PCL reconstruction has the potential to improve time-zero biomechanical characteristics through load sharing without added complications.

Wilson WT,
Hopper GP,
Banger MS,
Blyth MJG,
Riches PE,
MacKay GM

[Anterior cruciate ligament repair with internal brace augmentation: a systematic review.](#) *Knee*. 2022;35:192-200. doi:10.1016/j.knee.2022.03.009

- This systematic review and meta-analysis was the first to examine ACL primary repair using the *InternalBrace*™ technique exclusive of other techniques and included 9 studies consisting of 346 patients with a mean age of 32.5 years and a mean minimum 2-year follow-up.
- Meta-analysis of PROMs—including KOOS, Lysholm, and IKDC—revealed mean scores greater than 87% of max for all and mean side-to-side difference in AP laxity of 1.2 mm.

Takeaway

The authors concluded that ACL repair using the *InternalBrace* technique is a safe technique for treatment of proximal ruptures, which have the most potential for healing, with a failure rate of 10.4% at a mean follow-up of 2.7 years.

Mackenzie CEA,
Huntington LS,
Tulloch S

[Suture tape augmentation of anterior cruciate ligament reconstruction increases biomechanical stability: a systematic review of biomechanical, animal, and clinical studies.](#) *Arthroscopy*. 2022;S0749-8063(21)01127-0. doi:10.1016/j.arthro.2021.12.036

- This systematic review summarized 22 technical, animal, biomechanical, and clinical studies focused on ACLs augmented with suture tape to assess the pertinent literature currently available and “determine what evidence exists to support and oppose the technique in clinical practice.”
- No significant difference in complications, rates of ligamentization, histological findings, or evidence of stress shielding was found.
- PROMS in clinical studies include improved or equivalent outcomes in IKDC scores and return to sport.

Takeaway

Cited advantages of grafts with STA include evidence of gradually increasing load-sharing characteristics, 12.2% to 73.0% greater load to failure, and 17.0% to 60.2% reduced elongation.



van Eck CF,
Limpisvasti O,
ElAttrache NS

[Is there a role for internal bracing and repair of the anterior cruciate ligament? A systematic literature review.](#) *Am J Sports Med.* 2018;46(9):2291-2298. doi:10.1177/0363546517717956

- An electronic database search was conducted, identifying 89 publications describing preclinical and clinical studies on outcomes of ACL repair.
- Proximal ACL tears demonstrated better healing potential than distal or mid-substance tears in the setting of primary repair. *InternalBrace™* ligament repair increased the success rate of ACL repair.

Takeaway

“ACL repair may be a viable option in young patients with acute, proximal tears. The use of internal bracing, biological augmentation, and scaffold tissue may increase the success rate of repair.”

InternalBrace™ Ligament Augmentation Technique Citations

[The Lavender fertilized anterior cruciate ligament reconstruction: a quadriceps tendon all-inside reconstruction fertilized with bone marrow concentrate, demineralized bone matrix, and autograft bone.](#) *Arthrosc Tech.* 2019;8(9):e1019-e1023. doi:10.1016/j.eats.2019.05.013

[Primary repair of the medial collateral ligament with a double row suture technique and suture tape augmentation for acute tibial-sided injuries.](#) *Arthrosc Tech.* 2019;8(4):e395-e398. doi:10.1016/j.eats.2018.11.018

[Suture tape augmentation repair of the medial patellofemoral ligament.](#) *Arthrosc Tech.* 2019;8(10):e1159-e1162. doi:10.1016/j.eats.2019.06.003

[Patellar tendon graft anterior cruciate ligament reconstruction technique with suture tape augmentation.](#) *Arthrosc Tech.* 2019;8(4):e355-e361. doi:10.1016/j.eats.2018.11.003

[Anterolateral ligament repair augmented with suture tape in acute anterior cruciate ligament reconstruction.](#) *Arthrosc Tech.* 2019;8(4):e369-e373. doi:10.1016/j.eats.2018.11.014

[Repair and augmentation with internal brace in the multiligament injured knee.](#) *Clin Sports Med.* 2019;38(2):275-283. doi:10.1016/j.csm.2018.11.008

[Posterior cruciate ligament repair with suture tape augmentation.](#) *Arthrosc Tech.* 2019;8(1):e7-e10. doi:10.1016/j.eats.2018.08.022

[Medial patellofemoral ligament repair with suture tape augmentation.](#) *Arthrosc Tech.* 2019;8(1):e1-e5. doi:10.1016/j.eats.2018.08.021

[Posterolateral corner repair with suture tape augmentation.](#) *Arthrosc Tech.* 2018;7(12):e1299-e1303. doi:10.1016/j.eats.2018.08.018

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Levy E

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Schlechter JA

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Hoang V,
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Drogo P,
Wolf MR,
Ferretti A

Dabis J,
Wilson A

Hopper GP,
Heusdens CHW,
Dossche L,
Mackay GM

Hopper GP,
Heusdens CHW,
Dossche L,
Mackay GM

Hopper GP,
Heusdens CHW,
Dossche L,
Mackay GM



Saper MG

[Quadriceps tendon autograft anterior cruciate ligament reconstruction with independent suture tape reinforcement.](#) *Arthrosc Tech.* 2018;7(11):e1221-e1229. doi:10.1016/j.eats.2018.08.007

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Hopper GP,
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Mackay GM

[Anterior cruciate ligament repair using independent suture tape reinforcement.](#) *Arthrosc Tech.* 2018;7(7):e747-e753. doi:10.1016/j.eats.2018.03.007

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Hatch GFR

[Suture augmentation: an alternative to reconstruction for incomplete posterior cruciate ligament injuries in the multiple ligament–injured knee.](#) *Arthrosc Tech.* 2018;7(3):e239-e243. doi:10.1016/j.eats.2017.08.074

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[Anterior cruciate ligament reconstruction with suture tape augmentation.](#) *Arthrosc Tech.* 2018;7(4):e385-e389. doi:10.1016/j.eats.2017.10.010

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Sonnenfeld JJ,
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[Distal knee medial collateral ligament repair with suture augmentation.](#) *Arthrosc Tech.* 2018;7(9):e921-e926. doi:10.1016/j.eats.2018.05.001

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Van der List JP,
DiFelice GS

[Multiligament repair with suture augmentation in a knee dislocation with medial-sided injury.](#) *Arthrosc Tech.* 2018;7(8):e839-e843. doi:10.1016/j.eats.2018.04.006

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Elazab A,
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[Internal suture augmentation technique to protect the anterior cruciate ligament reconstruction graft.](#) *Arthrosc Tech.* 2017;6(5):e1633-e1638. doi:10.1016/j.eats.2017.06.020

van der List JP,
DiFelice GS

[Primary repair of the medial collateral ligament with internal bracing.](#) *Arthrosc Tech.* 2017;6(4):e933-e937. doi:10.1016/j.eats.2017.03.003

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[Allograft anterior cruciate ligament reconstruction utilizing internal brace augmentation.](#) *Arthrosc Tech.* 2016;5(5):e1143-e1147. doi:10.1016/j.eats.2016.06.007

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MacKay G,
Gilmer B

[Knee medial collateral ligament and posteromedial corner anatomic repair with internal bracing.](#) *Arthrosc Tech.* 2014;3(4):e505-e508. doi:10.1016/j.eats.2014.05.008



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