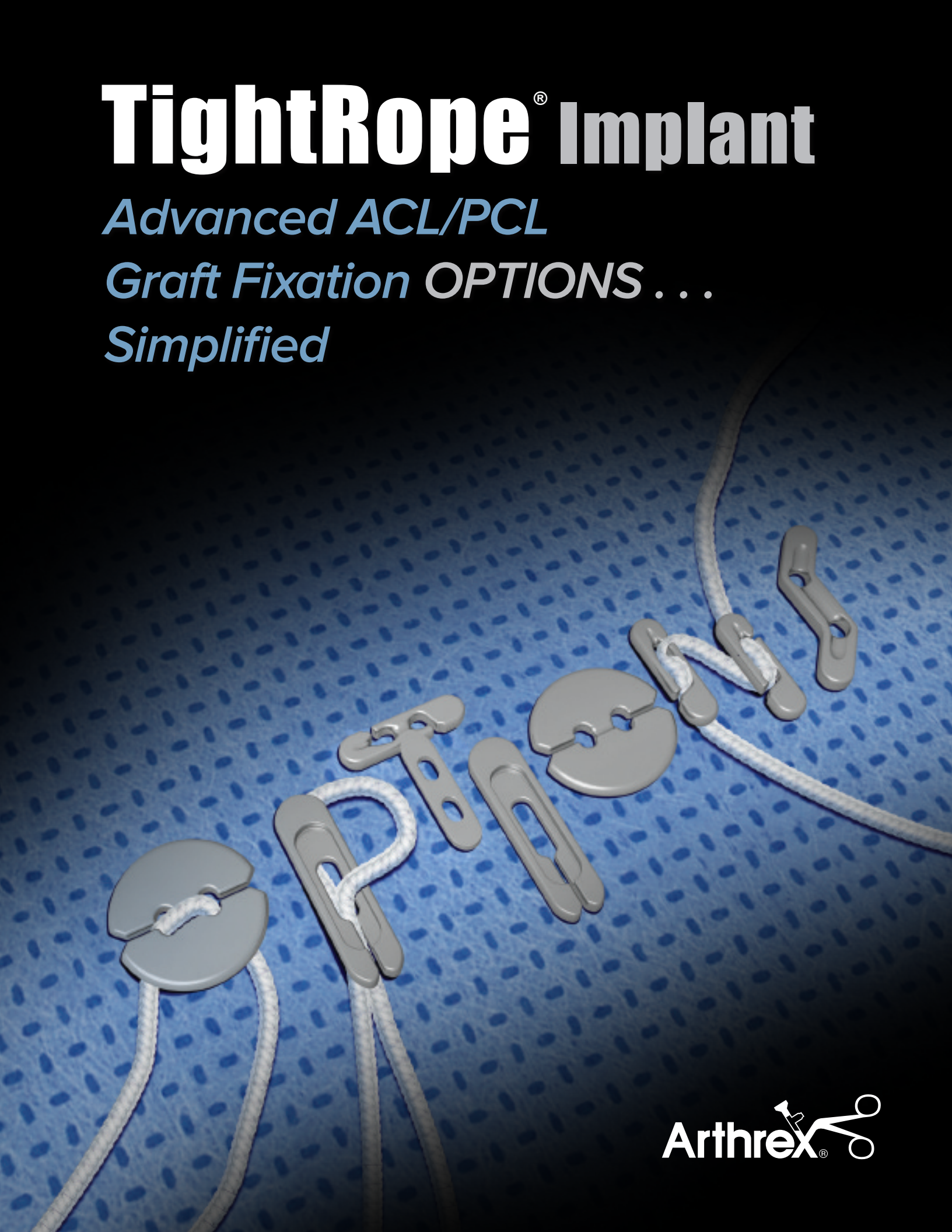
TightRope® Implant

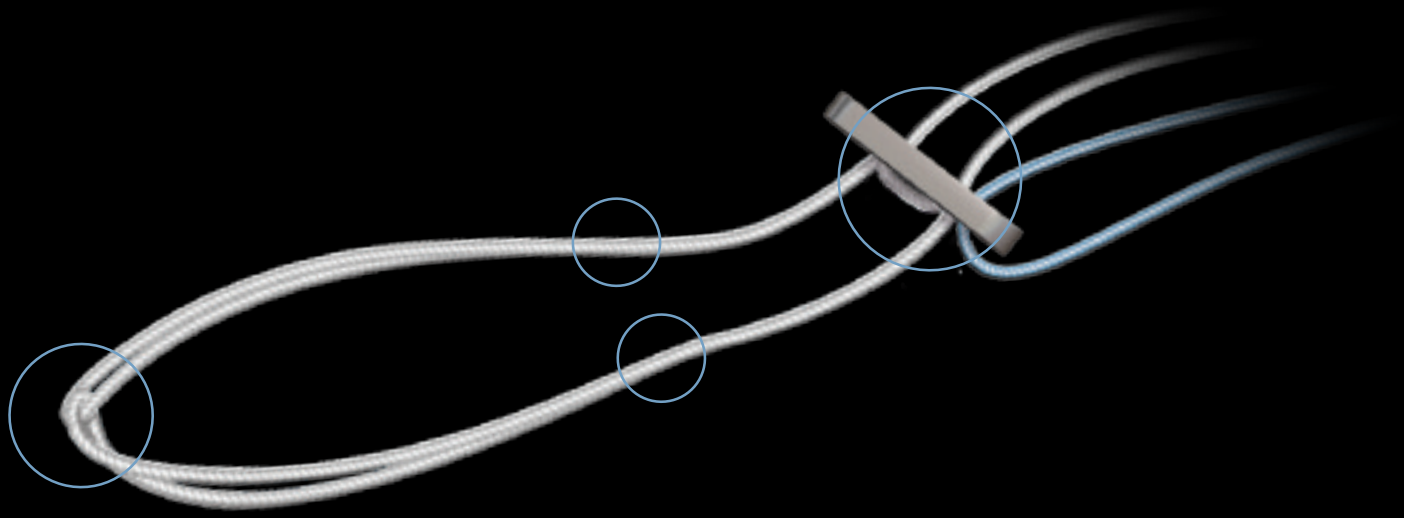
Advanced ACL/PCL Graft Fixation OPTIONS . . . Simplified



Arthrex®

More Than 9 Years of Clinical Experience and 1.5 Million Systems Implanted

The family of adjustable-suspension TightRope® fixation implants uses an innovative, 4-point locking system resulting in very high ultimate loads, while minimizing creep.[1,2] With more than 9 years of clinical history and more than 1.5 million systems implanted,[3] TightRope implant technology continues to be embraced. Arthrex is committed to product development and offering a full line of TightRope fixation products that provide surgeons with a wide array of solutions for varying patient needs.



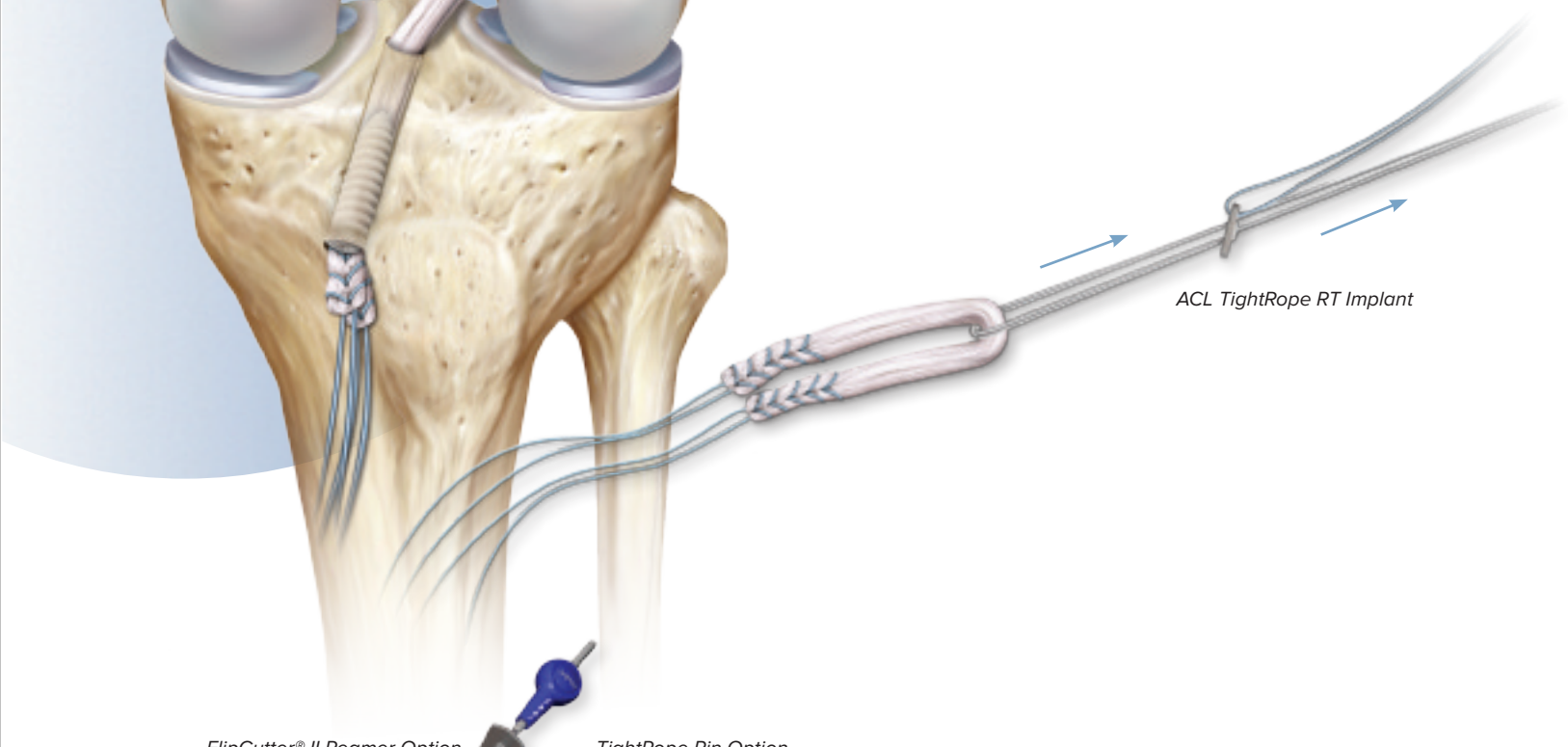
Features and Benefits:

- Proprietary 4-point, knotless locking system that resists cyclic displacement and provides high ultimate loads[1,2]
- One size fits all — no need to calculate the implant size
- Clinically proven outcomes[4-7]
- Options for various graft types and surgical applications

ACL TightRope® and TightRope RT Constructs

ACL TightRope Implant

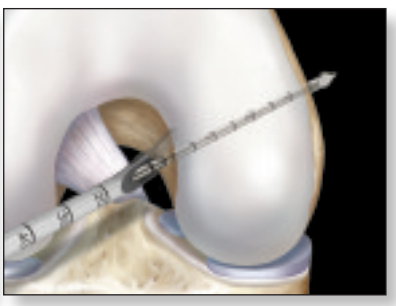
The ACL TightRope implant has revolutionized cortical fixation by allowing intraoperative adjustability of cortical fixation while providing a stiff, strong construct due to the proprietary 4-point locking system.[1,2] Use the ACL TightRope implant to pull tensioning strands in the same direction of graft advancement, eliminating the need to retrieve shortening strands from the joint.



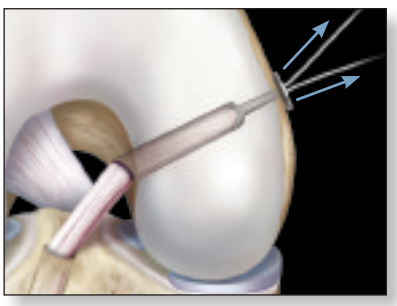
ACL TightRope RT Implant

FlipCutter® II Reamer Option

TightRope Pin Option

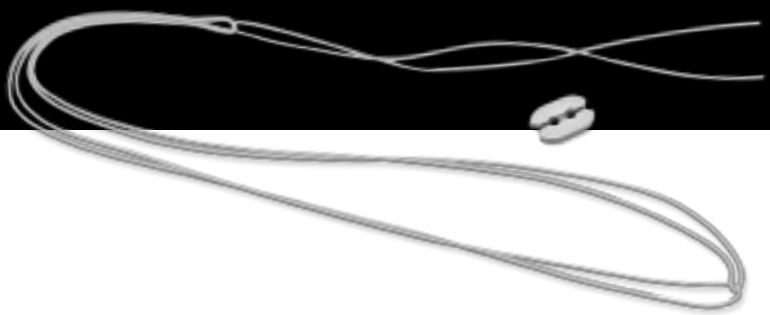


ACL TightRope and TightRope RT implants are compatible with FlipCutter reamers for retrograde reaming and the spade-tipped TightRope drill pin for transtibial and medial portal drilling. Both systems eliminate extra steps of "overreaming" and tunnel measurement.



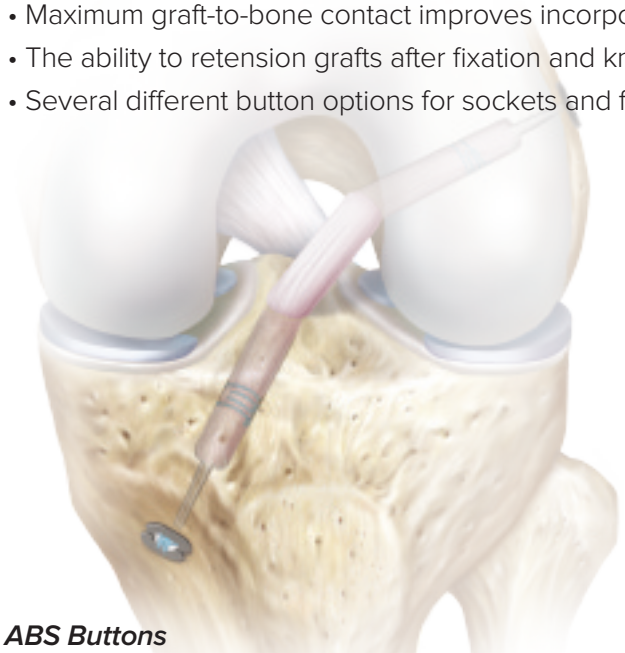
The ACL TightRope implant offers a unique ability to retension soft-tissue grafts after completing tibial fixation and cycling the knee.

Attachable Button System (ABS)



The TightRope® Attachable Button System (ABS) has revolutionized tibial fixation of ACL and PCL grafts. TightRope ABS implant loops can be used on all graft types and attach to a variety of button configurations for fixation over “retroreamed” sockets or full tunnels with concconcave buttons. The advantages of the TightRope ABS implants include:

- Strong, reliable cortical fixation superior to interference screws[7]
- Maximum graft-to-bone contact improves incorporation and healing[7]
- The ability to retension grafts after fixation and knee cycling
- Several different button options for sockets and full tunnels



ABS Buttons

Ideal for use over tibial sockets created with a FlipCutter® II reamer, the ABS loops pass easily through small-diameter tunnels and allow attachment of ABS buttons against the tibial cortex. ABS buttons are available in multiple sizes and shapes and provide strong, reliable cortical fixation.[2]

Concave ABS Buttons

Ideal for full tunnels, the centering feature of these buttons maintains position over the tunnel and provides a better seal at the cortex than standard flat buttons. The concave surface countersinks sutures and knots. The 14 mm and 20 mm buttons have slots for the TightRope loop along with 2 holes for additional sutures.

TightRope ABS Button
8 mm × 12 mm
AR-1588TB

TightRope ABS Button
round, 14 mm
AR-1588TB-1

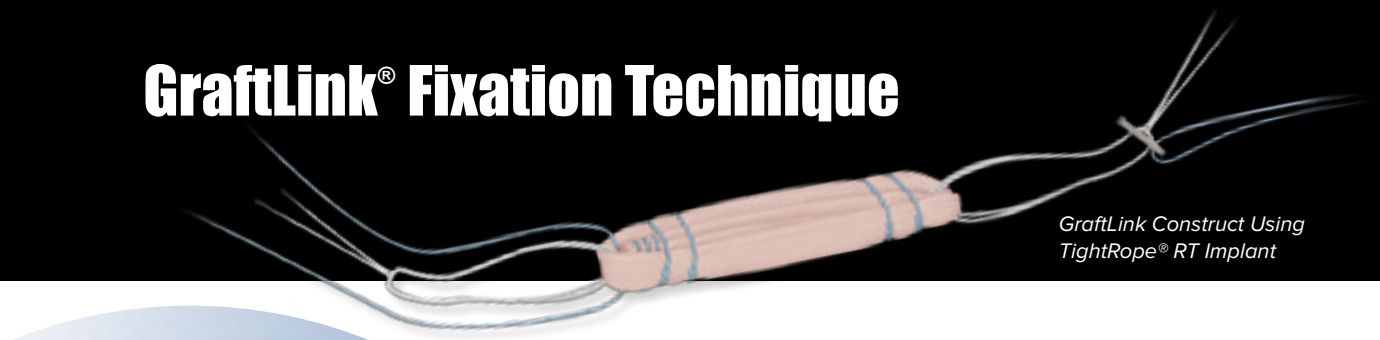
TightRope ABS Button
oblong, 3.4 mm × 13 mm
AR-1588TB-2

Concave ABS Button
11 mm w/ 4 mm collar
AR-1588TB-3

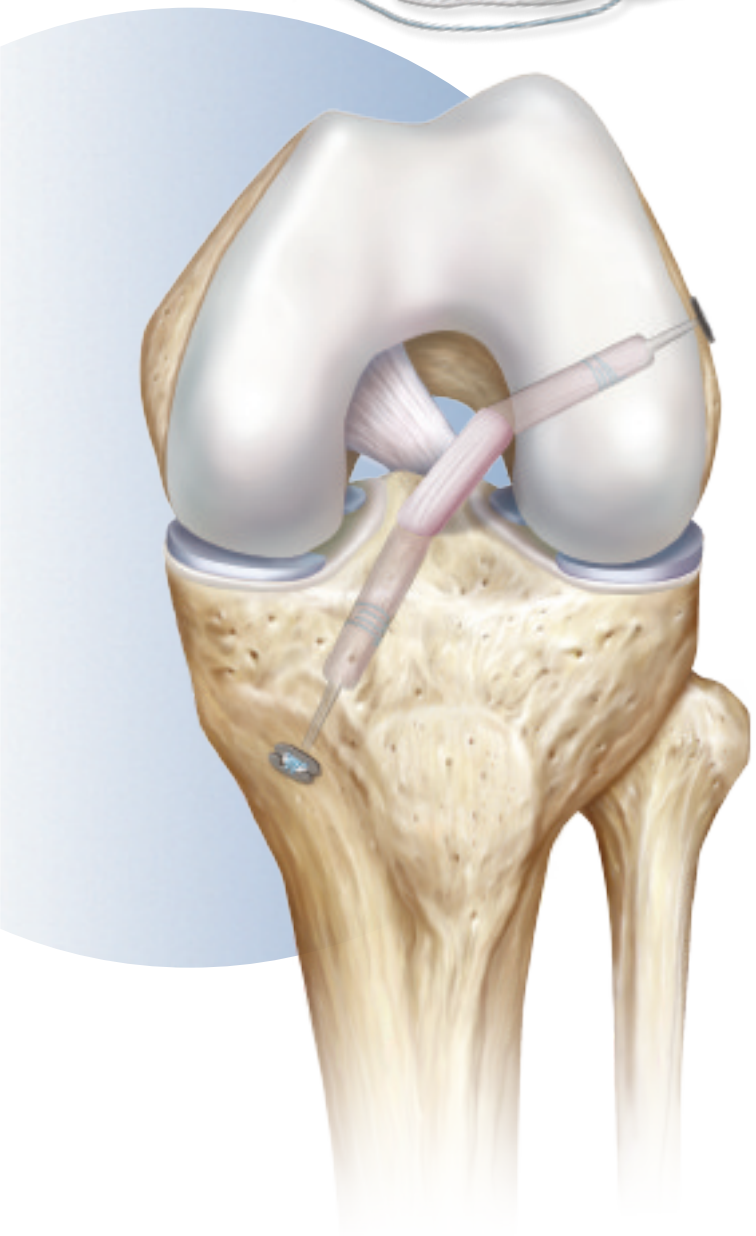
Concave ABS Button
14 mm w/ 7 mm collar
AR-1588TB-4

Concave ABS Button
20 mm w/ 9 mm collar
AR-1588TB-5

GraftLink® Fixation Technique



GraftLink Construct Using TightRope® RT Implant

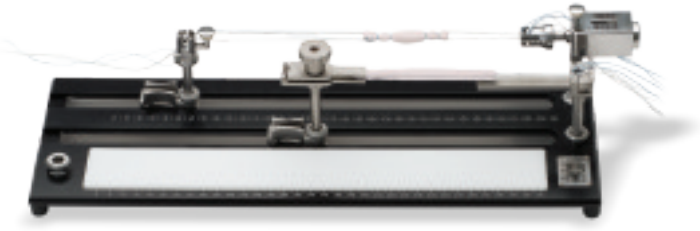


The GraftLink technique provides the ultimate in anatomic, minimally invasive, and reproducible ACL reconstruction.

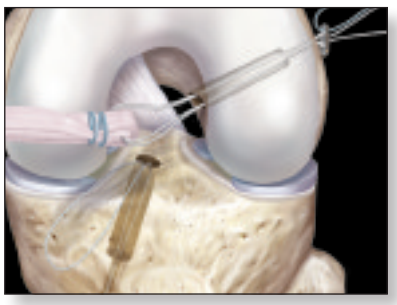
Anatomic – Independent tibial and femoral socket preparation with FlipCutter® II reamer and/or low-profile reamers facilitates unconstrained placement of the ACL graft.

Minimally Invasive – Single hamstring harvest decreases morbidity and loss of strength.[8] Socket preparation with the FlipCutter II reamer limits soft-tissue dissection and preserves bone and periosteum.

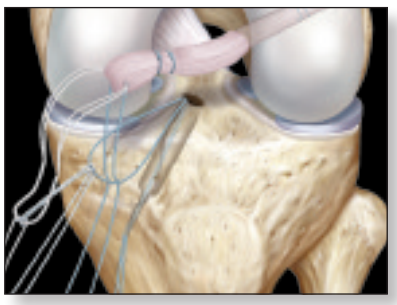
Reproducible – The GraftPro® graft prep system simplifies graft preparation. The tapered graft and adjustable femoral and tibial ACL TightRope® implant buttons facilitate graft passing, fine-tuning of graft depth, and graft tensioning from the femoral and tibial sides.



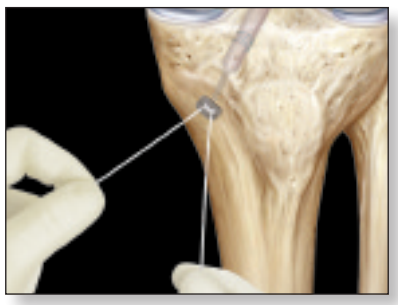
GraftPro Graft Preparation System Board – AR-2950D



Pass the femoral TightRope implant first.

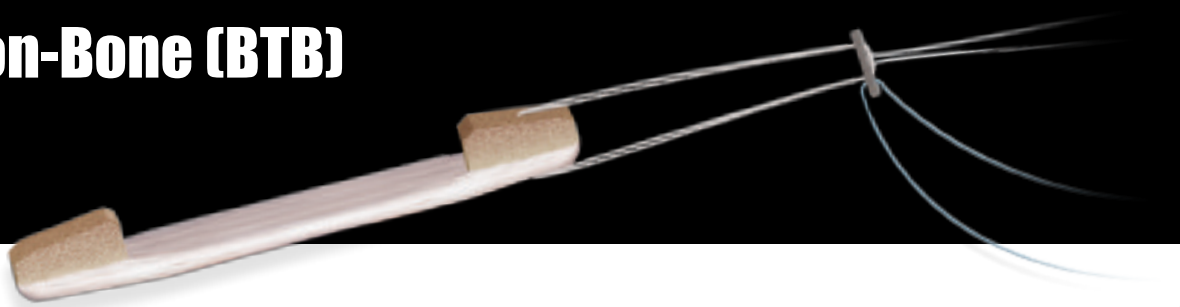


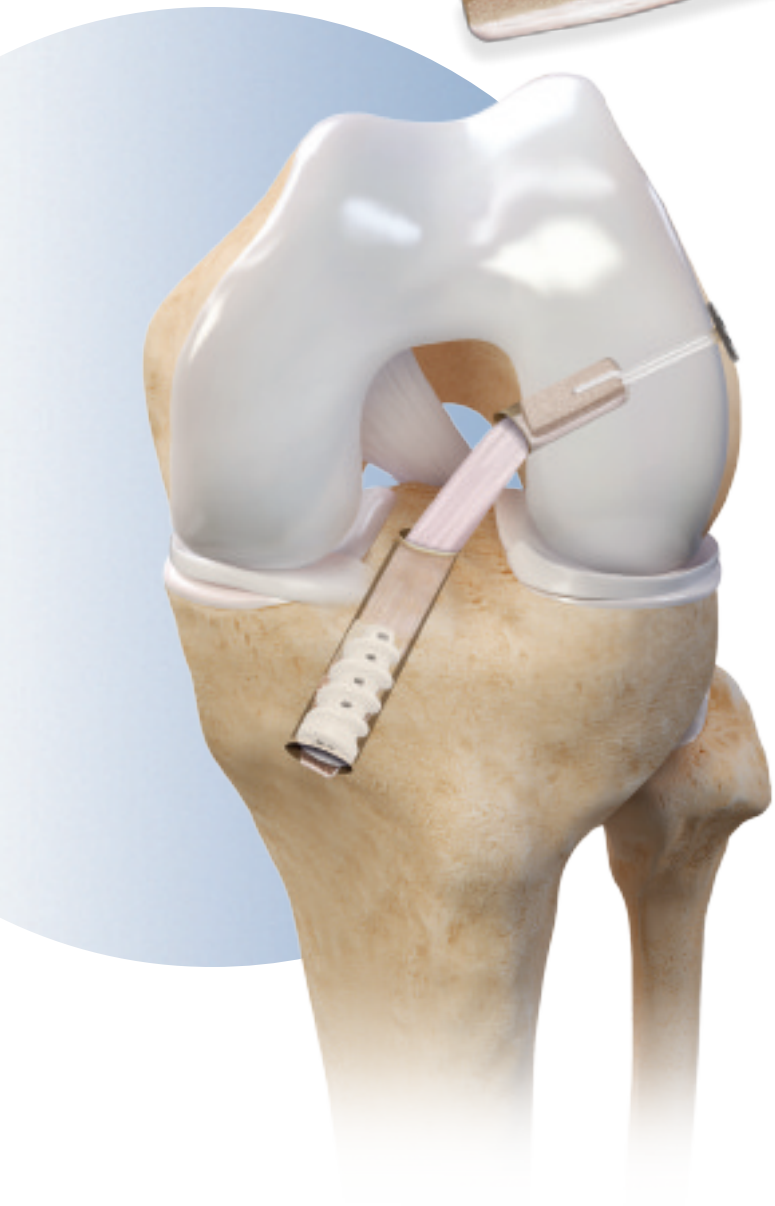
Pass the tibial TightRope implant second (ABS TightRope implant shown).



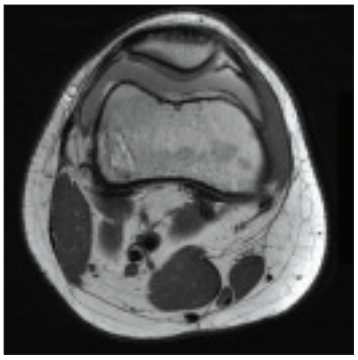
Retension the GraftLink technique construct.

Bone-Tendon-Bone (BTB)

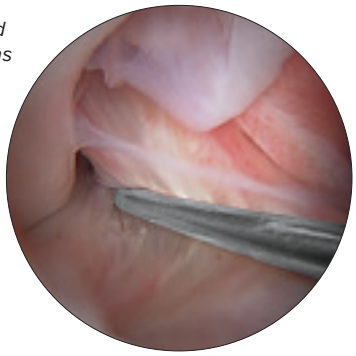




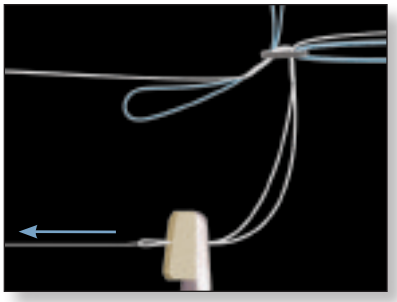
The simplicity and strength of the ACL TightRope® RT construct can be used with bone-tendon-bone (BTB) ACL grafts. The BTB TightRope construct offers the same adjustable, 4-point locking system as the ACL TightRope RT implant but allows placement through a small drill hole in the cortical bone block. The TightRope button facilitates dependable cortical fixation and the adjustable loop allows the graft to be pulled into the femoral socket as deep as needed for ideal graft tunnel-matching. The BTB TightRope button also allows fixation of BTB grafts into anatomic femoral sockets that can be difficult to reach with traditional interference screws.



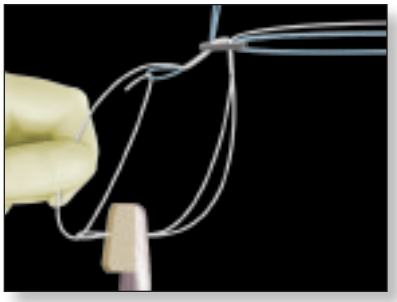
MRI shows the bone block from the patellar tendon graft well-integrated into the femoral socket at 7.5 months



Second-look arthroscopy shows graft well-incorporated and synovialized

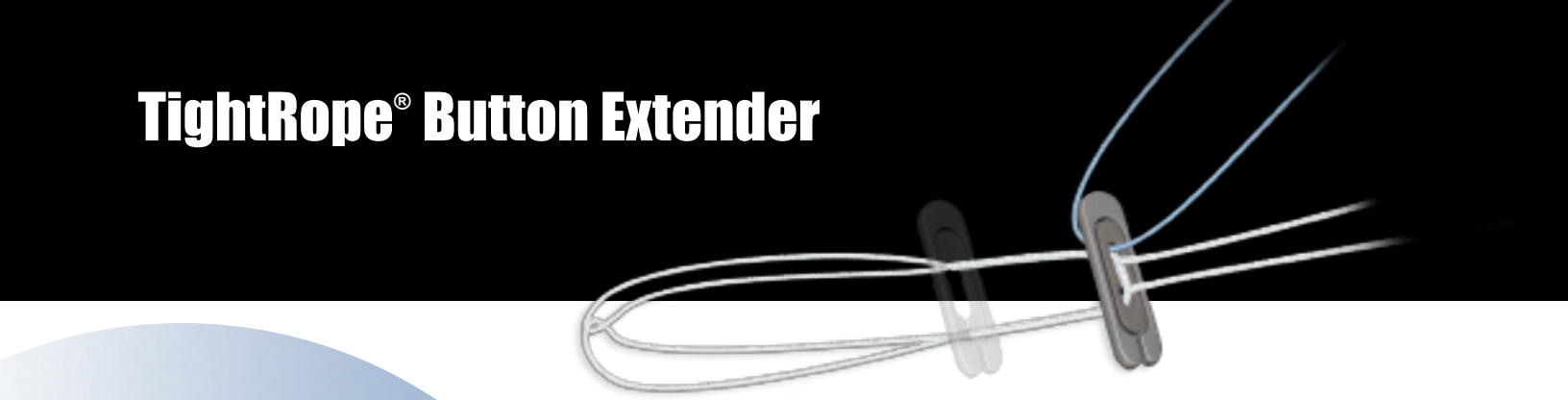


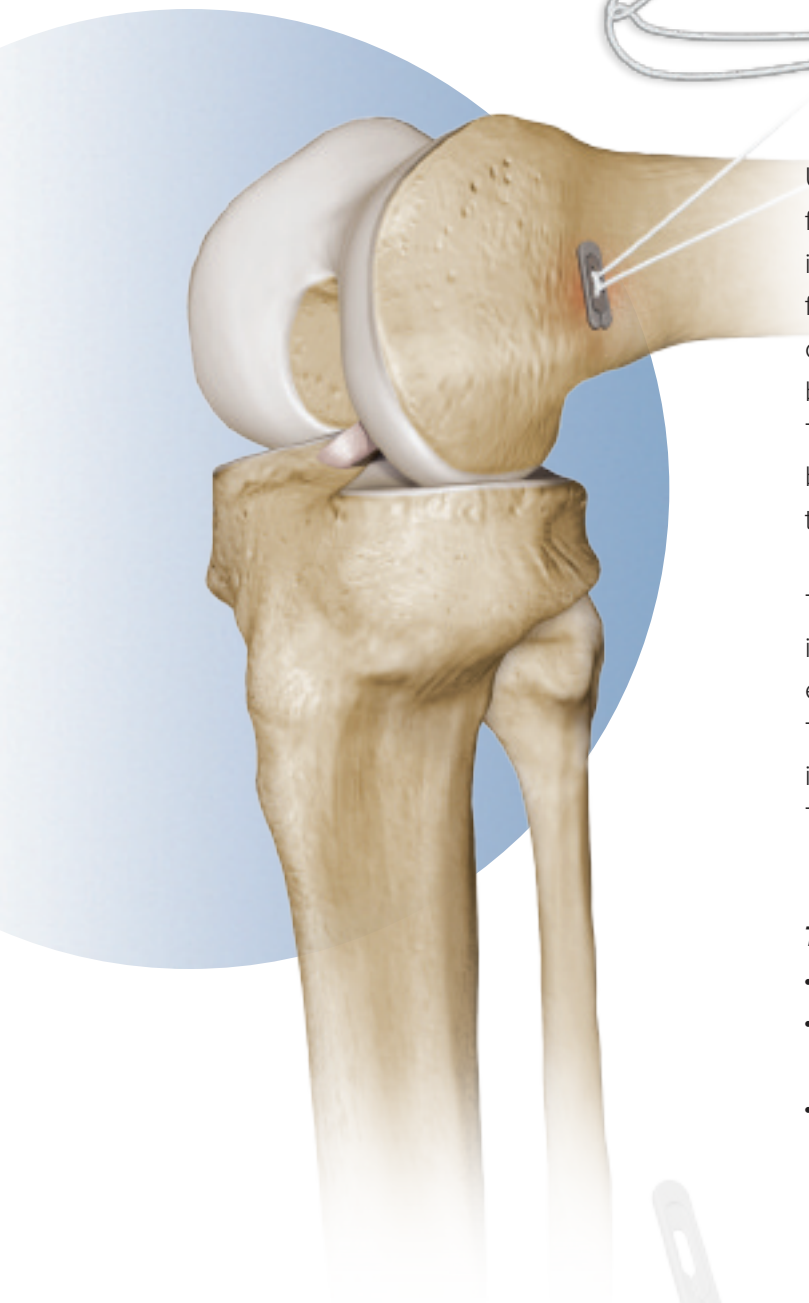
Load the implant through the bone block.



Complete the BTB TightRope construct by pulling the TightRope implant loop through the button.

TightRope® Button Extender



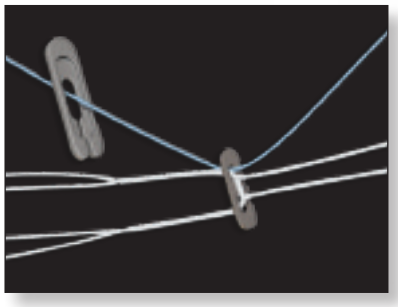


Use the TightRope button extender to create a larger footprint than a traditional TightRope button, resulting in additional cortical fixation. The TightRope button fits into the recessed section of the button extender, creating a large 20 mm × 5 mm footprint that maximizes button-to-bone contact against the cortex. Use the TightRope button extender following accidental cortical blowouts, during revision ACL surgery, and when full tunnels are used.

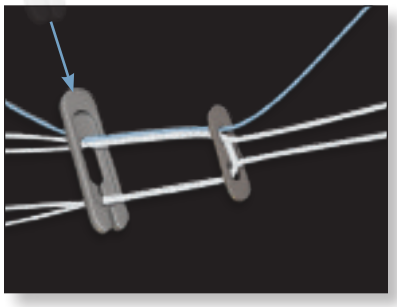
The minimum tunnel size to pass the button extender is 5 mm. The maximum tunnel size where the button extender can maintain cortical fixation is 11 mm. The button comes packed sterile and can be used in conjunction with the TightRope, TightRope RT, TightRope DB, or BTB TightRope implants.

TightRope Button Extender Advantages:

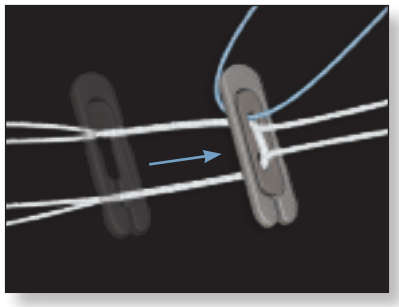
- Ideal for cortical blowouts, revisions, and full tunnels
- Easily loads onto a TightRope button without removing the graft
- Large 20 mm × 5 mm footprint maximizes button-to-bone contact against the cortex



Place passing suture through the button extender.

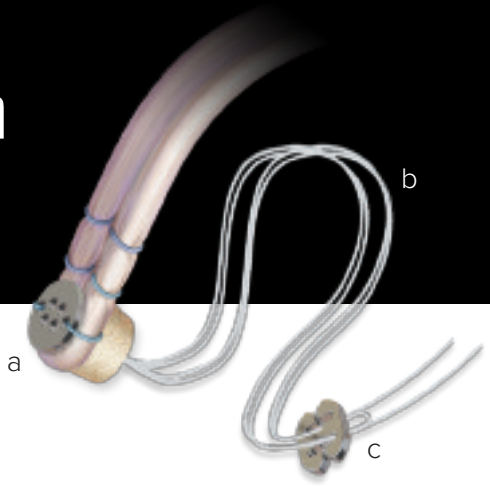


Pass all TightRope sutures through the button extender.



Recessed area allows the TightRope button to fit securely.

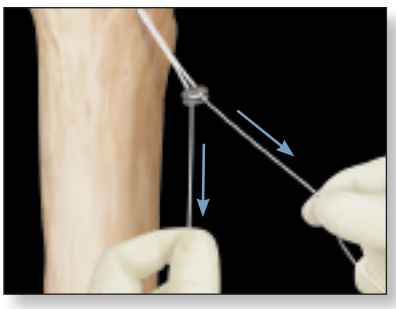
Inlay PCL Reconstruction



TightRope® implant technology has been incorporated into the unique PCL TightRope construct to simplify graft preparation and passing, while strengthening fixation.

- A round graft button secures the bone plug into the tibial socket (a). Suture holes in the button allow incorporation of whipstitched sutures into the fixation, which facilitates graft passing and augments fixation.
- The TightRope construct includes a proprietary, self-reinforcing, 4-point locking system that resists cyclic displacement (b).
- Dual buttons placed on opposite ends of the TightRope construct compress the graft into the tibial socket and lock securely into place (a,c).
- A broad, attachable button is loaded onto the TightRope implant after tibial passing, allowing unobstructed passage of the graft and implant through the joint and larger button-to-bone contact on the anterior tibia (c).

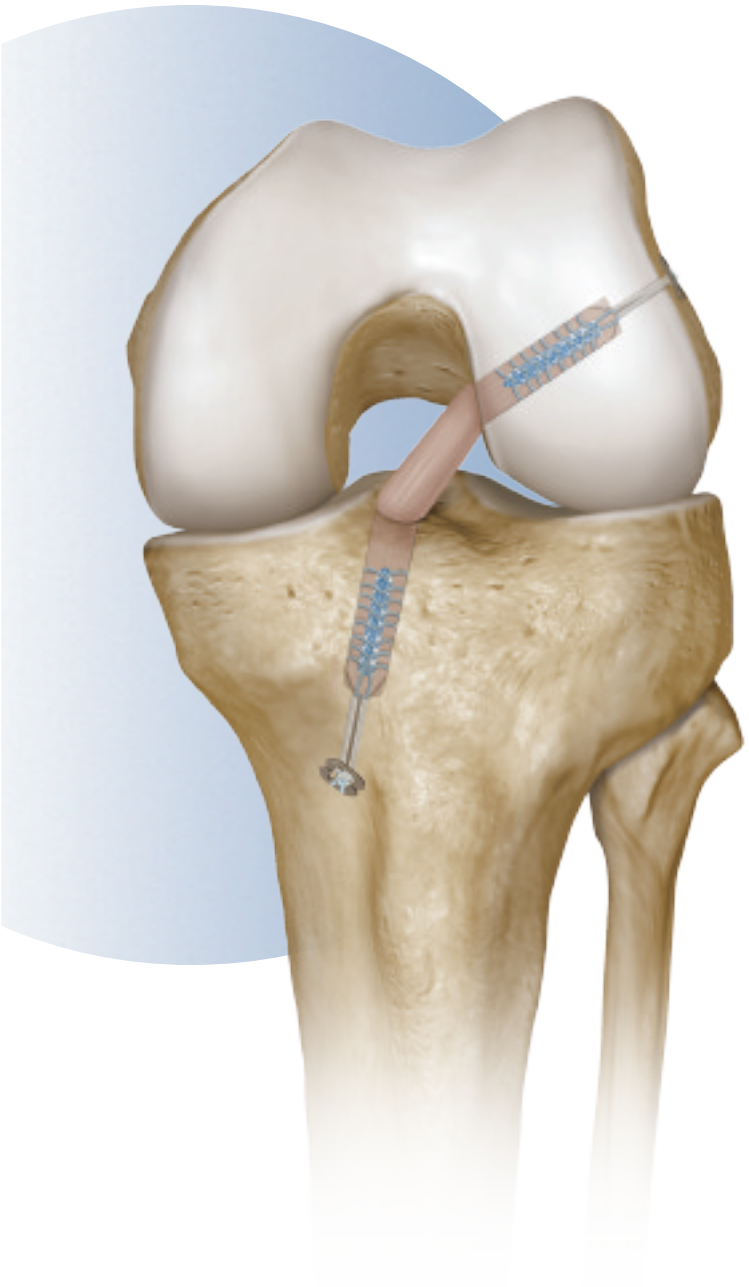
Pass the TightRope implant through the bone block of the graft.

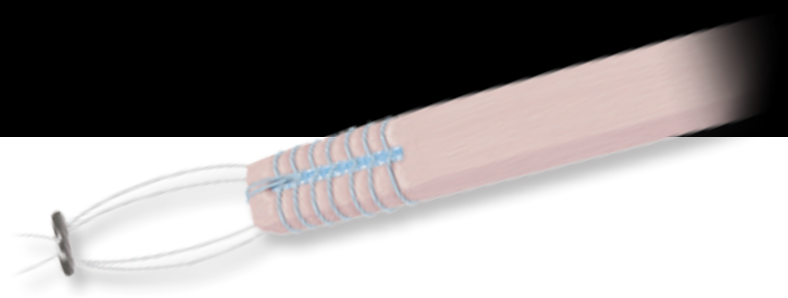


Easily tighten the attachable button to desired tension.

The graft is held securely in position.

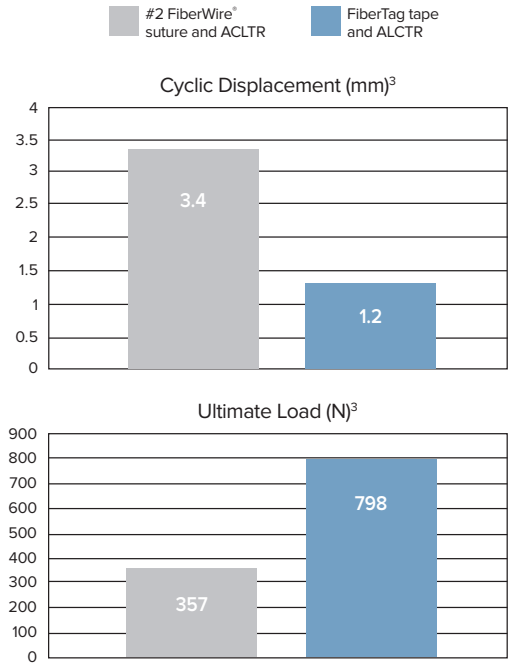
FiberLoop® With FiberTag™ Suture Whipstitching

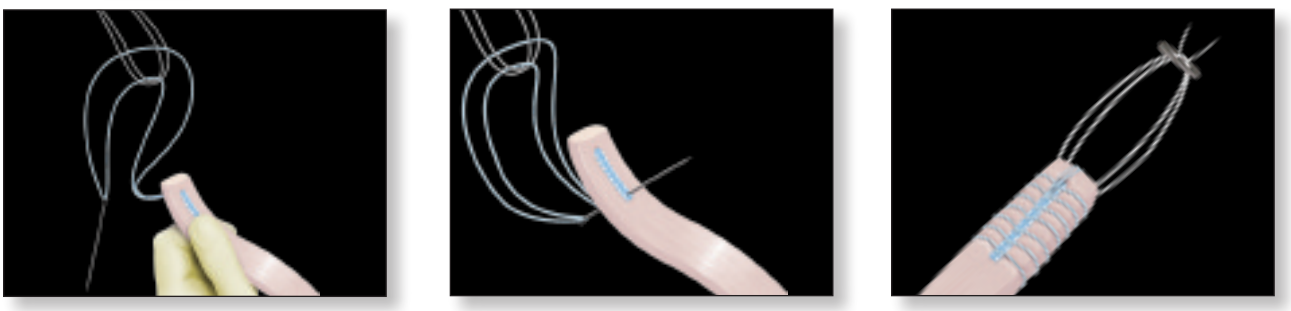




Eliminate the weak link in graft preparation by using the SpeedWhip™ rip-stop technique, which reinforces the suture/tissue interface with FiberTag tape. Incorporate FiberTag tape into the end of the FiberLoop construct, allowing each needle pass to integrate both the graft and tape. This construct has been shown to increase the strength over standard stitching alone.[8]

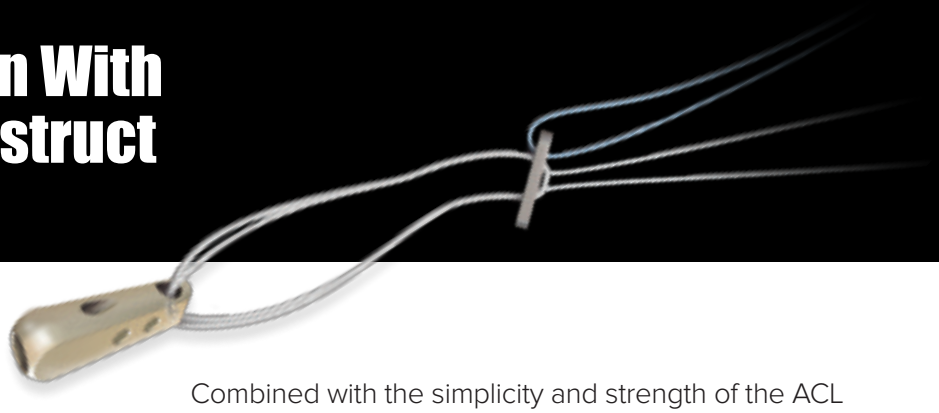
Strength Comparison of ACL TightRope® Construct Attached With Locking Suture vs FiberTag Tape

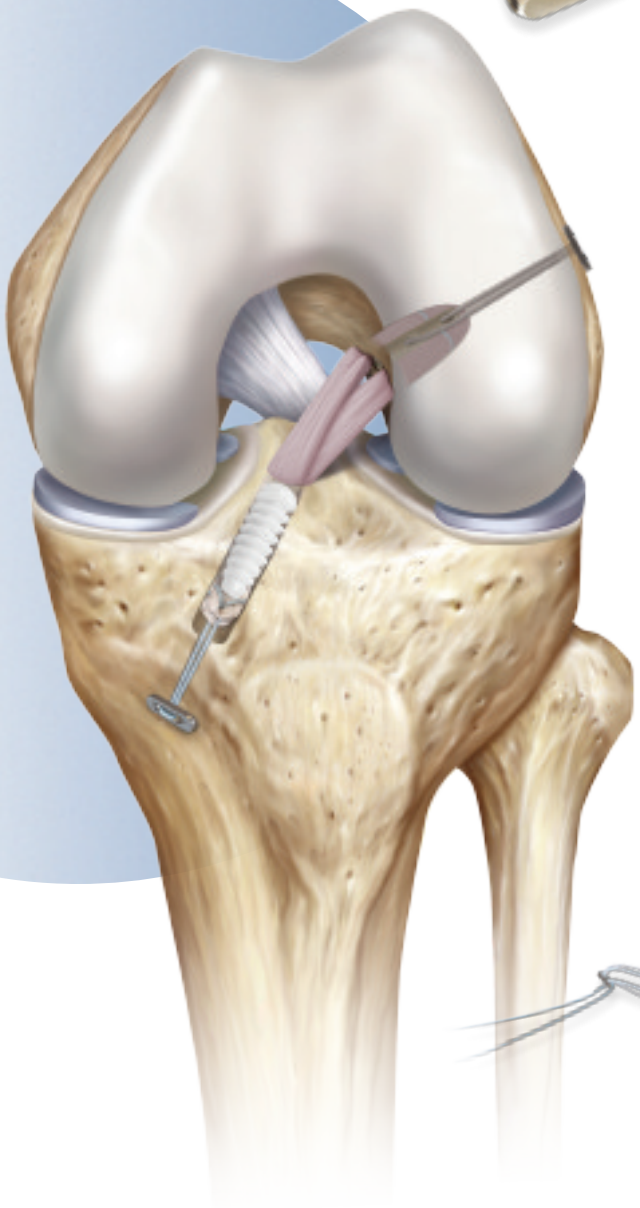




Place FiberTag tape onto a graft end to facilitate attachment of the ACL TightRope implant.

ACL Reconstruction With TightRope® DB Construct





Combined with the simplicity and strength of the ACL TightRope implant, the TightRope DB construct offers aperture graft compression and greater coverage of the ACL footprint. This construct comes with a disposable driver to facilitate graft advancement and orientation.

Titanium Button:

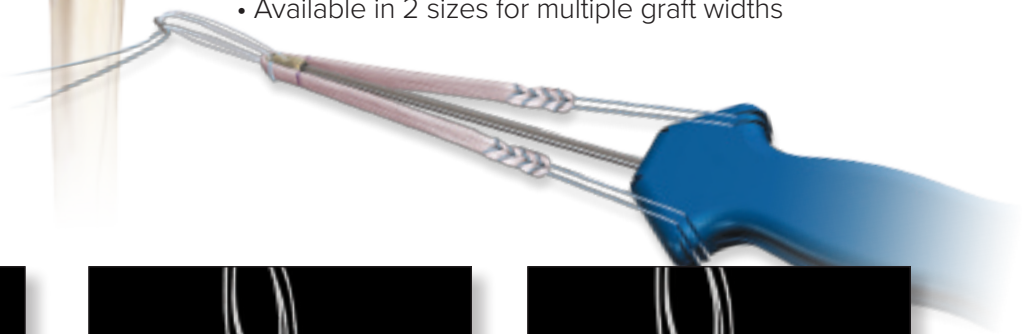
- Allows consistent cortical fixation
- Passes through small guide pin hole, preserving bone and decreasing surgical steps

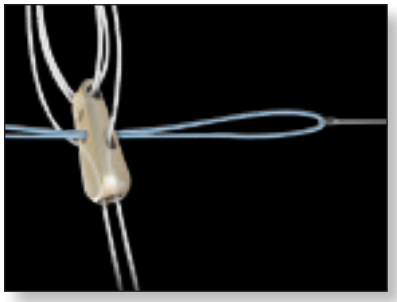
Adjustable ACL TightRope Technology:

- Eliminates need for multiple sizes
- Facilitates complete filling of femoral socket with the graft
- Locks securely and resists slippage due to 4-point knotless fixation

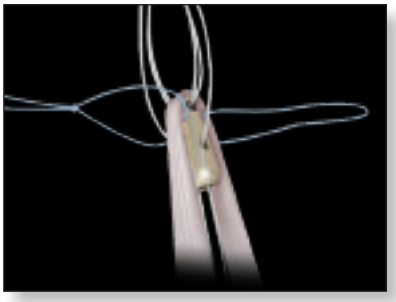
PEEK Spacer/Wedge:

- Provides aperture compression of the graft
- Positioned concentrically as to not interfere with graft tunnel contact
- Available in 2 sizes for multiple graft widths

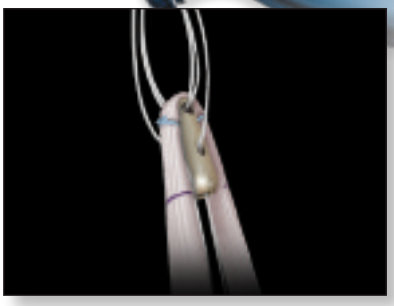




Pass a #2 FiberLoop® suture through one or both of the open holes in the wedge.

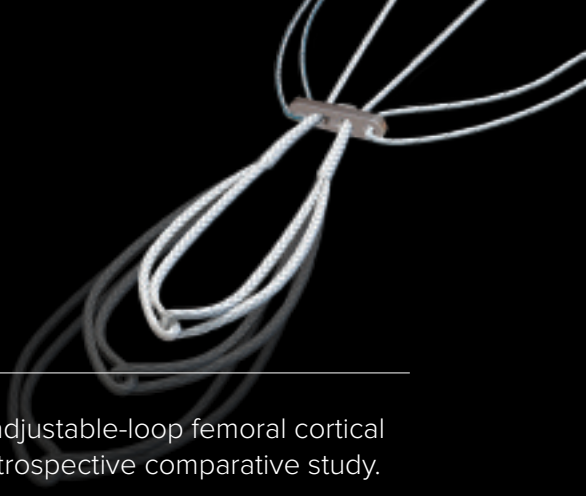


Place the midpoint of the graft over the wedge.



Cut the FiberLoop suture near the needle and discard the needle.

ACL TightRope® Implant Scientific Articles



In Vivo Citations – Clinical Outcomes

Boyle MJ, Vovos TJ, Walker CG, Stabile KJ, Roth JM, Garrett WE. Does adjustable-loop femoral cortical suspension loosen after anterior cruciate ligament reconstruction? A retrospective comparative study. *Knee.* 2015;22(4):304-308. doi:10.1016/j.knee.2015.04.016.

Nawabi DH, McCarthy M, Graziano J, et al. Return to play and clinical outcomes after all-inside, anterior cruciate ligament reconstruction in skeletally immature athletes. *Orthop J Sports Med.* 2014;2(7)(suppl 2): 2325967114S00038. doi:10.1177/2325967114S00038.

Benea H, d'Astorg H, Klouche S, Bauer T, Tomoaia G, Hardy P. Pain evaluation after all-inside anterior cruciate ligament reconstruction and short term functional results of a prospective randomized study. *Knee.* 2014;21(1):102-106. doi:10.1016/j.knee.2013.09.006.

Blackman AJ, Stuart MJ. All-inside anterior cruciate ligament reconstruction. *J Knee Surg.* 2014;27(5):347-352. doi:10.1055/s-0034-1381960.

In Vitro Citations – Biomechanical Validation

Smith PA, Piepenbrink M, Smith SK, Bachmaier S, Bedi A, Wijdicks CA. Adjustable- versus fixed-loop devices for femoral fixation in ACL reconstruction: an in vitro full-construct biomechanical study of surgical technique-based tibial fixation and graft preparation. *Orthop J Sports Med.* 2018;6(4):2325967118768743. doi:10.1177/2325967118768743.

Nye DD, Mitchell WR, Liu W, Ostrander RV. Biomechanical comparison of fixed-loop and adjustable-loop cortical suspensory devices for metaphyseal femoral-sided, soft tissue graft fixation in anatomic anterior cruciate ligament reconstruction using a porcine model. *Arthroscopy.* 2017;33(6):1225-1232.e1. doi:10.1016/j.arthro.2016.12.014.

Chang MJ, Bae TS, Moon YW, Ahn JH, Wang JH. A comparative biomechanical study of femoral cortical suspension devices for soft-tissue anterior cruciate ligament reconstruction: adjustable-length loop versus fixed-length loop. 2018;34(2):566-572. *Arthroscopy.* doi:10.1016/j.arthro.2017.08.294.

References

1. Johnson JS, Smith SD, LaPrade CM, et al. A biomechanical comparison of femoral cortical suspension devices for soft tissue anterior cruciate ligament reconstruction under high loads. *Am J Sports Med.* 2015;43(1):154-160. doi:10.1177/0363546514553779.
2. Smith PA, DeBerardino TM. Tibial fixation properties of a continuous-loop ACL hamstring graft construct with suspensory fixation in porcine bone. *J Knee Surg.* 2015;28(6):506-512. doi:10.1055/s-0034-1394167.
3. Arthrex, Inc. LA1-00021-EN. Naples, FL; 2018.
4. Blackman AJ, Stuart MJ. All-inside anterior cruciate ligament reconstruction. *J Knee Surg.* 2014;27(5):347-352. doi:10.1055/s-0034-1381960.
5. Benea H, d'Astorg H, Klouche S, Bauer T, Tomoaia G, Hardy P. Pain evaluation after all-inside anterior cruciate ligament reconstruction and short term functional results of a prospective randomized study. *Knee.* 2014;21(1):102-106. doi:10.1016/j.knee.2013.09.006.
6. Nawabi DH, McCarthy M, Graziano J, et al. Return to play and clinical outcomes after all-inside, anterior cruciate ligament reconstruction in skeletally immature athletes. *Orthop J Sports Med.* 2014;2(7)(suppl 2):2325967114S00038. doi:10.1177/2325967114S00038.
7. Boyle MJ, Vovos TJ, Walker CG, Stabile KJ, Roth JM, Garrett WE. Does adjustable-loop femoral cortical suspension loosen after anterior cruciate ligament reconstruction? A retrospective comparative study. *Knee.* 2015;22(4):304-308. doi:10.1016/j.knee.2015.04.016.
8. Arthrex, Inc. LA1-00039-EN. Naples, FL; 2018.

Ordering Information

TightRope® Implants	
ACL TightRope Implant	AR-1588T
ACL TightRope RT Implant	AR-1588RT
TightRope RT Implant System, w/ 8 mm FlipCutter® II Reamer	AR-1588RT-07
TightRope RT Implant System, w/ 9 mm FlipCutter II Reamer	AR-1588RT-18
TightRope RT Implant System, w/ 10 mm FlipCutter II Reamer	AR-1588RT-11
TightRope RT Implant System, w/ 11 mm FlipCutter II Reamer	AR-1588RT-13
ACL TightRope RT Implant Delivery System, w/ ACL TightRope Drill Pin	AR-1588RTS
Double-Loaded TightRope RT w/ Short FlipCutter Kits, 7 mm – 11 mm	AR-1288-70 – AR-1288-110
TightRope Button Extender	AR-1589RT
PCL TightRope Fixation System	AR-1588TP

TightRope ABS Implants	
TightRope ABS Implant	AR-1588TN
Open TightRope ABS Implant	AR-1588TN-1
TightRope ABS Button, 8 mm × 12 mm	AR-1588TB

TightRope ABS Tibial Fixation Kits	
TightRope ABS Implant, w/ 11 mm Concave ABS Button	AR-1588TN-2
TightRope ABS Implant, w/ 14 mm Concave ABS Button	AR-1588TN-3
TightRope ABS Implant, w/ 20 mm Concave ABS Button	AR-1588TN-4

Optional Buttons	
TightRope ABS Button, round, 14 mm	AR-1588TB-1
TightRope ABS Button, oblong, 3.4 mm × 13 mm	AR-1588TB-2
Concave ABS Button, 11 mm round w/ 4 mm collar	AR-1588TB-3
Concave ABS Button, 14 mm round w/ 7 mm collar	AR-1588TB-4
Concave ABS Button, 20 mm round w/ 9 mm collar	AR-1588TB-5

TightRope DB and BTB Implants	
ACL TightRope DB Implant, 7 mm	AR-1588TDB-7
ACL TightRope DB Implant Delivery System	AR-1588TDB-7S
TightRope BTB Fixation System	AR-1588BTB
ACL TightRope BTB Fixation System w/ 10 mm FlipCutter II Reamer	AR-1588BTB-02

Accessories for All TightRope Implants Except ABS	
ACL TightRope Drill Pin, open eyelet, 4 mm	AR-1595T
ACL TightRope Drill Pin, closed eyelet, 4 mm	AR-1595TC
TightRope Suture Cutter	AR-4520

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This description of technique is provided as an educational tool and clinical aid to assist properly licensed medical professionals in the usage of specific Arthrex products. As part of this professional usage, the medical professional must use their professional judgment in making any final determinations in product usage and technique. In doing so, the medical professional should rely on their own training and experience and should conduct a thorough review of pertinent medical literature and the product's directions for use. Postoperative management is patient-specific and dependent on the treating professional's assessment. Individual results will vary and not all patients will experience the same postoperative activity level or outcomes.

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