

TightRope[®] CCL Fixation System

Surgical Technique



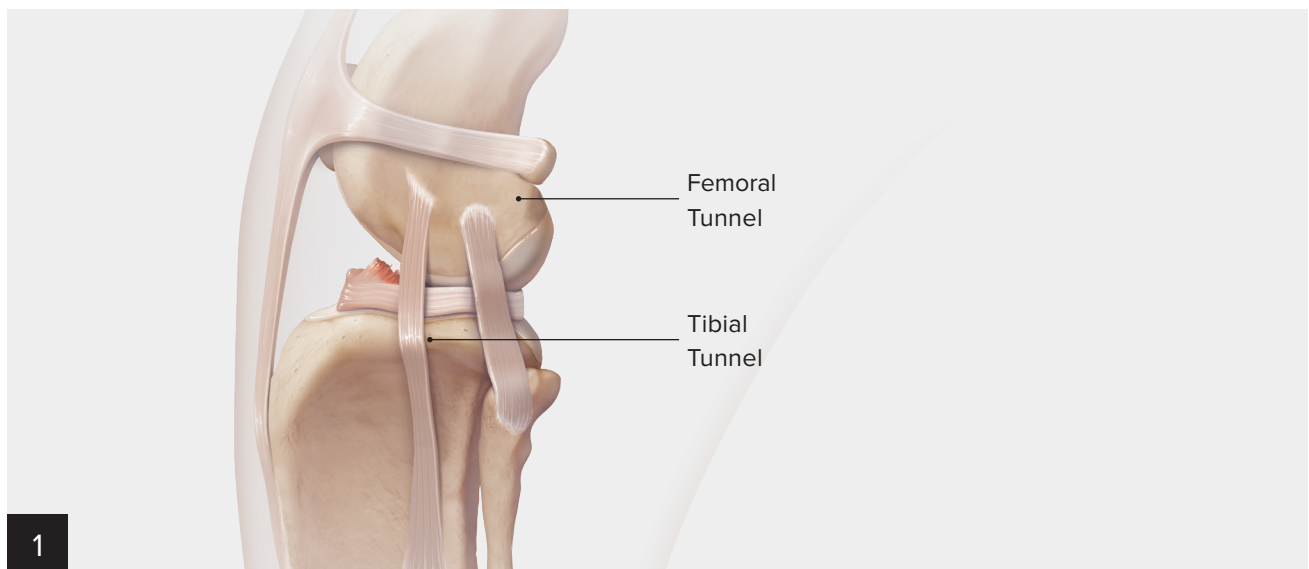
Arthrex[®] 
Vet Systems

TightRope® CCL Fixation System Technique Guide

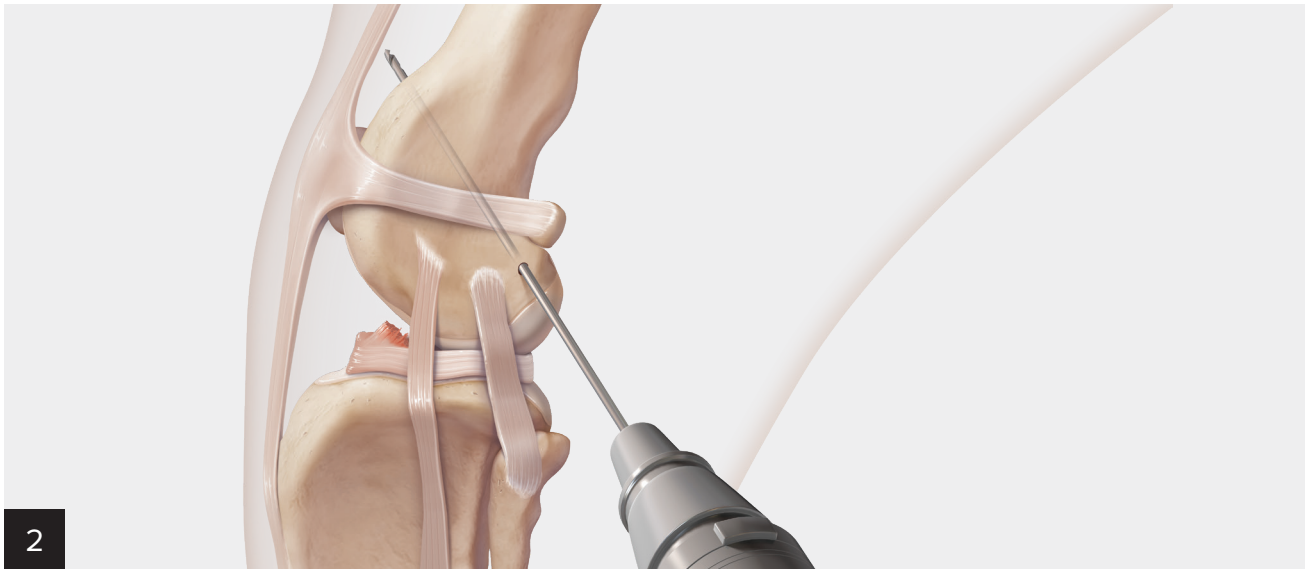
The TightRope CCL technique was developed to provide a less invasive method for the cranial cruciate ligament-deficient canine stifle. TightRope CCL seeks to optimize the lateral suture stabilization technique by employing bone-to-bone fixation, an implant with superior strength and stiffness designed specifically for ligament repair, and a method for consistent isometric implant placement. As such, TightRope CCL can counteract cranial tibial thrust, drawer, and internal rotation, while providing optimal joint range of motion.

To begin, position the patient in dorsal recumbency and prepared the affected stifle for surgery. Strict adherence to aseptic technique for patient preparation and surgery is critical to success. Preparation and draping such that the limb is exposed from proximal thigh to below the hock is recommended to allow for adequate stifle palpation and manipulation during surgery.

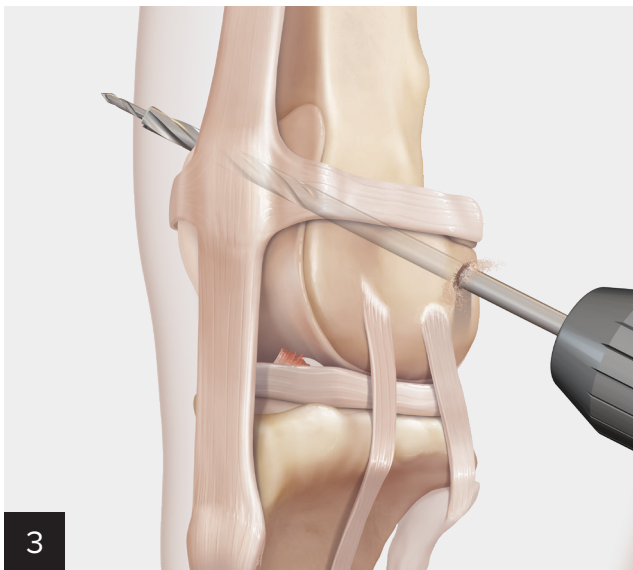
A lateral or medial parapatellar approach with arthrotomy, or stifle arthroscopy, is performed to allow for complete exploration of the stifle joint and visualization and palpation of the menisci. Pathology of ligament and meniscus should be treated appropriately. The joint is thoroughly lavaged and the joint capsule closed. The caudolateral aspect of the stifle is exposed by caudal dissection and retraction of the lateral fascial incision when an arthrotomy has been performed or by mini-incision through the skin and fascia from the lateral fabella to the tibial tuberosity after arthroscopy has been performed. The TightRope implant is placed outside the joint capsule but deep to the fascia.



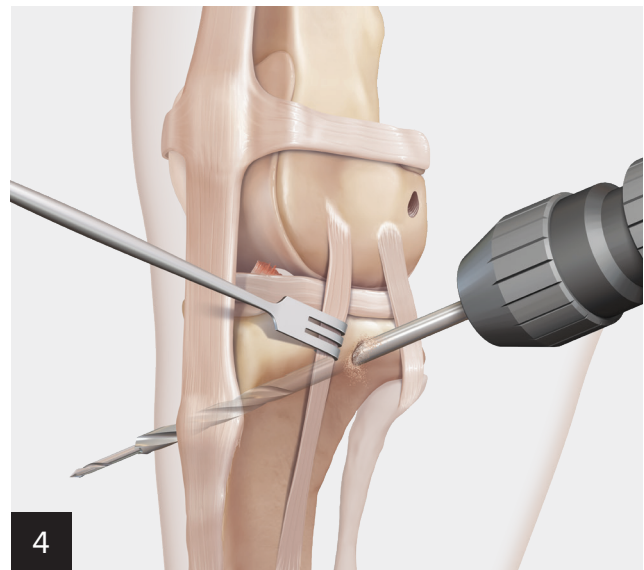
The start site for the femoral tunnel is just distal to the lateral fabella-femoral condyle junction (ie, 2 mm from the caudal edge of the lateral femoral condyle). The tibial start site is located caudally within the groove of the long digital extensor tendon.



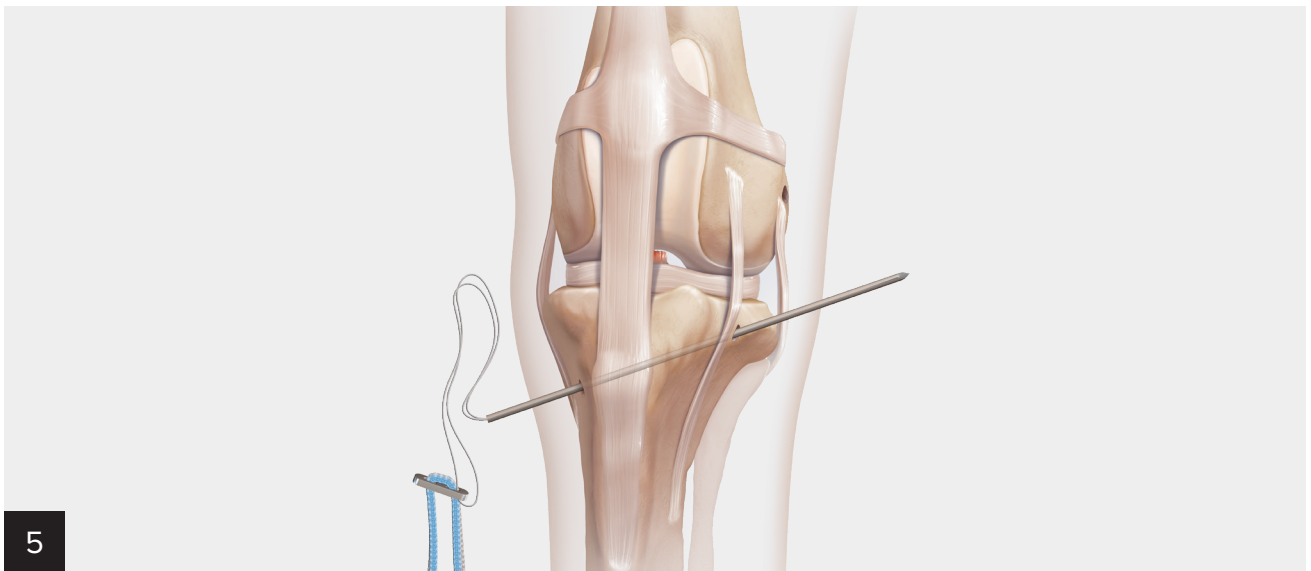
Insert the .049 in/1.2 mm guidewire 2 mm distal to the lateral fabella and within the caudal portion of the lateral femoral condyle. With the stifle held in extension, advance the guidewire at a 45° to 60° angle proximally. The guidewire should traverse the distal femur and exit at the cranial-caudal midpoint of the distal diaphysis of the femur on the medial side immediately caudal to the vastus medialis muscle and at the level of the proximal patella.



Insert the cannulated drill bit onto the guidewire and advance it through the femur until it exits through the medial side of the femur. Carefully ream the femoral tunnel back and forth with the drill bit.

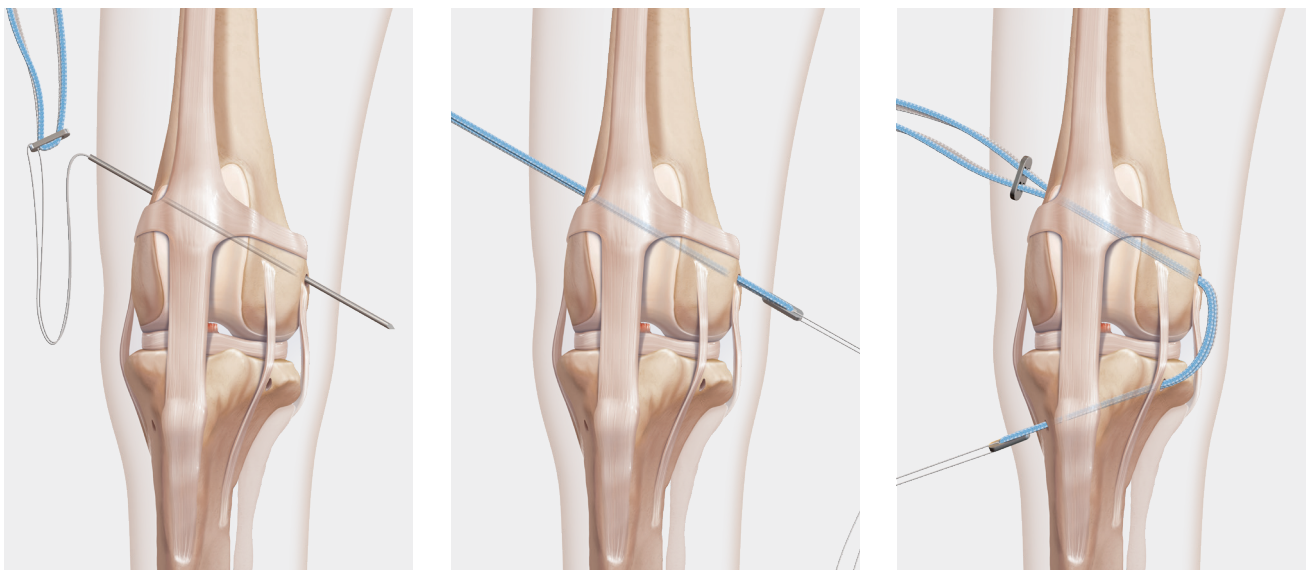


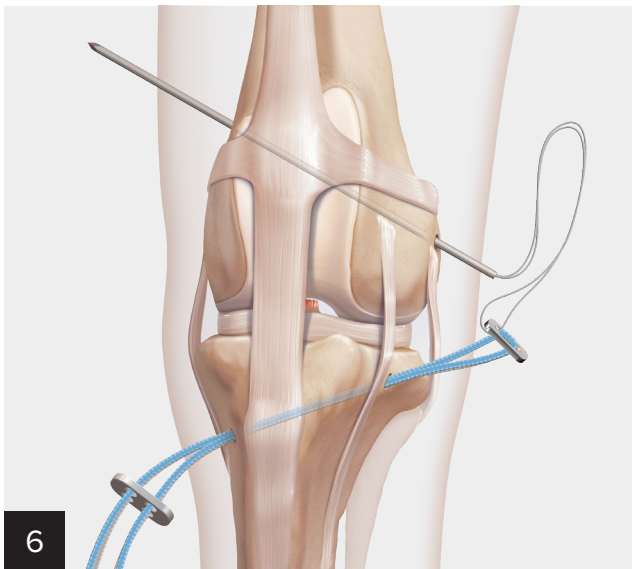
Place the guidewire within the tibial extensor groove proximally and resting against its caudal ridge. Advance the guidewire through the tibia at a 45° to 60° angle to exit medially within the footprint of the caudal sartorius insertion. Drill over the guidewire with the cannulated drill bit (protect the soft tissues).



Insert the TightRope® needle through the tibial tunnel in a medial to lateral direction. As tension is applied to the needle and FiberTape® suture, the toggle button will lay down to allow it to advance through the tunnel.

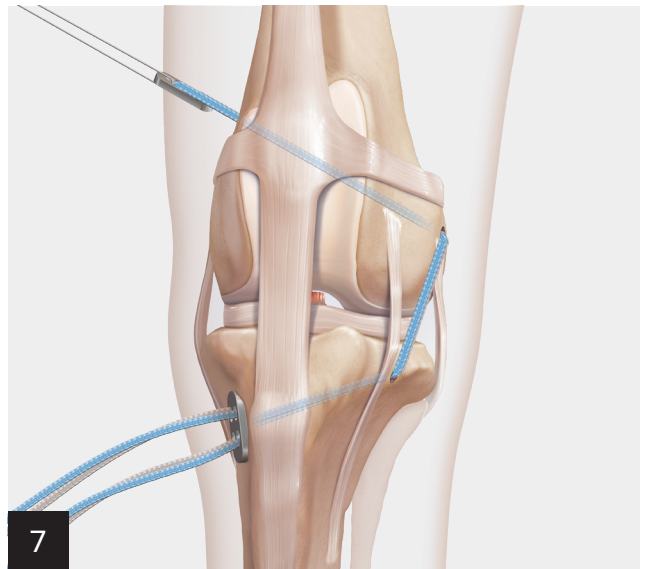
Femoral Button Method





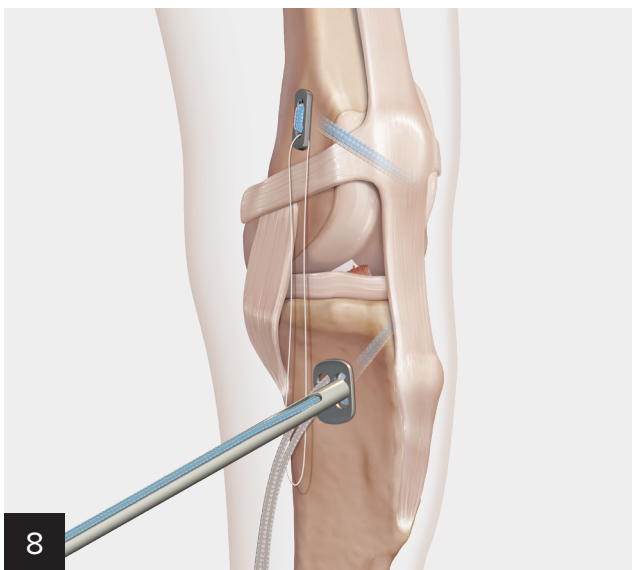
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Advance the TightRope® needle through the femoral tunnel in a lateral to medial direction.



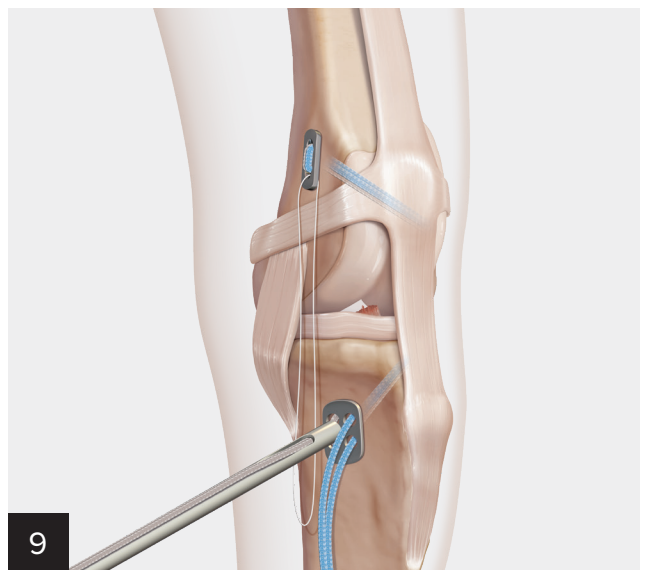
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Once the toggle button has exited the femoral tunnel, flip the button by pulling the white suture in a slight upward direction and by pulling back on the FiberTape® suture strands laterally. Ensure that the toggle is flipped and seated fully on medial femoral bone by direct visualization or palpation.



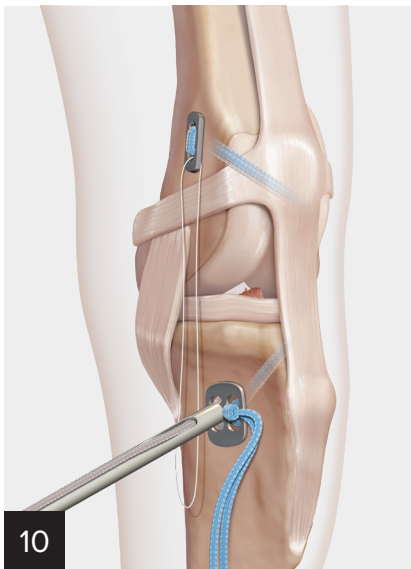
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Advance the 4-hole button over the FiberTape suture strands and seat it firmly and completely against the medial tibial bone. Advance the 2 blue strands of FiberTape suture into the tensioner and tension to 10 to 12 lb. Check drawer, internal rotation, and range of motion (ROM) of the stifle. Cycle the joint through a full ROM 20 to 30 times.

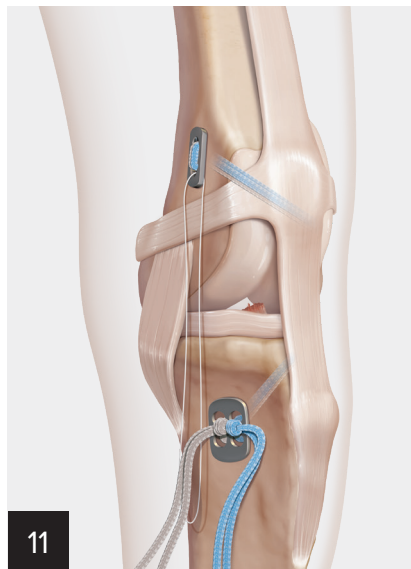


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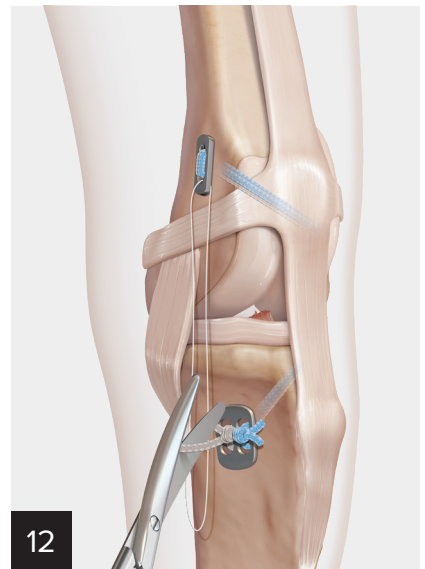
Remove the blue strands from the tensioner; advance the 2 white strands of FiberTape suture into the tensioner and tension to 10 to 12 lb. Confirm ROM, internal rotation, and drawer are optimized.



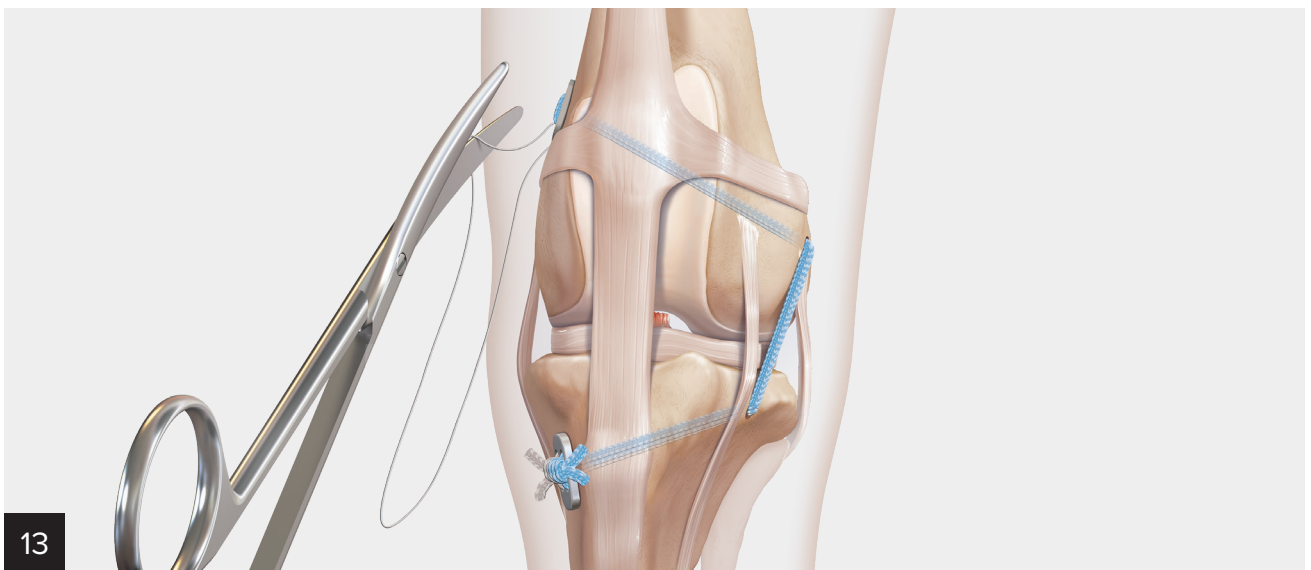
Put the stifle at a weightbearing angle (ie, approximately 140°) and tie a knot (single throw) with the blue strands of FiberTape® suture. Reinforce the knot with 4 to 5 throws.



Remove the tensioner from the white strands of suture and recheck the ROM, rotation, and drawer. If satisfied, tie the white strands of FiberTape suture.



Cut the suture limbs, leaving about 6 mm of suture..



After final assessment of the TightRope implant placement and function, cut one limb of the white suture attached to the lead needle. Pull the needle away from the skin and the suture will come with it. Carefully and securely imbricate the lateral fascia over the TightRope implant using 2-0 or 0 PDS or Maxon sutures.

TightRope® CCL Fixation System Pearls

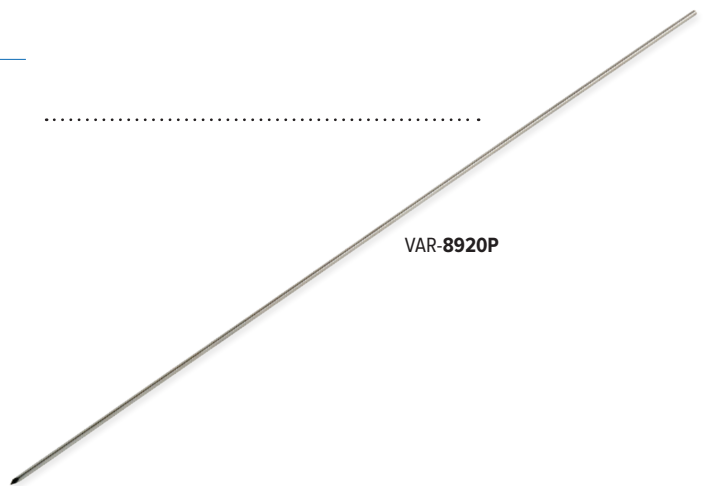
- When first learning the procedure, do not skimp on dissection. Visually identify all critical landmarks for optimal guidewire placement and verify the toggle and button are firmly seated on bone by direct visualization.
- When placing the guidewires, you may need to start them at an angle perpendicular to the bone and then adjust to the final drilling angle to prevent them from slipping from the intended start site. Starting with the drill in reverse or using a 14 gauge needle as a sleeve may also aid in maintaining your guidewire start sites.
- Ream your tunnels back and forth carefully to ensure no soft tissue or bone fragments remain in the tunnel.
- After drilling each tunnel, it is helpful to have another guidewire or small gage needle ready to place into the tunnel. The guidewire typically comes out with the cannulated drill bit, so having something to place into the tunnel to ensure you can locate it when placing the TightRope implant is essential. Placing a hemostat on the end of the guidewire may help the guidewire to stay in place.
- Do not remove the TightRope implant from the package until both tunnels are drilled in the appropriate locations and everything is prepared for its placement. Then, put on a new pair of sterile surgical gloves to handle and place the TightRope implant.
- Hold on to the white 2-0 suture rather than the TightRope needle when pulling the TightRope system through the tunnels to keep the suture from pulling free from the needle.
- If tension cannot be maintained and/or if drawer is not counteracted appropriately while maintaining good ROM, then the TightRope implant should be assessed. When this occurs, it is likely that the tunnels are not in the proper locations and/or the toggle or button was not seated directly onto the bone well. The surgeon must then decide if correction is feasible or another treatment needs to be employed.
- Take postoperative 2 view radiographs to ensure proper button placement and tunnel location. This will assist in troubleshooting any problems.
- An aiming guide may be used to aide in proper placement of the 1.24 mm guidewire.

Recommended Postoperative Management

- Cefazolin 22 mg/kg IV 30 minutes prior to incision, 90 minutes later, then every 6 hours until oral antibiotic therapy is initiated.
- Oral antibiotics (eg, cephalexin 22-30 mg/kg every 8-12 hours) for at least 10 days post-op.
- Bandaging at your discretion (soft-padded bandage for at least 24 hours is typical).
- Restrict to kennel rest when unobserved and to controlled muscle-building activities (ie, leash walking) for 8 weeks post-op.
- Professional rehabilitation is encouraged.

Guidewire

The 1.24 mm (.049 in.in) guidewire is helpful for obtaining the proper orientation before drilling through the canine bone.



Cannulated Drill Bit

The reusable 3.5 mm cannulated drill bit provides an aggressive head to drill through tough bone.



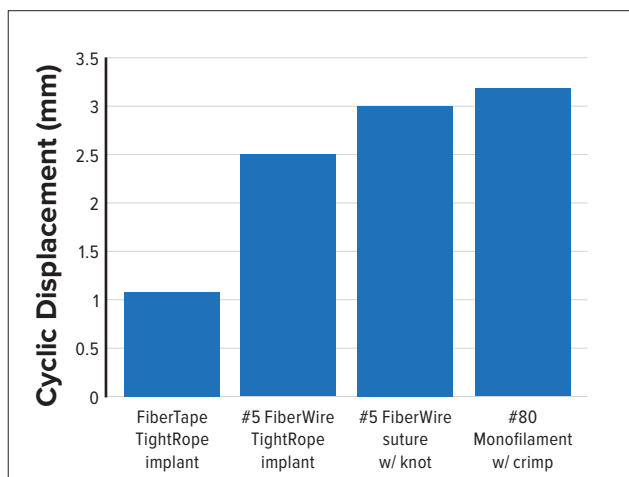
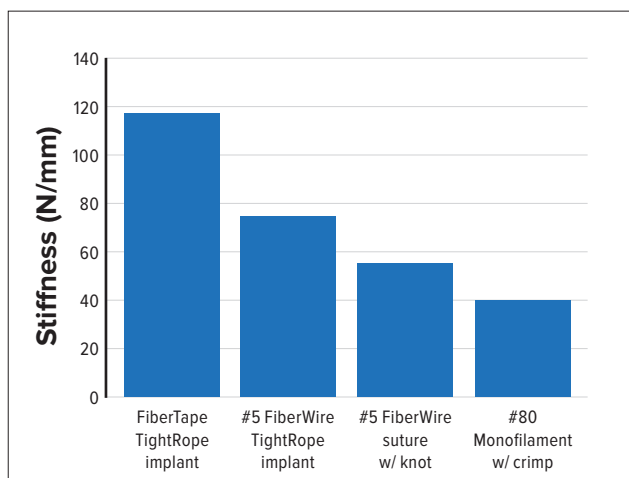
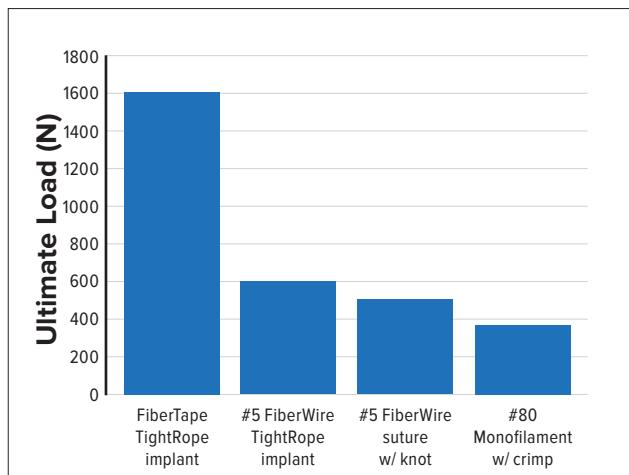
Suture Tensioner With Tensiometer

The redesigned suture tensioner can be used to quickly set and control the desired tension on FiberWire® suture and FiberTape® suture. The open design allows for better visualization of the suture during suture capture and the easy-to-read tension markings allow the surgeon to accurately dial-in the appropriate tension setting.



Mechanical Testing

Using metal fixtures to mimic the tunnel placement for a Canine TightRope® CCL repair, 4 different suture-based reconstructions were subjected to mechanical testing. The 4 suture constructs included a double FiberTape® TightRope implant (TightRope CCL fixation system, VAR-2800), a similar construct using #5 FiberWire® suture, knotted #5 FiberWire suture, and a #80 monofilament with a crimp. Samples were loaded for 100 cycles between 10N and 100N at 1 Hz, followed by a single-cycle pull to failure at 20 mm/min. The ultimate load, stiffness, and cyclic displacement values for all 4 constructs are shown in the data tables. One-way ANOVAs were used to compare the mean values for the 4 constructs. The TightRope CCL fixation system was significantly superior to the other 3 constructs, with a higher mean ultimate load and higher mean stiffness ($P < .001$, for both, and a lower mean cyclic displacement ($P < .001$).



Ordering Information

Instruments

Product Description	Item Number
TightRope® CCL anchor fixation system	VAR-2800
Mini TightRope CCL fixation system	VAR-2801
FiberWire® scissor	VAR-11796
Suture tensioner with tensiometer	VAR-1529
Cannulated drill bit, 2.7 mm	VAR-8911DC
Cannulated drill bit, 3.5 mm	VAR-8920DC
Guidewire, TightRope implant	VAR-8920P
Aiming guide	VAR-2810

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