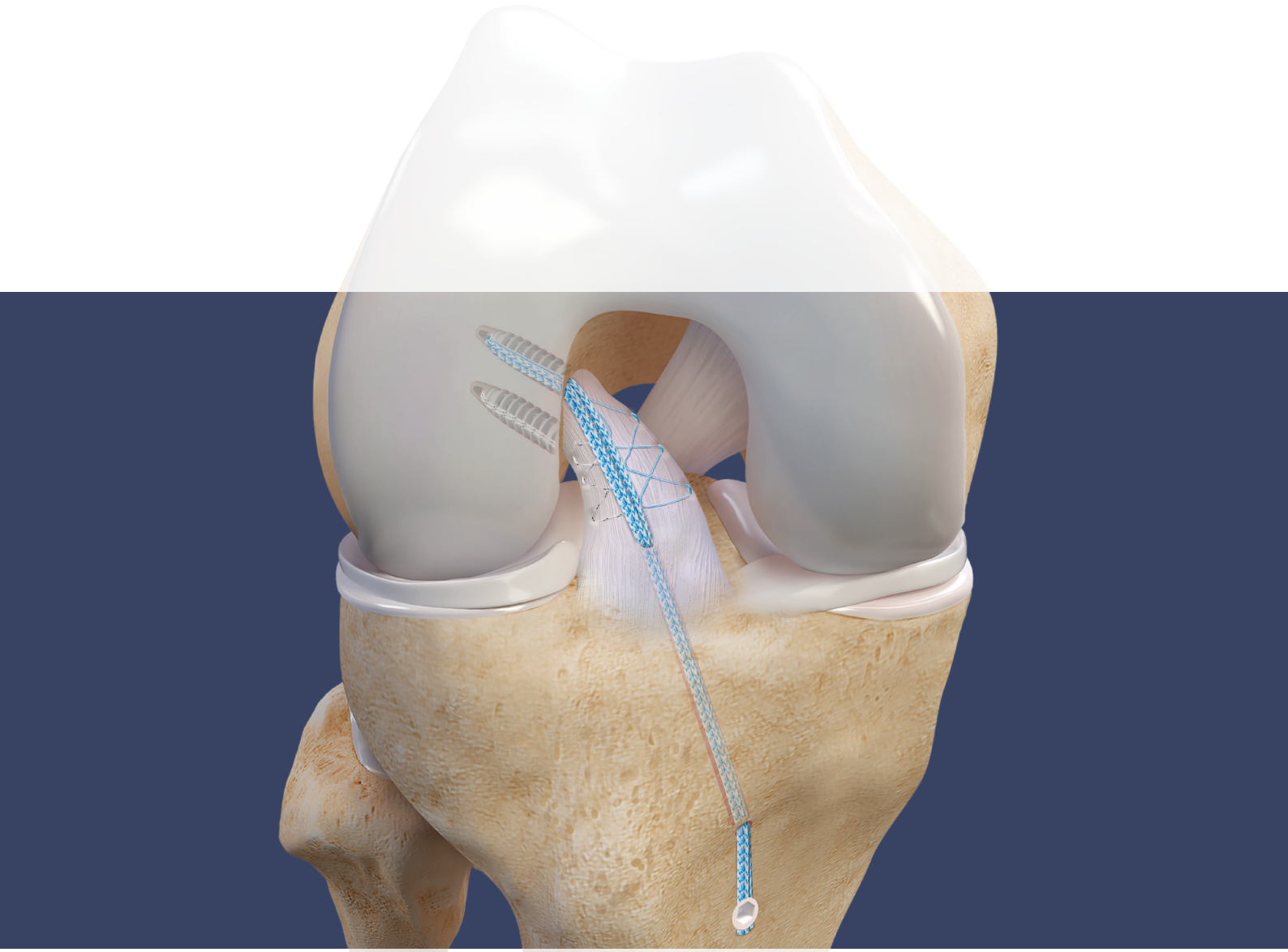
SwiveLock® ACL Primary Repair Implant System

Surgical Technique



Arthrex®

ACL Primary Repair Described by Gregory S. DiFelice, MD

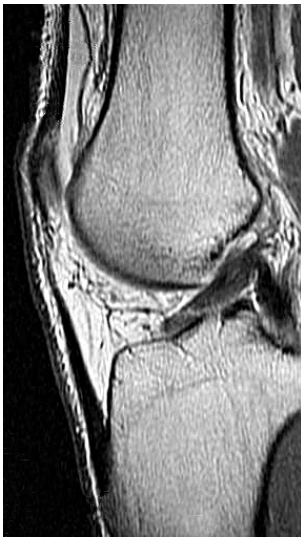
Over the past decade, there has been a renewed interest in primary repair as a potential treatment for certain patterns of ACL rupture. Primary ACL repair, performed through an arthrotomy, was largely abandoned by the mid-1990s due to unpredictable and inconsistent clinical outcomes. However, careful analysis of the older data reveals that certain subgroups, especially patients with proximal tears and good to excellent tissue quality, had better clinical outcomes than the group as a whole.[1] In addition, studies reporting outcomes of remnant-preserving ACL surgeries have shown encouraging results with a higher potential for early healing and better functional outcomes as compared to remnant-resecting surgery. Preservation of the native ACL using the described arthroscopic primary repair technique can achieve short-term clinical success in a carefully selected subset of patients with proximal avulsion-type tears and good to excellent tissue quality. Primary repair, as described, has resulted in good to excellent clinical outcomes at average 3-year follow-up.[2] Smaller cohorts of patients have also shown durability of results past an average of 60 months, while early comparative cohorts between repair and reconstruction have not revealed significant differences in outcomes.[3]

Arthroscopic primary repair is a conservative approach to ACL surgery in that no grafts need to be harvested, no tunnels need to be drilled, and revision surgery, if necessary, is more analogous to a primary reconstruction.[4] The goal of the procedure is to preserve the remnant native ligament when conditions allow, which will not be for all patients. By doing this, the native nerve endings and blood supply are preserved. In light of the significant reduction in morbidity to the patient, in combination with preservation of native anatomy, meaningful recovery time is greatly reduced.[5]

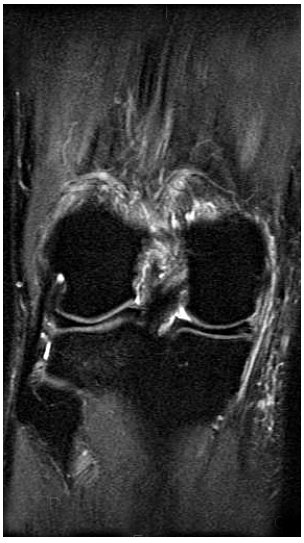
In a retrospective study, patients were contacted to complete the forgotten joint score questionnaire between 2 and 5 years following surgery. Based on the data in this study, patients undergoing arthroscopic primary ACL repair can expect to have significantly less daily awareness of their operated knee at short- to mid-term follow-up as compared with patients undergoing ACL reconstruction.[6]

Patient Selection

When selecting a patient who may benefit from primary ACL repair, it is critical to appropriately evaluate two variables: the acuteness of the injury and the tear pattern. A higher percentage of successful outcomes with primary ACL repair has historically been seen in patients with acute injuries that were addressed within the first 4 weeks post injury and in those with proximal tear patterns **(Figures 1 and 2).**[7,8] Other variables, such as age, activity level, tissue quality, and injury mechanism, also need to be considered in the surgical decision-making process when choosing between primary ACL repair and the more conventional ACL reconstruction. Based on several early outcome studies in younger patients, it appears that ACL repair should be used cautiously in this cohort.



■ **Figure 1:** Sagittal T1 MRI showing proximal ACL tear

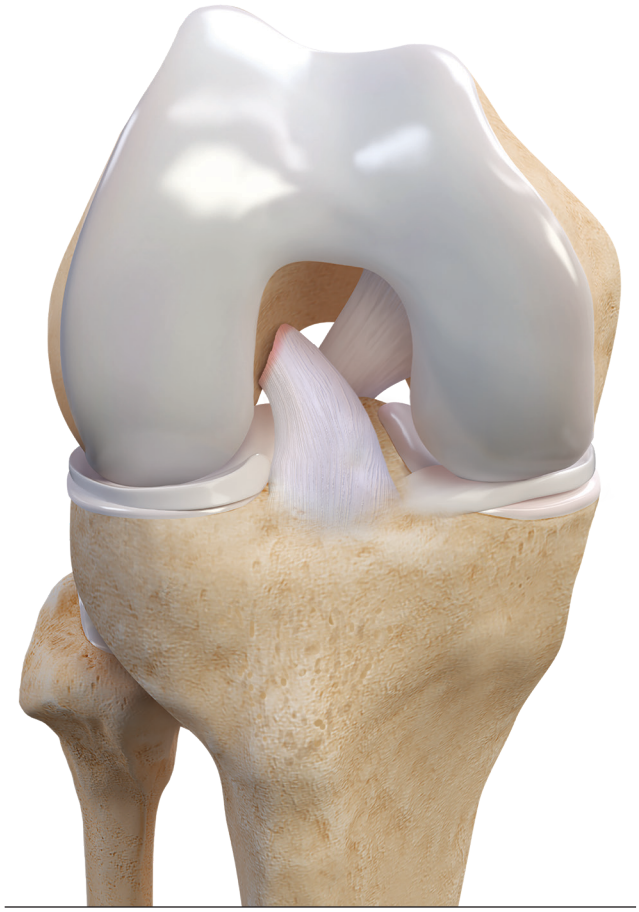


■ **Figure 2:** Coronal PD MRI showing proximal ACL tear. Note that fibers do not contact the femoral wall

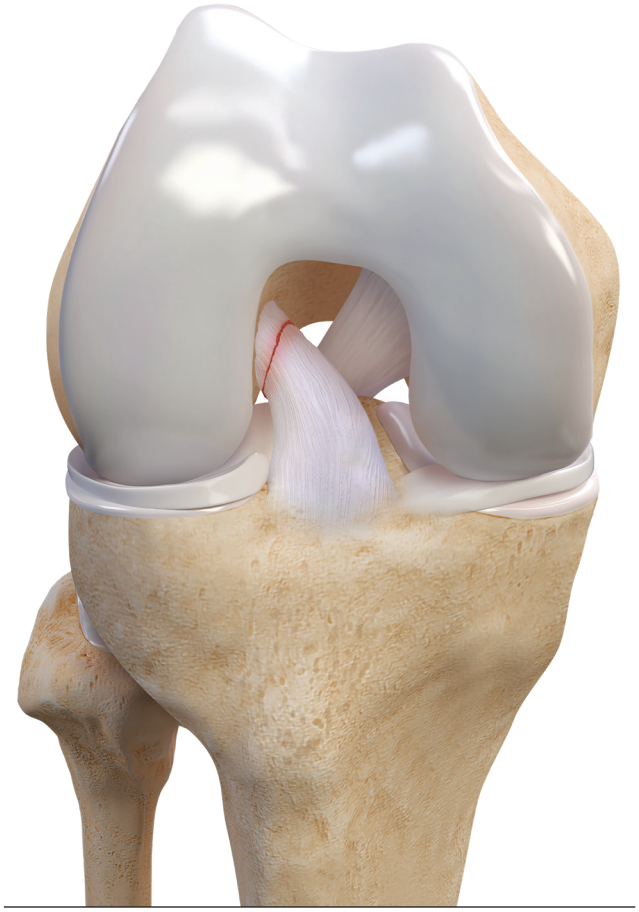
Technique Evaluation

With the implementation of modern-day technology, such as magnetic resonance imaging for patient selection, arthroscopy for minimally invasive surgery, advanced rehabilitation programs for stiffness prevention, and suture anchors for direct tensioning, it has been shown that outcomes of arthroscopic primary repair in patients with proximal tears are significantly better than the historic experience.[9]

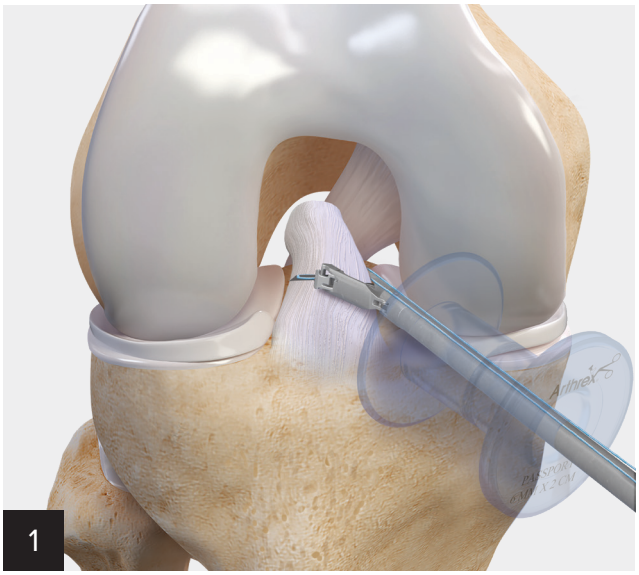
This arthroscopic ACL repair procedure should be performed only on modified Sherman Type I or Type II tears. Modified Sherman **Type I** ACL tears are true soft-tissue avulsions with up to 10% of the length of the ligament tissue left attached to the femur, whereas modified Sherman **Type II** ACL tears have up to 25% of the tissue left attached to the femur.[10]



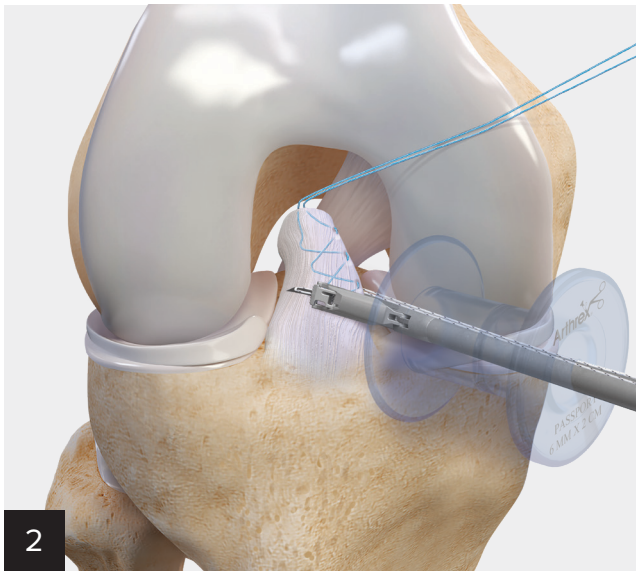
■ **Type I** tear



■ **Type II** tear

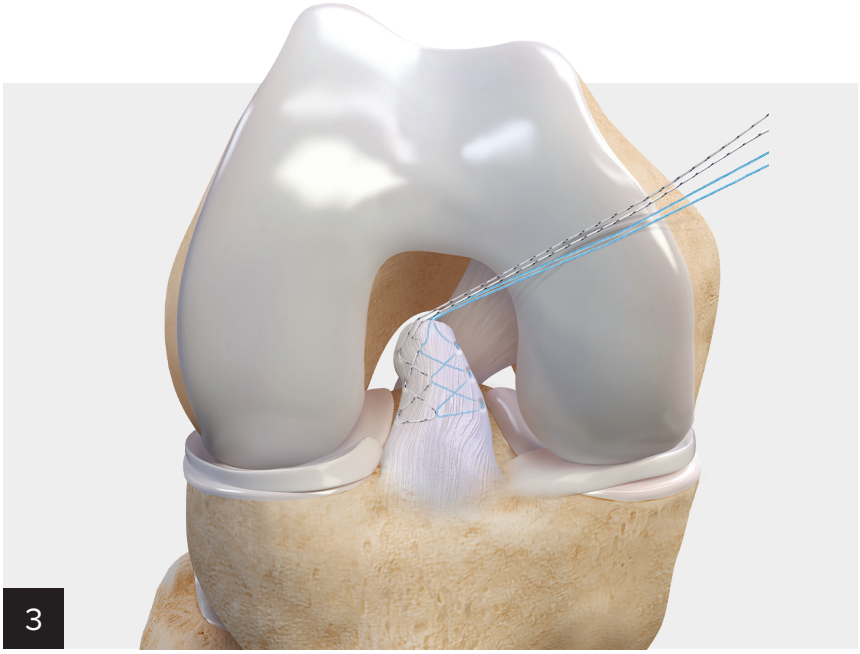


Use standard arthroscopic portals including anterolateral viewing portal and anteromedial (AM) working portal. The PassPort Button™ cannula is used for suture management in the working portal to optimize visibility and maneuverability inside and outside the joint while aiding in suture management. The 8 cm × 3 cm version is most frequently used. The ligamentum mucosum, if intact, is usually resected, and a portion of the fat pad is resected to optimize visualization.



Suture passage through the ACL tissue begins at the intact base of the ligament distally and progresses toward the proximal end. Pass a #2 FiberWire® suture through the AM bundle of the ACL using the FastPass Scorpion™ suture passer **(a)**.

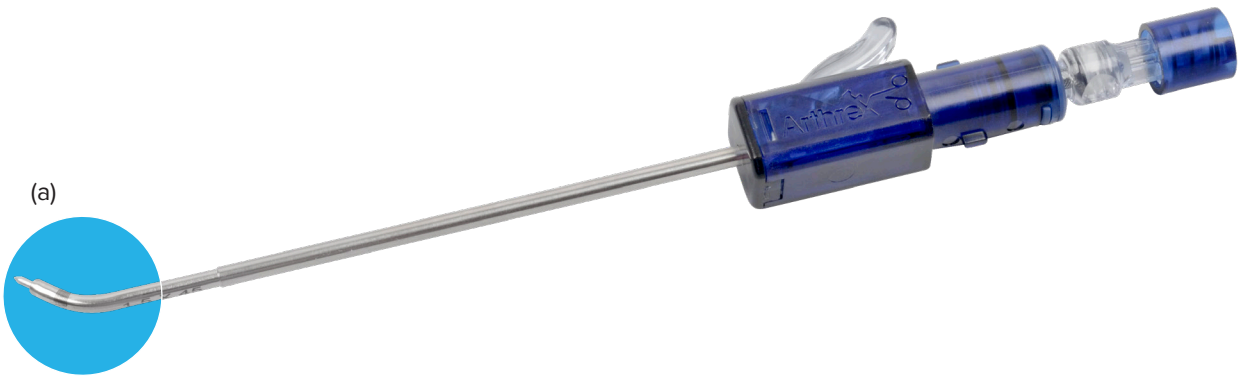
After the first pass, alternate passes with opposite ends, creating a Bunnell-type stitch pattern running up the AM bundle. In a normal length ACL, a total of 3 to 5 passes can be performed with each limb of the FiberWire suture. The final bite should exit the avulsed end of the ligament to ensure that the tissue sits flush to the femoral wall after repair.

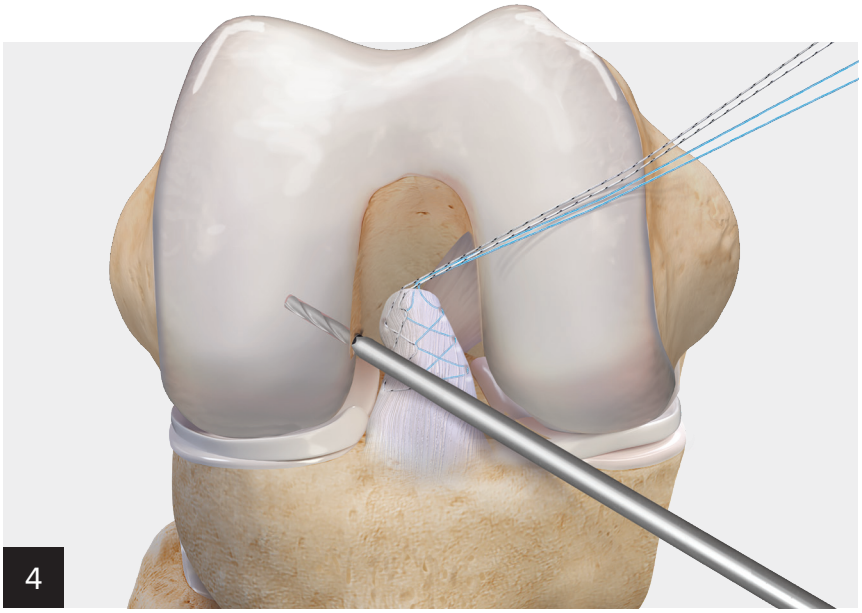


An inferomedial accessory portal is made. The FiberWire® suture is retrieved and parked outside the accessory incision.

The same technique is performed using a #2 TigerWire® suture in the posterolateral (PL) ACL bundle. Similar to the AM bundle, 3 to 5 passes are typical for the PL bundle. As more passes are performed, the risk of transecting already placed sutures increases. It is important to be aware of the tactile feedback provided by the FastPass Scorpion™ suture passer during suture passing. If abnormal resistance is encountered when delivering the Scorpion needle, the pass should be aborted and the FastPass Scorpion suture passer should be redirected and suture passage reattempted. The final bite should exit the avulsed end of the PL bundle toward the wall of the femur to ensure that the tissue sits flush to the femoral wall after repair. At this point, the TigerWire sutures are retrieved via the inferomedial accessory portal, and the FiberWire sutures are retrieved through the PassPort Button™ cannula in preparation for ACL fixation.

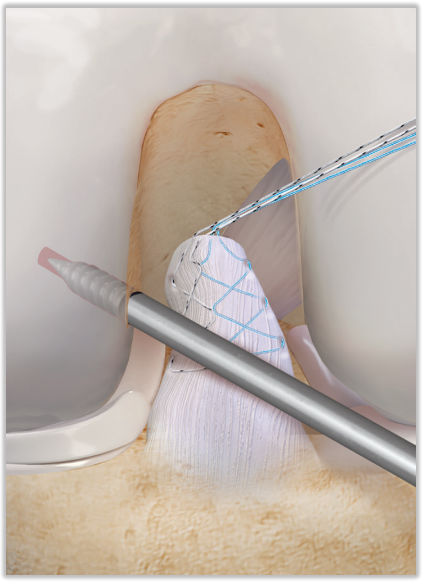
- With tension on both FiberWire and TigerWire sutures to retract the ACL, the native ACL bony origin can be roughened with a burr. Once roughened, or in sequence with roughening, a PowerPick™ instrument **(a)** can be used to fenestrate the ACL footprint to optimize the healing environment. Alternatively, a small opening anterior notchplasty can be performed.



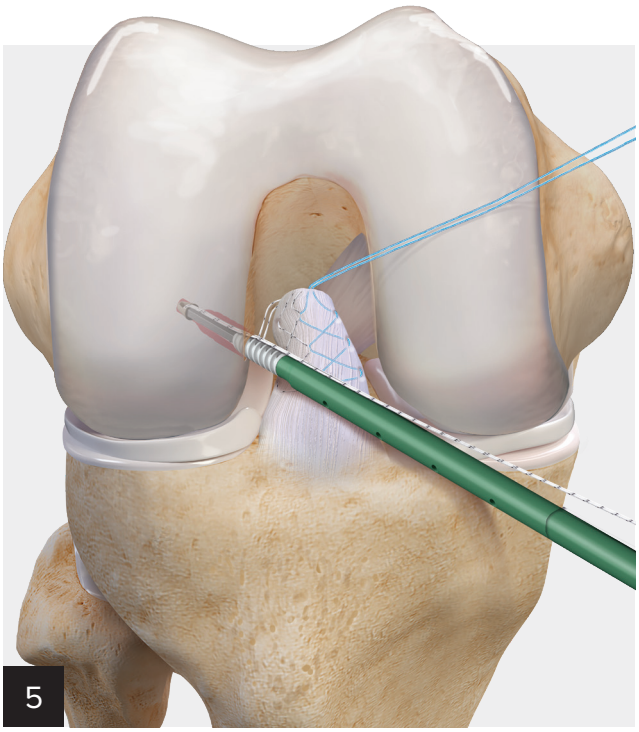


Placement of the suture anchors directly into the femoral footprint of the ACL will occur through the inferomedial accessory portal. With the knee in 115˚ of flexion, the 2.4 mm in-line drill guide is inserted towards the origin of the posterolateral bundle on the femur. Then the in-line drill is now drilled to the depth of the first laser etch mark or until the proximal laser line meets the drill guide.

Note: Some surgeons prefer to visualize the ACL femoral footprint via the medial portal to optimize visualization and placement of the drill holes and anchors.



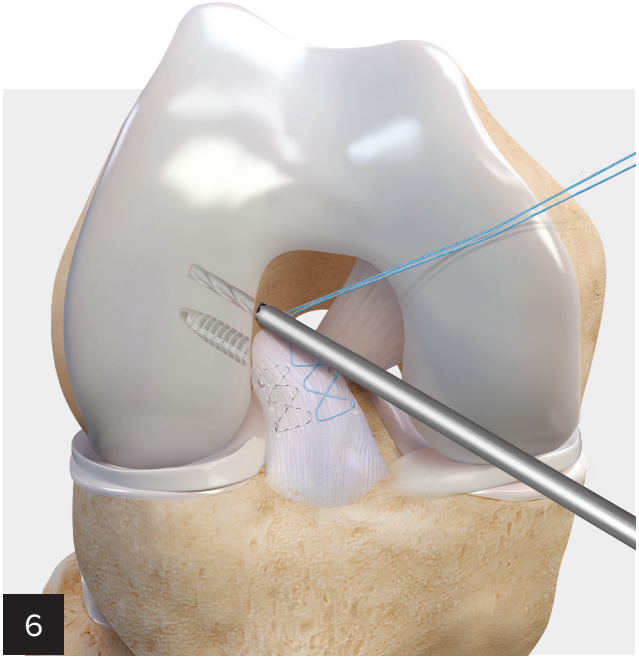
■ The drill hole is then tapped with a 4.75 mm SwiveLock® punch tap.



The TigerWire® sutures are retrieved through the inferomedial accessory portal and loaded into the eyelet of the 4.75 mm BioComposite SwiveLock anchor. With the knee still in 115˚ of flexion, the SwiveLock anchor is inserted into the drill hole in the PL bundle origin and the sutures are tensioned. The eyelet of the anchor is advanced into the bone socket until the anchor body contacts bone.

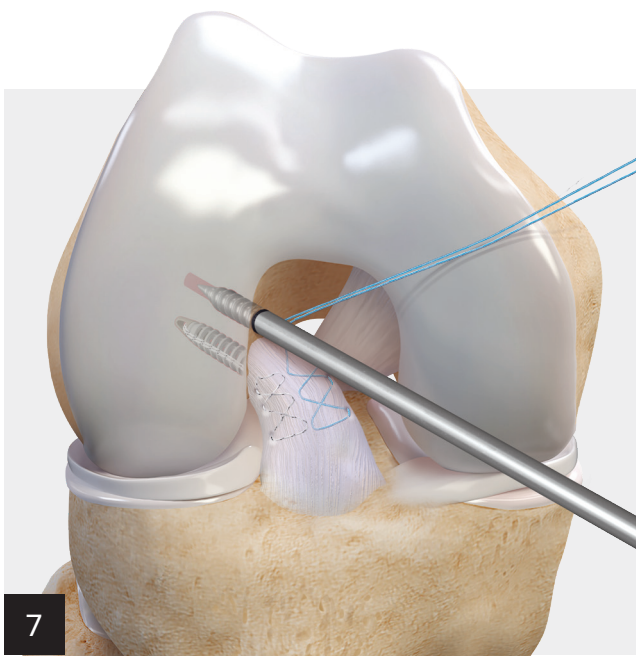
With the sutures tensioned appropriately, advance the screw by holding the thumb pad while the turning the inserter handle clockwise. The anchor is fully deployed when the screw is flush or slightly countersunk into the bone.

Remove the orange suture cleat tab on the handle of the SwiveLock anchor to release the retention suture and remove the driver. Pulling one limb of the retention suture will allow it to be fully removed from the implant. Alternatively, the retention suture can be retained and used to fortify the ACL fixation per surgeon discretion. Next, cut the free ends of the repair sutures with an open-ended suture cutter so that they are flush with the edge of the bone socket.

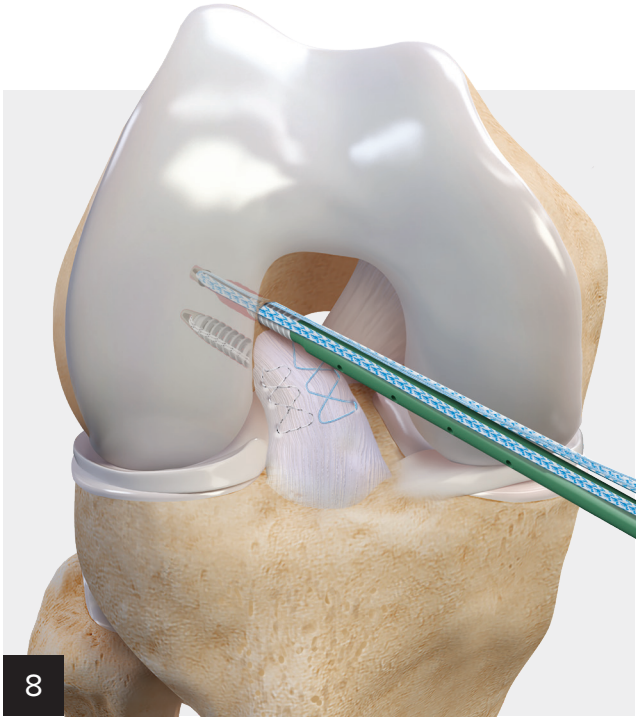


With the knee at 90˚ of flexion, insert the 2.4 mm in-line drill guide through the inferomedial accessory portal toward the origin of the AM bundle. Then drill the in-line drill to the depth of the first laser etch mark or until the proximal laser line meets the drill guide.

Retrieve the FiberWire® sutures through the inferomedial accessory portal and load the sutures into the eyelet of the 4.75 mm BioComposite SwiveLock® anchor with the extended length FiberTape® suture loop for the *Internal*Brace™ technique.



Then tap the drill hole with a 4.75 mm SwiveLock punch tap.

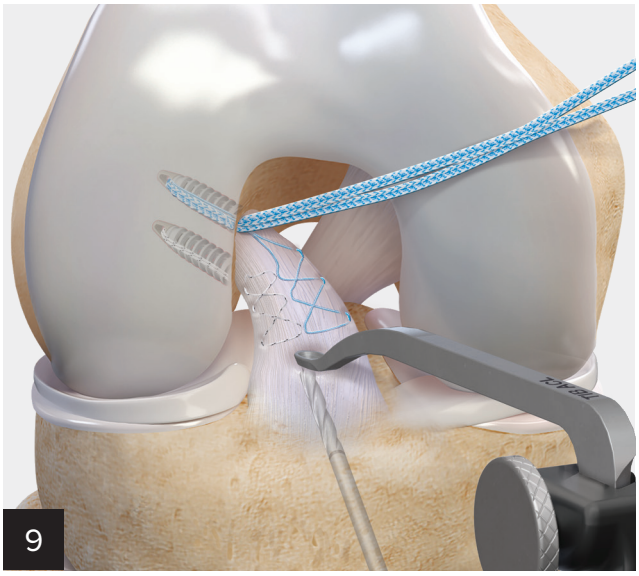


With the knee still at 90˚ of flexion, insert the SwiveLock anchor into the drill hole in the AM bundle origin and tension the sutures. Advance the eyelet of the anchor into the bone socket until the anchor body contacts bone. The anchor is fully deployed when the screw is flush or slightly countersunk in the bone.

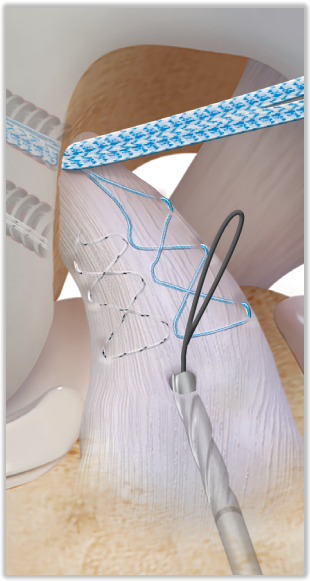
Now remove the orange suture cleat tab on the handle of the SwiveLock anchor to release the retention suture and remove the driver. Pulling one limb of the retention will allow it to be fully removed from the implant.

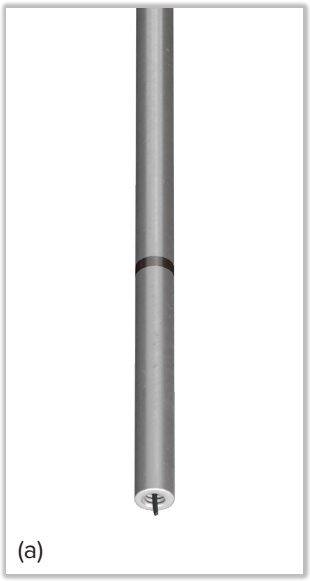
With the FiberWire suture left in place, the free ends of the repair sutures are cut with an open-ended suture cutter so that they are flush with the edge of the bone socket. Then retrieve the FiberTape suture out of the AM portal for later use.

The *Internal*Brace 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 *Internal*Brace technique is for use during soft tissue-to-bone fixation procedures and is not cleared for bone-to-bone fixation.

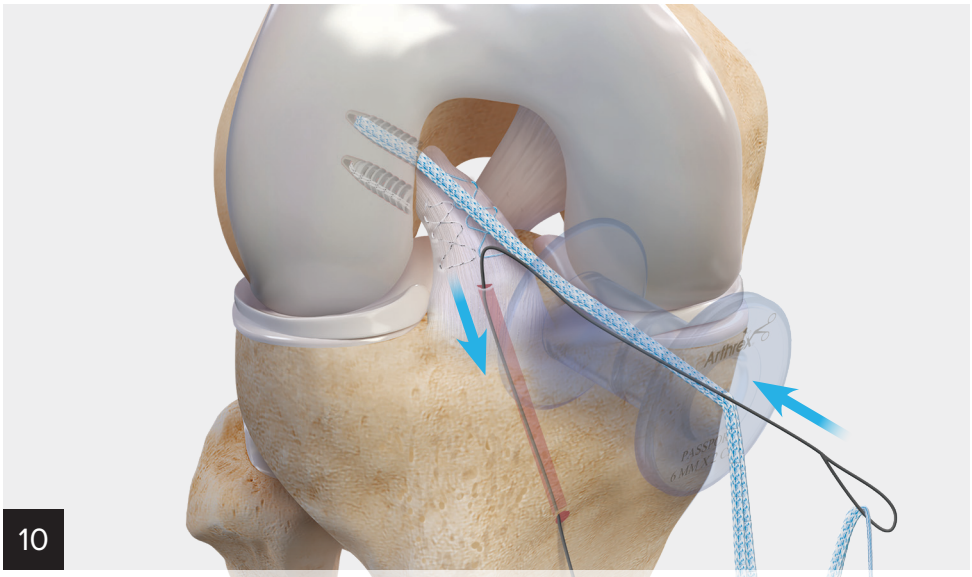


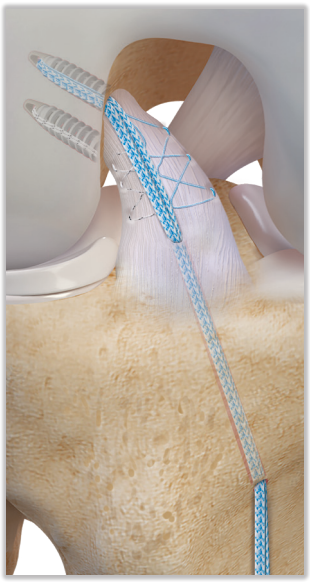
Use the RetroConstruction™ tibial ACL marking hook and the 2.4 mm drill sleeve to localize centrally into the anterior third of the ACL tibial insertion. Then drill the 2.4 mm cannulated drill into the joint. Once in position, remove the ACL drill guide, leaving the 2.4 mm cannulated drill pin in the proximal tibia. The trocar is removed from the cannulated drill allowing a lasso wire to be delivered through the cannulation of the drill until it is visualized in the joint.



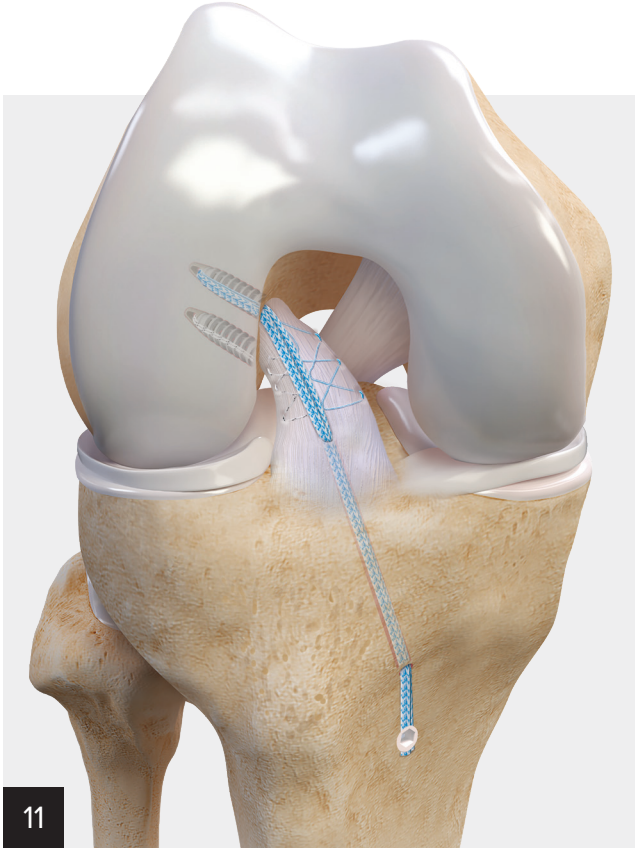


- Now retrieve the lasso wire through the PassPort Button™ cannula with a KingFisher® grasper.
- Advance the lasso wire until the opposite end of the wire is no longer visible at the back end of the cannulated drill **(a)**. Chuck the cannulated drill and carefully remove it from the tibia. Pay attention to the lasso wire to ensure it remains visible in the distal aperture of the tibial tunnel.





With both the lasso wire and the FiberWire® suture in the PassPort Button cannula, the single strand of the FiberWire suture can be inserted through the wire lasso loop, and then retrieved distally through the ACL insertion and tibial bone tunnel.

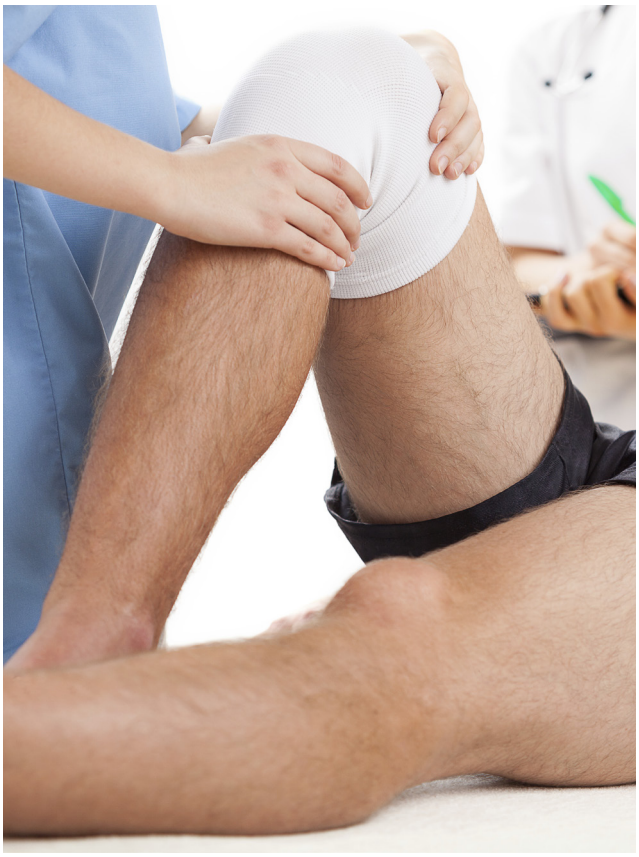


Final Fixation: Using the drill guide and 2.4 mm cannulated drill, drill a hole 1 cm distal to the tibial bone tunnel to the laser mark at the drill flutes. The 4.75 mm SwiveLock® tap is then used to prepare the hole.

Now pass the FiberTape® suture through the eyelet of the 4.75 mm BioComposite SwiveLock anchor. With the knee in full extension and with tension on the FiberTape suture, deploy the 4.75 mm SwiveLock anchor in standard fashion to complete the *Internal*Brace™ technique.

Now remove the orange suture cleat tab on the handle of the SwiveLock anchor to release the retention suture and remove the driver. Pulling one limb of the retention suture will allow it to be fully removed from the implant. The FiberTape suture can be cut flush with the bone. A physical exam of the knee should reveal full range of motion with a negative Lachman exam at this point. **Note: Do not apply extra tension to the FiberTape sutures after the SwiveLock anchor is inserted into the tibial socket.**

Postoperative Care Described by Gregory S. DiFelice, MD



Postoperatively, during the first month, the main objectives are controlling swelling and restoring range of motion and quadriceps control:

- A brace is worn for the first month with weight-bearing as tolerated. The brace is locked in extension until volitional quadriceps control has returned at which point the brace can be unlocked for ambulation.
- Immediately after surgery, use intermittent cold therapy with compression.
- Range-of-motion exercises are initiated in the first few days after surgery in a controlled fashion.
- The morbidity of this procedure is far less than with a standard ACL reconstruction, and therefore, many patients can make significant progress by doing the exercises on their own.[5] Hence, formal therapy does not necessarily have to start until after the first month. Decisions in this regard should be made on a case-by-case basis. After one month, patients are quickly weaned off of the brace.
- At 4 to 6 weeks postoperatively, patients are advanced to gentle strengthening and placed on a standard ACL rehabilitation protocol.

Ordering Information

Product Description	Item Number
ACL SwiveLock® Anchor Repair Kit	AR-**1594**
8 mm × 30 mm PassPort Button™ Cannula 2.4 mm Crown-Tip Drill Guide 2.4 mm Cannulated Drill w/ SutureLasso™ Suture Passer SD Loop #2 TigerWire® Suture #2 FiberWire® Suture 4.75 mm SwiveLock Anchor Punch/Tap (2x) BioComposite SwiveLock Anchor 4.75 mm × 19.1 mm SwiveLock Anchor 4.75 mm × 19.1 mm w/ Extended Length FiberTape® Loop	

Product Description	Item Number
2.4 mm Cannulated Drill w/ SutureLasso Suture Passer SD Loop	AR-**1594D-24**

Instruments

Product Description	Item Number
FastPass Scorpion™ Suture Passer	AR-**13999MF**
PowerPick™ Instrument	AR-**8150PX-45**
KingFisher® Suture Retriever	AR-**13970NR**
Open-Ended Suture Cutter	AR-**16794L**
FiberTape Suture Retriever	AR-**13974NR**
Tibial ACL Drill Guide	AR-**1510T**
RetroConstruction™ Drill Guide Handle, side release	AR-**1510HR**
Ratchet Drill Sleeve, 2.4 mm	AR-**1510FD-24**
Spade Tip Drill for 5.5 mm Corkscrew® FT and 4.75 mm and 5.5 mm SwiveLock anchors	AR-**1927D**
Cannulated Drill, 4 mm	AR-**1218-40**
Cannulated Drill, 4.5 mm	AR-**1218-45**
5.2 mm tap for 4.75 mm SwiveLock anchor	AR-**1593-5**

Products advertised in this brochure/surgical technique guide may not be available in all countries. For information on availability, please contact Arthrex Customer Service or your local Arthrex representative.

References

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