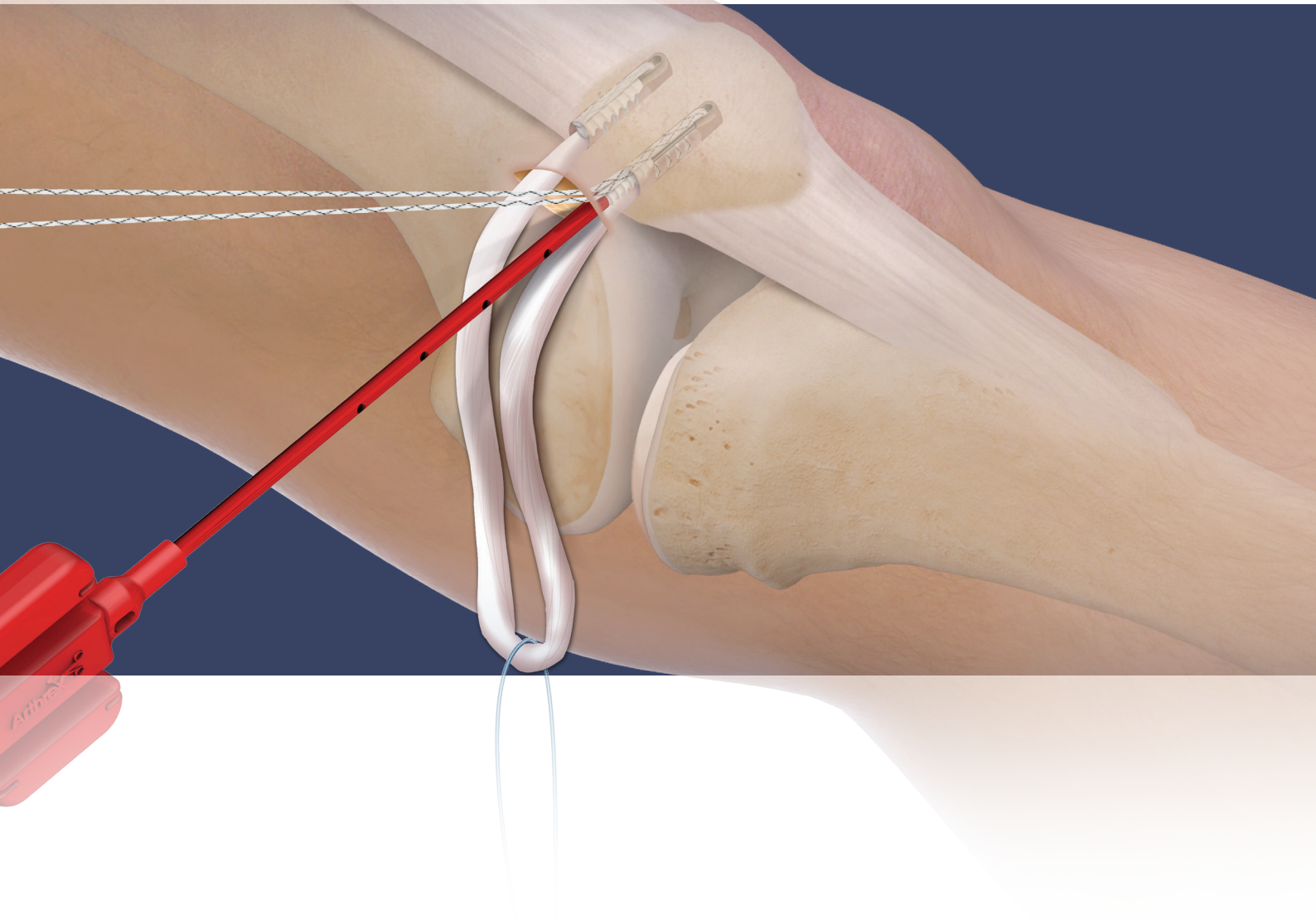
Medial Patellofemoral Ligament (MPFL) Reconstruction

Surgical Technique



Arthrex®

Introduction

The medial patellofemoral complex, consisting of the medial patellofemoral ligament (MPFL) and the medial patellotibial ligament, is the main passive stabilizer of the patellofemoral joint. Since it has been shown that rupture of the MPFL is the primary pathological consequence of patellar dislocation[1] and biomechanical studies have demonstrated that the MPFL is an important passive restraint against patellofemoral instability (PFI) and lateral patellar displacement, reconstruction of the MPFL has become a widely accepted technique for restoration of patellofemoral stability. Therefore, numerous techniques for reconstruction of the MPFL have been described with promising clinical results.[2] However, since it is known that a nonanatomic reconstruction of the MPFL can lead to nonphysiologic patellofemoral loads and kinematics,[3] the goal of surgical intervention must be an anatomic reconstruction.

There have been multiple studies to evaluate the femoral insertion of the MPFL. Based on these anatomic,[1] biomechanical[4] and radiologic[5] findings, it is now possible to avoid the complications of increased patellofemoral pressure that are associated with nonanatomic (too anterior/proximal)[3] fixation of the graft.

The anatomic double bundle MPFL reconstruction technique replicates the native shape of the MPFL and provides outstanding flexion and extension. The double bundle technique also effectively limits rotation throughout the ROM, minimizing postoperative instability. The technique, if accomplished directly and anatomically, may also provide for more aggressive rehabilitation protocols and earlier return to activity.[6]

As mentioned above, an important determinant of a successful outcome of MPFL reconstruction is the proper position of the femoral fixation of the graft, and our technique incorporates the use of a femoral template to ensure proper placement of the graft in the femur. This position provides a static fixation point that equalizes the tension across the graft in flexion and extension, thus minimizing the stresses across the patellofemoral joint.

Pathomorphology of PFI Overview

The pathomorphology of PFI is dependent on different static and passive factors, such as alignment of the lower limb, dysplasia of the trochlea, and functionality of the MPFL. The patella is primarily stabilized by the MPFL from full extension to approximately 20° of flexion and has no bony guidance, thus forcing the MPFL complex to bear the load of restraint against the lateralizing vector of the quadriceps muscle.

At about 20° of flexion, the patella should engage into the trochlear groove, where the lateral trochlear facet is providing the static stabilization against patellar lateralization. The trochlea provides stability up to 60° to 70° of flexion, where the patella begins engaging into the notch. In cases of trochlear dysplasia, the patella cannot be guided properly, and dislocation of the patella can occur more easily.

Very seldom, there are cases in which the patella does not engage the notch in greater than 70° of flexion, and instability occurs. This can occur in cases of a valgus deformity or internal rotation of the distal femur, where the trochlear groove and the notch are positioned medially and the patella cannot engage. Chronic patellar dislocation is often seen in these cases with the patella tracking on the lateral condyle during the entire range of motion. In these cases, a realignment procedure should be considered.

Application for MPFL Reconstruction

Since most cases of patellar instability occur in extension or slight flexion with a slight underlying trochlear dysplasia, the majority can be treated with a reconstruction of the MPFL. The MPFL is ruptured in almost all cases after an acute patellar dislocation and is additionally weakened in cases of congenital trochlear dysplasia since the patella tracks improperly from early childhood. The additional stresses and tension on the medial soft-tissue complex from this maltracking can lead to an underdeveloped or insufficient MPFL and subsequent instability. Also, in cases with a PFI in deeper flexion, reconstruction of the MPFL should be considered as a concomitant procedure to provide stability in extension.

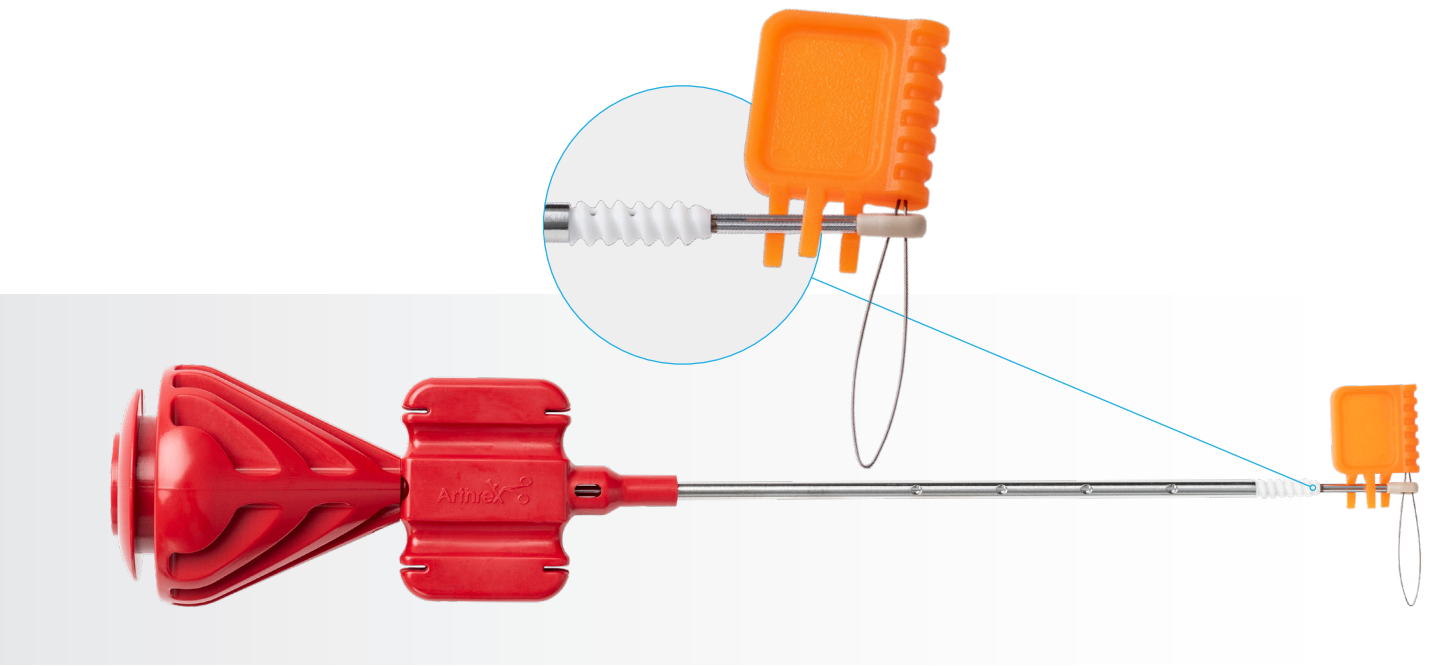
SwiveLock® Anchor Kits Features and Benefits

3.9 mm SwiveLock Anchor and FastThread™ Interference Screw Implant System (AR-1360FT-BC)

- **Improved, shorter screw:** Prominent leading thread and large thread pitch facilitate screw engagement and advancement.
- **Biocomposite material and fenestrations:** Proprietary biocomposite material has withstood the test of time with more than a decade of clinical use and millions of implantations. Vented sidewalls and screw geometry decrease material by 22% without losing fixation strength.

3.9 mm SwiveLock Anchor and TightRope® Implant System (AR-1360TR-BC)

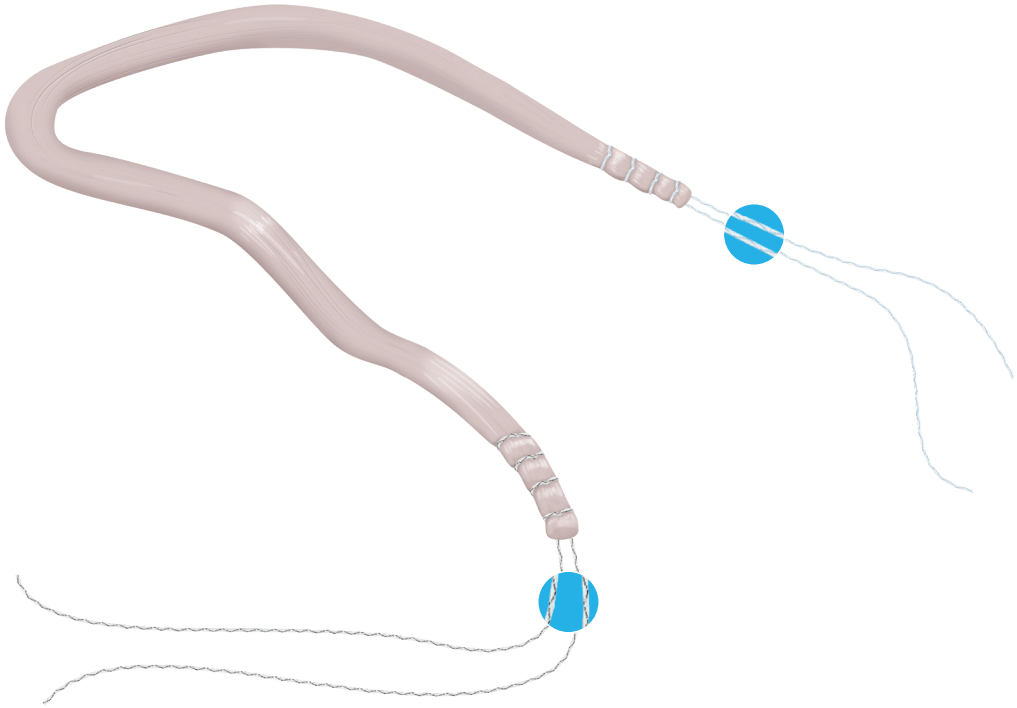
- **Precise tensioning and retensionability:** Allows for provisional graft fixation and the gradual adjustment of graft tension while directly evaluating patellofemoral alignment.
- **Minimal implant material:** Using cortical suspensory fixation instead of an interference screw in the femur may be advantageous in patients whose femoral tunnel is close to the physis.



The new 3.9 mm BioComposite SwiveLock anchor minimizes the drill and implant size in the patella while offering improved fixation strength over smaller sub-4 mm implants.

Graft Selection

A gracilis autograft is used as the size and strength have been shown to be sufficient for MPFL reconstruction (approximately 4 mm in diameter).[6] Minimum graft length is 18 cm. Whipstitched 10 mm at each end with a SutureTape, FiberLoop®, or FiberWire® with FiberLoop suture. The graft should be tapered at each end to facilitate insertion of the graft into the patella.



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Atraumatic Tendon Harvester (AR-10300)

The Atraumatic Tendon Harvester facilitates minimally invasive harvesting from an anterior or a posterior incision. The smooth edge of the harvester bluntly dissects the tendon off the muscle to decrease the amount of muscle removed, which may lead to reduced patient morbidity while also reducing the time needed to prepare the graft.

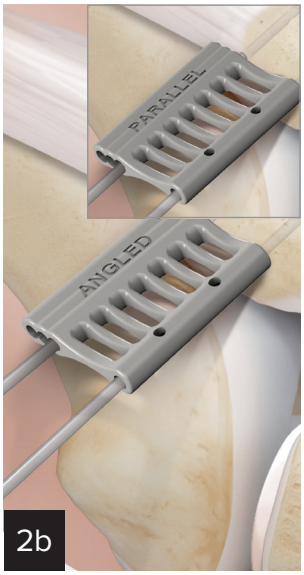
Blunt Edge:

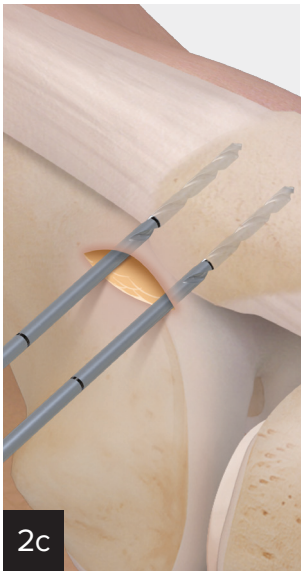
- May reduce premature amputation
- Bluntly dissects the tendon off muscle, which decreases the amount of muscle removed and may lead to reduced morbidity, compared to cutting
- Less muscle on the harvested tendon may reduce graft preparation time

Opening/Closing Tip:

- Facilitates loading of tendons into the harvester
- Secures the tendon in the closed tip
- Allows the distal hamstring to remain attached to the tibia if desired

Patella Preparation



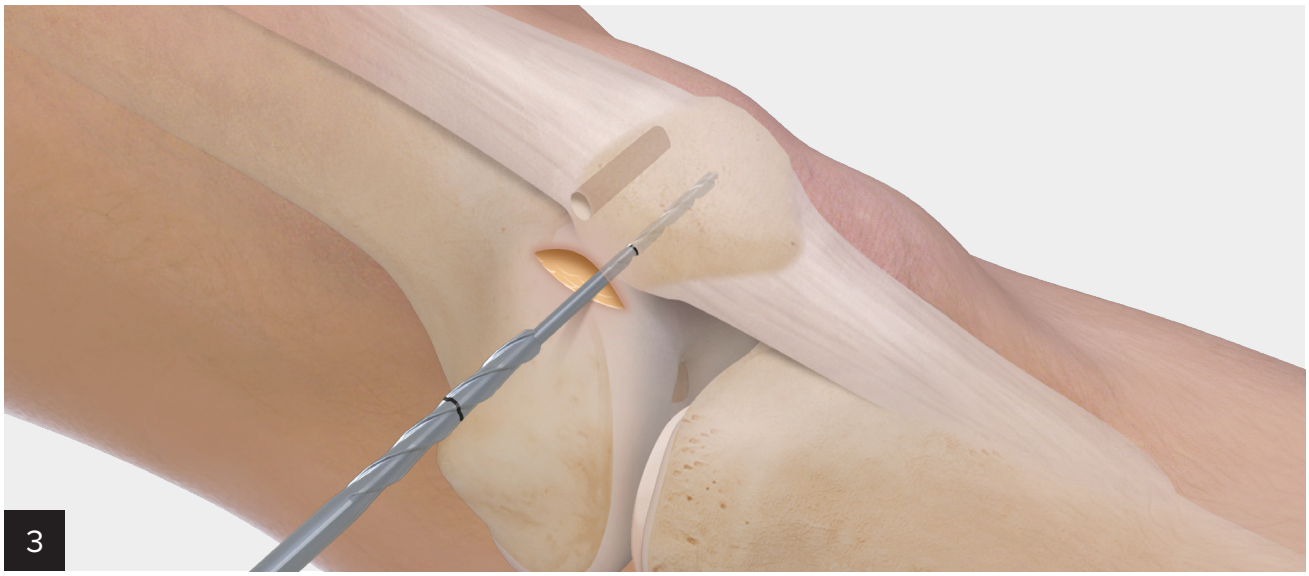


Palpate the medial patellar border and make a 2 cm skin incision from the superomedial corner extending to the center of the medial edge of the patella. Dissect and expose the medial edge of the patella. Use the parallel drill guide to drill the shorter 2.4 mm guide pin to a depth of 24 mm at a point 3 mm distal to the proximomedial corner of the patella. Place a second guide pin 15 mm to 20 mm distal and parallel to the first one using the parallel guide.

(2a) Alternative technique #1: The angled guide may be used if convergent or divergent sockets are preferred.

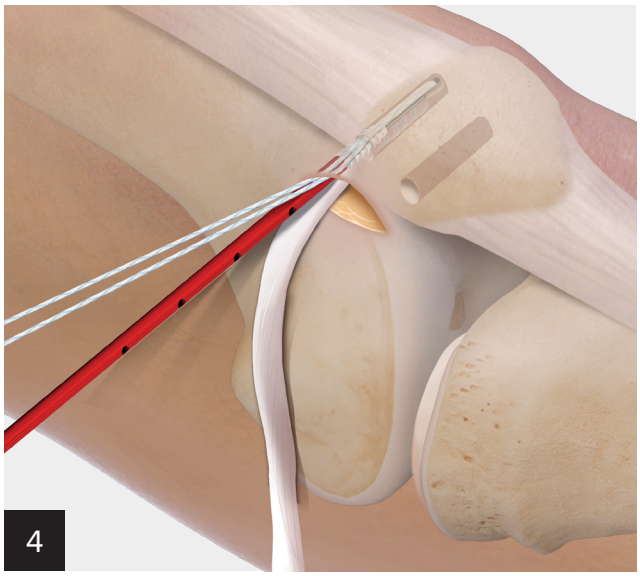
(2b) Alternative technique #2: The parallel or angled drill guides can be used to drill the distal guide pin first. The offset of the guide can then be used to drill the second guide pin on the proximal aspect of the patella.
Note: Drilling the distal guide pin first may be advantageous when the proximal guide pin is at a more oblique angle on the patella.

(2c) Alternative technique #3: The guide pins may be drilled free hand without the use of the parallel or angled guides if preferred.



Remove the parallel guide and over-drill the two guide pins with a 4.0 mm cannulated reamer to a minimum depth of 22 mm. Remove the guide pins after over-drilling is complete.

Patella Graft Fixation



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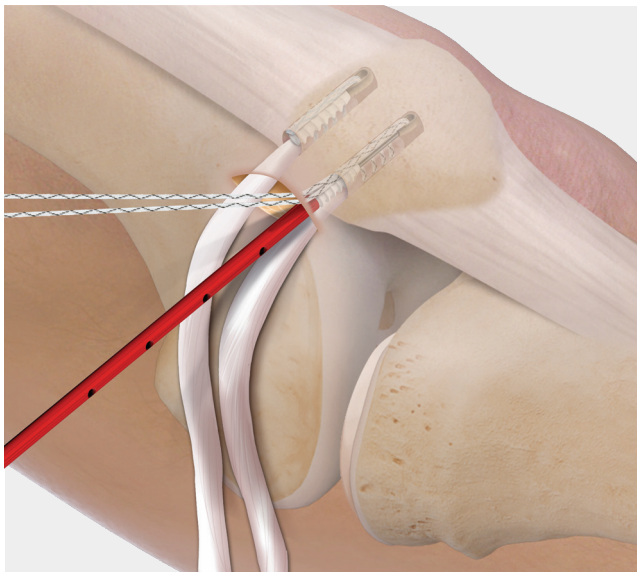
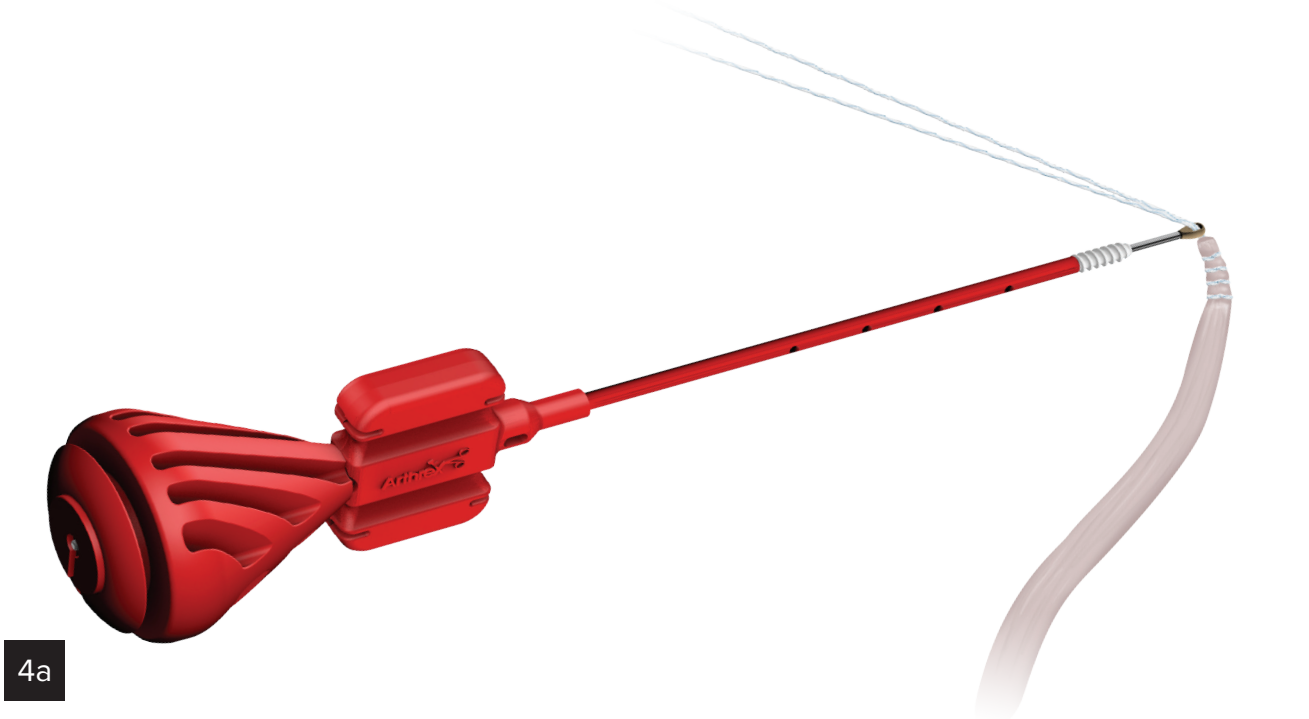
Pass the tails of one graft end through the eyelet of the first 3.9 mm SwiveLock® anchor and push the graft/anchor into the proximal drill hole until the eyelet is fully seated. Maintain tension on the suture limbs and screw the SwiveLock anchor into the patella.



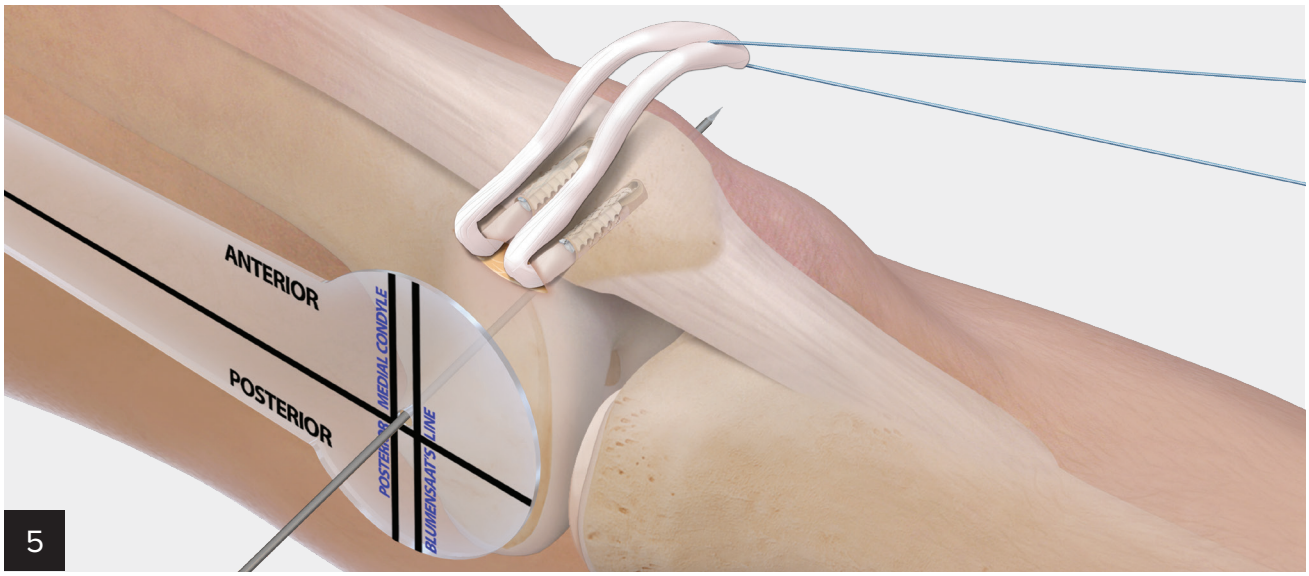
Repeat this procedure with the second graft end if using femoral interference screw fixation.



4a

TightRope® implant technique: Before inserting the second SwiveLock® anchor, loop the TightRope implant (AR-1588T) over the graft. Repeat the SwiveLock anchor insertion procedure with the second graft end.

Femoral Insertion Preparation



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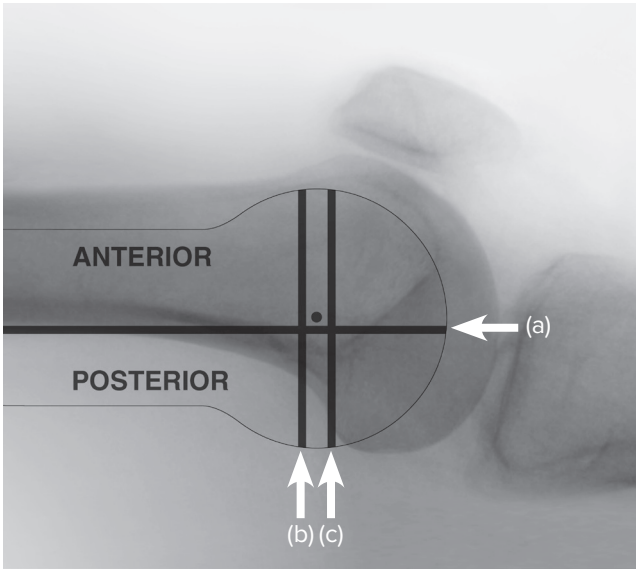
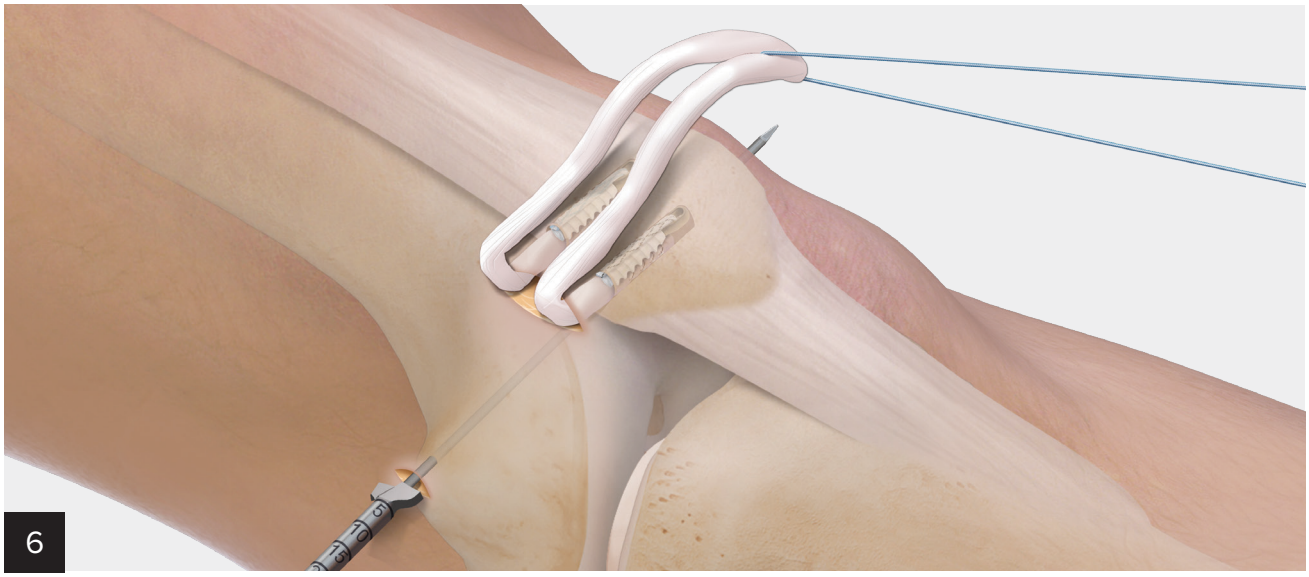
The proper position of the femoral insertion of the MPFL is very important to maintain proper biomechanics of the patellofemoral joint throughout the entire range of motion. The use of the MPFL template can help establish the position of the guide pin. The insertion point is approximately **(a) 1 mm anterior to the posterior cortex extension line, (b) 2.5 mm distal to the posterior articular border of the medial femoral condyle, and (c) proximal to the level of the posterior point of Blumensaat's line.** The template is placed on the area of the medial epicondyle on the distal femur and, under fluoroscopic guidance, a 2.4 mm guide pin is drilled across the femur and out through the lateral epicondyle. The pin should be aimed slightly proximal and anterior to avoid the intercondylar notch.



TightRope® implant technique: A 4 mm spade-tipped TightRope drill pin **(5a)** is drilled across the femur and out through the lateral epicondyle.
Note: Pull back on the TightRope pin as it exits the lateral cortex to identify intraosseous length and mark that distance on the TightRope implant. The pin should be aimed slightly proximal and anterior to avoid the intercondylar notch.

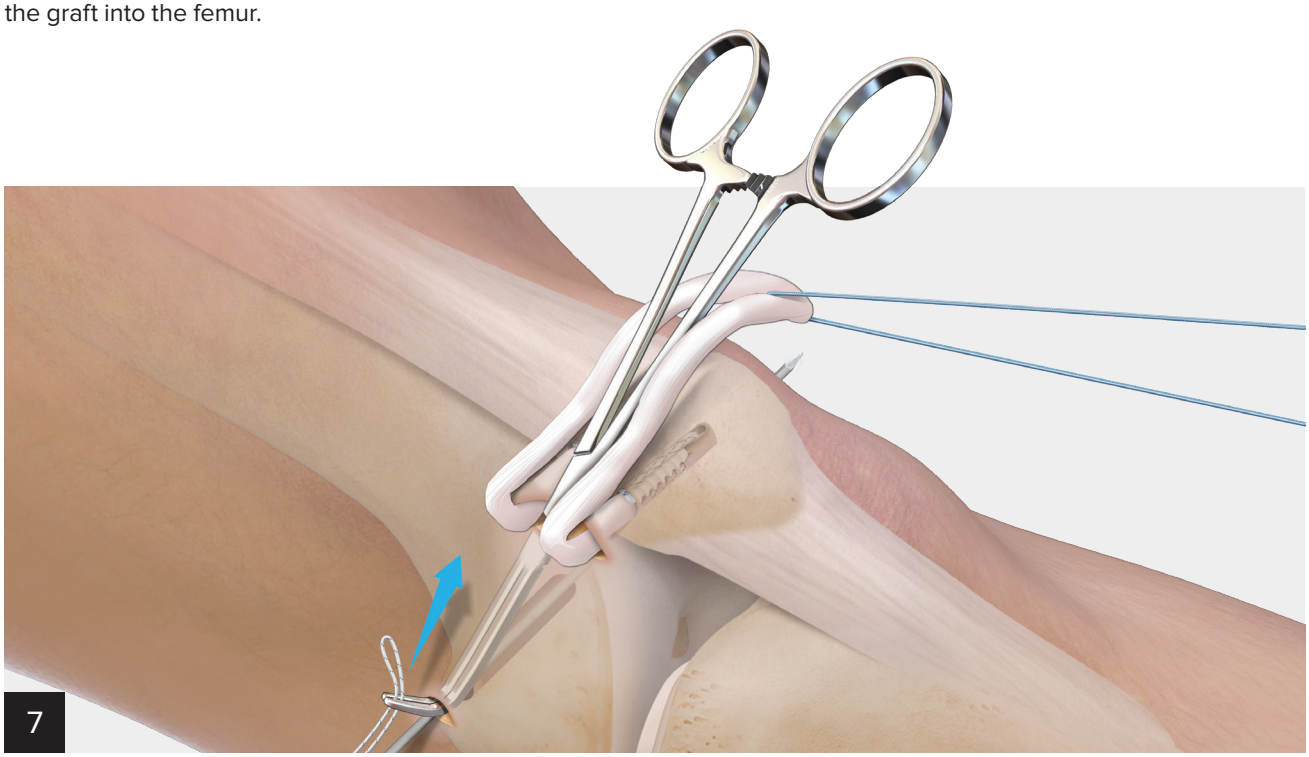

5a



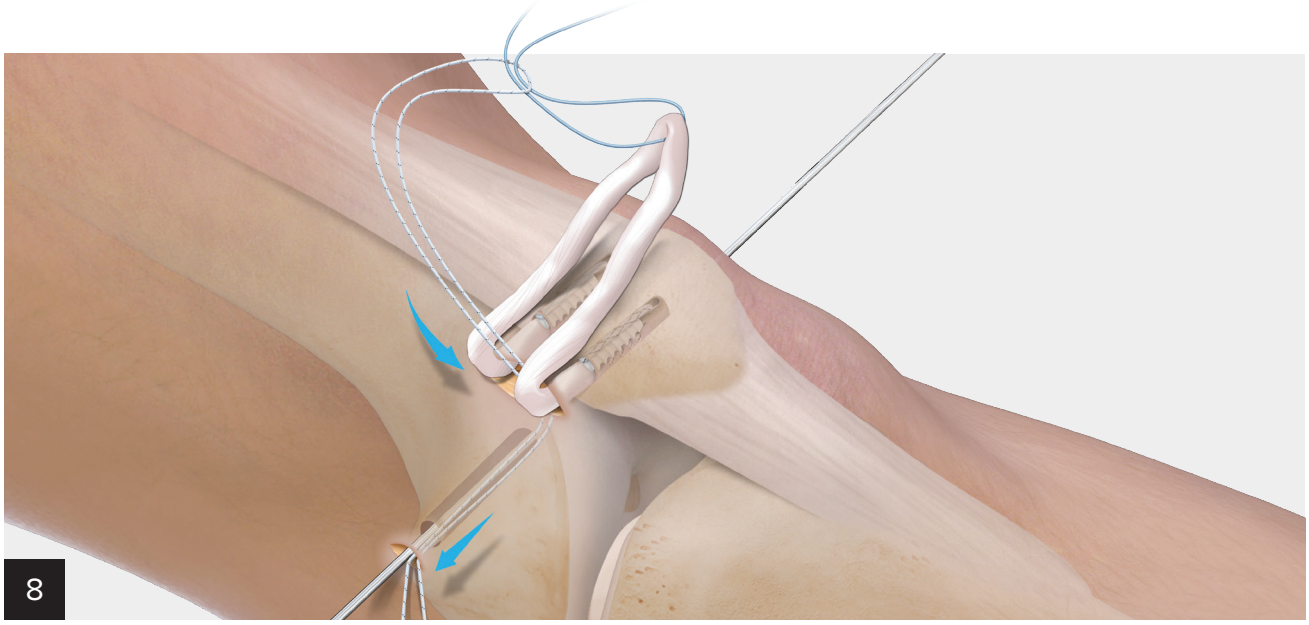
Identify the space between the vastus medialis and the capsule, and bluntly dissect toward the femoral insertion area with a scissor, leaving the capsule intact. Insert a right-angle clamp into the prepared layer down to the medial epicondyle and turn the tip of the clamp toward the skin. Make a 1 cm longitudinal incision.

TightRope® implant technique: Use a 6 mm drill to create a socket extending to the far cortex. Maintain the 2.4 mm guide pin in the femur as it will be used to pass the graft into the femur.

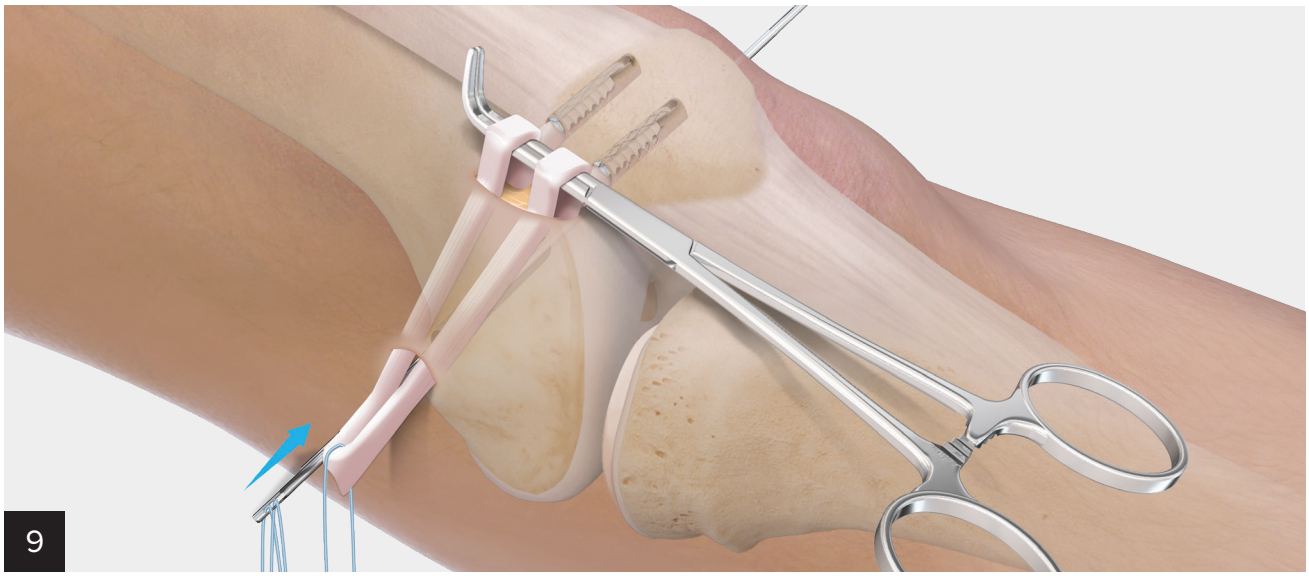
Note: Before drilling, the isometry of the MPFL may be provisionally evaluated. The graft is wrapped around the 2.4 mm guide pin with adequate tension on the graft and the knee is cycled through the ROM. If isometry is not adequate, change the pin location before drilling with the 7 mm reamer.



Insert the right-angle clamp back through the patellar incision and down through the femoral incision. Using the clamp, pass a looped #2 TigerWire® suture back to the patellar insertion area.

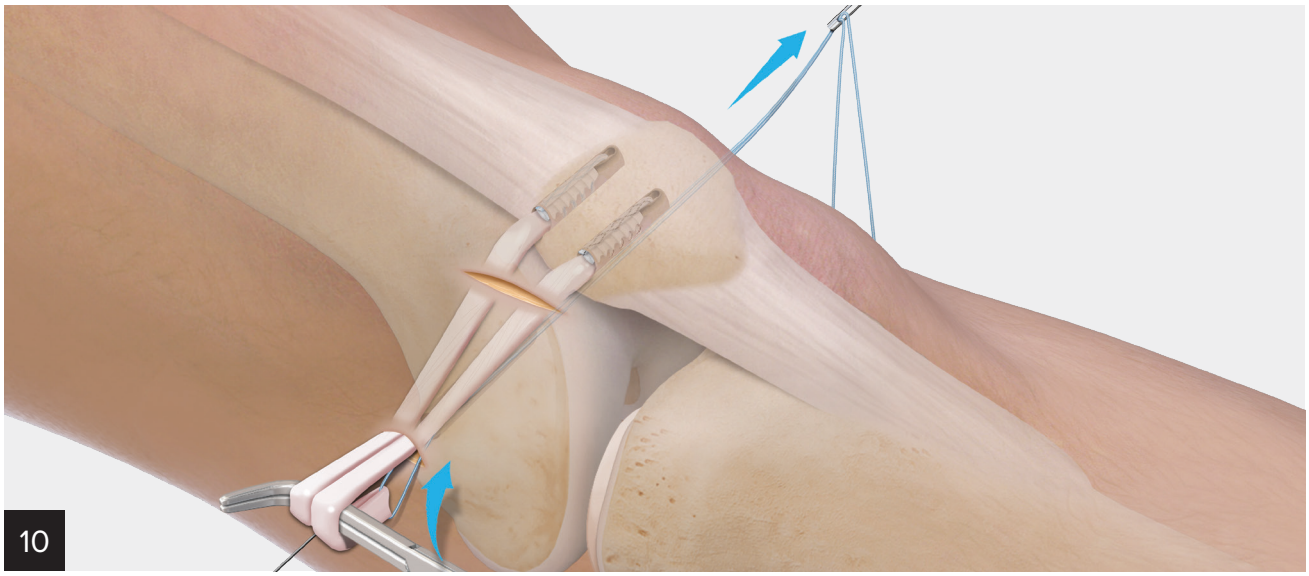


Load the blue suture limbs from the looped end of the graft into the TigerWire® passing suture loop and pass the sutures from the patellar origin to the insertion point at the medial femoral epicondyle. It is very important to maintain equal tension on both graft bundles during this step to ensure proper biomechanics of the patellofemoral joint.

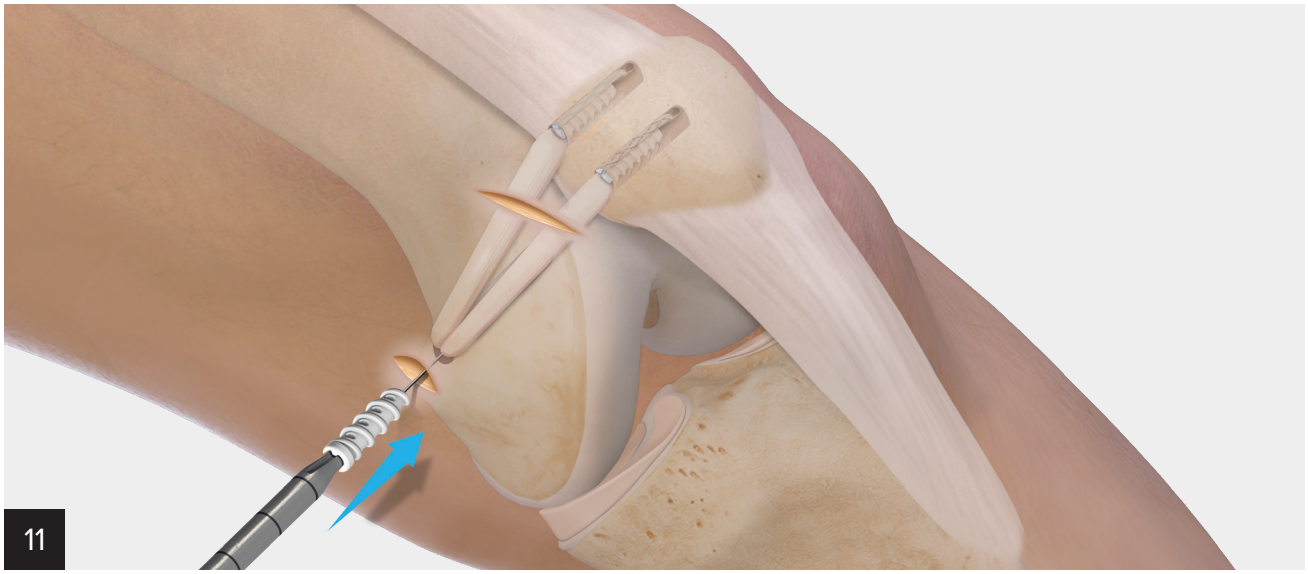


Deliver the sutures out of the medial femoral incision and, with equal tension on both graft bundles, loop the passing suture (blue) into the eyelet of the 2.4 mm pin. The graft can then be pulled down to the medial epicondyle.

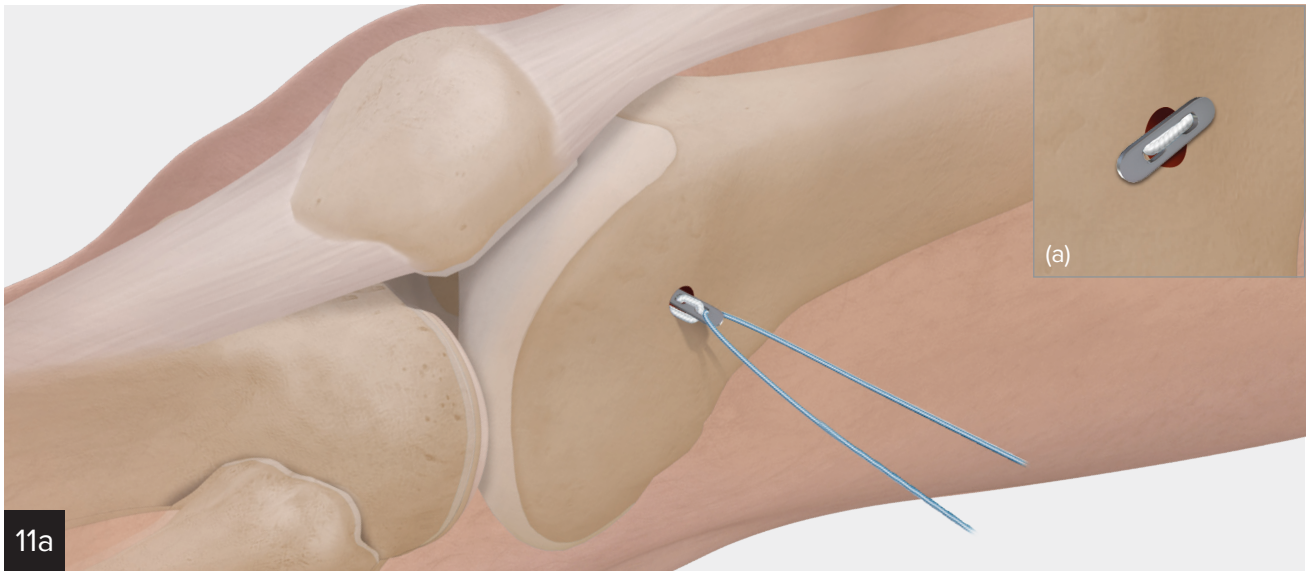
Femoral Graft Passage and Fixation



Place a 1.1 mm nitinol guidewire into the drill hole next to the femoral guide pin to facilitate insertion of the 6 mm × 20 mm FastThread™ BioComposite interference screw. Loop the graft sutures into the eyelet of the 2.4 mm guide pin and deliver the suture tails out of the lateral femur prior to the graft entering the femoral socket. Using a clamp as a pulley, pretension the graft and insert it into the socket with equal tension on both graft bundles.



With the knee at 30° of flexion, manually fixate the lateral patellar facet flush with the lateral femoral condyle. While maintaining tension on the graft, insert the 6 mm × 20 mm screw into the femur.



TightRope® implant technique: Using a clamp as a pulley, pretension the graft and insert it into the socket with equal tension on both graft bundles as the TightRope implant is pulled out the lateral side. Maintain tension on the graft until the TightRope button is flipped on the cortical bone on the lateral side **(a)**. **Note: If the button cannot flip because the sutures are too short or excessive force must be used to flip the button, lengthen the TightRope sutures manually before passing and flipping the button. With the knee at 30˚ of flexion, manually fixate the lateral patellar facet flush with the lateral femoral condyle.**

Final fixation can be accomplished by pulling the TightRope implant's tightening sutures on the medial side, alternating tension on each strand.

It is crucial that the tensioning sutures are not overtightened while holding the patella in the middle of the trochlear groove. Once the construct is tensioned completely, the TightRope implant cannot be loosened.

Overtightening of the TightRope implant could result in the patella being overconstrained to the medial side. **Note: Evaluate the tracking and tension of the patella throughout the knee ROM. If more tension is required, continue to tension the TightRope implant until adequate fixation is achieved. If the patella is overconstrained, the TightRope implant can be cut out and replaced with a BTB TightRope implant (AR-1588BTB) or a FastThread™ BioComposite interference screw (AR-4020C-06) can be used for final femoral fixation.**

References

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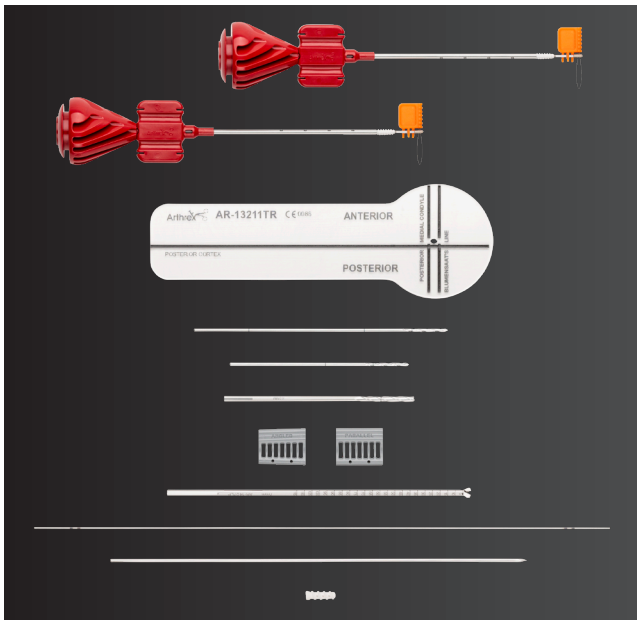
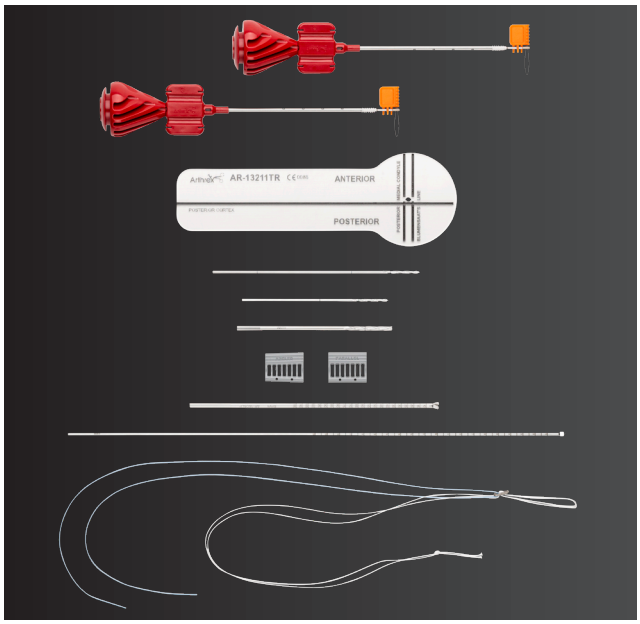
Ordering Information



MPFL Reconstruction With FastThread™ BioComposite Interference Screw Set (AR-**1360FT-BC**)

Product Description
Parallel Drill Guide
Angled Drill Guide
2.4 mm × 120 mm Drill Tip Guide Pin
2.4 mm × 170 mm Drill Tip Guide Pin
4.0 mm Cannulated Drill
3.9 mm BioComposite SwiveLock® Anchor
MPFL Template
2.4 mm Guide Pin, w/ eyelet
7 mm Low-Profile Reamer
1.1 mm Nitinol Guidewire
6 mm × 20 mm FastThread BioComposite Interference Screw



MPFL Reconstruction With TightRope® Implant (AR-**1360TR-BC**)

Product Description
Parallel Drill Guide
Angled Drill Guide
2.4 mm × 120 mm Drill Tip Guide Pin
2.4 mm × 170 mm Drill Tip Guide Pin
4.0 mm Cannulated Drill
3.9 mm BioComposite SwiveLock Anchor
MPFL Template
4 mm Spade Tip Pin
6 mm Low-Profile Reamer
ACL TightRope Implant

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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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