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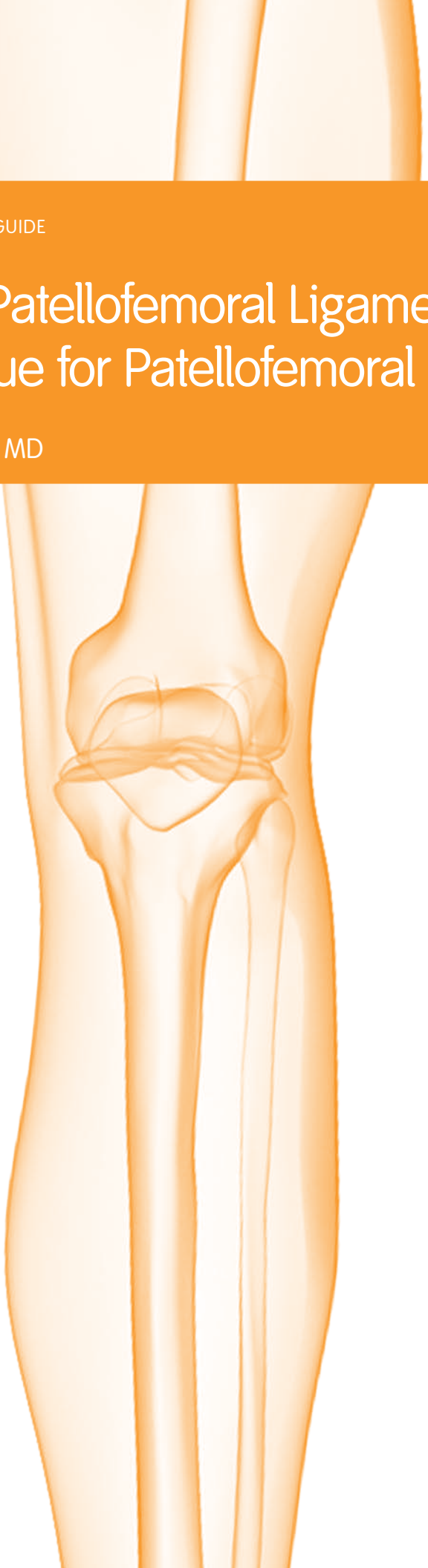
KNEE TECHNIQUE GUIDE

Medial Patellofemoral Ligament Reconstruction Technique for Patellofemoral Instability

David Flanigan, MD



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Medial Patellofemoral Ligament Reconstruction Technique for Patellofemoral Instability

The following technique guide was prepared under the guidance of David Flanigan, MD. Created under close collaboration with the surgeon, it contains a summary of medical techniques and opinions based upon his training and expertise in the field, along with his knowledge of Smith & Nephew's products. Smith & Nephew does not provide medical advice and recommends that surgeons exercise their own professional judgement when determining a patient's course of treatment. This guide is presented for educational purposes only. ***Prior to performing this technique, or utilizing any product referenced herein, please conduct a thorough review of each product's indications, contraindications, warnings, precautions and instructions as detailed in the Instructions for Use provided with the individual components.***

As described by:

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The views expressed here are my own and not those of my employer.

Introduction

Patella dislocations are significant injuries, comprising about 2-3% of acute knee injuries.[1] Current initial treatment for first-time patella dislocations is often nonsurgical, consisting of aggressive rehabilitation, occasional bracing and return to activities. Recurrent instability can frequently occur after a primary dislocation, leading to disability.[1] The medial patellofemoral ligament (MPFL) has been shown to be the primary structure injured during a patella dislocation. Furthermore, the MPFL has been shown to be the primary static restraint to lateral translation of the patella.[2]

In the past, plication techniques have been used to attempt to tighten the medial patellofemoral ligament. These techniques are not as effective in preventing recurrence of dislocation as reconstruction of the MPFL.[3,4] Contemporary techniques for addressing patella instability focus on pathologic structures and anatomically restoring the static restraint to lateral patella translation with a medial patellofemoral ligament (MPFL) reconstruction. The goal of these procedures is to recreate the primary ligamentous restraint to prevent lateral patella instability.[4] The technique described here uses an allograft to recreate the static checkrein effect of the medial patellofemoral ligament. Additionally, if the lateral structures are tight or shortened, lateral lengthening may be required for appropriate balancing of the parapatellar structures in certain situations.

Lateral Knee Radiograph

Standing Weight-Bearing Radiograph

Merchant View Radiograph

Pathophysiology

In recurrent instability, the MPFL is often torn or stretched. The function of the MPFL is critical in stabilizing the patella in early knee flexion (0-30°). This occurs when the patella is not engaged in the trochlea. In the setting of a normal trochlea, the lateral trochlea provides a static restraint to lateral translation of the patella at increased knee flexion.[5] Though not a primary cause of patella instability, the lateral structures of the knee can contribute to the recurrent instability of the patella when medial structures are attenuated.

Alignment issues that are pathologic and that contribute to the instability should be addressed. They should be staged and/or concomitantly addressed with MPFL reconstruction. Other bony issues, including trochlear dysplasia, should be identified because they often contribute to recurrent patellofemoral instability. This is best graded from a true lateral radiograph. In cases of trochlear dysplasia, patients may be apprehensive with lateral translation of the patella at higher knee flexion angles (30° and beyond), because the patella is not secured in the trochlear groove. Standard radiographic views to evaluate alignment and concomitant pathologies are Lateral Knee View, Merchant View and Standing Weight-Bearing A/P View. [6,7]

Limb alignment and rotation should be assessed for other sources of patellar instability including: obvious valgus, patella alta, excessive femoral anteversion and increased tibial tubercle-trochlear groove distance (TTTG), and/or lateral positioned tibial tubercle.

Indications

The primary indication for MPFL reconstruction is recurrent lateral patella instability or dislocation. Isolated MPFL reconstruction may be contraindicated in cases of concomitant pathology, and should be considered in combination with other procedures such as a tibial tubercle osteotomy or lateral lengthening. Furthermore, MPFL reconstruction addresses instability symptoms and should not be expected to address patellofemoral pain.

The technique described is recommended for skeletally mature patients.

Surgical Technique

Patient Positioning

Place the patient in the supine position on a radiolucent table with the foot up. A tourniquet is placed but not used during the case. Use a lateral post for the diagnostic arthroscopy and to maintain the leg's position during fluoroscopy. Place a large C-arm (fluoroscopy) on the opposite side of the table from the patient and utilize it to achieve a true lateral radiographic to aid in achieving an anatomic position on the femur.

Examination of the Knee

Evaluate patella instability while the patient is under anesthesia. Note the excursion of the patella medially and laterally. If the patella can be dislocated, note at what degree of flexion it reduces and then track appropriately.

Assess the tightness of the lateral structures. Complete a comprehensive ligament examination of the knee as well. Perform a complete arthroscopic exam of the knee intraarticularly before proceeding with the MPFL reconstruction. Search the knee joint, including the posterior aspects of the knee and the popliteal recess, for any loose bodies that require removal. Evaluate the chondral surfaces to determine the presence of trochlear dysplasia, the tracking of patella and the extent of chondral damage, and assess the need for treatment.

Arthroscopic Image of Loose Body

Surgical Site and Graft Preparation

1. Prepare a 24-25cm long graft by tapering the ends and whipstitch 25mm of each end. The ends of the graft combined should pass through a 6mm sizing tube for 30-50mm to ensure ease of docking into the femoral tunnel. Whipstitching each end of the graft with different color sutures for easy distinction will aid in proper passage and positioning of the graft during the procedure.

   Note:
   Autograft or allograft can be utilized for MPFL reconstructions; however, allograft tendon is preferred to reduce the risk of graft harvest-site pain and complications. Either a semitendinosis or peroneal longus tendon is selected (based on availability, semitendinosis graft is preferred). Graft size and length may need to be adjusted for petite patients.

2. Mark the proposed surgical incisions to prepare for the the MPFL repair. **(Figure 1)**
   - Line 1: Medial Patella Incision
     - 3-4cm longitudinal line off the medial border of the patella
   - Line 2: Femoral Incision
     - 2-3cm longitudinal line at location of medial epicondyle

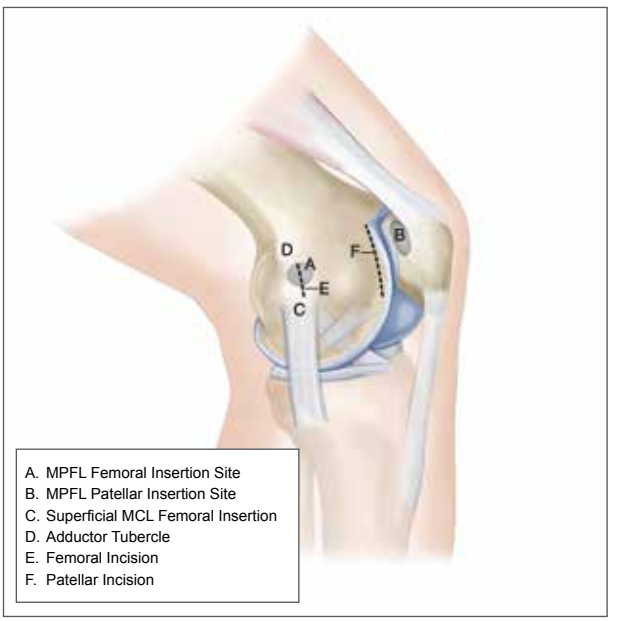

Figure 1 Medial Anatomy of the Knee with Surgical Incisions

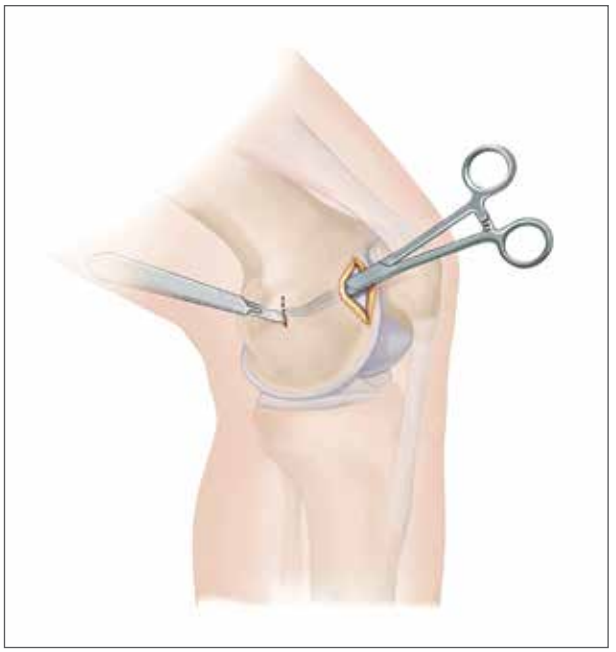

Figure 2 Kelly Clamp Placement

3. Make a 3-4cm incision off the medial border of the patella. Incise the medial retinaculum 2-3mm off the border of the patella along the proximal two-thirds of the patella just below the VMO.

   Note:
   Take care to incise only fascial layers I and II (Warren and Marshall), leaving layer III (synovial joint capsule) intact.

4. Create the soft-tissue tunnel for the graft using finger dissection between layers II and III. Palpate the medial epicondyle, adductor tubercle and saddle region of the medial aspect of the femur at the site where the MPFL attaches.

5. Place a curved Kelly clamp between the layers and push it through the soft tissues at the level of the medial epicondyle. Make a 2-3cm longitudinal incision centered on the tip of the Kelly clamp at the level of the medial epicondyle. Spread the soft tissues medially using the Kelly clamp. **(Figure 2)**

6. Grasp a passing suture (#2 ULTRABRAID® Suture) between the incisions and secure to aid in later graft passage. **(Figure 3)**

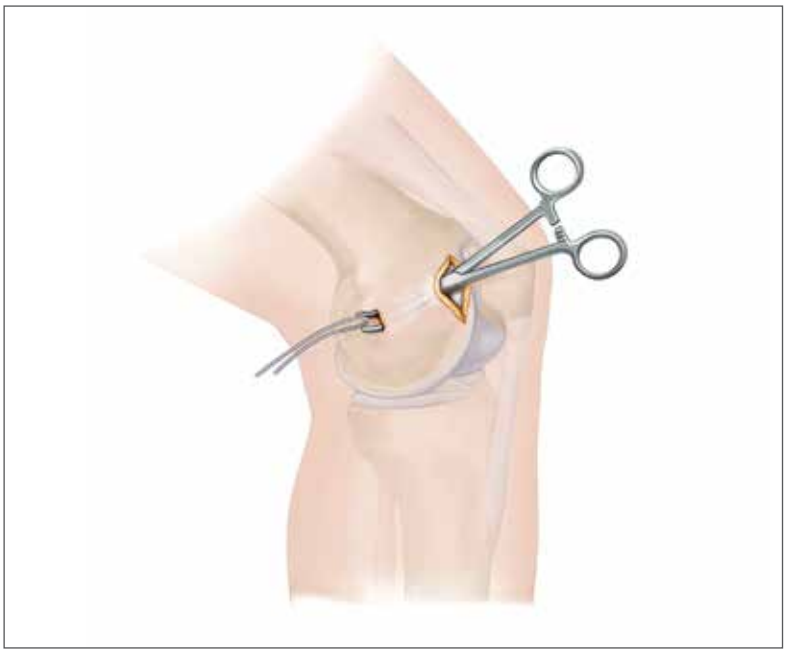

Figure 3 Suture Passing

ULTRABRAID Suture

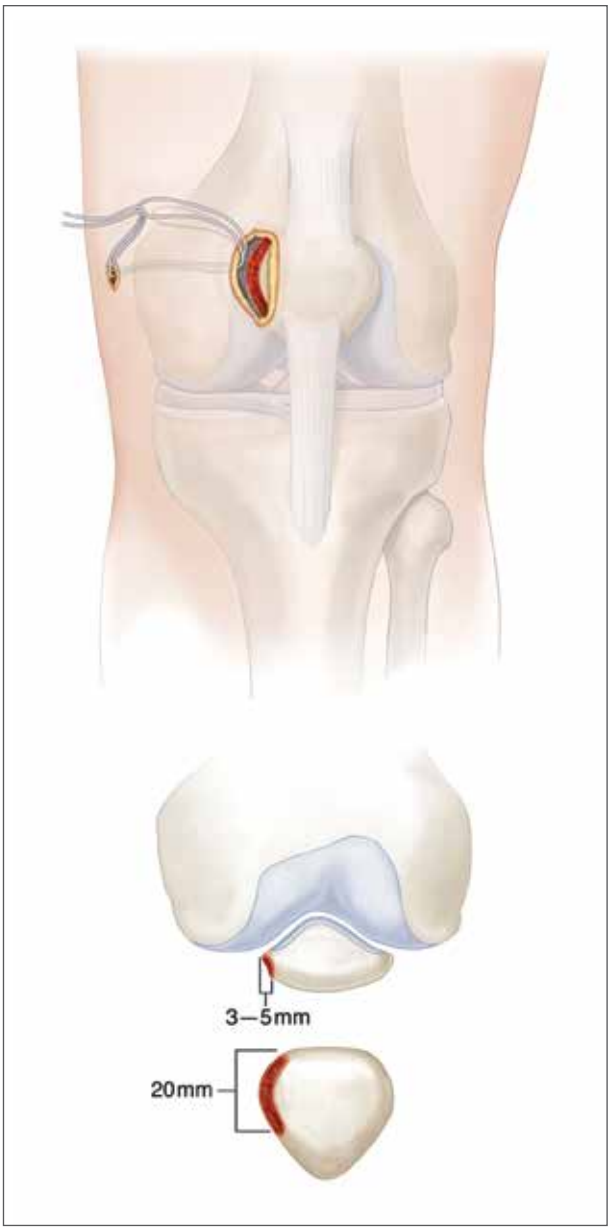

Figure 4 Creation of Trough on the Patella

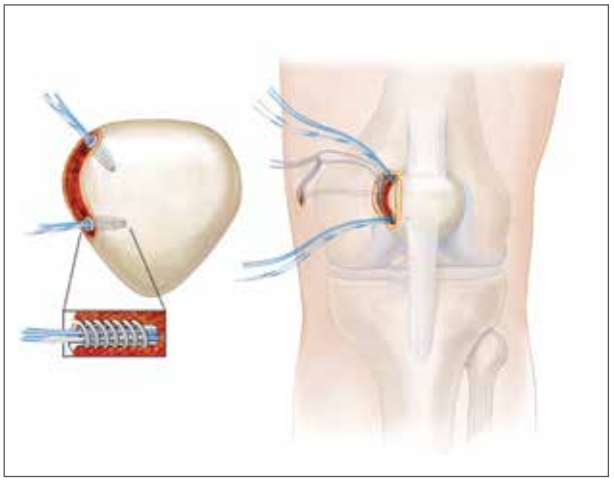

Figure 5 Placement of HEALICOIL REGENESORB Suture Anchors

Preparation of the Patella

1. Elevate layers I and II off the proximal two-thirds of the patella (1 to 4 o'clock position for a right knee, 11 to 8 o'clock position in the left knee) to prepare the medial border of the patella.

   Note:
   Take care not to puncture layer III. If layer III is punctured, use one of the sutures in the anchor to close this layer back to the patella.

2. Use a rongeur to create a 2cm long, 5mm wide, and 3-5mm deep trough on the medial border of the patella. The trough is on the proximal two-thirds of the medial border of the patella, anterior to the medial articular surface. A high-speed burr can be used if needed. **(Figure 4)**

Anchor Placement

Consider the patient's patellar morphology when selecting a fixation offering. The HEALICOIL◊ REGENESORB Suture Anchors are preferred due to the advanced biocomposite material and unique, open-architecture design, which promotes bony ingrowth. If the patella is narrow or small, other suture anchors like the all-suture SUTUREFIX◊ ULTRA Anchor may be a superior alternative with the small diameter and shallow insertion depth.

1. Place the drill guide for the 4.75mm HEALICOIL◊ REGENESORB Suture Anchor with two ULTRABRAID◊ Sutures (Blue, Cobraid Blue) in the proximal anchor site (1 o'clock position on right knee, 11 o'clock position left knee) within the medial bone trough. At this position, aim the drill slightly distally to allow for the contour of the patella. Fluoroscopy can be utilized to aid in positioning the drill guide for anchor placement.

   Note:
   Take care to remain within the cancellous portion of the bone without penetrating into the joint surface and/or breaching the anterior patella cortex.

2. Tap the path to a depth of 25mm.

   Note:
   Due to the hardness of the patella bone, it is recommended that both anchor sites be drilled and tapped prior to placement. When using the 4.75mm Fully Threaded Dilator, it is recommended to advance 2 to 3 clockwise turns and then back-tap by reversing with a counterclockwise turn.

DYONICS◊ Elite Abrader Burr

HEALICOIL REGENESORB Threaded Dialator

HEALICOIL REGENESORB Suture Anchor

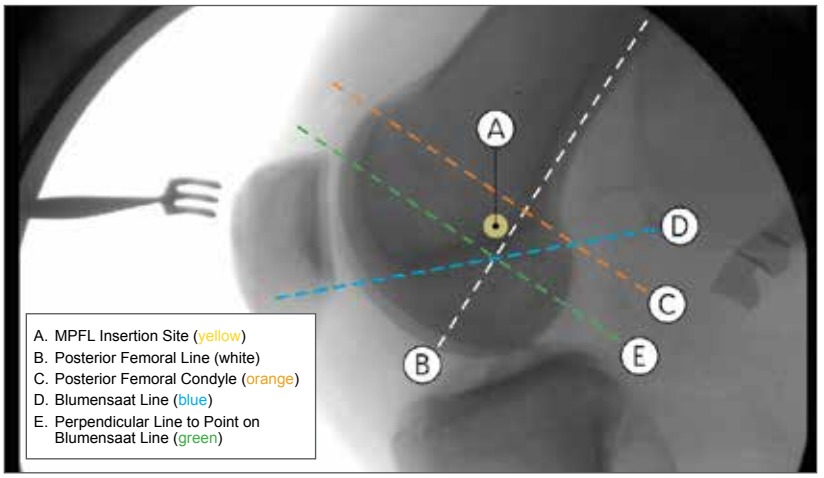

Figure 6 Fluoroscopy of Distal Femur

3. Deploy the HEALICOIL® REGENESORB Suture Anchor and finish with the sutures exiting anteriorly and posteriorly.
4. Place a second HEALICOIL REGENESORB Suture Anchor in a similar fashion about 1.5cm distal to the first anchor within the trough (3:30 clock position in right knee, 8:30 clock position in left knee). This anchor can be placed transverse. **(Figure 5)**

Preparation of the Femoral Socket Under Fluoroscopy

1. Position a large C-arm (fluoroscopy) from the opposite side of the table. Place a bump under the knee to flex the knee to approximately 60–70° and use a lateral post to maintain the leg's position. Obtain a perfect lateral projection as an assistant holds the knee in this position. Palpate the anatomic landmarks (medial epicondyle, adductor tubercle, saddle region) from the medial femoral incision.
2. Position a spade-tipped 3.0mm passing pin in the saddle region between the medial epicondyle and adductor tubercle. The femoral insertion is found just anterior to the posterior femoral cortex line and in between perpendicular lines of the intersection of medial condyle and posterior cortex and intersection of posterior point of Blumensaat's line.[8–10] **(Figure 6)**.
3. Drill the passing pin across the knee, aiming slightly anteriorly and proximally to avoid entering into the notch or exiting posteriorly. Pierce the lateral aspect of the knee with the pin and exit through the lateral soft tissues. **(Figure 7)**
4. Use a 7mm reamer to drill the femoral socket until the lateral cortex is reached, but not penetrated. Leave the passing pin in place until graft passage and dockage into the femoral socket are complete.
5. Excise the soft tissue around the femoral socket to assist in easy passage of the graft into the femoral tunnel.

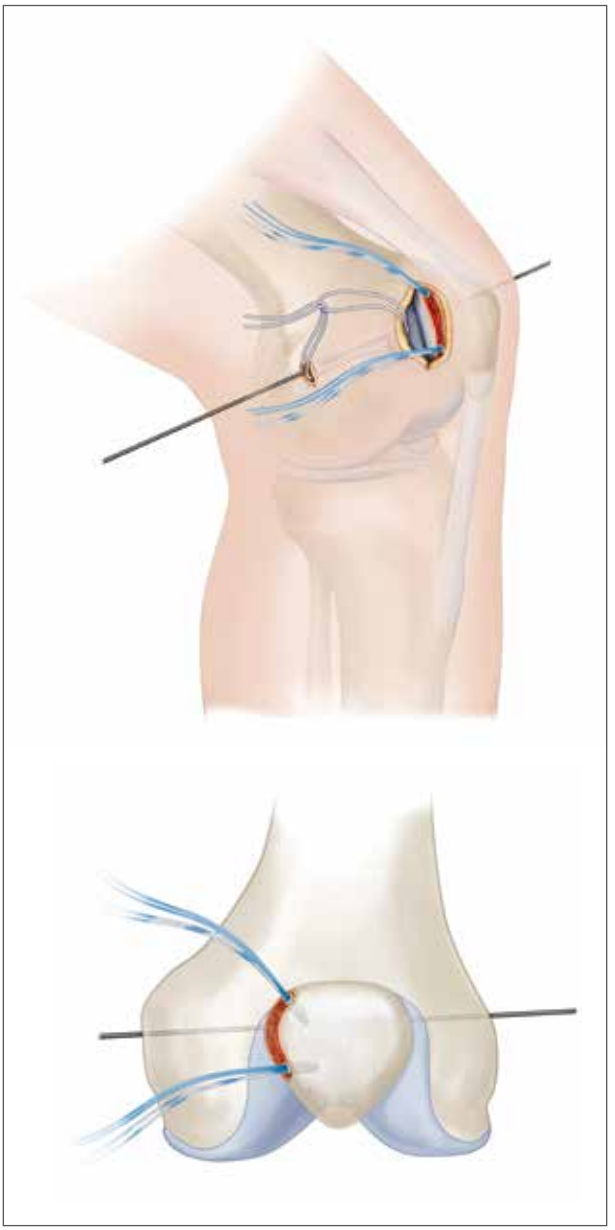

Figure 7 Passing Pin Placement

Passing Pin, Spade Tip

ACUFEX® DIRETOR® ELITE

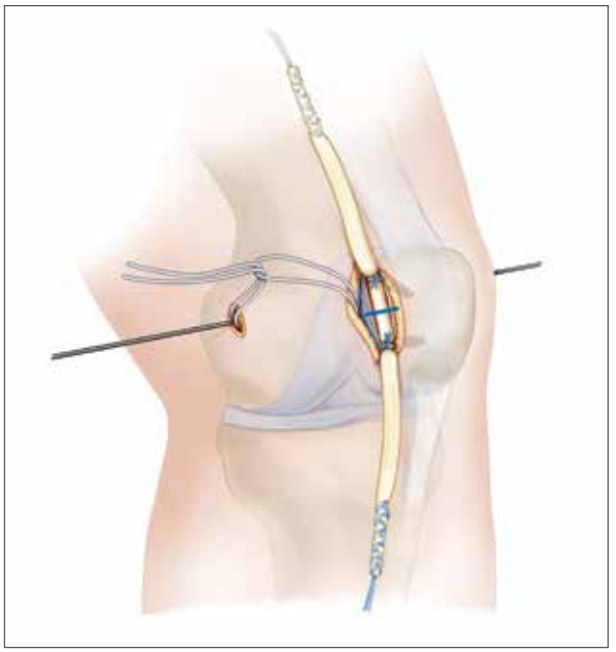

Figure 8 Graft Placement

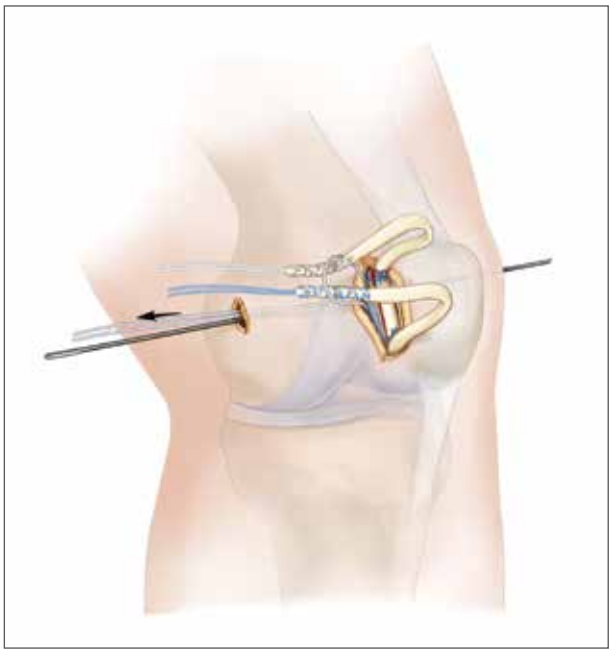

Figure 9 Graft Passage

Graft Placement and Passage

1. Place the allograft tendon mid portion within the patella trough. Create two equal limbs that will be secured into the femoral socket. These two limbs will closely re-approximate the wide insertion of the medial patellofemoral ligament on the medial surface of the patella.
2. Tie the sutures around the graft, securing the graft within the trough, while the graft is held in the trough with hemostats by an assistant. **(Figure 8)**

   Note:
   If the capsule was penetrated during preparation, use one of the posterior suture limbs to grasp the synovium and reattach it to the patella.
3. Use the #2 ULTRABRAID® Suture as a passing suture to pass the two arms of the graft through the tunneled region between layers II and III within the medial femoral incision. **(Figure 9)**

   Note:
   Ensure the limbs do not cross as crossing can cause issues with graft docking and tensioning. Passing each limb separately can aid in avoiding graft crossing during passage and potential graft-friction pain postoperatively.
4. Place the sutures of the limbs of the graft in the eyelet of the passing pin and pull the pin laterally. **(Figure 10)**
5. Place the guidewire for the BIOSURE® PK Interference Screw in the femoral socket.
6. Dock each limb of the graft individually into the femoral socket.

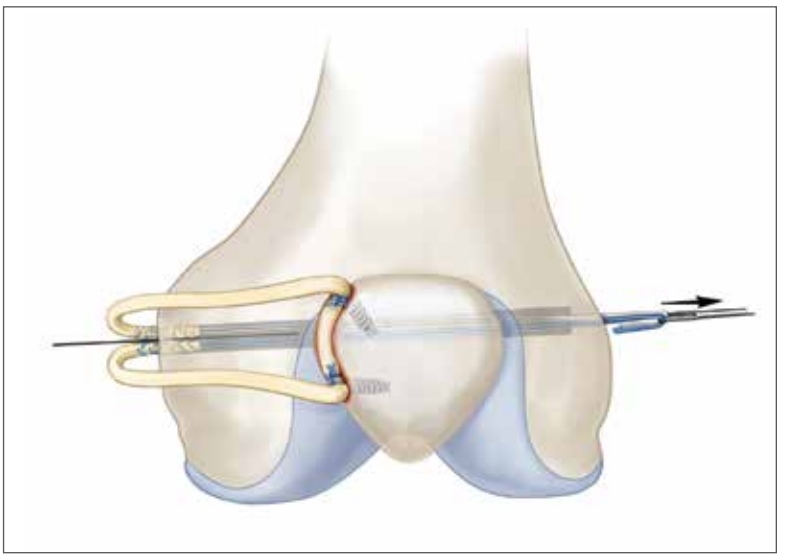

Figure 10 Docking Graft in Femoral Tunnel

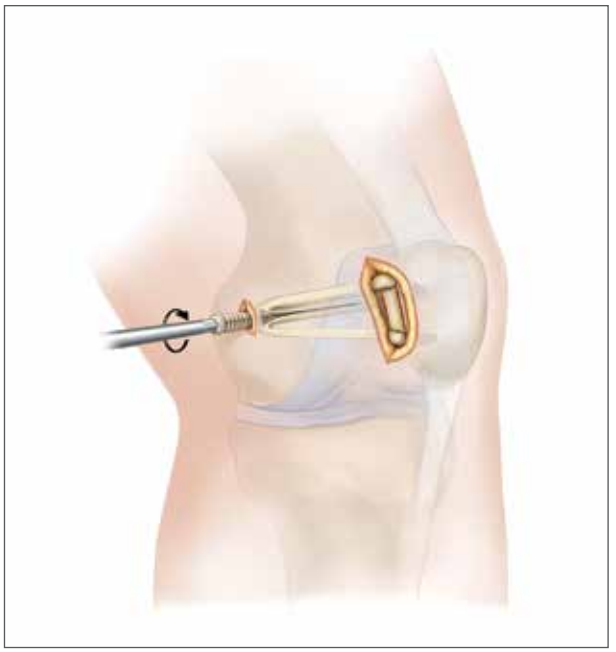

Figure 11 Insertion of BIOSURE PK Interference Screw

Femoral Fixation

1. Cycle the knee numerous times, holding mild tension on the graft sutures to ensure proper docking of graft in the femoral tunnel. Then cycle the knee with no tension to ensure the knee has full range of motion and that the patella is not over tensioned.
2. Position the knee at 70° of knee flexion. Place a 7x25mm BIOSURE® PK Interference Screw over the guidewire and countersink it 2-3mm. **(Figure 11)**
3. Place a 3-5mm incision at the lateral suture exit point and use the ELITE PREMIUM Sliding Suture Cutter to cut the sutures at the lateral cortical bone.

Wound Closure

1. Irrigate the wounds.
2. If lateral lengthening was performed, reassess the lateral structures to determine the best balancing of the knee with range of motion (see Appendix A for details).
3. Suture layer I (superficial oblique layer) and layer II (deep transverse layer) together, closing the capsule at its appropriate lengthened state. The lateral structures can typically be lengthened 1-2cm.
4. On the medial side, close the patella retinacular layers with 0 Vicryl to re-approximate the retinaculum without over-tensioning.
5. Use a standard layered closure to close both wounds.
6. Cycle the knee to ensure full range of motion. Assess patellar tracking and excursion to validate a sturdy checkrein to lateral translation. **(Figure 12)**

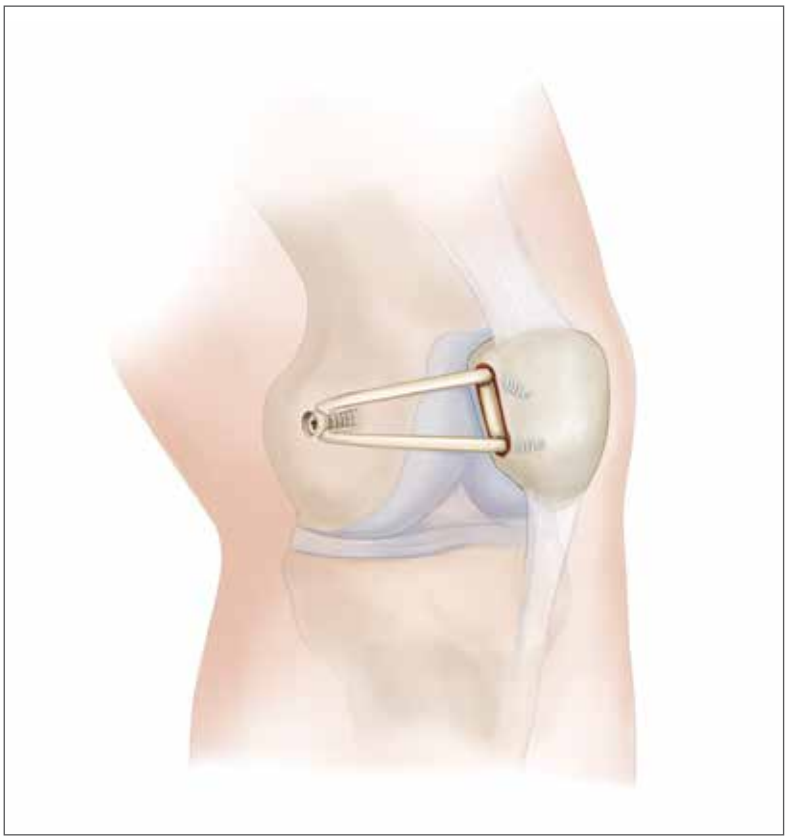

Figure 12 Completed Reconstruction

BIOSURE Driver

BIOSURE PK
Interference Screw

Postoperative Care and Rehabilitation

Use cold therapy to control swelling and pain in the postoperative time period. Motion is not limited in the initial perioperative period. The goal is at least 90˚ of knee flexion and full extension by four weeks with full motion by six weeks after the procedure. A postoperative hinged knee brace or immobilizer is not needed following an isolated MPFL reconstruction. A functional patella-stabilizing brace can be used per surgeon discretion, after the incisions have healed. The patient is allowed full weight-bearing with crutches. Wean the patient off crutches within one to two weeks when the patient demonstrates appropriate quadriceps control and adequate range of motion of the knee. Quadriceps strengthening is progressed in tandem with progress in return of motion. It is important to address concomitant functional issues postoperatively that may contribute to injury. These include conditions such as poor proximal or trunk control (CORE).[11] The patient should demonstrate appropriate dynamic limb stabilization and control prior to return to sports. Return to sports for an isolated MPFL reconstruction is typically around four to six months.

Appendix A

Lateral Retinacular Lengthening

If the lateral structures are tight or shortened, lateral lengthening may be required in order to achieve realignment of the patella for appropriate balancing of the parapatellar structures. On exam, a tight lateral retinaculum can be illustrated by a positive patellar tilt test and demonstration of a J sign. The lateral structures of the knee have been implicated in promoting lateral instability of the patella when the medial structures are compromised (as in patella dislocations).[5,12–14] Therefore, lengthening these structures will permit increased laxity to the structures but maintain a checkrein laterally. By keeping the lateral checkrein, other complications associated with lateral retinacular release can be limited.[15–17]

1. Make a 3-4cm incision based off the lateral aspect of the patella. Identify the full thickness soft-tissue flaps and the superficial oblique retinaculum.
2. Make an incision a few millimeters lateral to the patella from the distal reflection of the vastus lateralis to just past the distal portion of the patella.

   Note:
   Take care to incise only the superficial oblique layer.
3. Elevate the superficial oblique layer laterally from the deeper transverse layer towards the lateral epicondyle.
4. Incise the deep transverse retinacular layer longitudinally near the epicondyle.[15]

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Ordering Information

To order the instruments used in this technique, call +1 800 343 5717 in the U.S. or contact an authorized Smith & Nephew representative.

Prior to performing this technique, consult the Instructions for Use documentation provided with individual components – including indications, contraindications, warnings, cautions and instructions.

ULTRABRAID° Suture

Reference #	Description
7211080	ULTRABRAID #2 White Suture and Needle Assembly, 38", sterile
7210914	ULTRABRAID #2 White Suture and Needle Assembly, 38", Box of 10, Sterile
7211081	ULTRABRAID #2 COBRAID Suture and Needle Assembly, 38", Sterile
7210915	ULTRABRAID #2 COBRAID Suture and Needle Assembly, 38", Box of 10, Sterile
7210914	ULTRABRAID #2 White Suture and Needle Assembly, 38", Sterile
72200886	ULTRABRAID #2 White Suture, 38", Box of 10, Sterile

Burrs

Reference #	Description
7205468	Short Sheath Burr Outer
72200722	4.0 Abrader Burr Elite

HEALICOIL° REGENESORB° Suture Anchor and Accessories

Reference #	Description
72203704	HEALICOIL REGENESORB 4.75mm Suture Anchor with Two ULTRABRAID Sutures (Blue, Cobraid Blue)
72203482	3.5mm HEALICOIL Spade Tip Drill
72203709	HEALICOIL REGENESORB Fully Threaded Dilator, Reusable

BIOSURE° PK Interference Screw and Accessories

Reference #	Description
72202263	7mm x 25mm BIOSURE PK Screw
7211137	Guidewire 1.2mm x 9", Box of 5, Sterile
7211138	Guidewire 1.2mm x 12", Box of 5, Sterile
72201201	Guidewire 1.2mm x 18", Box of 5, Sterile
72201887	BIOSURE Driver
72201888	BIOSURE Ratcheting Handle Driver
7207707	Ratcheting Handle with Hudson Adapter

ACUFEX° DIRECTOR° ELITE Tray and Accessories

Reference #	Description
72202814	Passing Pin, 3.0mm, Spade Tip
72201746	ACUFEX DIRECTOR ELITE ACL Drill Guide System
72201965	ACUFEX DIRECTOR ELITE Soft Tissue Drill Guide System

Caution: U.S. Federal law restricts these devices to sale by or on the order of a physician.

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