Medial Patellofemoral Ligament Reconstruction

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Background: Recurrentlateral patellar dislocation is a devastating condition associated with different pathologies, including medial patellofemoral ligament (MPFL) injury, increased tibial tubercle to trochlear groove (TT-TG) distance, and trochlear dysplasia. This video aims to provide an overview of isolated MPFL reconstruction in a patient with recurrent patellar dislocation and chronic MPFL injury.

Indications: Isolated MPFL reconstruction is indicated for patients with recurrent lateral patellar instability following an initial trial of nonoperative management, in the absence of other contributing anatomic factors. Candidates for isolated MPFL reconstruction should have a TT-TG distance of <20 mm, and normal or Dejour type A trochlear morphology.

Technique Description: Semitendinosus allograft is used to reconstruct the torn or attenuated MPFL. Following diagnostic arthroscopy, an incision is made over the medial border of the patella and dissection is carried through the skin and subcutaneous tissue to the fascia. Two K-wires are over-drilled and two 3.5-mm Arthrex SwiveLock anchors are placed. The allograft is prepared and whipstitched on both sides. The central portion of the graft is tide down to the anchors. A second incision is then made on the medial side of the knee over the epicondyle. Dissection is carried down to the fascia, and palpation is used to identify Schottles' point. This is confirmed with fluoroscopy. An 8-mm drill bit is then used to drill to a depth of 60 mm on the femoral side. The grafts are passed one at a time through the femoral tunnel. The femoral side is fixed with an Arthrex BioComposite Interference Screw and the incisions are subsequently irrigated and closed in a layered fashion.

Results: MPFL reconstruction demonstrates good functional and clinical outcomes with high rates of patient satisfaction and low rates of failure. A recent systematic review demonstrated an 84% rate of return to sport, improved postoperative outcomes, and pooled risks of recurrent instability and reoperation of less than 5% following isolated MPFL reconstruction.

Conclusion: Isolated MPFL reconstruction should be considered for patients with recurrent patellar instability in the absence of other clinical risk factors.

The author(s) attests that consent has been obtained from any patient(s) appearing in this publication. If the individual may be identifiable, the author(s) has included a statement of release or other written form of approval from the patient(s) with this submission for publication.

Keywords: medial patellofemoral ligament reconstruction; medial patellofemoral ligament; MPFL; patellar dislocation; patellar instability

VIDEO TRANSCRIPT

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The medial patellofemoral ligament (MPFL) has a broad-based attachment on the superior aspect of the medial border of the patella, with the midpoint of the ligament located approximately 40% of the total patellar length from the proximal pole of the patella. The ligament runs medially toward the femoral attachments of the adductor magnus tendon at the adductor tubercle, and the superficial *medial collateral ligament* (MCL) at the medial epicondyle. Proximately the MPFL attaches to the distal border of the *vastus medialis oblique* (VMO) muscle. The MPFL can be identified anterior to the medial joint capsule, forming a distinct extra-articular layer of the medial aspect of the knee.

Cadaveric studies have demonstrated that the MPFL is isometric or nearly isometric throughout knee range of motion and is the primary stabilizer against lateral

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patellar translation during the first 30° of knee flexion. Beyond 30° of flexion with the patella fully engages the trochlear groove, and the role of the MPFL is diminished in the face of increased bony restraint. It is important to note that trochlear dysplasia and patella alta can alter the relationship of soft tissue and bony patellar stabilization during knee flexion, and place an increased emphasis on the role of the MPFL in resisting lateral patellar translation.

Patients presenting with first-time lateral patellar dislocation, with no evidence of loose body, are typically managed nonoperatively. Treatment consists of physical therapy with a focus on quad and particularly VMO strengthening as well as core and gluteal strengthening. Patient should be evaluated for and counseled regarding risk factors for recurrent instability. Radiographic findings of patella alta or trochlear dysplasia as well as evidence of ligamentous laxity on physical examination are indicative of an increased risk of failure of nonoperative treatment.

Recurrent lateral patellar instability, despite a trial of nonoperative management, is the primary indication for isolated MPFL reconstruction. Primary MPFL repair is typically contraindicated due to high rates of recurrent instability. Other indications for isolated MPFL reconstruction include a tibial tubercle trochlear groove (TT-TG) distance of <20 mm, normal or Dejour type A trochlear morphology, and the absence of patella alta. The presence of any of these findings should prompt consideration of concomitant bony procedures, including tibial tubercle osteotomy and trochleoplasty.

This patient is a 51-year-old woman who presents with recurrent left patellar instability. The patient reports an index dislocation 2 years prior to presentation with multiple subsequent dislocation events. On examination, she has symmetric knee range of motion, from 0° to 140° bilaterally. She has a negative J sign, but positive patellar apprehension testing on the affected side. She has increased lateral patellar glide in full extension and in 30° of flexion on the affected side compared with the contralateral side, consistent with MPFL injury.

X-rays and magnetic resonance imaging (MRI) were obtained demonstrating evidence of chronic MPFL injury with a normal TT-TG distance of 12 mm. Given these findings, we elected to perform a left knee arthroscopy and isolated MPFL reconstruction with allograft tissue. Allograft is used in all patients, as the literature demonstrates similar improvements in outcomes between allograft and autograft, as well as higher failure rates with use of autograft tissue.

The patient is positioned supine on the operating table. Examination is performed following induction of anesthesia. In this case, the patient has a 3- to 4-quadrant lateral glide in full extension on the affected left side and a 3-quadrant lateral glide in full extension on the right. She has a 3-quadrant lateral glide at 30° of flexion on the left side and a 2-quadrant lateral glide at 30° of flexion on the right side. She has neutral patellar tilt.

Incisions are marked prior to diagnostic arthroscopy, including superolateral and inferolateral arthroscopic portals. All patients undergo diagnostic arthroscopy prior to MPFL reconstruction, to evaluate patellar tracking and the status of the patellar and trochlear cartilage. Arthroscopy is performed via the superolateral portal with the 70° arthroscope, as this allows for excellent visualization of patellar tracking throughout knee range of motion without interference of the arthroscope.

This patient demonstrates grade 3 changes diffusely across her central and medial patellar facets. She tracks laterally from 0° to 40° of flexion and is dislocatable at full extension to approximately 20° of flexion. Following inspection of the patellofemoral joint, chondroplasty is performed as indicated via the inferolateral portal, and diagnostic arthroscopy of the entire knee joint is completed. No additional intra-articular pathology was noted in this patient.

Following arthroscopy, an incision is made over the medial border of the patella. Dissection is carried down through the skin and subcutaneous tissue to the fascia. Layers 1 and 2 are elevated off the patella. A Kelly clamp is then used to define the plane between layer 1 and layer 3, which is left intact. Two K-wires are subsequently placed at the superior third in the middle third of the patella, parallel to the anterior patellar surface. Appropriate anchor position is determined by palpation of the superior and inferior poles, as well as the anterior and posterior aspects of the patella. When drilling, care is taken not to injure the anterior cortex or the articular cartilage.

The wires are over-drilled and 2 preloaded 3.5-mm Arthrex (Naples, FL) SwiveLock anchors are placed. The two sutures of each anchor are separated into a medial and lateral suture. The semitendinosus allograft is then prepared on the back table. In this patient, it was sized to fit an 8-mm femoral tunnel and was cut at 200 mm. It is whipstitched on both sides. The central portion of the graft is then tied down to the anchors. Preloaded anchors are used so that the graft can be tied to the medial aspect of the patella, ultimately allowing for individual tensioning of each graft limb prior to final fixation.

A second incision is then made on the medial side of the knee over the epicondyle. Dissection is carried down to the fascia and palpation is used to identify Schottles' point. The location of Schottles' point is then confirmed fluoroscopically using the mini C-arm. Appropriate position of the patellar anchors is also confirmed at this time.

The fascia around Schottles' point is opened using electrocautery. An 8-mm low-profile drill bit is then used to drill to a depth of 60 mm on the femoral side.

A Beath pin is passed through the femoral tunnel exiting through the superolateral arthroscopy portal. Passing sutures are placed in the Beath pin and pulled through the femur to be used later to facilitate graft passage. The 2 limbs of the graft are then passed between layers 2 and 3 to the medial femoral tunnel. The grafts are passed one at a time through the femoral tunnel. The knee is then cycled several times and good mobility of the patella superiorly and inferiorly is confirmed.

Following cycling, the femoral side is fixed with an Arthrex BioComposite Interference Screw measuring 9 by 28 mm in size. The graft is fixed at 90° of knee flexion. Although the literature has demonstrated no significant difference in clinical outcomes or failure rates following

graft fixation at flexion angles between 20° and 90°, the authors believe that fixation at 90° allows for full engagement of the patella within the trochlea, thus preventing overtightening of the graft that might occur with fixation in lesser degrees of flexion.

Following graft fixation, the knee is again brought through a range of motion. In full extension, the patient has a 2-quadrant medial and lateral patellar glide with an excellent checkrein and endpoint. At 30° of flexion, she has a 1-quadrant lateral glide, and in full extension she has a superior and inferior glide of about 1 quadrant. This degree of patellar mobility provides a checkrein to lateral patellar translation while avoiding over-constraint of the joint.

Simulation studies have demonstrated that allowing 1 quadrant of lateral patellar translation at 30° of knee flexion best prevents lateral patellar translation without increasing contact pressures on the medial patellar facet. Following assessment of patellar motion, incisions are irrigated, and closed in a layered fashion. The patient is then placed in a hinged brace locked in full extension.

Postoperatively the patient is allowed full weightbearing with the knee locked in extension for walking. Knee range of motion is permitted from 0° to 90° in the brace for the first 2 weeks postoperatively. Rehabilitation focuses on reestablishment of quadriceps strength as well as endurance exercises. Return to sport is permitted when the patient demonstrates full knee range of motion, quadriceps and hamstring strength of 90% of the contralateral side, no reactive effusion or instability with sport specific drills, and no patellofemoral symptoms.

Complications of MPFL reconstruction include graft overtightening, patellar fracture, and graft failure. Patellar fracture is rare but usually relates to malposition or excessively large bone tunnels. Graft failure is manifested by recurrent lateral patellar subluxation or dislocation. Risk factors for recurrent dislocation include poor surgical technique as well as predisposing factors such as patella alta, trochlear dysplasia, and lateralization of the tibial tubercle.

MPFL reconstruction demonstrates consistently good functional outcomes with high rates of patient satisfaction and reported failure rates of less than 10%. MPFL repair and nonoperative treatment on the other hand are associated with increased rates of failure. A recent systematic review of outcomes following isolated MPFL reconstruction demonstrated an 84% rate of return to sport, high postoperative patient reported outcomes, and pooled risks of recurrent instability and reoperation of <5%.

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