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Operative Techniques in

Sports Medicine

Strategies for Reconstruction of the Medial Patellofemoral Ligament

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The medial patellofemoral ligament (MPFL) has been identified as the main soft tissue restraint to lateral displacement of the patella. It is almost always injured with a patella dislocation, and as such, repair or reconstruction of the MPFL has become a common surgical procedure when treating recurrent patellofemoral instability. This article describes 3 techniques of MPFL reconstruction, with variations based on the method of fixation of the graft to the patella. Meticulous surgical techniques to try to avoid complications and an understanding of when to address some of the predisposing biomechanical factors causing patellofemoral instability should lead to good postoperative function and patient satisfaction.

KEYWORDS . Patellofemoral instability, MPFL Reconstruction

Introduction

Patellofemoral joint instability is a common surgical problem, with a reported incidence of first time dislocation of 7 per 100,000 across all age groups[1] and 29 per 100,000 between the ages of 10 and 17 years.[2] Recurrent dislocation occurs in 50%-70% with nonsurgical management,[3,4] with the odds of further events increasing almost 7 fold after a second episode.[2] For any individual, the risk is modified by their specific pathoanatomy and activity level.

A number of factors have been identified in the pathogenesis of patellofemoral instability, including trochlear dysplasia, patella alta, increased tibial tuberosity-trochlear (TT-TG) distance (often related to trochlear dysplasia), and ligament hyperlaxity.[5,6] The medial patellofemoral ligament (MPFL) is the primary soft tissue restraint to lateral patella displacement, providing 50%-60% of resistance to lateral displacement,[7-9] and is almost uniformly injured after an acute dislocation.[10]

Over the past 2 decades, an improved understanding of the anatomy[11-13] and biomechanics[8,9,14,15] of this ligament, coupled with a trend toward more anatomical surgery, has lead to the popularization of MPFL reconstruction in the surgical management of patellofemoral instability.

Since the earliest reports of MPFL reconstruction in the early 1990s,[16] many techniques have been described using a variety of grafts[17-27] and fixation techniques.[28-42] In this article, we present 3 techniques for MPFL reconstruction which vary based on the mode of fixation of the graft on the patella:

1. free hamstring autograft with bone tunnel patella fixation (Getgood),
2. free hamstring autograft with soft tissue anchor patella fixation (Hiemstra), and
3. quadriceps tendon autograft left attached to the patella (Fink).

In each technique, arthroscopy is performed prior to the MPFL reconstruction. Intra-articular pathology should be addressed and predisposing factors such as patella alta, excessive lateral position of the tibial tuberosity, excessive lateral patellar tilt, or trochlear dysplasia should be assessed and addressed if indicated.

Patella Bone Tunnel Fixation

The patient is placed in a supine position on the operating table, with a foot roll and lateral rest used to hold the knee at

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Conflict of interest: L.H. is a paid consultant of Conmed Linvatec. C.F. is a paid consultant of Karl Stortz. T.L. and A.G. have no disclosures in relation to the content of this article.
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http://dx.doi.org/10.1053/j.otsm.2015.02.006

approximately 90° of flexion, and a tourniquet applied to the upper thigh. Routine prophylactic antibiotics are given before prior to the inflation of the tourniquet.

Examination under anesthesia is performed first. The degree of medial-lateral patella glide is measured in quadrants with the knee held at 30° of flexion. Lack of medial restraint on lateral patella subluxtion and the ability to fully dislocate the patella should be documented. Should patella tilt or a tight lateral retinaculum be present, a lateral retinacular lengthening or limited release may be required. In our practice, this is required in approximately 15% of cases.

Arthroscopy is performed through standard anterolateral and anteromedial portals. A full diagnostic arthroscopy is performed, paying particular attention to the articular cartilage of the retropatellar surface, the lateral and central trochlea, and the lateral femoral condyle, and careful inspection for loose chondral bodies, which may at times be in the posteromedial or posterolateral compartments. Trochlea groove morphology may also be assessed.

The gracilis tendon is then harvested as a free graft. This is performed via an oblique incision over the pes anserinus insertion (other authors have described harvesting through a popliteal crease approach), avoiding injury to the sartorial branch of the saphenous nerve (Fig. 1A). Whip-stiches are then applied to each end of the graft using a No. 1 resorbable suture (Fig. 1B).

A horizontal incision is made over the medial border of the patella at the junction of its proximal and middle thirds, following Langer's lines (Fig. 1A). The medial retinaculum is incised (layer 1) longitudinally and reflected over the medial third of the patella, and the tunnel positions for the MPFL graft are identified. The proximal tunnel aperture is located on the anterior surface of the patella just below the superior pole. The distal aperture is placed half-way down the medial border of the patella on its medial edge. The bone tunnels are made using a 3.2 mm drill. These should converge with a cortical bone bridge of 1-1.5 cm between the apertures to prevent fracture (Fig. 1C). A passing suture is then passed through the tunnel and used to pass the smaller, musculotendinous end of the graft through the patella tunnel from proximal to distal (Fig. 1D).

A further longitudinal skin incision is then made over the medial epicondyle (Fig. 1A). The subcutaneous fat is bluntly dissected to avoid injury to the saphenous nerve, and the layer 1 fascia divided in the line of its fibers. The medial epicondyle is palpated and the adductor tubercle identified. The femoral attachment of the MPFL is defined as proximal and posterior to a line joining the medial epicondyle and adductor tubercle, as demonstrated by LaPrade et al.[43] Intraoperative fluoroscopy can also be utilized as described by Schottle et al[44] or Stephen et al,[45] which can be particularly useful when teaching residents and fellows to guide initial pin placement (Fig. 1E). Trainees should understand that these reference points are based on a small number of normal cadavers only. They should not be assumed to be correct, as demonstrated by Sanchis-Alfonso.[46] A 2.5-mm eyelet guide pin is then drilled through this attachment point, aiming proximally and anteriorly, and passed through the lateral side of the femur. Blunt forceps are then passed up under layer 1, and the free limbs of the graft retrieved, taking care to avoid twisting the limbs over their course from patella to femur (Fig. 1F). It is very important to make the soft tissue tunnel wide enough so that the graft does not get caught through the flexion range, causing increased tension in the graft and subsequently increasing compressive forces on the patellofemoral articulation.

Final femoral preparation is then performed. The graft is wrapped around the guide pin and the knee passed through a range of movement to check for graft anisometry. If the graft tightens in flexion, the femoral position is too proximal or too anterior. Once the ideal position has been identified, the femoral socket is drilled with a 6-mm cannulated drill to a depth of 30 mm. The guide pin is then used to shuttle the graft sutures through the tunnel. The graft is pulled into the tunnel with the knee at 90° and a hemostat applied to the graft sutures over the lateral skin. In this position, the patella should be engaged in the trochlea without any tension on the MPFL graft. The knee is brought down to 30° of flexion and the amount of lateral patella mobility is assessed (Fig. 1G). At least 1 quadrant of lateral movement should be possible, with a firm end point. If the graft is slack in flexion, but tight in extension, the position is too distal or too posterior. It is vital that the graft is not "tensioned" to avoid overconstraint throughout the range of motion. It is a check rein to lateral displacement; therefore, it is better to have it slightly slack than overtensioned. If the graft is too tight, the hemostat may be released and the graft allowed to slacken. Understanding the physiological laxity of the contralateral normal patella is helpful to avoid excessive tension. The knee is then brought up to deep flexion and graft tension checked at the patella insertion, where no tension should be observed.

Once these checks have been made and found to be satisfactory, femoral fixation is performed with an interference screw (Fig. 1H). Care should be taken to ensure that the screw is not left proud. The wounds are then closed in layers with particular attention to closing the medial retinaculam over the graft on the patella.

Postoperatively, no bracing is used and patients are encouraged to bear weight as comfort allows. As the graft it anatomometrically placed, early aggressive range of motion is encouraged. Medial patella glides are encouraged to help keep the patella mobile; however, lateral movements should be avoided for the first 6 weeks. Isometric quadriceps exercises commence immediately, with closed-chain quadriceps work beginning at 4 weeks. Open-chain exercises are avoided for the first 3 months. Return to sport is encouraged from 4 months once range of movement and neuromuscular control is regained.

Soft Tissue Anchor Patella Fixation

Arthroscopic assessment is performed as noted earlier. This method of MPFL reconstruction is performed using a free tendon graft, either a gracilis or semitendinosus tendon autograft or a soft tissue allograft. The ideal graft length is 22-23 cm depending on the size of the patient. A 1 resorbable