

# Medial Patellofemoral Ligament Reconstruction: Use of All-Suture Anchors for Patellar Fixation and a Dynamic Femoral Attachment



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**Abstract:** The medial patellofemoral ligament is one of the most relevant structures preventing patellar dislocation. Numerous surgical techniques have been described to reconstruct this structure and patellar biomechanics. Complications after this procedure concern both patella and femur. This technique avoids tunneling the patella and the use of intraoperative radiographs by using the adductor magnus tendon insertion.

The medial patellofemoral ligament (MPFL) is a primary static stabilizer and is one of the most important elements in restricting lateral patellar translation. Reconstruction of this ligament has demonstrated reduced lateral instability and improved functional outcomes after dislocation. Recent studies have shown complication rates as high as 25%, making it important to identify techniques to minimize them. Complications are well described in literature, such as arthrofibrosis, limited range of motion, recurrent subluxation, and hardware-related pain, with patellar fracture being one of the most terrifying complications described after this procedure. The purpose of this publication is to present a technique that minimizes the risk of patellar complications and the use of intraoperative radiographs.

## Indications

MPFL reconstruction is performed in patients with objective patellar instability. As in previous studies, the

instability should be evaluated with the patient under anesthesia and requires that there be a soft end point or no end point in lateral patellar displacement either at full knee extension or at 30° flexion. Horizontal lateral mobility should not be larger than 1 to 2 quarters of patellar diameter.<sup>1</sup> When tibial tuberosity trochlear groove distance is greater than 20 mm, a combined MPFL reconstruction and distal realignment of the extensor mechanism of the knee is mandatory.

## Surgical Technique (With Video Illustration)

### Graft Tendon Harvesting

The knee is placed in 90° of flexion and a longitudinal 3-cm incision is performed at pes anserinus insertion and gracilis tendon is harvested at the same fashion for ligament reconstruction. The gracilis tendon is harvested using a closed tendon stripper (Stryker, Mahwah, NJ) and placed on the working table (Stryker) for preparation in a standard fashion. The tendon is sized and stored wrapped in vancomycin-soaked gauze for 5 minutes, as previously published by Perez-Prieto et al.,<sup>2</sup> to reduce the risk of infection (Fig 1), to reduce risk of surgical site infection.

### Patellar Exposure

A 4-cm medial parapatellar incision is performed and medial retinaculum is exposed with blunt dissection. Retinaculum is incised in line with skin incision 2 to 3 mm from the medial border of the patella, preserving enough tissue for posterior repair (Fig 2).

### Femoral Attachment

By palpation, the adductor magnus (AM) tendon insertion at adductor tubercle is detected. We perform

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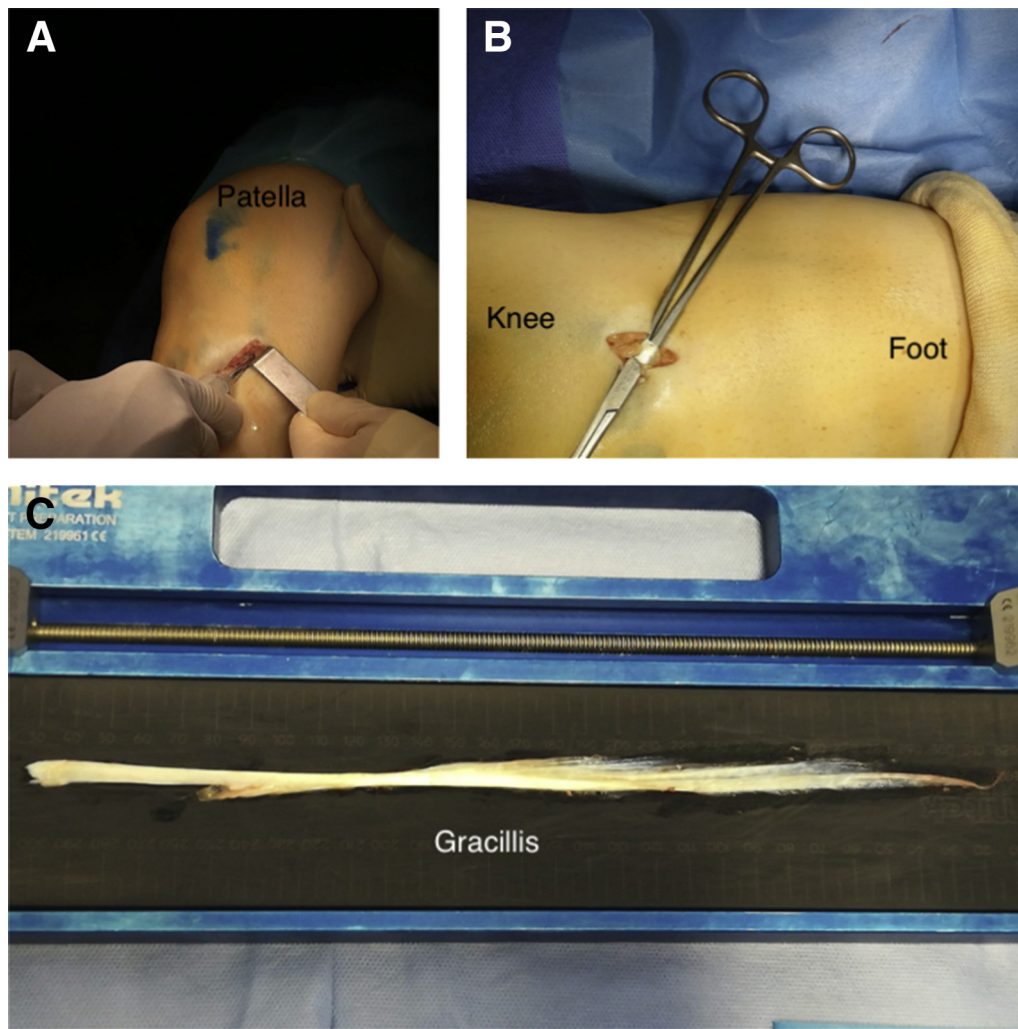
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**Fig 1.** (A) Supine position, the right knee is flexed to 90°, a longitudinal incision one finger breadth medial to the anterior tibial tubercle is made, approximately 3 cm in length. (B) Harvesting of the gracilis tendon at the same fashion as in anterior cruciate ligament reconstruction. (C) Gracilis is prepared on the working table in a standard ligament reconstruction fashion.

another 4-cm skin incision above. A dissection is carried out until the AM tendon is exposed. A no. 2 VICRYL loop (Ethicon, Johnson & Johnson, Somerville, NJ) is passed through the layers 2-3 of the medial retinaculum to the AM tendon as a guide suture. Care must be taken to stay extra-articular (Fig 3).

#### Patellar Fixation

Debridement of the superomedial border of the patella is performed with a rongeur and a 1.4-mm drill is used to drill 2 tunnels in the superomedial patellar border. Two 1.4-mm all-suture anchors (Iconix Intellibraid; Stryker, Kalamazoo, MI) are drilled. Fixation of the graft is secured with locked knots (Fig 4).

#### Graft Pass and Suture

The graft is passed through layers 2-3 of the medial retinaculum. AM hiatus is used as an elastic pulley for the graft. The graft is looped using the AM tendon and

sutured together at 30° of flexion with an ultra-resistant no. 2 suture thread (Force Fiber; Stryker). Tension is calculated on the basis that the patella could still be manually lateralized some 10 mm to avoid overconstraint.<sup>1</sup> The medial retinaculum is closed and stitched to the graft to augment stability (Fig 5) (Video 1). Pearls and pitfalls are listed in Table 1.

#### Rehabilitation Protocol

The knee is braced in extension for 2 weeks. Quadriceps strengthening in full extension and partial weight-bearing are authorized immediately. Full range of motion and normal gait are a milestone from the third week.

#### Discussion

The need to repair the MPFL after the first episode of patellar dislocation seems to be clear in the literature.



**Fig 2.** Supine position, right knee, medial view. (A) Adductor magnus tendon is identified and dissected. (B) Guide suture is placed between 2-3 layers of the medial retinaculum, so it remains extra-articular (arrow).

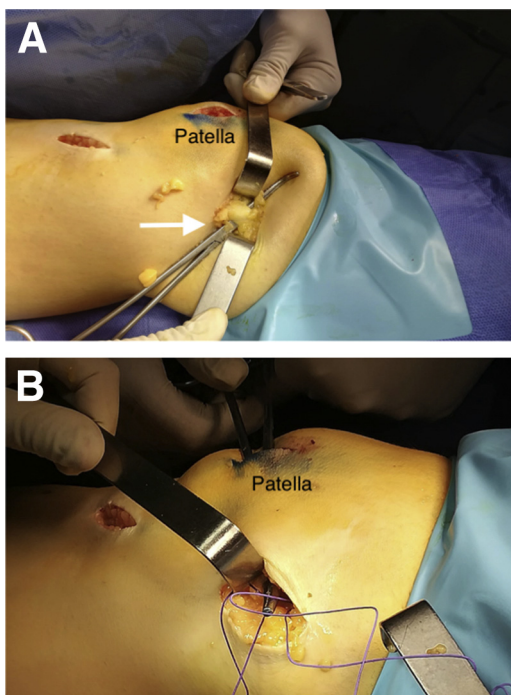
The recurrence rate after the first patellar dislocation approaches 40%, and a history of a previous instability episode has been associated with the greatest risk of subsequent instability episodes.<sup>3</sup> Neri et al.<sup>4</sup> describe the rupture of the MPFL between 95% and 100% of

cases after acute lateral patellar dislocation. Huber et al.<sup>5</sup> clearly show the alteration of the patellar biomechanics in knees with a MPFL injured. A lateralization of 1 to 5 mm in the first 30° in flexion has been associated with patellar instability. As a result of this, it would be mandatory to carry out the MPFL reconstruction in the general population and, even more, in the sport population.

Currently, “à la carte” treatment<sup>6</sup> is performed, depending on the characteristics of the patient, but the MPFL reconstruction has gained historically supporters for its good published results.<sup>7</sup>

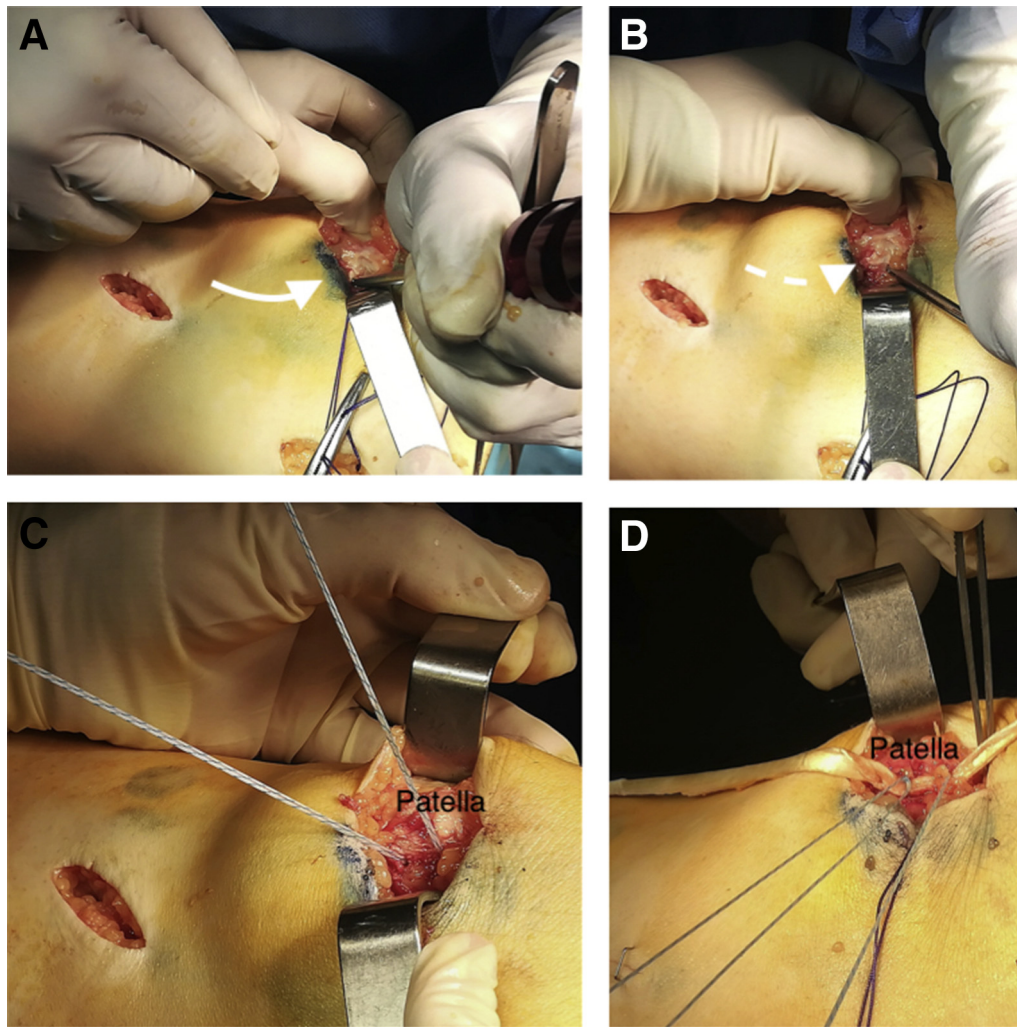
McNeilan et al.<sup>8</sup> studied different graft choices for medial patellofemoral reconstruction, showing no superiority between autograft and allograft or synthetic grafts. All of them showed low rates of complications and good-to-excellent results. Within this, there were no significant differences between the use of gracilis, semitendinosus, adductor, or quadriceps tendons. Taking into account that the force that an MPFL has to endure is 200 N under normal conditions,<sup>9</sup> the force offered by an autologous gracilis tendon fascicle would be 4 times greater than the requirements<sup>10</sup> and therefore valid. Furthermore, the length of this tendon would be sufficient to create a double band that would lead to a resistance 8 times greater than the native MFPL.

One of the main complications of MPFL reconstruction techniques is the patellar fracture, even in an atraumatic setting. This response to a nonphysiological tunnel positioning that supports activity loading stresses. With this technique, we avoid the tunnels that would weaken the patella. Makovicka et al.<sup>11</sup> noticed the difference between patellar bone tunneling and all-suture anchors.



**Fig 3.** Supine position, right knee, medial view. (A) Adductor magnus tendon is identified and dissected (arrow). (B) Guide suture is placed between 2-3 layers of the medial retinaculum, so it remains extra-articular.





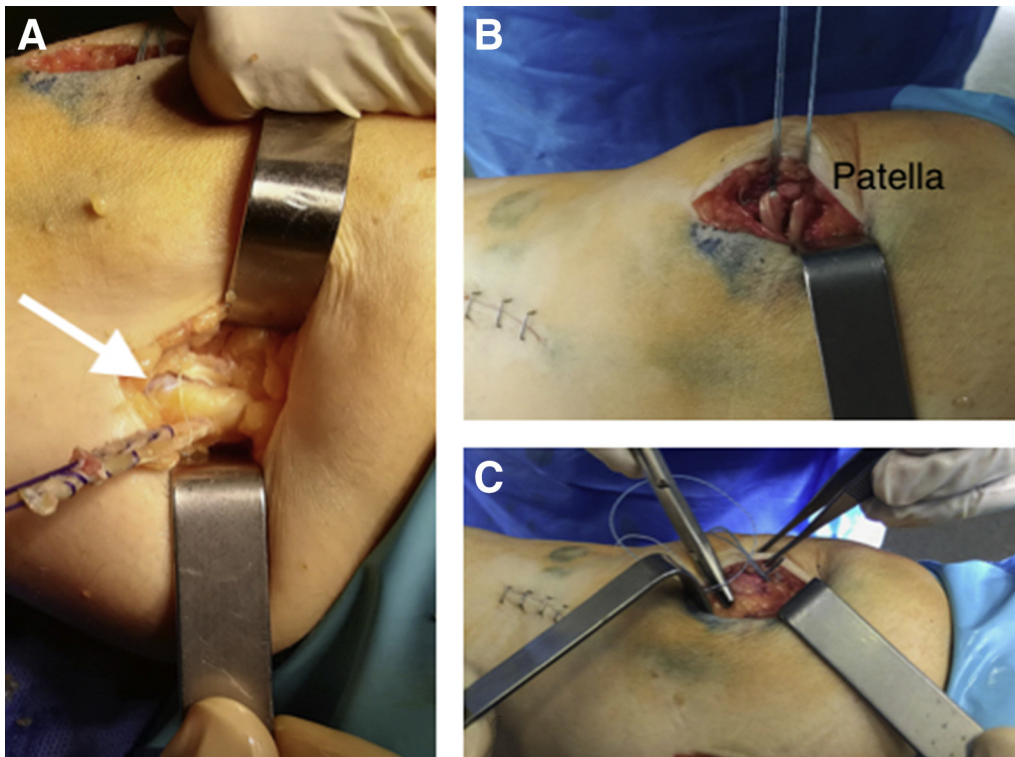
**Fig 4.** Supine position, right knee, medial view. (A) Drilling of the medial all-suture anchor (white arrow). (B) Drilling of the superomedial all-suture anchor (dotted arrow). (C) Nonabsorbable sutures from both anchors. (D) Fixation of the graft using locking knots.

Drilling the patella avoiding both the anterior cortex and the articular surface is a complicated technique for the surgeon and would increase the risk of patellar fracture. Furthermore, the all-suture anchors technique avoids a new lateral parapatellar incision that would augment the risk of infection and decrease surgical cosmesis. Bonazza et al.<sup>12</sup> not only studied the risk of patellar fracture but also, tunneling would cause a loss of graft length; that plasties with a larger diameter will need larger tunnels and that the revision of that surgery would be more complex.<sup>13</sup>

Femoral fixation has been an important point to study in the reconstruction of the MFPL trying to resemble it to the native ligament and achieving an isometric point that reproduces it more reliably.<sup>14</sup> The technique proposed by Monllau et al.<sup>15</sup> avoids the use of intraoperative radiographs to look for the isometric point (Schottle's point)

and furthermore, performing a nonanatomical and quasi-isometric fixation on the tendon of the adductor magnus that would not alter the femoropatellar pressures in the complete range of motion of the knee and getting a lateral patellar restriction and, therefore, its stability. This is due to the proximity of this tendon to the natural insertion of the native MFPL and the elasticity that it would provide to replace the difference in length at complete knee mobility.

Clinical and functional outcomes in the general population are very good and complications and dislocation rates are lower after surgery. In the athletic population, the considerations must be different and more demanding. As noted previously, surgery is imperative for recreational athletes with the intention of returning to play after the injury. Menetrey et al.<sup>16</sup> consider both objective and subjective aspects to begin sports activities: 1, no pain; 2, no instability; 3, no effusion; 4,



**Fig 5.** Supine position, right knee, medial view. (A) Graft is looped around A tendon and sutured itself (arrow). (B) View of patellar fixation. (C) Closure of retinaculum.

complete range of motion; 5, 85% to 90% of the strength compared to the contralateral; and 6, good dynamic stability. Some authors consider timing<sup>13</sup> essential (approximately 6 months), others propose specific programs for rehabilitation and test batteries to objectively measure patellar stability,<sup>17-19</sup> so do we. Despite that, between 53% and 69% of the athletes will return to their preinjury sports level.<sup>20-22</sup>

This surgical technique presents several advantages. It's simple, safe, and reproducible. No tunneling the

patella avoid weakness after surgical procedure and risk for patellar fracture. The use of AM tendon as a reflexion pulley has shown to be a reasonable attachment at the femoral site. There is no need for intraoperative radiographs because of this anatomical landmark. Limitations of this technique are that the use of a quasi-anatomic femoral attachment insertion could be questionable, but the use of a dynamic femoral insertion is advantageous, as the exact femoral insertion of the MPFL is still under debate (Table 2).

**Table 1.** Tips, Pearls, and Pitfalls

Pearls	Pitfalls and Risks
Save the tendon in a gauze soaked in vancomycin to reduce the risk of infection.	
In the proximal two-thirds of the patella, drill 2 convergent holes for the insertion of all-suture 1.4-mm implants.	Avoid drilling the patella on its inferior part.
The graft is passed through the layers 2 and 3 of the medial retinaculum. This must be taken into account because the vastus medialis inserts superficially to MPFL insertion.	
After reconstruction, a lateral translation of 10 mm is recommended to avoid overtightening.	Overtension must be avoided. It can lead to arthrofibrosis because of pain.
Limb is placed in a knee orthosis in full extension.	

MPFL, medial patellofemoral ligament.

**Table 2.** Advantages and Disadvantages

Advantages	Disadvantages
No radiographs	Quasi-anatomical
Dynamic femoral insertion	
No patella tunneling	

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