Technical Note

Posterolateral Intra-/Extra-articular Tenodesis Technique: A Technique for Lateral Tenodesis of the Knee

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Abstract: Posterolateral tenodesis is necessary for restoring biomechanics in posterolateral instability of the knee. We propose a technique that provides the tenodesis effect to both intra- and extra-articular aspects of the knee. We call it the posterolateral intra-/extra-articular tenodesis technique, which is a technique for posterolateral reconstruction. This minimally invasive technique is particularly helpful in patients with high-grade posterolateral corner injury with the advantage of precise placement of the graft.

Posterolateral rotatory instability of the knee often occurs in association with anterior cruciate ligament (ACL) injury. Patients with ACL injury who have posterolateral rotatory instability of the knee usually require restoration of the knee when ACL reconstruction is performed to lower the risk of ACL reinjury.

A study found that about 20% of ACL injuries involve injuries of the posterolateral corner (PLC),[1] such as the lateral collateral ligament or the popliteus tendon. Misdiagnosis of such injuries could result in comorbidity. Many techniques have been proposed to restore these structures. Usually, a large incision is necessary to achieve graft reconstruction.[2] We propose a simple technique with a small incision to restore these structures to restore the rotational stability of the injured knee. We call it the posterolateral intra-/extra-articular tenodesis (PLATE) technique.

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Surgical Technique

The patient is placed in the supine position. The gracilis tendon is harvested in a standard manner. Both ends of the graft are placed with a whipstitch using an absorbable suture. The site of the skin incision is located by palpating the skin on the lateral side of the femoral condyle, where the skin is illuminated by the light from the arthroscope. The popliteus tendon insertion is identified arthroscopically at the lateral condyle of the femur. After the location is identified, an 18-gauge needle is used to mark the location for the graft tunnel. The needle is pointed toward the anterior aspect of the popliteus tendon and lies adjacent to the tendon (Fig 1). Next, an incision is made about 3 cm from superior to inferior, parallel to the iliotibial band. A guide pin is inserted at the marked location, from the lateral side to the superomedial side of the knee. A 6-mm reamer is used to create a tunnel of 3 cm in depth (Fig 2). Then, a suture is passed by using the end of the guide pin, leaving the loop side laterally for passing of the graft in later steps. After completion of the femoral tunnel, the iliotibial band is identified by retracting the subcutaneous tissue. Distally, the proximal fibula is then identified, and a 4-cm vertical incision is made above the head of the fibula. By meticulously removing the surrounding soft tissue, ensuring not to injure the common peroneal nerve, the surgeon performs removal of some muscle attached to the bone using a periosteal elevator. Then, a 4.5-mm drill is used to create a tunnel at the proximal fibula (Fig 3). The graft is placed inside the fibular tunnel with the tunnel at the middle of the graft. At the first incision, a clamp is

placed underneath the superior part of the iliotibial band and exits the iliotibial band (Fig 4). The clamp retrieves both ends of the graft to pass through the iliotibial band. Next, both ends of the graft are placed in the loop of the previously prepared suture, which resides in the femoral tunnel. Then, the graft is shuttled into the femoral tunnel, leaving both suture ends of the graft at the medial aspect of the thigh (Fig 5). A guidewire for an interference screw is inserted into the femoral tunnel, adjacent to the graft. The graft is then tightened manually, and an interference screw with a diameter of 7 mm is inserted (BioScrew; ConMed, Utica, NY) with the knee in slight flexion and internal rotation (Fig 6). The skin is closed in a routine fashion (Video 1).

Rehabilitation

Knee range of motion of 0° to 30° in a dial-lock knee brace is advised 2 weeks after surgery. Gradual passive motion of the knee is performed. Knee flexion is increased until 90° of flexion is reached at 6 weeks postoperatively. Isometric strengthening of the quadriceps is performed routinely. Walking with weight as tolerated with axillary crutches is recommended. If there are associated meniscal injuries, weight bearing is allowed after 4 weeks postoperatively.

Discussion

The posterolateral intra-/extra-articular tenodesis technique is a simple and safe procedure to restore posterolateral rotational and varus stability of the knee. The procedure restores both the intra- and extra-articular structures of the knee, where lateral

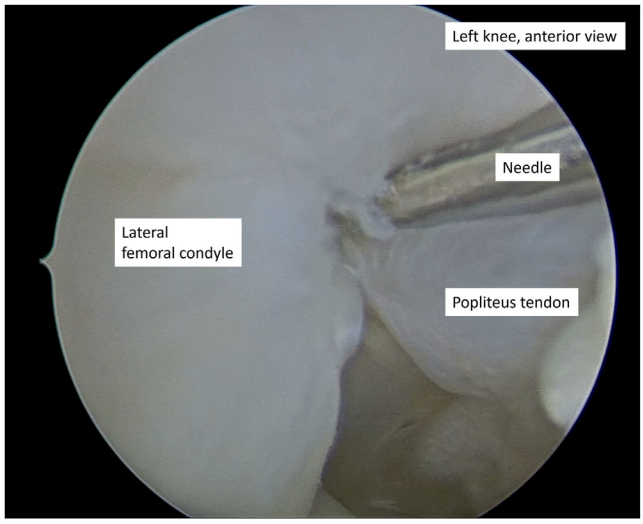

Fig 1. The left popliteus tendon insertion is identified arthroscopically at the lateral condyle of the femur. After the location is identified, an 18-gauge needle is used to mark the location for the graft tunnel.

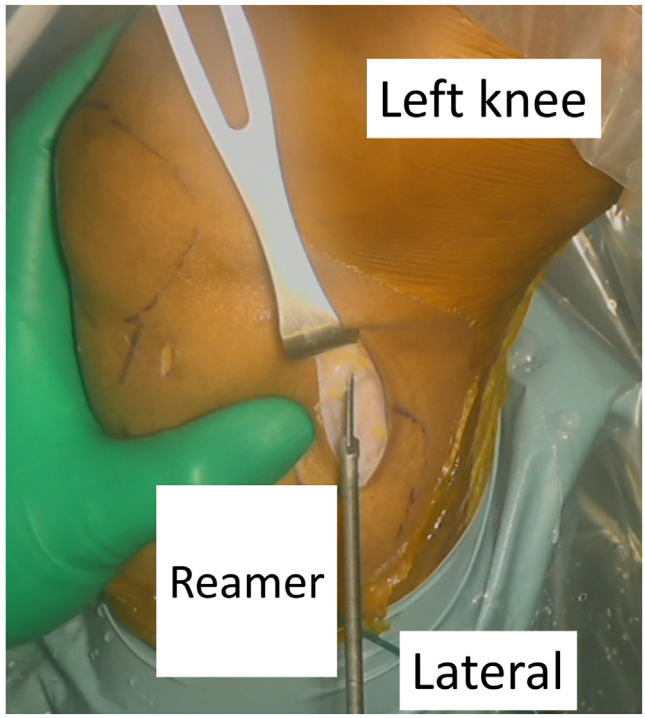

Fig 2. A 6-mm reamer is used to create a tunnel of 3 cm in depth in a left knee.

Fig 3. A guidewire is inserted to prepare a tunnel at the proximal fibula in a left knee, after which a drill is used to create the tunnel.

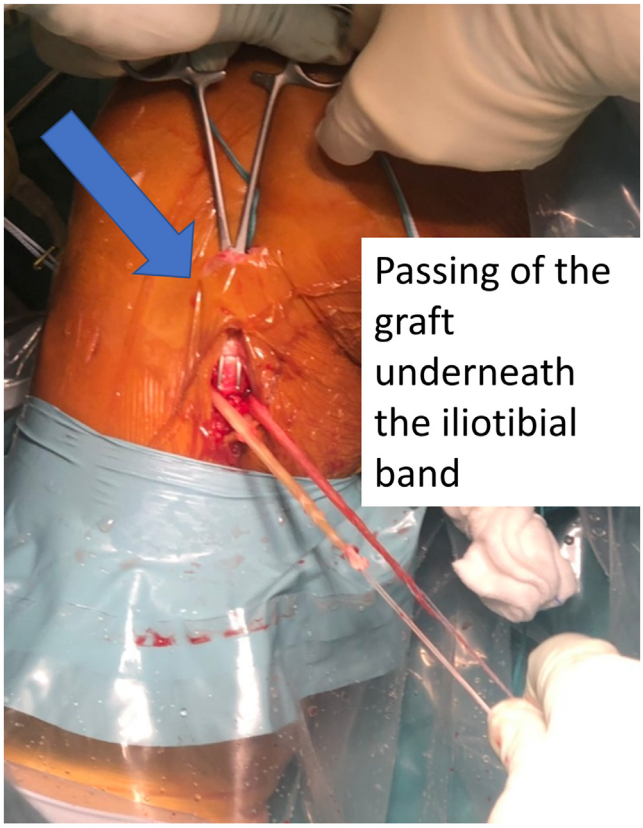

Fig 4. A lateral-side view of the left knee shows a clamp placed underneath the iliotibial band for graft passage. Blue arrow indicates clamp that placed underneath the skin and iliotibial band.

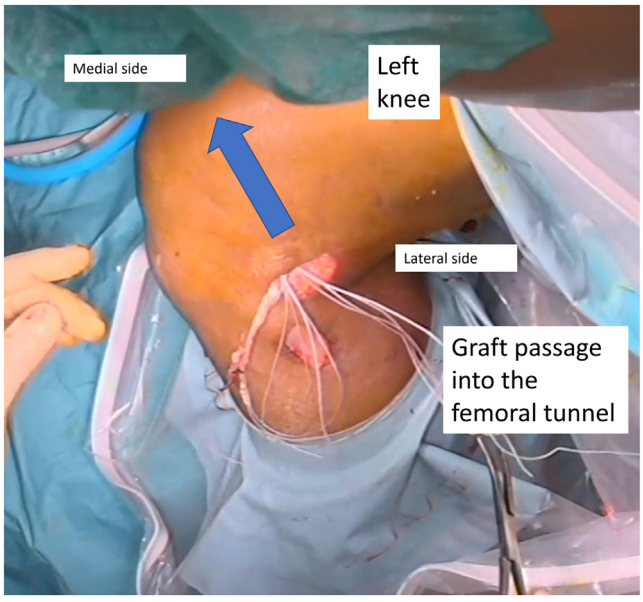

Fig 5. A lateral-side view of the left knee shows passage of the graft into the femoral tunnel, from lateral to medial, by pulling the suture loop. Blue arrow indicates direction of pulling the suture loop.

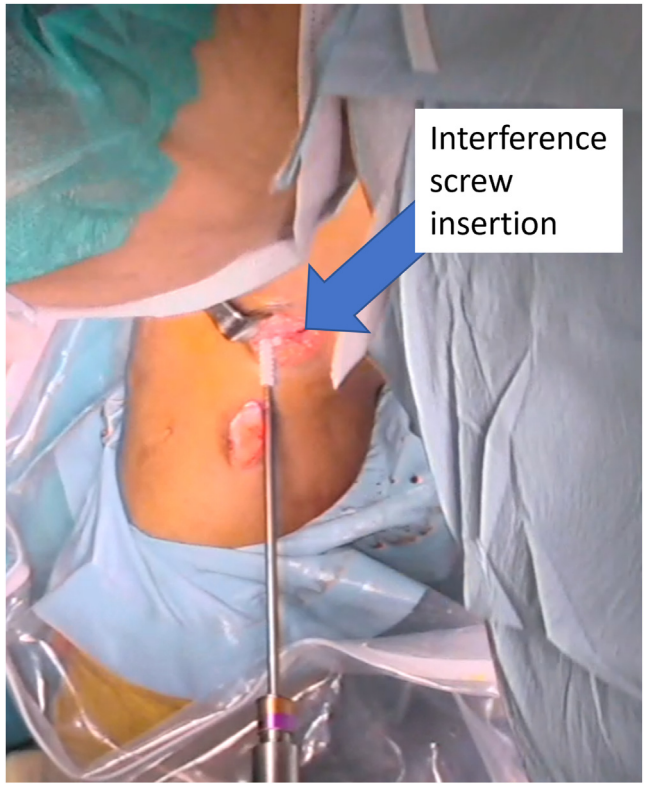

Fig 6. A lateral-side view of the left knee shows graft fixation at the femoral tunnel by an interference screw. Blue arrow indicates an interference screw was inserted through the incision on the femoral side.

structure injury is not uncommon in cruciate ligament injuries. Moreover, the method requires a small incision that respects the soft tissue by use of an arthroscope. This lowers the risk of increased pain postoperatively and encourages postoperative rehabilitation.

PLC injuries are frequent when an ACL injury is present. The most common PLC injury with ACL tear is inferior popliteomeniscal fascicle injury, followed by superior popliteomeniscal fascicle injury.[3] When left untreated, knees with PLC injuries typically exhibit functional instability.[4] A series from Temponi et al.[1] found a combined injury rate of about 20%. Restoration of the rotational stability in ACL injuries has been reported to lower the risk of ACL reinjury. It is recommended to undertake reconstruction or a combined hybrid repair within 3 weeks of the injury when the workup shows a combined acute PLC and ACL injury.[5] Failure to identify a PLC injury during ACL surgery immediately results in increased tension in the ACL graft, potentially leading to graft failure.

PLC repair is not recommended because of its high failure rate.[5,6] PLC reconstruction is usually performed after an injury to the PLC because of the lower failure rate despite the variety of reconstruction techniques.[2]

Table 1. Advantages, Limitations, Pearls, and Pitfalls

Advantages
Allows combination of intra- and extra-articular tenodesis in 1 procedure
Small incision
Allows precise insertion of femoral attachment of graft
Requires 1 graft for procedure
Controls both rotational and varus instability
Low cost because of minimal use of implants
Limitations
May require additional graft if ipsilateral hamstring graft has been used
Requires stable proximal tibiofibular joint
Pearls
Identification of the popliteus tendon insertion is performed arthroscopically, which will create a consistent graft insertion in every case.
The guide pin is aimed superomedially to reduce the chance of the pin entering the intercondylar notch.
The surgeon should not go below the biceps femoris insertion to avoid injury to the common peroneal nerve.
Passing of the sutures should be performed meticulously to prevent further damage to the soft tissue.
Pitfalls
The inability to identify the insertion of the popliteus tendon can lead to incorrect positioning of the graft attachment site.

Regarding the aforementioned rotatory instability, there are many proposed techniques for addressing the issue.[7-10] Our technique involves restoring the lateral structures of the knee, namely the lateral collateral ligament and the popliteus tendon. The anterior limb of the graft will enhance the stability of the lateral collateral ligament. The posterior limb of the graft will provide stability from the popliteus tendon. The procedure also provides a simple technique with a small incision that allows for early rehabilitation postoperatively. Advantages, limitations, pearls, and pitfalls are provided in Table 1.

Disclosures

The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

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