Technical Note

One-Stage Posterior Cruciate Ligament Inlay Reconstruction Combining Anterior Cruciate Ligament Reconstruction Following Knee Dislocation

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Abstract: Knee dislocation is a rare but severe injury that involves damage to the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), lateral or medial ligamentous structures, and other soft tissues or bony structures surrounding the knee joint. No consensus exists regarding the best treatment method. This work presents a method of 1-stage ACL and PCL reconstruction in which a contralateral quadriceps tendon–bone autograft with tibial inlay technique is used for the PCL and contralateral hamstring tendon autograft with suspension fixation is used for the ACL. After harvesting grafts, the patient is put in the lateral decubitus position. Under arthroscopy, the femoral tunnel for the anterolateral bundle of the PCL is created using an 8-mm reamer via a prepositioned guide pin. Next, the tibial tunnel of the ACL is created with an appropriate diameter cannulated reamer. Directed by the femoral guide instrument with a 7-mm offset, a guide pin is positioned retrograde through the tibial tunnel. A reamer is then used to create a 35-mm long closed-ended femoral tunnel for the ACL. A posterior arthrotomy for the PCL inlay technique is performed. After capsulotomy, a unicortical window is created at the footprint of the PCL and the inlay graft is fixed using a 3.5mm-cancellous screw and washer. The PCL graft is then passed into the femoral tunnel. The ACL graft is passed in a retrograde fashion using the Beath pin. The ACL graft is fixed by tying with a washer on the femoral side and by tying with a screw on the tibial side. The PCL graft is then fixed on the femoral side. **Key Words:** Knee dislocation—Cruciate ligament—Arthroscopy—Tibial inlay technique.

Dislocation of the knee is a rare but serious injury that may include damage to the cruciate ligaments, collateral ligamentous structures, joint capsule, neurovascular structures, and other soft tissue or bony structures. Generally, the anterior cruciate ligament (ACL) and the posterior cruciate ligament (PCL) are both injured in knee dislocation, although single cruciate ligament injury is also possible.[1-4] Most diagnosed cases can be reduced by manual manipulation. After reduction, controversy exists regarding the optimum treatment of knee dislocation. Surgical repair or reconstruction appears to achieve better results than conservative treatment.[5,6] Various methods for reconstructing the ACL and PCL after knee dislocation have been proposed. These methods include 1-stage reconstruction of the isolated PCL, 1-stage reconstruction of both the ACL and PCL, or 2-stage reconstruction of the PCL and then the ACL. The reconstruction can be performed using various grafts, including allograft or autograft.[7-13] Previous studies obtained con-

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Table 1. *Three-Stage Program in Acute Knee Dislocation*

Stage I (emergent and urgent condition)
Determine dislocation status: reduction and splinting or external fixation
If vascular injury, repair or vein graft
If compartment syndrome, fasciotomy
Soft tissue status (open dislocation or crushing injury), wound debridement and repair
Stage II (in 1–3 weeks)
MCL, PL injuries, repair
Meniscus injuries, repair or meniscectomy
Avulsed cruciate ligament fracture, repair
Chondral or osteochodral fragment, repair or remove
Nerve injury, repair or release if necessary
Achievement of full range of motion
Stage III (in 4–12 weeks)
ACL tear, ACL reconstruction
PCL tear, PCL reconstruction

Abbreviations: MCL, medial collateral ligament; PL, posterolateral structures of knee.

troversial results owing to small case numbers and various severities of injury. In this article, we propose a method of 1-stage ACL and PCL reconstruction following stabilization of knee soft tissues and under the condition with near-full range of motion preoperatively. The PCL is reconstructed using contralateral quadriceps tendon–bone autograft with the inlay technique, and the ACL is reconstructed using contralateral semitendinosus and gracilis tendon (hamstring tendon) autograft with the suspension fixation technique.

SURGICAL TECHNIQUES

Timing of Surgery

A 3-stage program is proposed for treating knee dislocation (Table 1). In stage I, the emergent conditions of dislocation, vascular injury, compartment syndrome, and open-type dislocation are carefully and properly treated. Splinting or external fixation is applied after reduction in cases with an unstable knee. In stage II (1 to 3 weeks), the lateral or medial collateral ligaments are repaired. Furthermore, the torn meniscus and chondral fragments are repaired or removed. If necessary, a neurolysis or repair for nerve injury is performed during this stage.[14] Passive range of motion exercise is encouraged for better range of motion recovery. During stage III (4 to 12 weeks), 1-stage reconstruction of the ACL and PCL is performed once near full range of motion is achieved in the knee joint.

Preparation for Tendon Harvesting

The patient is placed in the supine position for harvesting the contralateral autograft. A tourniquet is placed on the proximal thigh of the uninjured leg. The leg is prepared and draped in the standard sterile fashion.

Technique for Harvesting the Contralateral Semitendinosus and Gracilis Tendon Autograft

An oblique incision of approximately 3 cm is made 1.5 cm medial to the tibial tubercle and extending distally to harvest the graft and periosteum. Dissection is carried down through the subcutaneous tissue to the sartorius fascia. Next, the underlying semitendinosus and gracilis tendons should be palpated and identified individually. The sartorial fascia is incised over the interval between the gracilis and semitendinosus tendons. Next, both tendons should be individually identified and isolated; the gracilis tendon is the proximal tendon and the semitendinosus is the distal one. A Penrose drain tube is passed around the semitendinosus tendon. A running baseball whipstitch of No. 2 Ethibond suture (Ethicon, Somerville, NJ) is placed up and down for 1.5 cm. The tendon is then detached from its insertion. While holding the sutures under tension, blunt and sharp dissection is performed around the tendon to ensure adequate release of all accessory fascial bands before tendon stripping. The tendon is then harvested using the tendon stripper with knee flexion and traction applied on the grasping suture. The gracilis tendon is similarly harvested.

Technique for Harvesting the Contralateral Quadriceps Tendon–Patellar Bone Autograft

A short midline incision is made approximately 4 cm from the mid-patella, extending proximally to provide adequate exposure. The fascial and multiple aponeurotic layers in front of the anterior surface of the patella then are incised longitudinally. The osseotendinous junction of the quadriceps tendon at the upper patellar pole is then identified. Next, a 10-mm wide marker is made at the center of the upper patella, and extended proximally along the main fiber axes of the rectus femoris. The proximal portion of the patella is prepared using a bone plug 10 mm wide, 10 mm long, and 8 mm deep. The bone plug is fashioned with a flattened surface and prepared for accepting a 3.5-mm cancellous screw through predrilling and pretapping. Subsequently, the quadriceps tendon, comprising the full thickness of the rectus femoris and a partial thick-