Posterolateral Corner Reconstruction

Fibular-Based Technique

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The posterolateral corner of the knee has been referred to as the “dark” side of the knee. It has earned this reputation from the complexity of its anatomy and the poor predictability of outcomes with the widely varied surgical reconstructions. Multiple techniques to reconstruct the posterolateral corner have been described. However, none has emerged as a gold standard in either chronic or acute situations.

Our technique has evolved over time to a fibular-based technique for several reasons. First, the technique can be performed with a single, autograft hamstring tendon, which is easy to harvest and provides consistently good tissue for grafting. Second, the technique is relatively easy to master and requires a minimum of tourniquet time. Third, remaining native tissue can be preserved and incorporated into the reconstruction construct. Fourth, no tunnels are required that may collide with the femoral anterior cruciate ligament tunnel in combined reconstructions. Finally, it also offers the advantage of avoiding allograft tissue, which can be of variable quality and is associated with a higher infection rate. Allografts also take longer to revascularize and incorporate into host tissue than autograft.

A fibular-based technique preserves native tissue and therefore can be used as a purely reconstructive technique or to augment an acute repair. Techniques that require more dissection behind the tibia create additional iatrogenic injury to native tissue and prolong the case. A recent study compared the biomechanical results of a fibular-based reconstruction to a combined fibular and tibial-based reconstruction. The knees were stressed in varus and external rotation at both 30° and 90° and compared to the intact side. There were no statistical differences between the fibular and combined techniques.

A fibular-based technique can be used in all posterolateral corner injuries, both acute and chronic. This includes instances with associated tibiofibular dislocations. In this situation, the fibula is stabilized to the tibia with a 6.5-mm cancellous screw, and the posterolateral corner reconstruction is then performed in the usual manner. In our experience, the screw fixation has been adequate to keep the fibula reduced and allow secure healing of both the posterolateral corner and the proximal tibiofibular joint.

Larson et al evaluated the isometry of the ligaments on the lateral side of the knee. They demonstrated the fibular head is isometric to the epicondyle throughout knee range of motion. Their data showed a graft taken from any position on the fibular head to the lateral epicondyle would provide restraint to varus stress at any position of knee flexion. The posterior aspect of the fibular head had a more isometric relationship with the anterior portion of the lateral epicondyle. Similarly, the anterior fibular head had an isometric relationship with the posterior aspect of the lateral epicondyle. If our reconstruction is performed correctly, both limbs should be isometric. The first limb leaves the anterior fibula and wraps around the posterior aspect of the screw in the lateral epicondyle. The second limb courses from the posterior fibular head and wraps around the same screw anteriorly. The anterior limb of the graft reproduces the lateral collateral ligament (LCL). The posterior limb represents the course of the popliteofibular ligament. This is not an anatomical reconstruction of the ligament. It does provide isometric fixation that will provide support throughout range of motion on the posterolateral aspect of the knee. In the same study, Larson et al also demonstrated a graft coursing from the lateral...
the two incisions. A full-thickness soft-tissue flap is then simultaneously, a 7-cm skin bridge should be left between and bisecting Gerdy's tubercle and the fibular head dis-

majority of acute injuries and reconstruct chronic ones. A diagnostic arthroscopy is performed prior to the procedure to confirm any suspected ligamentous injuries. A tourniquet is placed high on the thigh, and a lateral valgus bar is placed on the bed at the level of the tourniquet. A diagnostic arthroscopy is performed prior to reconstruction in both acute and chronic injuries. At this time, the knee should be assessed for any injuries or damage to the articular cartilage, menisci, or cruciate liga-
ments. Checking the popliteus and lateral meniscus for damage is essential. A varus load should be applied to the knee while inspecting the medial compartment. Separation of the medial femoral condyle from the medial tibial plateau of 10 mm at the midportion of the compartment confirms incompetence of the posterolateral corner. Typically, cruciate reconstruction is performed at this time prior to the posterolateral corner reconstruction.

After the arthroscopic portion of the procedure, the leg is exsanguinated and the tourniquet elevated. The semitendinosus tendon is harvested in a standard fashion. On the back table, all muscle tissue is removed from the tendon. The tendon is tubularized, and no. 2 nonabsorbable suture is run through both ends to aid graft passage through the bone tunnel and soft tissue.

In an acute injury, repair of all damaged structures also should be performed. This is best performed within 2 weeks of the injury. This repair should be performed as soon as possible after injury to allow identification of damaged structures before the formation of abundant scar tissue. Proximal and distal avulsion injuries can be repaired with direct sutures to bone, suture anchors, or soft-tissue screws and washers. We prefer to augment the majority of acute injuries and reconstruct chronic ones with our fibular-based reconstruction.

A longitudinal incision is made on the lateral side of the knee centered on the lateral epicondyle proximally and bisecting Gerdy's tubercle and the fibular head distally (Figure 1). If performing a cruciate reconstruction simultaneously, a 7-cm skin bridge should be left between the two incisions. A full-thickness soft-tissue flap is then made down to the iliotibial band. At this point, the peroneal nerve is identified in the soft tissue, proximally behind the biceps femoris. The nerve is marked with a vascular loop and protected throughout the entire procedure.

The deep structures through the lateral soft tissue are exposed through the three windows as described by Terry and LaPrade (Figure 2). The first window is a longitudi-

nal split in the iliotibial band centered on Gerdy's tubercle and extending proximally. This exposes the femoral attachment of the LCL and the insertion of the popliteus tendon on the femur, as well as the insertion of the bi-

cess femoris to the fibula. A longitudinal incision is made through the deep fascia anterior and parallel to the LCL to allow for evaluation of the insertion of the popliteus, the lateral meniscus, the anterior portion of the popliteofibular ligament, and the structures of the popliteal hiatus. The inferior lateral geniculate artery will be transected by this incision and must be ligated.

Next, the femoral attachment of the LCL and the insertion of the popliteus are identified. A 6.5-mm soft-tissue screw and washer is used as an anchor and placed at “ground zero,” which is a point equidistant between the femoral attachment of the LCL and the insertion of the popliteus tendon (Figure 3). Before placing the screw, the soft tissue between the attachment sites of the LCL and popliteus are elevated off the bone. The drill bit has a countersink that removes soft tissue and creates a bleeding bed to stimulate healing of the graft at the femoral attachment site. The screw is then inserted and advanced most of the way, with just enough protruding to allow passage of the graft below the screw.

The peroneal nerve is then freed down to where it crosses the fibular neck and protected. A tunnel is drilled anterior to posterior through the fibular head using a 7-

mm acorn reamer over a guide wire (Figure 4). The tun-

gle should traverse the fibular head approximately 1 to 1.5 cm distal to the proximal tip of the fibular head. This allows adequate bone bridge proximal to the tunnel and provides protection for the peroneal nerve distally. The semitendinosus tendon is then passed through the tunnel in the fibular head. The posterior limb is passed under the biceps femoris and underneath the iliotibial band up to the screw at the femoral attachment site. The anterior limb is passed underneath the iliotibial band up to the same site. The limbs of the graft are crossed in a figure-of-eight fashion around the screw, leaving the posterior limb longer than the anterior limb (Figure 5). With the knee flexed 30° valgus, internal rotatory forces are placed on the knee, and the screw and washer are tightened with tension on the tendon graft. Stability is checked. The longer posterior limb is usually long enough to be passed into the bone tunnel in the fibular head. The passing sutures are then tied to each other, and the graft limbs are sewed to each other for added support.

The incision in the lateral capsule and the iliotibial band are both closed. The skin is then closed after copious irrigation. We like to keep the patient with the knee locked in extension for 4 to 6 weeks, and then gentle range-of-motion exercises are started.
Figure 1. The longitudinal incision crosses the lateral epicondyle proximally and bisects Gerdy’s tubercle and the fibular head distally. Figure 2. The lateral side of the knee is exposed through the three windows. The first window divides the iliotibial band starting at Gerdy’s tubercle and splits proximally. The second window is in the space between the biceps femoris and the iliotibial band. The third window is posterior to the biceps femoris. Figure 3. The position of the drill hole is at “ground zero,” which is a point equidistant from the femoral attachment of the lateral collateral ligament and the insertion of the popliteus tendon. Figure 4. A 7-mm tunnel is drilled through the fibular head 1 to 1.5 cm from the proximal tip and superior to the point where the peroneal nerve crosses the neck of the fibula. The nerve should be carefully protected during this portion of the procedure. Figure 5. The limb exiting the posterior fibular tunnel is passed beneath the biceps tendon and then tunneled underneath the iliotibial band to pass anterior to the screw. This limb is left as long as possible (A). The limb exiting the anterior fibular tunnel is passed first underneath the iliotibial band and then posterior to the screw. The longer limb is then brought back through the fibular tunnel and sutured to itself (B). (Illustrations by Stan Coffman.)
CONCLUSION

The fibular-based technique is a reproducible, dependable technique for reconstruction of the posterolateral corner of the knee. It can be performed with a single autograft hamstring tendon, avoiding the use of allograft. It has been demonstrated to be isometric and thus provides support through the entire range of knee flexion. It provides stability equal to more involved techniques that require allograft and pass tissue to the posterolateral tibia. It also preserves native tissue and can be performed as an augmentation to a repair of native tissue or as a reconstruction of chronic injuries to the posterolateral corner.

REFERENCES