TECHNICAL NOTE ARTICLE

Arthroscopic Bridge Technique for PCL Avulsion: Surgical Technique and Key Points

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Abstract

This study describes all-arthroscopic fixation of the posterior cruciate ligament avulsion fracture using 'suture bridge technique'. We used this technique in 3 consecutive patients. All were satisfied and returned to the activities prior to injury. This technique can be considered as a safe and effective method for fixation of PCL avulsion, which allows active mobilization with lowered risk of complications.

Keywords: Arthroscopic bridge technique, Avulsion, Posterior cruciate ligament, Repair

Introduction

The posterior cruciate ligament (PCL) is the main static stabilizer of the knee (1-3). The incidence of PCL injury varies between 1% to 44% among all knee ligament injuries (4-6). PCL avulsion occurs in the setting of high-energy trauma, motorcycle accidents, and occasionally in lower-energy sports-related injuries in young and active individuals (5).

Knee arthroscopy is recommended prior to fixing the fragment in order to evaluate the accompanying intra-articular injuries. Several techniques have been described for the fixation of a PCL avulsion fracture. With the posterior open approach, there is a risk of neurovascular injury (6-8). A whole arthroscopic procedure has been described by Dr. Dinshaw Pardiwala in VuMedi that was also presented in Osaka Congress in 2009. This current technique is both diagnostic and therapeutic, which allows good reduction of the fragment with lower complication rate.

We believe that a complete arthroscopic procedure is an effective and safe method in fixing the PCL avulsion fracture. This paper describes this technique and presents the results of our patients after this type of surgery.

Materials and Methods

Three consecutive patients with the diagnosis of PCL avulsion fracture were operated using the arthroscopic assisted technique.

Surgical technique and the key points

Arthroscopy starts from the anterolateral portal. The hematoma is washed out via anterolateral portal using the gravity for the irrigation inside the knee, The sloppy ACL sign and significant PCL laxity are common arthroscopic findings. With the use of a high anteromedial portal, synovium of the intercondylar notch is shaved and the intervening fat between the ACL and PCL is partially removed. At this time, any concomitant meniscal and chondral injury is evaluated and managed.

Once the posteromedial compartment is visualized, a high posteromedial portal is created. Using the shaver, the posterior aspect of the PCL and the posterior joint capsule are separated to create a working space. To do this, a low posteromedial portal is created and a 6 mm cannula is inserted. A switching stick is passed through the high posteromedial portal and the arthroscope is moved to this

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portal. Using the high posteromedial portal for visualization and the low posteromedial and anteromedial portals as the working portals, a plane is developed between the posterior aspect of the PCL and the posterior joint capsule.

After identifying the bone fragment, two 4.5 mm bone tunnels is created using the PCL tibial guide from 2-3 cm inferior and medial to the tibial tubercle exiting from inferomedial and inferolateral of the PCL tibial fossa and 25 mm below the joint line. To do this, the PCL guide is passed through the anteromedial portal to the space between the PCL and the posterior joint capsule.

Once the tunnels are created, bone fragment is fixed using the suture bridge. A suture is passed round the bone-ligament junction. This is done by passing each end of a single strand suture from the anteromedial portal to be retrieved through the low posteromedial portal. Then a sliding knot is used to create the loop and bridge and several half hitches are done to create the 'suture bridge'. Our preference for the length of the suture bridge is reaching to close to the lower part of avulsed bone fragment and try to avoid too short or too long suture bridge [Figure 1].

Then 2 lasso wire (ARTHREX) are passed through the tunnels to retrieve the 2 limbs of the suture and pass through the 2 tunnels each containing one limb of the suture. Traction is applied to the suture while anterior drawer is applied to the tibia and reduction is checked under direct visualization. Then the suture is tied over the anterior tibia [Figure 2; 3]. Reduction of the PCL fragment is also checked by fluoroscopy. After closing the incisions, the limb is placed in a long leg brace with a small pillow under the lower leg to support the lower leg against gravity [Figure 4]. Isometric quadriceps exercise is started the day after surgery and range of motion can be started about 2 weeks after surgery.

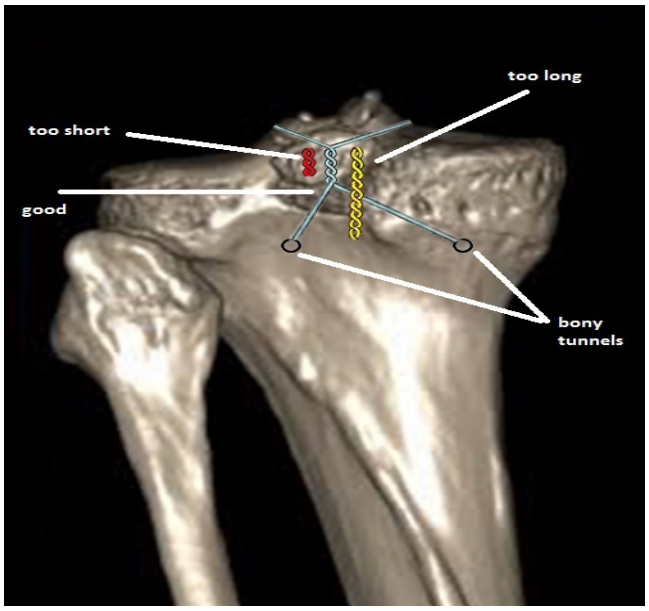

Figure 1. It shows the proper length of the suture bridge.

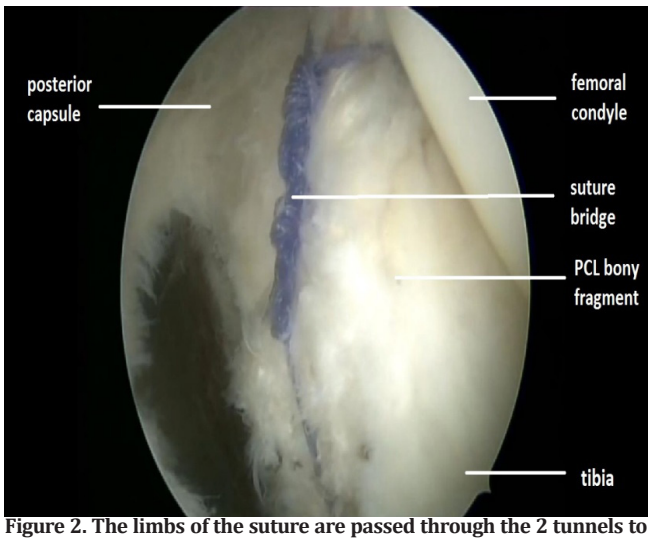

Figure 2. The limbs of the suture are passed through the 2 tunnels to exert traction on the bone fragment.

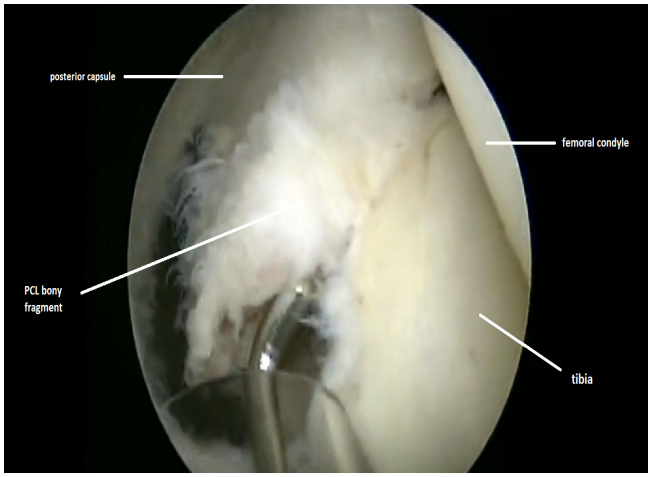

Figure 3. Reduction is checked under direct visualization.

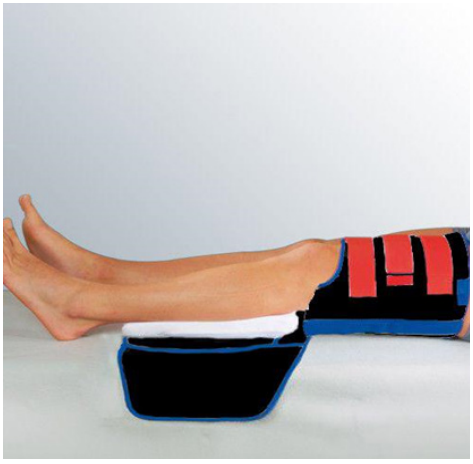

Figure 4. The limb is placed in a long leg brace with a small pillow under the lower leg to support the lower leg against gravity.

Discussion

Conservative treatment of PCL avulsion does not re-establish the biomechanics of the knee joint (2, 9). Yang et al. used the open methods and reported good results (10). Many other reports used cannulated screws describing the risk of damage to the posterior elements and the neurovascular structures (11-13). Since it is recommended to perform a simultaneous diagnostic arthroscopy, we believe that an all-arthroscopic surgery is a safe and effective method in the fixation of the PCL avulsion fracture. With this technique, there is no need to change the position and setup. Yet, no neurovascular injury has been reported with this technique. In addition, the risk of damage to the posterior structures is lowered when an arthroscopic bridge technique is used for the repair of the PCL avulsion. This is a safe and secure technique that allows patients to start full early range of motion and power. However, the limitations of this technique are the need for high-tech devices, and expertise in arthroscopy of the knee.

In conclusion, it seems that an arthroscopic bridge technique is likely to provide good and acceptable results with anatomical reduction of the fragment while it is a safe and effective method. Moreover, the arthroscopic bridge technique minimizes the risk of neurovascular injuries.

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