

Case Report

Popliteal Artery Laceration During Arthroscopic Posterior Cruciate Ligament Reconstruction

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Abstract: We report a case of acute laceration of the popliteal artery during an arthroscopic posterior cruciate ligament reconstruction. This injury can occur during the creation of the posteromedial portal, the manipulation of the tissues in the posterior part of the capsule of the knee joint, or when drilling the tibial hole. We recommend that a qualified vascular surgeon should be immediately available at the time of the surgery. In case of suspecting the occurrence of a popliteal artery injury, the vascular surgeon should be immediately consulted and arteriography and vascular repair should be performed. **Key Words:** Posterior cruciate ligament—PCL reconstruction—Vascular complication—Popliteal artery laceration.

The reported incidence rate of posterior cruciate ligament (PCL) ruptures ranges between 1% and 44% of all acute knee ligament injuries.¹ The trans-tibial technique, which is a very demanding surgery, is the most common method for PCL arthroscopic reconstruction.²⁻⁴ One of the most feared complications of PCL reconstruction is injury to the popliteal artery.⁵⁻⁷ To our knowledge, its occurrence during arthroscopic isolated PCL surgery has not been reported. We report a case of acute popliteal artery laceration during a PCL arthroscopic reconstruction.

CASE REPORT

A 17-year-old boy suffered a grade III PCL injury in the right knee during soccer practice. Clinical examination and magnetic resonance imaging confirmed the isolated PCL injury (Fig 1). The patient experienced knee instability despite 3 months of nonsurgical treatment; therefore, PCL allograft reconstruction was arthroscopically performed.

We used a double-bundle PCL reconstruction technique.^{3,8,9} The patient was positioned supine. A standard arthroscopic examination of the joint was performed. To improve visualization, we made a posteromedial portal under direct arthroscopic vision. The motorized shaver and radiofrequency device were then used to detach the remaining PCL remnant. Both femoral tunnels were drilled through the anterolateral portal. Using a PCL guide, both tibial tunnels were drilled through the anteromedial portal with the knee flexed approximately 90°. When the 2 guidewires were in position, 2 tibial tunnels were created using a cannulated 8-mm reamer. Two tibial posterior tendon allografts were prepared to fit an 8-mm tunnel. In both grafts we performed an independent passage and tensioned individually in different grades. The anterolateral bundle was fixed with the knee flexed in 70° to

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FIGURE 1. Sagittal magnetic resonance image of the right knee showing irregular contour of the PCL with an increased signal intensity, compatible with a complete tear.

90° and the posteromedial bundle in 10° to 15° of extension. Biodegradable interference screws were used for graft fixation procedures with a staple at the distal tibia. The entire surgical procedure was uneventful. The tourniquet time was 90 minutes.

Once the surgical procedure was completed and the tourniquet was released, there was copious bleeding from the posteromedial incision and the patient's blood pressure decreased. This bleeding was stopped through compression and extension of the leg. However, the patient's foot was cool and no dorsalis pedis and posterior tibial pulses were palpable. Angiography of the right lower extremity was urgently performed; it showed extravasation of the contrast material from the anterior area of the popliteal artery at the level of the joint (Fig 2). The popliteal fossa was immediately explored by the vascular and orthopaedic surgeons through an S popliteal incision. The popliteal artery had a longitudinal, 1.5-cm laceration on the anterior area of the vessel (Fig 3). Revascularization with an interposition saphenous vein graft was performed. Postoperatively, adequate peripheral pulses were noted and confirmed with the use of Doppler



FIGURE 2. Lateral intraoperative image of a contrast arteriogram performed to the right lower extremity that shows extravasation of contrast material to the popliteal area.

ultrasound. There were no further complications after the surgery.

Fifteen months after the operation, the knee had a complete range of motion with good stability and a Lysholm score of 92. Postoperative magnetic reso-

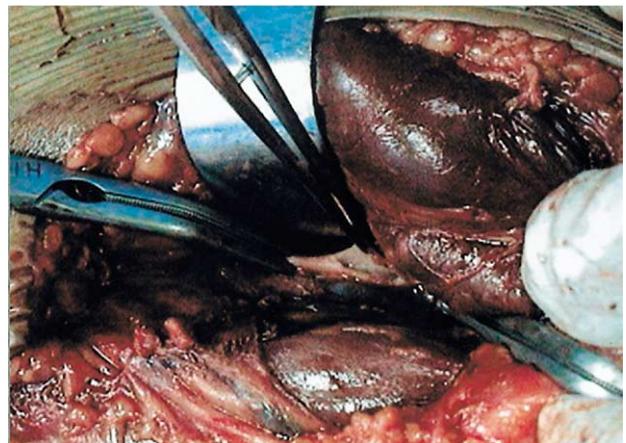


FIGURE 3. Intraoperative photograph showing the pattern of the popliteal laceration on the anterior wall of the vessel before surgical repair.

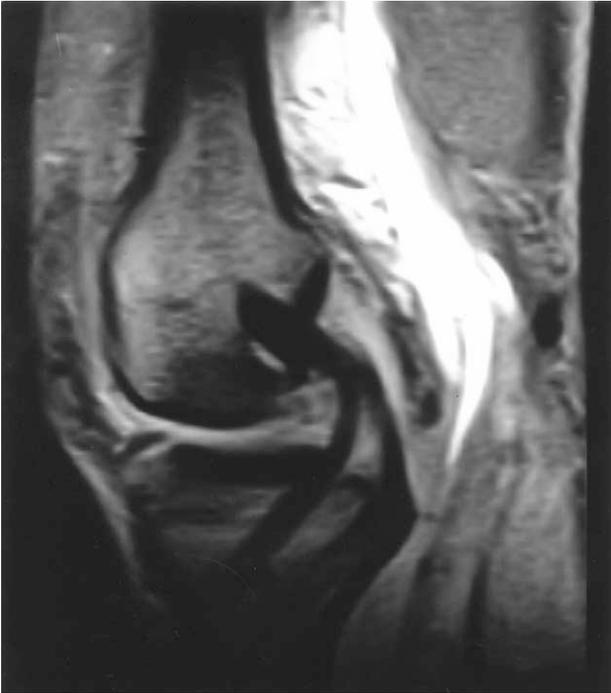


FIGURE 4. Sagittal magnetic resonance image 1 year after the double-bundle reconstruction of the PCL using double-double tunnel that shows graft continuity.

nance imaging of the knee showed a continuous and hypointense signal of the graft (Fig 4).

DISCUSSION

Although the reported incidence rate of vascular lesion during arthroscopy is very low, it may have been underestimated because most of the studies were retrospective.^{10,11} In 1985, in his review of arthroscopic procedures performed by members of the Arthroscopy Association of North America, DeLee reported a 1% incidence rate of such complication.¹² In 1986, Small found only 12 vascular complications in more than 375,000 knee arthroscopies (0.003%), only 9 injuries of which involved popliteal vessels.^{13,14} There have been occasional case reports of popliteal artery injuries after arthroscopic meniscectomy, meniscal repair, and arthroscopic synovectomy.^{6,15-17}

Acute injury of the popliteal artery is an extremely rare complication of PCL surgery but a serious and possibly fatal one. Many authors have addressed the potential damage of the popliteal artery during PCL reconstruction, but surprisingly there are only 2 published reports of popliteal artery thrombosis following PCL reconstruction.

Wu et al.¹⁸ reported a case with an acute popliteal artery occlusion after arthroscopic PCL reconstruction with spontaneous resolution. The possible causes included underlying atherosclerosis, the use of a pneumatic tourniquet, surgical manipulation, and arterial spasm. In 1993, Jackson et al.¹⁹ described in their technical note a case example of popliteal artery thrombosis developed during the postoperative phase as a result of trauma of the soft tissue and arterial intima during PCL and ACL reconstruction.

The popliteal artery is at high risk of being injured during the drilling of the tibial tunnel or manipulation of the posterior capsule during surgery. There are several methods to make this surgery safer. Some of them are the use of a spade-tipped guidewire, the use of an oscillating drill, the use of a tapered drill bit, and the direct visualization of the drill bit exiting the bone. Intraoperative radiographs and image intensification help to confirm guidewire placement and to monitor guidewire and reamer position during drilling. The best method of neurovascular injury prevention during transtibial drilling is to use a posteromedial safety incision to protect the neurovascular structures.^{7,19,20}

In addition, several authors have reported that an increased flexion of the knee might prevent the occurrence of this lesion. In an *in vivo* study, the distance between the anterior aspect of the popliteal artery and the posterior tibial cortex varies from a mean 5.9 mm in full extension to 7.2 mm at 90° of flexion. In 76% of the knees, the popliteal artery moved away from the posterior tibial surface during flexion of the knee. Therefore, the flexed knee does not always confer safety.^{11,21}

The site of the popliteal artery injury corresponds to the projection of the tibial tunnel. We really do not know at what moment during the surgery the injury occurred. According to the type of laceration, it was probably caused by the guide pin when drilling the tibial tunnel that advanced when the drill bit passed. Although a protection curettage was used, this might have moved sometime during this step of the surgery. This injury may occur during the creation of the posteromedial portal, the manipulation of the tissues in the posterior part of the capsule of the knee joint, or when drilling the tibial hole. In our patient, 2 tibial tunnels were made, thus increasing the risk of damaging neurovascular structures. The advantage of 2 tibial tunnels is to try to reproduce in a better way the anatomy and to perform independent passage and fixation of both PCL bands.⁸ However, it is not the objective of this report to discuss the surgical technique.²²

From our experience with this case, we have concluded that special care should be taken in patients who undergo PCL arthroscopic reconstruction because of the proximity of vessels to the tibial tunnel. Therefore, we recommend that a qualified vascular surgeon should be immediately available at the time of surgery. In case one suspects the occurrence of a popliteal artery injury, the vascular surgeon should be immediately consulted and arteriography and vascular repair should be performed.

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