

Concomitantly combined ACL and PLC reconstruction: Case report and literature review

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Abstract

Introduction: : Injuries involving the posterolateral ligamentous system occur in approximately 7 - 16% of knee ligament injuries. However, only 28% of all posterolateral corner (PLC) injuries are alone and usually combined with cruciate ligament injury (posterior cruciate ligament-PCL > anterior cruciate ligament-ACL). Combined ACL and PLC tears account for 10% of complex knee injuries. An unaddressed posterolateral corner injury may be a leading cause of ACL reconstruction failure.

Case presentation: A 26 year old male patient with combined ACL and PLC injury. He was concurrently reconstructed by both ACL and PLC. We used 2 semitendinosi (1 in each knee) and 1 gracilis tendon (in the injured knee). The ACL was reconstructed by one stranded semitendinosus with all-inside technique and Tightrops fixation. The PLC reconstruction utilized one femoral tunnel at the isometric point, graft fixation at the femoral tunnel by tightrope, and at the tibial tunnel by absorbable screw. At the 9 months follow-up, the Cincinnati score was 70/100 and the IKDC score was B type.

Conclusions: Concomitantly combined ACL and PLC reconstruction has good results in remaining knee functions and decreasing ACL reconstruction failure. However, femoral tunnel creation needs to avoid femoral tunnel intersection.

Introduction

The posterolateral corner (PCL) structures interact functionally with the anterior cruciate ligament (ACL). They act as the primary restraint to varus and external rotation. The ACL acts as a secondary restraint to varus angulation. In an ACL-PLC injured knee, an untreated PLC injury causes a significant increase in force on the ACL graft and may be a leading cause of graft failure, so the reconstruction should be combined. Using the Hamstring tendon graft not only ensures size,

cost but also fixing the tendon by TightRop maybe reduce the risk of femoral tunnel intersection.

Case report

A 26 year old male patient injured right knee from playing volleyball 3 months ago. Living and labor activities are affected because of the painful knee joint. On physical examination, there were signs of injury of both ACL and PLC, no alignment deformity, no peroneal palsy. On the MRI, there was an injury of ACL, lateral collateral ligament (LCL), popliteus tendon (PLT), Popliteofibula ligament.

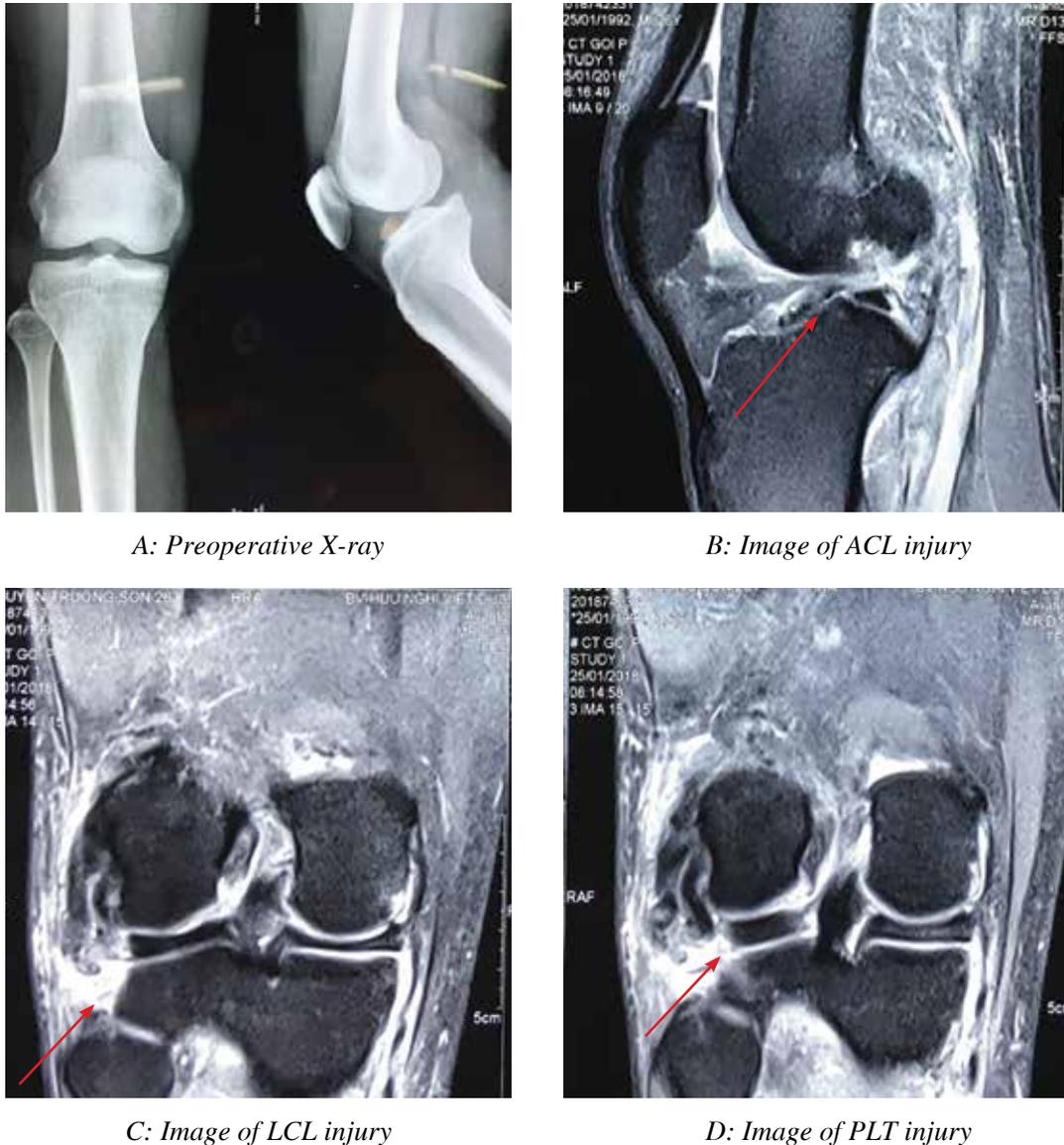


Figure 1: Preoperative injuries in Radiography examination

Technique

Preparing graft: exsanguination and then set tourniquet 350mmHg at the base of the thigh. Take the semitendinosus tendon and the gracilis tendon of the injured leg, the semitendinosus tendon of the healthy leg. A semitendinosus 8x60mm for ACL reconstruction. The remaining semitendinosus tendon and gracilis tendon measure 7x200mm.

ACL reconstruction: using the all-inside ACL reconstruction technique. Use a 7mm offset for the femoral tunnel in full flexion knee. The insertion of the tibial tunnel is the point at 3mm anterior border

of the lateral meniscus and behind the PCL 7mm, the angle of navigation ruler set at 65°. Fixed tendon with a tightrope.

PLC reconstruction

Approach: skin incision along the iliotibialband to lower between the fibular head and the Gerdy tubercle. Determinating the femoral biceps tendon and fibular head. Revealing the peroneal nerve at 6 - 8cm below the fibular head and posterior and lateral the long head of the femoral biceps tendon.

Creation of the fibular head tunnel: exposing the neck and the head of the fibula, from the front to the

back, the groove can be palpated as the attachment point of the LCL, the entry point 28,4mm below the top of the fibular head and behind the anterior border of the fibular head 8,2mm. Use a marking hook ACL and drill guide to guide the path from the entry point to the popliteofibular ligament. Reaming to the size of the graft and then pass through the tunnel a waiting thread.

Creation of the tibial tunnel: the anterior entry point is the position between the Gerdy's tubercle and the tibial tubercle. The posterior point is located at 1cm medial and 1cm superior to the fibular head tunnel. Use the marking hook ACL and drill guide, ream up to 7mm, and pass through a waiting thread.

Creation of the femoral tunnel: expose the lateral epicondyle at 70° knee flexion. According to Stannard [1] the isometric point is just at the anterior and superior to the lateral epicondyle. Use the guide to drill in the anteromedial direction (note avoid the femoral tunnel of the ACL).

Fixing the tendon in the femoral tunnel with TightRop, pass through the tendon under the IT band. One head of the tendon is passed through the fibular tunnel, then both heads are threaded through the tibial tunnel from back to front. Fix the tendon in the tibial tunnel with a 7mm absorbable screw.

Postoperative follow-up: 9 months postoperative follow-up, Cincinnati score is 70/100, the IKDC score is ranked B (almost normal).



A: Exposing the peroneal nerve



B: Drilling the femoral, tibial and fibular head tunnels



C, D: Passing tendons through the tunnels and fixation



Figure 2: Summary of steps for PLC reconstruction

Discussion

Choose the graft

There were many materials used to reconstruct ligaments such as allograft (patella tendon, Hamstring tendon...), autograft. The choice depends on the type of injury, funding, occupation, anthropology, and experience of each surgeon. In this case, the Hamstring tendon graft ensured size, convenience and cost.

Outcome of PLC and ACL combined reconstruction

ACL and PLC have functional interactions with each other in keeping the knee joint from varus and external rotation [2]. The failure rate of initial ACL reconstruction was 0,7 - 8% and that of revision ACL reconstruction was 5 - 52% due to some factors [3]. However, many authors believed that the main cause was due to an accompanying PLC injury that was not diagnosed and treated, about 11% of an ACL injury was associated with PLC injury [4].

Diagnosing and assessing PLC injuries remains a challenge. The symptoms could be ignore if the surgeons did not think about it, especially in case of an ACL combined was injured. The omission of PLC injury will make an unstable joint, increasing the impact force on the medial compartment. This lead to medial meniscus damage, promotes degeneration of the medial compartment, and increases the force on ACL and PCL. Hence, the rate of failure in ACL reconstruction increased [5].

The technique of concomitant ACL and PLC reconstruction

According to LaPrade et al. [6], PLC reconstruction was to restore three structures: the lateral collateral ligament (FCL), the popliteus tendon (PLT), and the popliteal-fibular ligament (PFL). The role of the FCL was the first structure to prevent knee varus, PLT helped limit hyper external rotation and PFL increased knee stability.

For acute PLC injury, the best intervention time was about 2 weeks after the injury. As for chronic PLC injury, surgery was indicated if the limb alignment was normal. It was not the same as

ACL reconstruction, PLC reconstruction was not a good result. Various methods had been tried, such as fixing the femoral biceps tendon, repairing or reconstructing structures. With the reconstructive technique according to Stannard et al. [1], it had yielded satisfactory results.

A problem an ACL and PLC combined reconstruction was the convergence of the femoral tunnels, sometimes avoiding tunnel intersections can lead to an undesirable position. According to Shuler [7], to avoid this phenomenon, it was not only based on experience, but also the patient's anatomy. Angelini [8] used the one femoral tunnel technique, two semitendinosus tendons, and one gracilis tendon, but he required at least 27cm of the semitendinosus tendon. Selim [9] improved technique by graft preparation to overcome this weak point in tendon size.

We used single-stage combined ACL and PCL reconstruction for this case. It is the all-inside ACL reconstruction and Stannard's PLC reconstruction. Although the tendon length in the femoral tunnel was only 20mm and with the size of the large femoral condyle, there was still a risk of a femoral tunnel intersection.

Conclusions

Concomitantly combined ACL and PLC reconstruction has good results in remaining knee functions and decreasing ACL reconstruction failure. However, femoral tunnel creation needs to avoid femoral tunnel intersection.

References

1. Stannard J.P., Brown S.L., Robinson J.T., et al. (2005). Reconstruction of the posterolateral corner of the knee. *Arthroscopy*, 21(9), 1051–1059.
2. Takeda Y., Xerogeanes J.W., Livesay G.A., et al. (1994). Biomechanical function of the human anterior cruciate ligament. *Arthroscopy*, 10(2), 140–147.
3. Noyes F.R. and Barber-Westin S.D. (1996). Revision anterior cruciate ligament surgery: experience from Cincinnati. *Clin Orthop Relat Res*, (325), 116–129.
4. O'Brien S.J., Warren R.F., Pavlov H., et al. (1991). Reconstruction of the chronically insufficient anterior

- cruciate ligament with the central third of the patellar ligament. *J Bone Joint Surg Am*, 73(2), 278–286.
5. Griffith C.J., Wijdicks C.A., Goerke U., et al. (2011). Outcomes of untreated posterolateral knee injuries: an in vivo canine model. *Knee Surg Sports Traumatol Arthrosc*, 19(7), 1192–1197.
 6. LaPrade R.F., Wozniczka J.K., Stellmaker M.P., et al. (2010). Analysis of the static function of the popliteus tendon and evaluation of an anatomic reconstruction: the “fifth ligament” of the knee. *Am J Sports Med*, 38(3), 543–549.
 7. Shuler M.S., Jasper L.E., Rauh P.B., et al. (2006). Tunnel convergence in combined anterior cruciate ligament and posterolateral corner reconstruction. *Arthroscopy*, 22(2), 193–198.
 8. Angelini F.J., Helito C.P., Tozi M.R., et al. (2013). Combined Reconstruction of the Anterior Cruciate Ligament and Posterolateral Corner With a Single Femoral Tunnel. *Arthroscopy Techniques*, 2(3), e285.
 9. Selim N.M. (2018). Combined Anterior Cruciate Ligament and Posterolateral Corner Reconstruction by Hamstring Tendon Autografts Through a Single Femoral Tunnel by Graft-to-Graft Suspension and Fixation. *Arthroscopy Techniques*, 7(5), e557.