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## Outcomes of Arthroscopic Management for Isolated Posterior Cruciate Ligament Tears

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**Abstract**

PCL injuries are rarely seen on their own and often happen alongside other ligament injuries. The study sought to investigate the functional outcomes of isolated PCL injuries that were treated through either arthroscopic PCL reconstruction or fixation. A total of thirty patients underwent surgery as part of this study. Patients with ACL injury or PLC injury were not included in the study. For patients with a complete tear, PCL reconstruction was performed using a hamstring tendon autograft. On the other hand, patients with displaced avulsion fractures underwent arthroscopic fixation using the suture bridge technique. Patients received regular follow-up after their surgery, which included clinical examinations and radiographic assessments. As part of the follow-up examinations, the Lysholm knee score and the International Knee Documentation Committee (IKDC) score were assessed. 22 out of 30 patients achieved excellent results, 5 patients had good results and 3 patients had fair results. There were notable improvements in the IKDC ratings during the subsequent follow-ups. Out of the total number of patients assessed, 21 were found to have normal or near normal ratings in the final IKDC assessment. arthroscopic PCL reconstruction with a hamstring graft has been found to provide reliable stability and produce excellent clinical results. Performing arthroscopic PCL avulsion fracture fixation during the second week after the injury can lead to favorable clinical outcomes and successful bony union.

## INTRODUCTION

The posterior cruciate ligament (PCL) plays a crucial role in preventing the knees from moving backward and in limiting the inward rotation of the tibia when the knee is flexed beyond 90 degrees<sup>[1]</sup>. External trauma can cause PCL tears when a force is applied to the front of the knee while it is bent, often referred to as a dashboard injury<sup>[2]</sup>.

The posterior cruciate ligaments play a crucial role in preventing the knee from moving backward during activities that involve bending the knee, such as deceleration<sup>[3]</sup>. This can often lead to complaints from patients about issues with deceleration. As many experts have noted, the PCL has a unique ability to heal itself after an injury, which sets it apart from the ACL<sup>[4,5]</sup>. There is ongoing debate surrounding the treatment of isolated PCL injuries<sup>[6]</sup>. Studies have shown that grade III PCL injuries that are left untreated can result in the development of patellofemoral and medial compartmental osteoarthritis.

Recent studies have highlighted the potential risks associated with conservative treatment, such as an increased risk of developing osteoarthritis. This could be due to factors like high-grade PCL laxity or the progression of meniscus tears<sup>[7,8]</sup>. In a study conducted by Shelbourne *et al.*, 68 patients with isolated PCL injuries were treated nonoperatively and followed up for an average of 17 years<sup>[9]</sup>. The findings revealed that the patients remained active and reported good subjective scores. However, the study also found that 23% of patients developed osteoarthritis after 7 years, increasing to 41% after 14 years. Additionally, 11% of the patients experienced moderate to severe osteoarthritis. Surgeons are expressing concerns about the need for early surgical intervention to restore stability and prevent further changes associated with osteoarthritis, particularly in cases of high-grade symptomatic tears<sup>[10]</sup>.

For patients experiencing significant PCL laxity and painful symptoms, surgical treatment with PCL reconstruction has proven to be an effective method<sup>[11,12]</sup>. Several studies have examined the clinical and functional outcomes of PCL reconstruction, specifically comparing different surgical techniques, graft sources and types of injuries. Studies on anterior cruciate ligament (ACL) reconstruction have examined the surgical outcomes in older age groups. The majority of these studies have found that patients over the age of 40 and even those over 50, can experience satisfactory outcomes. These outcomes include good symptomatic relief, restoration of function and a high rate of return to sports after reconstruction<sup>[13-16]</sup>.

The study sought to investigate the functional outcomes of isolated PCL injuries that were treated through arthroscopic PCL reconstruction or fixation.

## MATERIALS AND METHODS

A total of thirty patients were enrolled and underwent surgery. All the patients had traumatic causes. The study only included individuals with isolated PCL injuries, either complete ruptures or PCL avulsion fractures. Patients with ACL injury or PLC injury were excluded from the study. Upon clinical evaluation, it was determined that all patients exhibited clear signs of posterior sag and a positive posterior drawer. Prior to the surgery, the PCL rupture diagnosis was also confirmed through the use of magnetic resonance imaging (MRI).

A total of 30 patients with complete tear underwent PCL reconstruction using hamstring tendon autograft, while 10 patients with avulsion fractures underwent arthroscopic fixation of PCL avulsion fracture using the suture bridge technique. The average age at the time of surgery was 34.5 years. All patients were regularly monitored for a minimum of 1 year. The average follow-up period lasted for 18 months. Patients were evaluated post-operatively using the Lysholm Knee Score and the International Knee Documentation Committee (IKDC) score.

The patient underwent both arthroscopic PCL avulsion fracture fixation and arthroscopic PCL reconstruction using a standardized surgical procedure.

**Single Bundle Arthroscopic PCL Reconstruction:** Single Bundle Arthroscopic PCL Reconstruction was done using trans tibial technique with semi tendonus and gracilis autograft. Surgery was performed under GA with patient in supine position with involved knee in thigh holder under tourniquet control. Diagnostic arthroscopy was done using standard anteriolateral and antero medial portals. Under arthroscopic guidance postero medial portals placed. PCL tear was confirmed arthroscopically. Semitendnosis and gracilis auto graft obtained from ipsilateral leg. The graft was prepared and doubled. Tibial and femoral tunnels were reamed at anatomical foot prints of PCL. Graft passed through the tibial tunnel and fixed with bio interference screw. Tibial fixation was done with knee in 70° flexion and anterior drawer thrust using bio interference screw.

**Postoperative Rehabilitation:** Patients was immobilized in long knee brace with posterior support for tibia. Patients mobilized from first post op day with full weight bearing walking. Knee bending started from 4 weeks. Knee brace was weaned off after 4 weeks and ROM and strengthening exercise were taught.

**Arthroscopic PCL Avulsion fracture fixation:** Arthroscopic PCL avulsion fracture fixation was done using suture bridge technique. Surgery was performed

under GA with similar set up. Diagnostic arthroscopy was done using standard anterolateral and antero medial portals. Under arthroscopic guidance high postero medial and low postero medial portals were placed. PCL avulsion fracture was confirmed arthroscopically. Fracture bed was debrided. Fracture fragment is fixed by suture bridge technique and secured by the typing knots over an anterior tibial bone bridge.

**Postoperative Rehabilitation:** Patients was immobilized in long knee brace. Patients mobilized from first post op day with partial weight bearing. Knee bending started from 4 weeks. Knee brace was weaned off after 6 weeks. Quadriceps and hamstring strengthening exercise were encouraged.

## RESULTS AND DISCUSSIONS

The average preoperative Lysholm score for 30 knees was 40, while the average postoperative Lysholm score significantly improved to 91. Patients experienced a notable improvement in their Lysholm score starting from the third month of follow-up. The final assessment revealed that the majority of patients, specifically 22 out of 30, experienced excellent results. Additionally, 5 patients had good results, while 3 patients had fair results. There were notable improvements in the IKDC ratings during the subsequent follow-ups. According to the final IKDC ratings, 21 patients received a grade A or B, indicating that they were assessed as normal or near normal. (Table 1 and 2)

Isolated PCL injuries are now recognized as requiring aggressive treatment, as they are no longer considered to be benign. Arthroscopic PCL avulsion fracture fixations were typically performed during the second or third week after the injury. Due to the increased risk of compartment syndrome, the decision was made to delay the surgery for one week following the injury.

One benefit of PCL avulsion fracture fixation and arthroscopic PCL reconstruction compared to open techniques is the reduced morbidity. In addition, arthroscopy enables the evaluation and treatment of any accompanying meniscal and chondral injuries. Arthroscopy can help identify injuries in the posterolateral and posteromedial regions. Additional benefits include shorter hospital stays and a reduced risk of postoperative knee stiffness thanks to early mobilization. Studies on conservative treatment for isolated PCL injury have consistently shown positive subject and functional outcomes. However, it is worth noting that the patients included in these studies were generally between the ages of 22 and 31<sup>[17,18]</sup>. There is a lack of research on conservative treatment for older patients with PCL injury. It is important to consider

age-related changes in the ligament healing process, such as reduced healing potential, declining function of mesenchymal stem cells and decreased structural organization. Researchers discovered that as individuals age, the quality and quantity of human mesenchymal stem cells (hMSCs) that play a crucial role in regenerating different connective tissues decline significantly<sup>[19]</sup>.

Our study's functional outcomes align with a study conducted by Chang et al, which demonstrated a 90% rate of good or excellent results in Lysholm score following arthroscopic PCL reconstruction<sup>[20]</sup>. Our study revealed an impressive 90% of participants achieving good or excellent results in the Lysholm score. According to the study, a significant percentage of patients (85%) demonstrated normal or near normal IKDC scoring. Interestingly, our own study revealed an even higher percentage (90%) of patients with normal or near normal IKDC scores. In a study conducted by Sekiya JK *et al*, they assessed the functional outcome of single bundle arthroscopic PCL reconstruction. The results showed that 62% of the participants achieved normal to near normal IKDC scores<sup>[21]</sup>. In a case series by Fanelli *et al.*, they found that combining PCL/ACL and PLC reconstructions using autografts/allografts led to positive clinical outcomes. These included the elimination of the posterior drawer and pivot shift, as well as improvements in the Lachman test and postoperative Tegner activity score<sup>[22]</sup>. The study conducted by Panigrahi *et al.* focused on 20 patients who underwent combined ACL and PCL reconstructions. The results of the study showed a significant improvement in the Lysholm score, IKDC scores and Tegner activity scores, indicating positive outcomes for the patients<sup>[23]</sup>. In a recent study conducted by Song<sup>[12]</sup>, 36 patients with an average age of 37 years underwent the transtibial technique, while another group of 30 patients with an average age of 35 years underwent tibial inlay PCL reconstruction. A total of 21 patients in the transtibial group and 19 patients in the tibial inlay group successfully regained their preinjury levels of sports activity, according to the study findings. Devitt et al<sup>[24]</sup> conducted a comprehensive review of 14 studies involving 523 patients. The average age of the patients was 30.2 years and they all underwent isolated PCL reconstruction. The findings indicated a notable enhancement in functional outcome scores, although there was a limited number of patients who were able to fully recover to their preinjury level. These findings are crucial for healthcare professionals to consider when advising patients about what to expect before undergoing surgery.

PCL reconstruction can be quite challenging due to the complexities in structures. Having a solid grasp of surgical principles and techniques is crucial for patients

**Table 1: Comparison of IKDC scoring**

IKDC grades	Number of patients	Inference
A	21	Normal
B	5	Nearly normal
C	4	Abnormal
D	0	Severely Abnormal

**Table 2: Comparison of Lysholm score**

Lysholm Score	Number of patients	Inference
Excellent	22	>90
Good	5	84-90
Fair	3	64-83
Poor	0	<64

with posterior knee instability who are undergoing PCL reconstruction. This knowledge can greatly contribute to achieving satisfactory results. There have been recent advancements in both the understanding of PCL injuries and surgical techniques.

This study has some limitations that should be considered. These include the lack of a control group, a small number of patients, and a relatively short observation period.

## CONCLUSION

Arthroscopic PCL reconstruction with hamstring graft gives good stability and excellent clinical outcomes. Arthroscopic PCL avulsion fracture fixation safely done on the second week after the injury gives excellent clinical outcomes and achieves good bony union.

## REFERENCES

- Kennedy, N.I., C.A. Wijdicks, M.T. Goldsmith, M.P. Michalski and B.M. Devitt et al., 2013. Kinematic analysis of the posterior cruciate ligament, part 1. *The Am. J. Sports Med.*, 41: 2828-2838.
- Pache, S., Z.S. Aman and M. Kennedy, 2018. Posterior cruciate ligament: current concepts review. *Arch, bone, J. Surg.*, 6: 8-18.
- Andriacchi, T.P., G.B.J. Andersson, R.W. Fermier, D. Stern, and J.O. Galante, 1980. A study of lower-limb mechanics during stair climbing. *J. Bone, Joint, Surg.*, 62: 749-757.
- Jacobi, M., N. Reischl, P. Wahl, E. Gautier and R.P. Jakob, 2010. Acute isolated injury of the posterior cruciate ligament treated by a dynamic anterior drawer brace. *The J. Bone Joint Surg.. Br. volume*, 92: 1381-1384.
- Fowler, P.J. and S.S. Messieh, 1987. Isolated posterior cruciate ligament injuries in athletes. *The Am. J. Sports Med.*, 15: 553-557.
- Montgomery, S.R., J.S. Johnson, D.R. McAllister and F.A. Petrigliano, 2013. Surgical management of pcl injuries: Indications, techniques, and outcomes. *Curr. Rev. Musculoskeletal Med.*, 6: 115-123.
- de Velde, S.K.V., J.T. Bingham, T.J. Gill and G. Li, 2009. Analysis of tibiofemoral cartilage deformation in the posterior cruciate ligament-deficient knee. *The J. Bone Joint Surg.-Am.* 91: 167-175.
- Strobel, M.J., A. Weiler, M.S. Schulz, K. Russe and H.J. Eichhorn, 2003. Arthroscopic evaluation of articular cartilage lesions in posterior cruciate ligament-deficient knees. *Arthroscopy: The J. Arthroscopic and Related Surg.*, 19: 262-268.
- Shelbourne, K.D., M. Clark and T. Gray, 2013. Minimum 10-year follow-up of patients after an acute, isolated posterior cruciate ligament injury treated nonoperatively. *The Am. J. Sports Med.*, 41: 1526-1533.
- Amis, A.A., A.M.J. Bull, C.M. Gupte, I. Hijazi, A. Race and J.R. Robinson, 2003. Biomechanics of the pcl and related structures: Posterolateral, posteromedial and meniscofemoral ligaments. *Knee Surg., Sports Traumatology, Arthroscopy*, 11: 271-281.
- Yoon, K.H., E.J. Kim, Y.B. Kwon and S.G. Kim, 2019. Minimum 10-Year Results of Single Versus Double-Bundle Posterior Cruciate Ligament Reconstruction: Clinical, Radiologic, and Survivorship Outcomes. *Am, J. Sports Med.*, 47: 822-87.
- Song, E.K., H.W. Park, Y.S. Ahn and J.K. Seon, 2014. Transtibial versus tibial inlay techniques for posterior cruciate ligament reconstruction. *The Am. J. Sports Med.*, 42: 2964-2971.
- Brown, C.A., T.R. McAdams, A.H.S. Harris, N. Maffulli and M.R. Safran, 2013. Acl reconstruction in patients aged 40 years and older. *The Am. J. Sports Med.*, 41: 2181-2190.
- Desai, N., H. Björnsson, K. Samuelsson, J. Karlsson and M. Forssblad, 2013. Outcomes after acl reconstruction with focus on older patients: Results from the swedish national anterior cruciate ligament register. *Knee Surg., Sports Traumatology, Arthroscopy*, 22: 379-386.
- Toanen, C., G. Demey, P.G. Ntagiopoulos, P. Ferrua and D. Dejour, 2017. Is there any benefit in anterior cruciate ligament reconstruction in patients older than 60 years? *The Am. J. Sports Med.*, 45: 832-837.
- Weng, C.J., W.L. Yeh, K.Y. Hsu, C.H. Chiu, S.S. Chang, A.C.Y. Chen and Y.S. Chan, 2020. Clinical and functional outcomes of anterior cruciate ligament reconstruction with autologous hamstring tendon in patients aged 50 years or older. *Arthroscopy: The J. Arthroscopic & Related Surg.*, 36: 558-562.

17. Shelbourne, K.D. and Y. Muthukaruppan, 2005. Subjective results of nonoperatively treated, acute, isolated posterior cruciate ligament injuries. *Arthroscopy.*, 21: 457-461.
18. Shelbourne, K.D., T.J. Davis and D.V. Patel, 1999. The natural history of acute, isolated, nonoperatively treated posterior cruciate ligament injuries. *The Am. J. Sports Med.*, 27: 276-283.
19. Stolzinger, A., E. Jones, D. McGonagle and A. Scutt, 2008. Age-related changes in human bone marrow-derived mesenchymal stem cells: Consequences for cell therapies. *Mech. Ageing Dev.*, 129: 163-173.
20. Chan, Y.S., S.C. Yang, C.H. Chang, A.C.Y. Chen, L.J. Yuan, K.Y. Hsu and C.J. Wang, 2006. Arthroscopic reconstruction of the posterior cruciate ligament with use of a quadruple hamstring tendon graft with 3- to 5-year follow-up. *Arthroscopy.*, 22: 762-770.
21. Sekiya, J.K., R.V. West, B.C. Ong, J.J. Irrgang, F.H. Fu and C.D. Harner, 2005. Clinical outcomes after isolated arthroscopic single-bundle posterior cruciate ligament reconstruction. *Arthroscopy.*, 21: 1042-1050.
22. Fanelli, G.C. and C.J. Edson, 2004. Combined posterior cruciate ligament-posterolateral reconstructions with achilles tendon allograft and biceps femoris tendon tenodesis: 2- to 10-year follow-up. *Arthroscopy.*, 20: 339-345.
23. Panigrahi, R., A.K. Mahapatra, A. Priyadarshi, D.S. Das, N. Palo and M.R. Biswal, 2016. Outcome of simultaneous arthroscopic anterior cruciate ligament and posterior cruciate ligament reconstruction with hamstring tendon autograft: A multicenter prospective study. *Asian J. Sports Med.*, Vol. 7 .10.5812/asjsm.29287.
24. Devitt, B.M., R. Dissanayake, J. Clair, R.J. Napier, T.J. Porter, J.A. Feller and K.E. Webster, 2018. Isolated posterior cruciate reconstruction results in improved functional outcome but low rates of return to preinjury level of sport: A systematic review and meta-analysis. *Orthop. J. Sports Med.*, Vol. 6 .10.1177/2325967118804478.