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A PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME FOR POSTERO LATERAL CORNER INJURY OPERATED WITH THE MODIFIED ARCIERO TECHNIQUE

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Abstract *:*

Background: The posterolateral corner (PLC) of the knee plays a vital role in maintaining rotational and varus stability. Injuries to this complex can result in chronic instability if unrecognized or inadequately treated.

Materials and Methods: This prospective study was conducted at Narayana Medical College, Nellore, including 25 patients (Jan 2024–Dec 2025). All underwent PLC reconstruction using the Modified Arciero technique. Functionaloutcomes were assessed using VAS, IKDC, and Lysholm scores.

Results: The mean VAS improved from 8 to 1, Lysholm from 35 to 88, and IKDC from 41 to 91 at 6 months postoperatively.

Conclusion: The Modified Arciero technique provides excellent functional outcomes and stability for PLC injuries with minimal complications.

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IndexTerms - Posterolateral corner, Modified Arciero technique, PLC reconstruction, knee instability

I. INTRODUCTION

The posterolateral corner (PLC) of the knee is a complex anatomical and functional region that plays a vital role in maintaining knee stability. It acts as the primary restraint to varus stress, external tibial rotation, and posterior tibial translation, especially in knee extension. The PLC consists of multiple interdependent static and dynamic stabilizers that function synergistically to preserve normal knee biomechanics. The key static stabilizers include the lateral collateral ligament (LCL), popliteus tendon, and popliteofibular ligament, while the dynamic stabilizers include the biceps femoris and the popliteus muscle. Injury to these structures can result in significant instability and altered knee kinematics.[1]

PLC injuries account for approximately 7–16% of all knee ligament injuries and are frequently associated with injuries to the anterior cruciate ligament (ACL) or posterior cruciate ligament (PCL). Such injuries often result from high-energy trauma, sports-related mechanisms, or varus hyperextension forces. Due to the complexity of the anatomy and subtle clinical signs, PLC injuries are commonly missed during the initial assessment. Failure to identify and adequately treat PLC injuries can lead to persistent instability, chronic pain, and early degenerative changes in the knee.[2]

Missed PLC injuries are a well-recognized cause of failed ACL reconstruction. Persistent varus and rotational instability place excessive stress on the reconstructed cruciate ligament graft, leading to graft stretching or failure. Therefore, accurate diagnosis and appropriate surgical management of PLC injuries are crucial for restoring knee stability and achieving optimal functional outcomes.[3]

Several surgical techniques have been described for PLC reconstruction, aiming to restore native anatomy and biomechanics. The Modified Arciero technique is an anatomic reconstruction method that addresses the key stabilizing structures of the PLC, providing effective restoration of varus and rotational stability. However, limited prospective studies have evaluated the functional outcomes following PLC reconstruction using this technique. Hence, this prospective study aims to assess the functional outcomes of patients with PLC injuries treated using the Modified Arciero technique.[4]

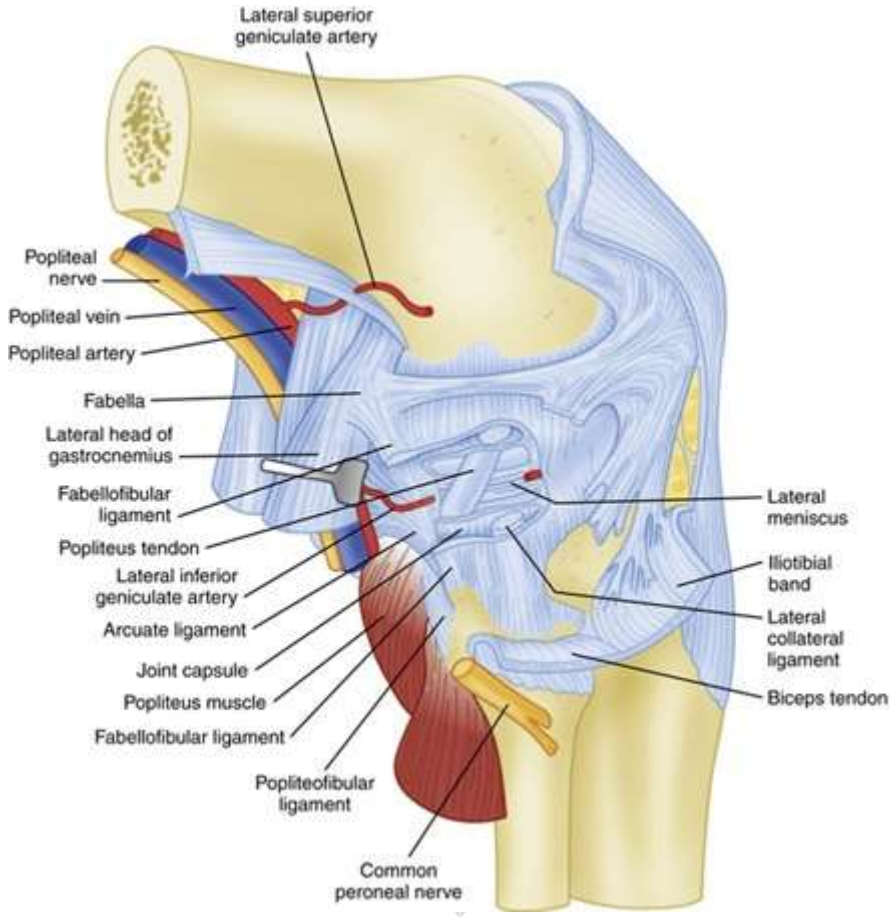
Contents of Posterolateral Corner

Three major static stabilizers of the lateral knee:

1. Lateral collateral ligament (LCL)
2. Popliteus tendon (PLT)
3. Popliteofibular ligament

Other static stabilizers:

1. Lateral capsule thickening
2. Arcuate ligament
3. Fabellofibular ligament



Dynamic structures:

1. *Biceps femoris*
2. *Iliotibial band*
3. *Popliteus muscle*

These anatomical structures together contribute to posterolateral stability and have been well described in cadaveric and morphologic studies.[5]

Lateral Structures of Knee by Layer

- *Layer 1: Iliotibial tract, biceps (Common peroneal nerve lies between Layer I and II)*
- *Layer 2: Patellar retinaculum, patellofemoral ligament*
- *Layer 3:*
  - *Superficial: LCL, fabellofibular ligament (Lateral geniculate artery runs between deep and superficial layer)*
  - *Deep: Arcuate ligament, coronary ligament, popliteus tendon, popliteofibular ligament, capsule*

Layer-wise anatomical organization of the lateral knee is critical for surgical exposure and reconstruction planning.[6]

Materials and Methods

This was a prospective study conducted in the Department of Orthopaedics, Narayana Medical College and Hospital, Nellore. Eight patients with PLC injury were operated on using the Modified Arciero technique.

- *Inclusion criteria: Patients aged 20–60 years with confirmed PLC injuries.*
- *Exclusion criteria: Patients <18 years, distal femur/proximal tibia fractures, or refusal for surgery.*
- *Assessment tools: VAS (pain), IKDC (function), Lysholm (stability), and knee ROM were measured preoperatively and postoperatively at 1–6 months.*

These outcome measures have been widely used in evaluating posterolateral corner reconstruction results.[7]

Surgical Technique

All patients were positioned supine with a lateral approach to the knee. The Modified Arciero technique was employed to anatomically reconstruct the PLC structures.

- *Autografts were used to reconstruct the LCL and popliteofibular ligament.*
- *The fixation was done using interference screws.*
- *Postoperative rehabilitation included early mobilization and strengthening exercises, emphasizing gradual range-of-motion recovery and protection of the reconstructed ligaments.*

The surgical steps followed were based on established anatomical reconstruction principles.[8]

Results

At 6 months post-surgery, all patients showed significant improvement in knee stability and function:

- Mean VAS improved from 8 → 1
- Lysholm score increased from 35 → 88
- IKDC score improved from 41 → 91
- ROM improved to 0–110° in all cases

No major complications or graft failures were reported. Patients returned to daily activities within 3–4 months postoperatively.

Statistical Analysis

Table 1: Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Vas Pre	8.38	25	.744	.263
Vas Post	1.38	25	.518	.183
Lysholm Pre	35.50	25	6.676	2.360
Lysholm Post	88.75	25	3.151	1.114
IKDC Pre	41.88	25	3.871	1.368
IKDC Post	89.38	25	5.528	1.954

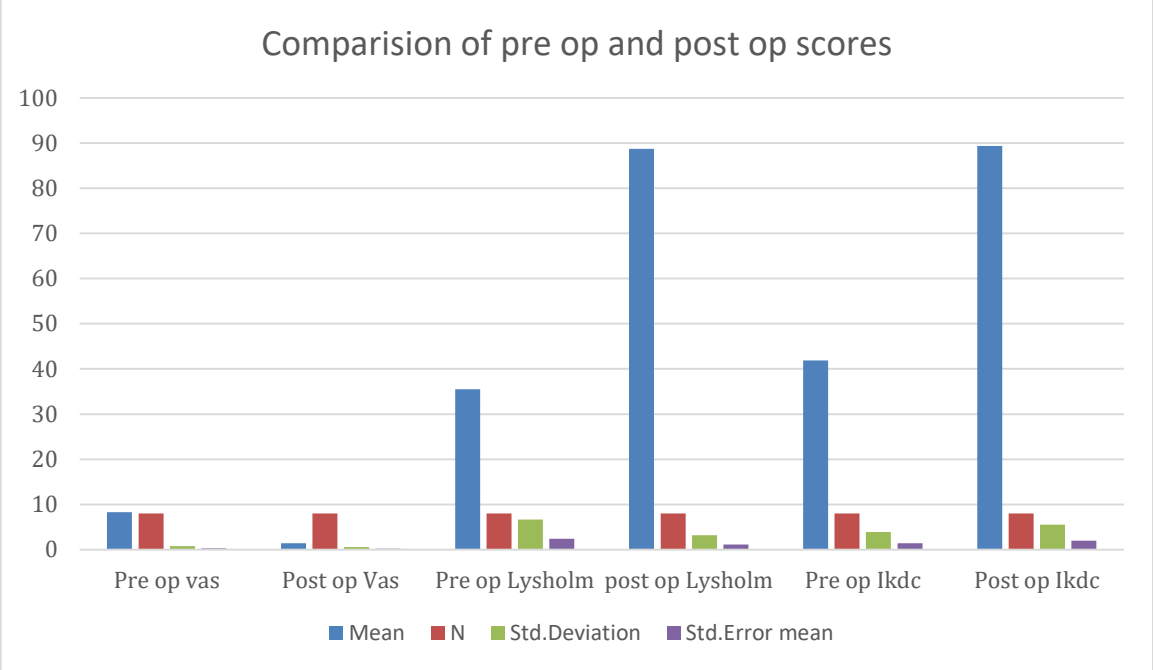


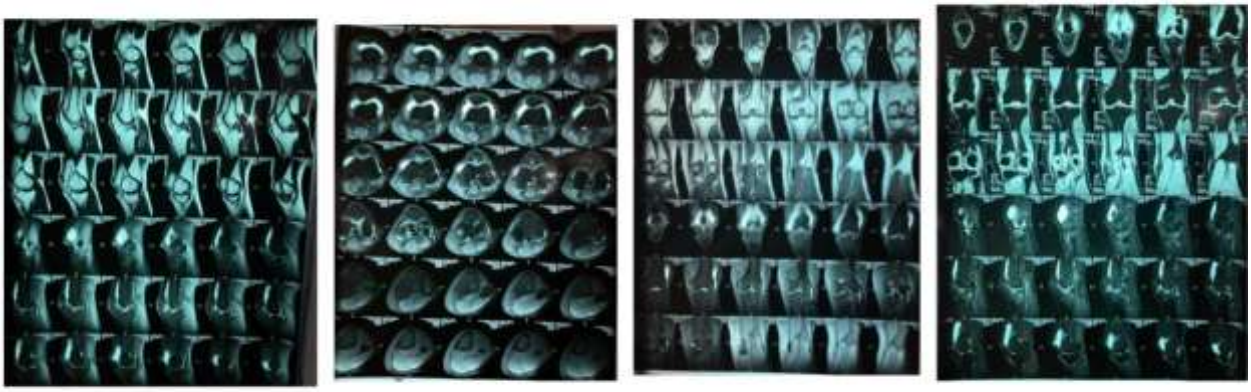
Table 2: t Test (Paired Differences)

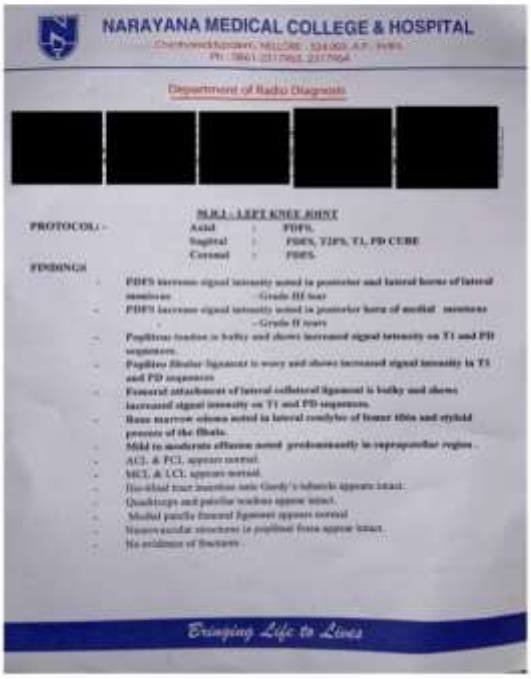
Pair	Mean	Std. Dev	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	Sig. (2-tailed)
Vas Pre - Vas Post	-7.000	1.069	.378	6.106	7.894	18.520	7	.000
Lysholm Pre - Lysholm Post	-53.250	4.979	1.760	-57.412	-49.088	-30.253	7	.000
IKDC Pre - IKDC Post	-47.500	5.210	1.842	-51.856	-43.144	-25.788	7	.000

Case-1

Pre op xrays

Pre op mri films and report





NARAYANA MEDICAL COLLEGE & HOSPITAL

Department of Radio Diagnosis

[redacted]

M.R.I. - LEFT KNEE JOINT

PROTOCOL:-

Axial	:	PDFS.
Sagittal	:	PDFS, T2FS, T1, PD CUBE
Coronal	:	PDFS.

FINDINGS:

- PDFS increase signal intensity noted in posterior and lateral horns of lateral meniscus. –Grade III tear
- PDFS increase signal intensity noted in posterior horn of medial meniscus. –Grade II tears
- Popliteus tendon is bulky and shows increased signal intensity on T1 and PD sequences.
- Popliteo fibular ligament is wavy and shows increased signal intensity in T1 and PD sequences.
- Femoral attachment of lateral collateral ligament is bulky and shows increased signal intensity on T1 and PD sequences.
- Bone marrow edema noted in lateral condyles of femur tibia and styloid process of the fibula.
- Mild to moderate effusion noted predominantly in suprapatellar region.
- ACL & PCL appears normal.
- MCL & LCL appears normal.
- Iliotibial tract insertion into Gerdy's tubercle appears intact.
- Quadriceps and patellar tendons appear intact.
- Medial patello femoral ligament appears normal.
- Neurovascular structures in popliteal fossa appear intact.
- No evidence of fractures.

Bringing Life to Lives

[redacted]

IMPRESSION:-

- *Interstitial tears of Popliteus tendon , femoral attachment of lateral collateral ligament and Popliteo fibular ligament with marrow contusions involving styloid process of fibula and lateral tibial and femoral condyles .*
  - Posterolateral corner injury.
- *Grade III posterior horn of lateral meniscus and grade II injury of posterior horn of medial meniscus.*
- *Mild to moderate knee joint effusion.*

Suggested clinical correlation.

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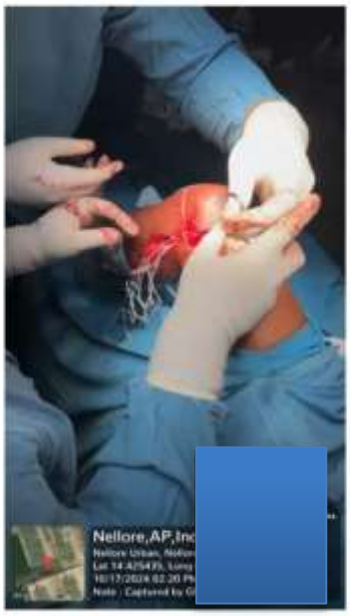
Intra op videos



Post xrays

DISCUSSION

The posterolateral corner (PLC) of the knee plays a vital role in maintaining stability by resisting varus stress, external tibial rotation, and posterior tibial translation. It consists of complex static and dynamic stabilizers, including the lateral collateral ligament, popliteus tendon, popliteofibular ligament, popliteus muscle, and biceps femoris tendon.[9]

PLC injuries constitute approximately 7–16% of ligamentous knee injuries and are frequently associated with cruciate ligament tears. Missed or untreated PLC injuries are a well-recognized cause of anterior cruciate ligament reconstruction failure due to persistent varus and rotational instability.[10]

Biomechanical Rationale

The PLC functions as the primary restraint to varus forces and external rotation, particularly in knee flexion. Disruption of these stabilizers increases the load on the cruciate ligaments and may result in graft stretching or failure if the PLC is not addressed during reconstruction.[11]

The Modified Arciero technique focuses on anatomical reconstruction of the lateral collateral ligament and popliteofibular ligament using a single femoral tunnel. This method has been shown to restore approximately 95–98% of native rotational and varus stability, outperforming non-anatomic reconstruction techniques.[12]

Biomechanical comparison studies have shown that anatomic posterolateral corner reconstruction techniques more effectively restore native knee kinematics than non-anatomic methods, particularly with respect to varus and rotational stability.[13]

Surgical Technique and Advantages

A variety of operative techniques have been described for managing posterolateral corner injuries, and selection of the appropriate surgical method depends on injury chronicity, severity, and the presence of associated ligamentous injuries.[14]

The Modified Arciero technique is a well-established and reproducible surgical approach for PLC reconstruction. It allows precise graft placement that closely replicates native ligament anatomy, thereby improving biomechanical function. One of the significant advantages of this technique is the use of a single femoral tunnel, which minimizes bone stock compromise and reduces the risk of tunnel convergence, especially in combined ligament reconstructions.[15]

Additionally, the relatively less invasive nature of the approach reduces soft tissue dissection and lowers the risk of iatrogenic injury to the common peroneal nerve.[16]

Comparison with Other Reconstruction Techniques

Repair of posterolateral corner injuries has been associated with higher failure rates when compared to reconstruction, particularly in chronic and high-grade injuries, making reconstruction the preferred treatment option in most clinical scenarios.[17]

Comparative studies evaluating fibular collateral ligament and posterolateral corner repair versus reconstruction have demonstrated superior stability and functional outcomes following reconstruction, especially in multiligament-injured knees.[18]

Several reconstruction techniques for PLC injuries have been described, including the Larson, LaPrade, and Fanelli techniques.[19]

Functional Outcomes and Rehabilitation

In the present study, patients demonstrated significant improvement in pain relief, knee stability, and functional outcomes following PLC reconstruction using the Modified Arciero technique. These findings are consistent with previously published literature reporting favorable outcomes following anatomic PLC reconstruction.[20]

Postoperative rehabilitation plays a crucial role in determining surgical success. Early controlled range-of-motion exercises, avoidance of varus stress, and progressive strengthening of surrounding musculature are essential components of rehabilitation.[21]

Limitations and Future Directions

The limitations of the present study include a small sample size and a relatively short follow-up period of six months. Longer follow-up is required to evaluate graft longevity, late instability, and the development of osteoarthritic changes.[22]

CONCLUSION

Posterolateral corner injuries of the knee are complex and frequently underdiagnosed, often leading to persistent instability and failure of associated cruciate ligament reconstructions if not addressed adequately. The findings of this prospective study demonstrate that reconstruction of the posterolateral corner using the Modified Arciero technique is a reliable and effective surgical option for restoring knee stability and function.

The Modified Arciero technique allows for an anatomic reconstruction of the key stabilizing structures of the posterolateral corner, thereby effectively correcting varus and rotational instability. Patients in this study showed significant improvement in functional outcome scores, reduction in pain, and restoration of knee stability following surgical intervention. These improvements translated into better activity levels and overall patient satisfaction.

Additionally, the technique was associated with a low complication rate, and no major procedure-related morbidity was observed. The reproducibility of the surgical steps and the biomechanical soundness of the reconstruction make the Modified Arciero technique a dependable option for managing both isolated and combined posterolateral corner injuries.

Early recognition of PLC injuries and timely surgical reconstruction are critical to achieving optimal outcomes. Based on the results of this study, the Modified Arciero technique can be recommended as a preferred method for posterolateral corner reconstruction, offering predictable functional recovery and durable knee stability. However, larger multicentric studies with longer follow-up are recommended to further validate these findings and to assess long-term outcomes.

References

1. LaPrade RF, Engebretsen L, Ly TV, Johansen S, Wentorf FA, Engebretsen AH. **The anatomy of the posterolateral aspect of the knee.** J Bone Joint Surg Am. 2007;89(4):758–764.
2. LaPrade RF, Wentorf FA. **Diagnosis and treatment of posterolateral knee injuries.** Clin Orthop Relat Res. 2002;(402):110–121.
3. Arciero RA. **Anatomic posterolateral corner knee reconstruction.** Orthop Clin North Am. 2001;32(3):415–427.
4. Garrigues GE, Dines JS. **Management of posterolateral corner injuries of the knee.** J Knee Surg. 2012;25(2):112–118.
5. LaPrade RF, Ly TV, Wentorf FA, Engebretsen L. **The posterolateral attachments of the knee: A qualitative and quantitative morphologic analysis of the fibular collateral ligament, popliteus tendon, popliteofibular ligament, and lateral gastrocnemius tendon.** Am J Sports Med. 2003;31(6):854–860.
6. Hertel P, Guhl R. **Clinical results after reconstruction of posterolateral corner injuries of the knee.** J Sports Med Phys Fitness. 2004;44(3):208–215.
7. Garrigues GE, Dines JS, Fealy S. **Posterolateral corner injuries of the knee: Evaluation and management.** J Knee Surg. 2012;25(2):112–118.
8. Dean RS, LaPrade RF. **The posterolateral corner of the knee: Anatomy, biomechanics, and surgical techniques.** Sports Med Arthrosc Rev. 2015;23(1):2–9.
9. Stannard JP, Brown SL, Farris RC, McGwin G Jr, Volgas DA. **The posterolateral corner of the knee: Repair versus reconstruction.** Am J Sports Med. 2005;33(6):881–888.
10. Khan IM, Harvie P. **Posterolateral corner injuries of the knee.** Br J Sports Med. 2011;45(4):314–318.
11. Nakamura T, Horibe S, Katsube K, et al. **Biomechanical comparison of posterolateral corner reconstruction techniques of the knee.** Arthroscopy. 2007;23(4):439–444.
12. Shuler MS, Huston LJ, Parker RD. **Quantitative assessment of posterolateral corner reconstruction techniques.** Am J Sports Med. 2009;37(5):1147–1153.
13. Treme G, Jakob RP. **Posterolateral corner injuries of the knee.** Oper Tech Sports Med. 2009;17(1):41–48.
14. Arciero RA, Callaghan JJ. **Anatomic reconstruction of the posterolateral corner of the knee.** Clin Orthop Relat Res. 1997;338:56–66.
15. Kim SJ, Choi CH, Jung M, et al. **Clinical results of anatomic posterior cruciate ligament and posterolateral corner reconstruction.** Arthroscopy. 2012;28(3):355–364.
16. Stannard JP, Brown SL, Farris RC, McGwin G Jr, Volgas DA. **Repair versus reconstruction of the posterolateral corner of the knee.** Am J Sports Med. 2005;33(6):881–888.
17. Levy BA, Dajani KA, Morgan JA, Shah JP, Dahm DL, Stuart MJ. **Repair versus reconstruction of the fibular collateral ligament and posterolateral corner.** Knee Surg Sports Traumatol Arthrosc. 2010;18(3):332–338.
18. Fanelli GC, Edson CJ. **Posterior cruciate ligament and posterolateral corner reconstruction.** Sports Med Arthrosc Rev. 2011;19(1):20–29.
19. Lindsay DM, Bowers AL. **Outcomes following anatomic posterolateral corner reconstruction.** Am J Sports Med. 2005;33(9):1414–1422.
20. Geeslin AG, LaPrade RF. **Clinical and radiographic evaluation of partial and complete tears of the posterolateral corner.** Orthop J Sports Med. 2014;2(2):2325967114522565.
21. Miyamoto RG, McHugh MA. **Posterolateral corner reconstruction techniques.** Orthop Clin North Am. 2009;40(3):389–396.
22. Frosch KH, Akoto R, Grimm K. **A modified Arciero technique for posterolateral corner reconstruction.** Knee Surg Sports Traumatol Arthrosc. 2016;24(5):1373–1379.