Technical Note

Combined Lateral Meniscus Posterior Tear Avulsion Reinsertion and Anterior Cruciate Ligament Reconstruction Without Additional Tibial Tunnel Drilling or Additional Implants

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Abstract: Avulsion of the lateral meniscal posterior root is a frequent lesion associated with anterior cruciate ligament (ACL) tear and needs to be repaired, as it is biomechanically equivalent to a complete meniscectomy. Several reinsertion techniques have been previously described, with 1 or 2 tunnels, and several fixation techniques are available. The technique described in this study consists of digging a rail between the meniscal footprint and the joint posterior aperture of the ACL tibial tunnel, passing 2 solid sutures in the meniscal root, then into the tibial tunnel. The 2 sutures are finally tensioned by tying them to the ACL tibial fixation button. This allows quick and easy repair of lateral meniscal posterior root avulsion, with controlled reduction and without any need for additional tunnel drill or implants. This is reproducible in a conventional ACL reconstruction procedure, without any risks of crossing tunnels in the tibia.

Avulsion of the lateral meniscal posterior root (LMPR) is one of the most frequent and significant meniscal lesions associated with anterior cruciate ligament (ACL) tear. The prevalence of such lesions ranges from 7% to 18% in patients with ACL tears.[1,2] Avulsion of the LMPR must be repaired, as it is equivalent to a complete meniscectomy in terms of load distribution,[3] and we now know that arthritis risk is reduced by repairing such lesions.[4] Furthermore, LMPR reinsertions with subsequent healing contribute to postoperative knee stability after ACL reconstruction.[5-7] The most commonly described reinsertion technique is a pull-up technique, using 1 or 2 additional tibial tunnels independent from the ACL tibial tunnel.[8] Some recent studies have reported satisfactory outcomes with transtibial reinsertion using the ACL tunnel.[9] Thus, we could use the same tunnel for ACL reconstruction and lateral meniscal root attachment, with a lower risk of crossing tunnels, thereby reducing the risk of meniscal extrusion.

The main issue associated with the use of the ACL tibial tunnel for the lateral meniscal root is to anteriorly over-reduce the meniscal root, which leads to the failure of meniscal healing. Proper meniscal root reduction is then mandatory at the time of arthroscopic fixation in a figure-of-4 position, helpful to reintegrate the posterior root on its anatomic position under visual control without the need for multiple tibial tunnel drilling or additional implants.

Surgical Technique

The described surgical technique is recommended for all LMPRs in the context of ACL reconstruction. Confirmation of an avulsion of the LMPR is obtained during the surgery.

In our center, we use semitendinosus graft for ACL graft, fixed by cortical adjustable fixation ACL reconstruction suture button PULLUP (SBM) on both tibial and femoral sides. We start every arthroscopy by exploring and analyzing the ACL tear and meniscal status. Radial tear of the posterior part of the lateral meniscus is a different injury and is not relevant for the described technique.

Once the meniscal root avulsion is confirmed under arthroscopy (Fig 1A), we drill a complete ACL tibial tunnel in the tibial footprint and placed in the ACL

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remnant, without any modification of the technique for ACL reconstruction.

Then, the shaver is used through the anteromedial portal to mill the inferior part of the LMPR. The footprint of the root is also cleaned, and fibrosis is removed.

The shaver is then used by the anteromedial portal (Fig 1B) to dig a small trench from the ACL tunnel to the anatomic place of the LMPR to control the position of the FiberWires (Arthrex) from the anatomic footprint to the tibial tunnel (Fig 1C) and avoid displacement of these in the femorotibial joint space.

The meniscal root is then stitched using a Knee Scorpion Suture Passer (Arthrex) by the anteromedial portal, with 2 FiberWires (Arthrex) (Fig 1D): one from the top to the bottom and a second one in the other direction. The 2 stitches are then pulled in the tibial tunnel (Fig 1E).

The ACL graft is then placed on its final intra-articular position (Figs 1F, G), keeping meniscal stitches posterior to the ACL graft. It is important to keep tension in meniscal sutures to avoid pulling them into the joint with the ACL graft. The ACL graft is then fixed in its

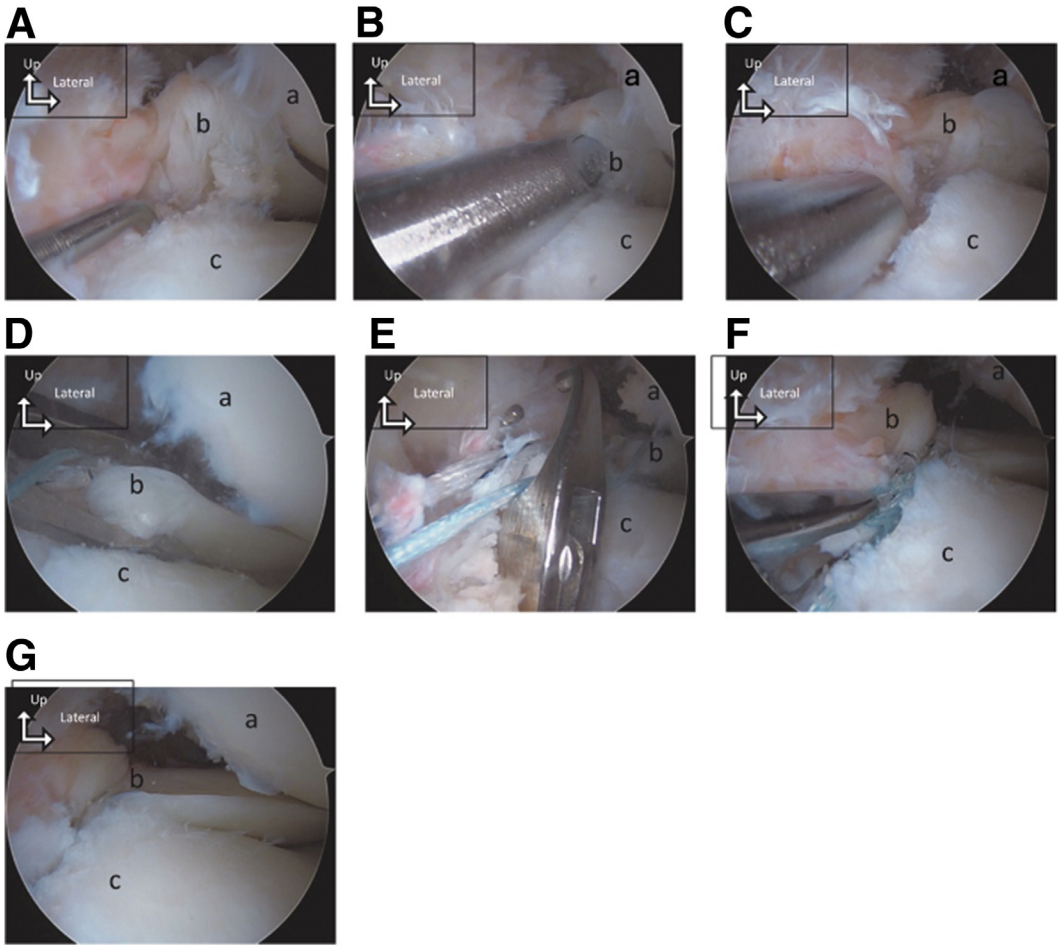

Fig 1. A. Lateral meniscal posterior root reinsertion technique illustration in a left knee (video illustration). Diagnosis of meniscal root avulsion. a, Lateral femoral condyle. b, Lateral meniscal root. c, Lateral tibial plateau. B. Lateral meniscal posterior root reinsertion technique illustration in a left knee (video illustration). Meniscal root and footprint preparation. a, Lateral femoral condyle. b, Lateral meniscal root. c, Lateral tibial plateau. C. Lateral meniscal posterior root reinsertion technique illustration in a left knee (video illustration). Driving trench preparation. a, Lateral femoral condyle. b, Lateral meniscal root. c, Lateral tibial plateau. D. Lateral meniscal posterior root reinsertion technique illustration in a left knee (video illustration). Placement of sutures in the meniscal root with a Scorpio Suture Passer (Arthrex). a, Lateral femoral condyle. b, Lateral meniscal root. c, Lateral tibial plateau. E. Lateral meniscal posterior root reinsertion technique illustration in a left knee (video illustration). Sutures passing through the ACL tunnel. a, Lateral femoral condyle. b, Lateral meniscal root. c, Lateral tibial plateau. F. Lateral meniscal posterior root reinsertion technique illustration in a left knee (video illustration). Meniscal reduction, with the sutures passed into the trench. a, Lateral femoral condyle. b, Lateral meniscal root. c, Lateral tibial plateau. G. Lateral meniscal posterior root reinsertion technique illustration in a left knee (video illustration). Final reduction. a, Lateral femoral condyle. b, Lateral meniscal root. c, Lateral tibial plateau.

definitive position, and the ACL reconstruction suture button PULLUP (SBM) is tightened, at a flexion of 20°. Meniscal root stitches are then tightened, while controlling under arthroscopy the correct tension where the meniscal root is placed in its footprint in flexion and extension. Both meniscal sutures are directed by the trench made at the beginning of the meniscal repair to place the Lateral posterior meniscal root in its anatomic position, controlling the correct tension by direct visualization. Both wires are then fixed on the button PULLUP (SBM) ropes. We thus avoid over-reducing meniscal tear and misplacement of the meniscal root, which is the main complication of the shared tibial tunnel for both ACL reconstruction and meniscal repair.

The pits and falls are cited in Table 1.

Postoperative Rehabilitation

For meniscal root avulsion associated with ACL tears, partial weightbearing is recommended for 45 days with 2 crutches. No brace is needed if there is no major collateral ligament injury (grade >2). Knee flexion is limited at 90° for the first 6 postoperative weeks. In all cases, no pivot contact sports are allowed before 6 months.

Discussion

The main advantage of the technique reported here is that it allows progressive reduction by avoiding an over-reduction of the posterior root of the lateral meniscal root (Table 2). This is achieved by driving the sutures during reduction under direct visual control. Strong fixation on cables to the cortical tunnel button is another advantage and does not require the use of an additional device use.

It has been claimed that reinsertion of the posterior root in the tibial ACL tunnel can sometimes be inaccurate, but in their anatomic study, Johannsen et al.[10] found that the distance between the anterior border of the footprint of the lateral posterior meniscal root and the posterior border of the tibial ACL footprint was only 12.7 ± 1.1 mm on average. We therefore considered that approximation as acceptable, especially if you create a bony groove to increase the contact area between the tibial bone and the meniscal root, which is likely to increase healing rates. The clinical study conducted by Ma[11] showed good clinical results after lateral meniscus reinsertion using the ACL tunnel, with a postoperative Lysolm score of 92.34 ± 6.32, but in their report, no groove was created in the tibial plateau to guide meniscal sutures from the meniscal footprint to the tibial tunnel. Zhou et al.[9] evaluated the same technique at the 2-year follow-up, comparing shared and independent tibial tunnels for ACL reconstruction and posterior meniscal root reinsertion. There was no difference between the 2 groups in terms of functional scores, pivot shift, or cartilage degeneration at the 2-year follow-up. Furthermore, the shared tunnel group involved a shorter surgery time and less meniscal extrusion at the 2-year follow-up, with stable healing at second-look arthroscopy.

In this study, we propose a simple technique to reinsert lateral meniscus posterior root avulsion by pulling it by the ACL tibial tunnel. Bhatia et al.[12]

Table 2. Advantages and Disadvantages

Advantages	Disadvantages
Anatomic reduction of posterior lateral meniscus root	Suture abrasion in bony tunnels
Short surgery time	Distance from meniscal root to button fixation
Visual control of reduction and tension	
No tibial tunnel coalition	

Table 1. Surgical Steps, Pitfalls, and Tricks

Surgical Steps	Pitfalls	Tricks
After the tibia tunnel drill, digging bone trench from the tunnel to the root meniscal footprint	Trench not deep enough	Using shaver knife as a mill
Fixing posterior meniscal root with Scorpio Suture Passer (Arthrex)	Confusing the sutures	Using 2 different traction sutures with 2 different colors. Retrieve it one by one in the tibial tunnel
While passing the ACL graft, the meniscal sutures must be kept posterior to the graft in the tunnel	Sutures tangled with the ACL graft	Intra- and extra-articular control of the suture position The sutures must be kept tensed down by the first surgical aid
Positioning the meniscal root	Misplacement of the meniscal root	Intra-articular control of the sutures inside of the bony trench Control of the suture tension by watching the meniscal root while making the knot Control of the suture tension in full flexion and extension

ACL, anterior cruciate ligament.

reported possible drawbacks associated with this technique, such as higher suture abrasion in the bony tibial tunnel. This issue can be mitigated using nonabsorbable wires with good abrasion resistance, such as FiberWire (Arthrex). Another potential limitation cited by Bhatia et al.[12] is suture displacement during knee movement, but this complication is reduced by controlling the movement of the repaired meniscal root under arthroscopy visualization in full flexion and extension during the reconstruction.

The main advantages of our technique are that it does not require any specific materials except a suture passer and 2 cables, does not lengthen the time of surgery by using ACL tunnels, and ensures an anatomic reduction of lateral posterior meniscal root avulsion to its original insertion.

A limitation of our technique is the distance from the meniscal root to the point of fixation, which is at the cortical end of the tibial tunnel, on the fixation button, but our technique avoids using additional implants. With strong knots on the plate, it is as strong as other previously reported fixation techniques.[9]

Disclosures

All authors (C.H., N.G., N.B.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Krych AJ, Hevesi M, Leland DP, Stuart MJ. Meniscal root injuries. *J Am Acad Orthop Surg* 2020;28:491-499.
2. Ciatti R, Gabrielli A, Iannella G, Mariani PP. Arthroscopic incidence of lateral meniscal root avulsion in patients with anterior cruciate ligament injury. *J Orthop Traumatol* 2021;22:30. https://doi.org/10.1186/s10195-021-00591-x.
3. Allaire R, Muriuki M, Gilbertson L, Harner CD. Biomechanical consequences of a tear of the posterior root of the medial meniscus: Similar to total meniscectomy. *J Bone Jt Surg Am* 2008;90:1922-1931.
4. Lee DR, Lu Y, Reinholz AK, et al. Root repair has superior radiological and clinical outcomes than partial meniscectomy and nonoperative treatment in the management of meniscus root tears: A systematic review [published online February 22, 2024]. *Arthroscopy*, 10.1016/j.arthro.2024.02.017.
5. Shybut TB, Vega CE, Haddad J, et al. Effect of lateral meniscal root tear on the stability of the anterior cruciate ligament–deficient knee. *Am J Sports Med* 2015;43:905-911.
6. Shekhar A, Tapasvi S, Williams A. Outcomes of combined lateral meniscus posterior root repair and anterior cruciate ligament reconstruction. *Orthop J Sports Med* 2022;10:232596712210833. https://doi.org/10.1177/23259671221083318.
7. Zheng T, Song G yang, Feng H, et al. Lateral meniscus posterior root lesion influences anterior tibial subluxation of the lateral compartment in extension after anterior cruciate ligament injury. *Am J Sports Med* 2020;48:838-846.
8. Nlandu A, Giurazza G, Lahsika M, et al. How to avoid suture damage in simultaneous anterior cruciate ligament reconstruction and lateral meniscal posterior root reinsertion with the transtibial pullout technique: A technical note. *Arthrosc Tech* 2024;13:102849. https://doi.org/10.1016/j.eats.2023.09.024.
9. Zhou Y, Bai F, Liu X, She H, Ding C, Xiang B. Shared ACL bone tunnel technique for repair of lateral meniscus posterior root tears combined with ACL reconstruction. *Orthop J Sports Med* 2022;10:232596712211143. https://doi.org/10.1177/23259671221114319.
10. Johannsen AM, Civitarese DM, Padalecki JR, Goldsmith MT, Wijdicks CA, LaPrade RF. Qualitative and quantitative anatomic analysis of the posterior root attachments of the medial and lateral menisci. *Am J Sports Med* 2012;40:2342-2347.
11. Ma Z. Surgical treatment of combined posterior root tears of the lateral meniscus and ACL tears. *Med Sci Monit* 2015;21:1345-1349.
12. Bhatia S, LaPrade CM, Ellman MB, LaPrade RF. Meniscal root tears: Significance, diagnosis, and treatment. *Am J Sports Med* 2014;42:3016-3030.