

Technical Note

Meniscal Ramp Lesion Repair Without the Need for a Posteromedial Portal

Abel Gómez Cáceres, M.Sc., Iskandar Tamimi Mariño, Ph.D.,
Francisco Javier Martínez Malo, M.Sc., Ignacio Vieitez Riestra, M.D., and
Raphael Pierre Idiart, Ph.D.

Abstract: Medial meniscal ramp injury has gained the attention of orthopaedic surgeons in recent years. It consists of a tear of the peripheral insertion of the posterior horn of the medial meniscus. Its prevalence in anterior cruciate ligament reconstruction varies between 9% and 40% according to different studies. Ramp lesions cannot always be diagnosed using magnetic resonance imaging scans. To identify ramp lesions, the arthroscope should be introduced into the posteromedial compartment of the knee during the routine examination of the knee (Gillquist maneuver). Not all authors advocate systematically repairing ramp injuries of the medial meniscus, especially when these injuries are small and stable. They have historically been repaired using an outside-in technique using a hook-type suture passed through a posteromedial portal. In this study, we present our all-inside suture technique without the use of a posteromedial portal.

Medial meniscal ramp injuries have gained the attention of orthopaedic surgeons in recent years owing to the better understanding of the biomechanics behind anterior cruciate ligament (ACL) injuries. These lesions were described by Strobel¹ in 1988. Medial meniscal ramp injury consists of a tear of the peripheral insertion of the posterior horn of the medial meniscus, at the level of the meniscocapsular junction, no more than 2.5 cm in the medial-lateral axis.²

To identify ramp lesions, the arthroscope should be introduced into the posteromedial compartment of the knee during the routine examination of the knee (Gillquist maneuver). During visualization of the posteromedial compartment, it is important, when in doubt, to palpate the meniscocapsular junction with a needle from a posteromedial portal.³ Recently, Pires et al.⁴

described a maneuver (the Recife maneuver) to explore the posteromedial compartment without the need to systematically create a posteromedial portal or the introduction of a needle.

Thaunat et al.⁵ classified medial meniscal ramp lesions into 5 types based on the location of the lesion injury. Their prevalence in ACL reconstruction varies between 9% and 40% according to different studies.⁶⁻⁸

Ramp lesions cannot always be diagnosed using magnetic resonance imaging scans.⁹ This is because the sensitivity of resonance is lower in lesions of the posterior horn and in vertical tears. Therefore, a thorough arthroscopic exploration of the knee is essential to accurately diagnose these lesions.^{7,10}

The medial meniscus is a secondary stabilizer of the knee. We know that longitudinal vertical lesions of the posterior horn associated with ACL tears must be repaired during the same surgical act to improve the long-term surgical outcomes.¹¹ It is also known that meniscal repairs associated with ACL reconstructions have lower failure rates than isolated repairs.¹² However, not all authors advocate systematically repairing ramp injuries of the medial meniscus, especially when these injuries are small and stable.^{13,14} For stable and small lesions, debriding the edges is a possible therapeutic option ("abraded and trephined").¹⁵ On the other hand, larger and more unstable lesions (>2 cm in length) should be repaired.^{16,17}

Ramp lesions have historically been repaired by an outside-in technique using a hook-type suture passed

From Departamento de Cirugía Ortopédica y Traumatología, Hospital HM Málaga (Malaga Institute of Sports Traumatology [IMATDE] Málaga), Málaga, Spain (A.G.C., I.T.M., F.J.M.M.); Novem Clinic, Málaga, Spain (A.G.C.); Hospital Regional Universitario de Málaga, Málaga, Spain (I.T.M., F.J.M.M., I.V.R.); and Hospital Vithas Xanit Internacional, Málaga, Spain (R.P.I.).

Received August 22, 2023; accepted December 1, 2023.

Address correspondence to Abel Gómez Cáceres, M.Sc., Paseo Antonio Machado 28, 29002, Málaga, Spain. E-mail: gomezcaeresabel@gmail.com

© 2023 THE AUTHORS. Published by Elsevier Inc. on behalf of the Arthroscopy Association of North America. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

2212-6287/231226

<https://doi.org/10.1016/j.eats.2023.102902>

through a posteromedial portal.¹⁸⁻²¹ Recent reports have reported using other suture devices such as “all-inside” suture devices or even using bottom jaw-to-suture retrieving top jaw arthroscopic forceps suture passers.^{22,23} In this study, we present our all-inside suture technique without the use of a posteromedial portal.

Surgical Technique

Patient Positioning

The patient is administered general anesthesia and is placed in the supine position. A tourniquet is placed on the proximal thigh, and an L-shaped support is placed on the distal end of the table to keep the knee in about 90° of flexion. Two additional supports are placed laterally (Figure 1) (Figure 2).

Arthroscopic Exploration

Standard anterolateral and anteromedial portals are created to perform a full examination of the knee. The stability of the posterior horn of the medial meniscus should be evaluated with a probe, especially in the presence of a visible peripheral lesion. Finally, with the arthroscope positioned in the anterolateral portal, an exploration of the posteromedial compartment is performed through the intercondylar notch (Video 1).

Ramp Injury Repair

If a ramp meniscal lesion is observed (Fig 3), a release of the medial compartment of the knee is performed using the pie-crusting technique with a No. 14 Abbotath (Abbott Laboratories, Chicago, IL) to avoid damage to the cartilage when introducing the suture implants (figure 4) (figure 5) (figure 6). Using the probe, we evaluate whether we can access the site of the ramp



Fig 1. The patient is administered general anesthesia and is placed in the supine position. A tourniquet is placed on the proximal thigh, and an L-shaped support is placed on the distal end of the table to keep the knee in about 90° of flexion. Two additional supports are placed laterally.



Fig 2. The patient is administered general anesthesia and is placed in the supine position. A tourniquet is placed on the proximal thigh, and an L-shaped support is placed on the distal end of the table to keep the knee in about 90° of flexion. Two additional supports are placed laterally.

tear without difficulty. We perform debridement of the edges of the lesion with a scraper. Subsequently, by use of a 12° curved Truespan all-inside suture device (DePuy Synthes, Raynham, MA), horizontal and vertical suturing is performed through the anteromedial

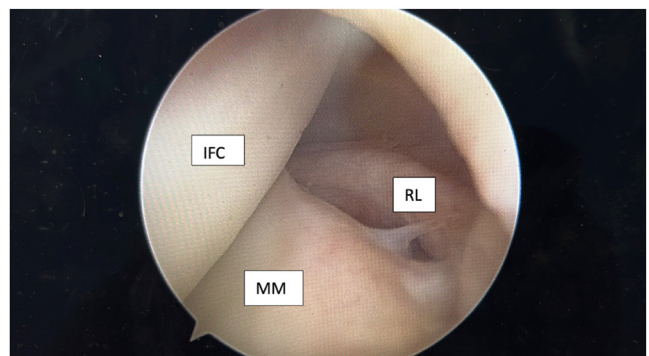


Fig 3. With the arthroscope positioned in the anterolateral portal, an exploration of the posteromedial compartment is performed through the intercondylar notch. A meniscal ramp lesion (RL) is observed. (IFC, internal femoral condyle; MM, medial meniscus.)



Fig 4. Release of the medial compartment of the left knee is performed using the pie-crusting technique.

portal under direct visualization from the anterolateral portal (Fig 7). Finally, we proceed to adjust the knot with a pusher under direct visualization to control the meniscal tension (Fig 8).

Postoperative Protocol

The knee joint is placed in an articulated brace after surgery. During the first 10 days, the brace is locked in

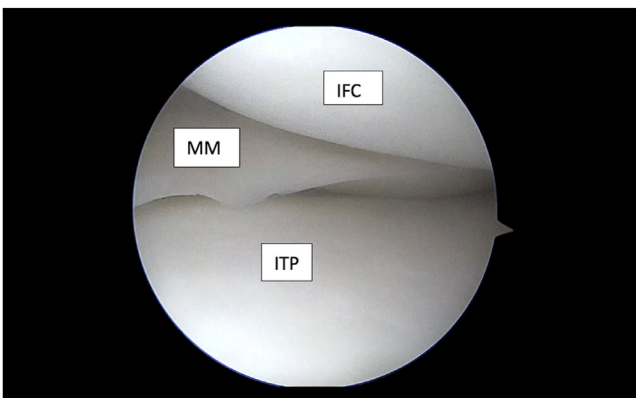


Fig 5. View of internal compartment without pie-crusting technique. (IFC, internal femoral condyle; ITP, internal tibial plateau; MM, medial meniscus.)

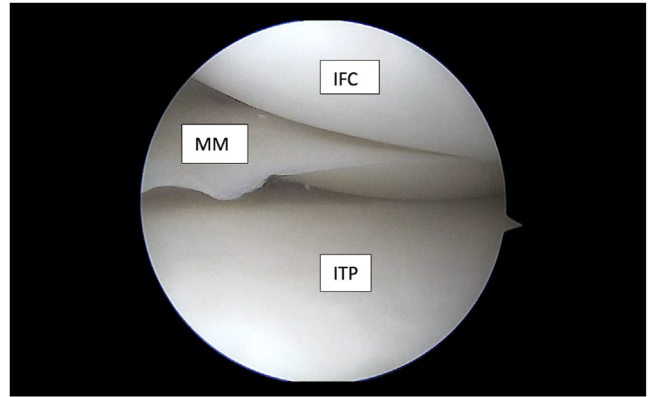


Fig 6. View of internal compartment after performing pie-crusting technique. (IFC, internal femoral condyle; ITP, internal tibial plateau; MM, medial meniscus.)

extension; then, flexion-extension exercises from 0° to 90° are started. At 6 weeks after surgery, patients were allowed to start full range-of-movement exercises. Physiotherapy is started immediately after surgery to avoid swelling of the operative extremity and to activate the quadriceps. The patient is kept partially weight bearing for at least 4 to 6 weeks.

Discussion

The described technique allows a ramp tear to be sutured without the need for a posteromedial portal, avoiding the risk of neurovascular injuries and shortening the surgical time of the procedure. All-inside meniscal sutures have become increasingly popular in recent years owing to the ease of their use in meniscal repairs, as well as low complication rates. These are available in any operating room in which ACL reconstruction is performed.²⁴⁻²⁶ On the other hand, other specific surgical instruments such as suture hooks or suture-passing knee forceps are not always available. Furthermore, not all surgeons are familiar with the use

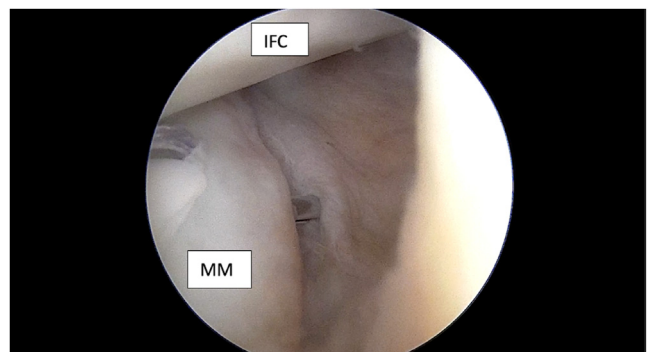


Fig 7. By use of the Truespan all-inside-suture device, horizontal suturing is performed on the left knee through the anteromedial portal under direct visualization from the anterolateral portal. (IFC, internal femoral condyle; MM, medial meniscus.)

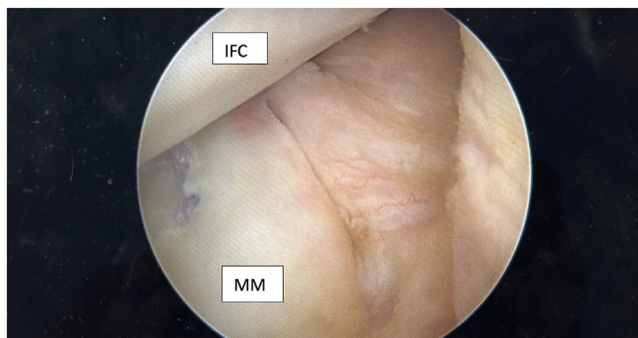


Fig 8. The knot is adjusted with a pusher under direct visualization to control the meniscal tension. (IFC, internal femoral condyle; MM, medial meniscus.)

of these instruments, which is more technically demanding and requires a longer learning curve. However, some authors advocate the use of the posteromedial portal. Gousopoulos et al.²⁷ stated that hook repairs through the posteromedial portal have a lower secondary meniscectomy rate than all-inside repairs. They compared 237 patients who underwent suturing with a hook with 237 patients who underwent suturing with an all-inside device, with a follow-up period of 97.7 ± 17.3 months.

In a systematic review, Alessio-Mazzola et al.²⁸ reported that the repair of ramp lesions leads to good clinical results with low complication rates regardless of the suture technique used. The recurrence rate of repaired lesions ranged between 0.8% and 7.3%.²⁸

In vitro, ramp sutures with all-inside devices have been shown to reduce the anterior and rotational instability that occurs as a consequence of posteromedial meniscocapsular lesions.²⁹ Chen et al.³⁰ used an all-inside device for suturing of ramp lesions in 46 patients. Control (second-look) arthroscopy showed that the lesion had completely healed in 40 patients; in 5, the healing was incomplete; and in 1, the meniscal repair had failed. Of the 40 patients whose

lesions had healed, 36 were asymptomatic and 4 had a degree of joint-line tenderness.³⁰ In a cadaveric study, Heilpern et al.³¹ confirmed that the use of all-inside suture devices was safe and effective in repairing these difficult injuries. They obtained a failure rate of 2.5%.³¹

Mostafa Zaky Abdelrazek et al.³² described a technique similar to ours, in which all-inside sutures were used without the need for a posteromedial portal. On the other hand, Negrín et al.³³ used the posteromedial portal to lift the meniscocapsular ligament when performing meniscal repair. In this way, they could ensure that the needle of the suturing device passed through the 2 sides of the ramp lesion.³³

As in any meniscal repair of the posterior horn, a narrow joint space can make the arthroscopic procedure particularly difficult. The pie-crusting technique for the medial collateral ligament is a safe technique used to increase the medial joint space.³⁴⁻³⁶ Its use also facilitates the repair of ramp injuries with all-inside devices from the standard anterior portals.^{37,38} In ramp injuries in which the meniscotibial ligament is affected, to use all-inside devices, Labarre et al.³⁹ placed a suture under the medial meniscus and across the meniscotibial ligament.

The use of sutures with all-inside suturing devices such as the device used in our technique has a low complication rate. To avoid neurovascular lesions, Chen et al.³⁰ recommended limiting the depth of the device to 20 mm (Table 1). It is important to remove implants that may remain intra-articular when they are not supported in the capsular area. Sonnery-Cottet et al.⁴⁰ published a case of an osteochondral injury due to the presence of these loose implants in the internal compartment. The repair of ramp lesions with all-inside devices is a safe, reproducible, and relatively short technique, with a relatively short learning curve.

In conclusion, the use of all-inside suture devices to repair ramp lesions without an accessory posteromedial portal is a safe and accessible technique. It reduces the

Table 1. Pearls, Pitfalls, Advantages, and Disadvantages

Pearls

- The pie-crusting technique should be performed to avoid damaging the cartilage when introducing the suture implants.
- The arthroscope should be placed from the lateral portal.
- Suturing should be performed in full extension.

Pitfalls

- To avoid damage to the neurovascular structures, the length of the implant must be controlled.

Advantages

- The need to create a posteromedial portal is avoided.
- The technique does not require specific suture materials (e.g., suture hooks).

Disadvantages

- Sometimes, the technique does not allow the meniscal tear to be reduced.
- The surgeon may encounter difficulty in debriding the edges of the lesion.

surgical time in procedures that are already long because of concomitant ACL injury.

Disclosure

The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

References

1. Strobel M. *Manual of arthroscopic surgery*. New York: Springer, 1988.
2. Chahla J, Dean CS, Moatshe G, et al. Meniscal ramp lesions: Anatomy, incidence, diagnosis, and treatment. *Orthop J Sports Med* 2016;4:2325967116657815.
3. Sonnery-Cottet B, Conteduca J, Thauat M, Gunepin FX, Seil R. Hidden lesions of the posterior horn of the medial meniscus: A systematic arthroscopic exploration of the concealed portion of the knee. *Am J Sports Med* 2014;42:921-926.
4. Pires D, Monteiro L, Rocha de Faria JL, et al. Diagnosis by manual maneuver of medial meniscus ramp lesions. *Arthrosc Tech* 2023;12:e959-e964.
5. Thauat M, Fayard JM, Guimaraes TM, Jan N, Murphy CG, Sonnery-Cottet B. Classification and surgical repair of ramp lesions of the medial meniscus. *Arthrosc Tech* 2016;5:e871-e875.
6. Liu X, Feng H, Zhang H, Hong L, Wang XS, Zhang J. Arthroscopic prevalence of ramp lesion in 868 patients with anterior cruciate ligament injury. *Am J Sports Med* 2011;39:832-837.
7. Bollen SR. Posteromedial meniscocapsular injury associated with rupture of the anterior cruciate ligament: A previously unrecognized association. *J Bone Joint Surg Br* 2010;92:222-223.
8. Cristiani R, van de Bunt F, Kvist J, Stålmán A. High prevalence of meniscal ramp lesions in anterior cruciate ligament injuries. *Knee Surg Sports Traumatol Arthrosc* 2023;31:316-324.
9. Hatayama K, Terauchi M, Saito K, Aoki J, Nonaka S, Higuchi H. Magnetic resonance imaging diagnosis of medial meniscal ramp lesions in patients with anterior cruciate ligament injuries. *Arthroscopy* 2018;34:1631-1637.
10. Sharifah MI, Lee CL, Suraya A, Johan A, Syed AF, Tan SP. Accuracy of MRI in the diagnosis of meniscal tears in patients with chronic ACL tears. *Knee Surg Sports Traumatol Arthrosc* 2015;23:826-830.
11. Rodriguez AN, LaPrade RF, Geeslin AG. Combined meniscus repair and anterior cruciate ligament reconstruction. *Arthroscopy* 2022;38:670-672.
12. Paxton ES, Stock MV, Brophy RH. Meniscal repair versus partial meniscectomy: A systematic review comparing reoperation rates and clinical outcomes. *Arthroscopy* 2011;27:1275-1288.
13. Balazs GC, Gredtizer HGIV, Wang D, et al. Non-treatment of stable ramp lesions does not degrade clinical outcomes in the setting of primary ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2020;28:3576-3586.
14. Albayrak K, Buyukkusu MO, Kurk MB, Kaya O, Kulduk A, Misir A. Leaving the stable ramp lesion unrepaired does not negatively affect clinical and functional outcomes as well as return to sports rates after ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2021;29:3773-3781.
15. Liu X, Zhang H, Feng H, Hong L, Wang XS, Song GY. Is it necessary to repair stable ramp lesions of the medial meniscus during anterior cruciate ligament reconstruction? A prospective randomized controlled trial. *Am J Sports Med* 2017;45:1004-1011.
16. Acosta J, Ravaei S, Brown SM, Mulcahey MK. Examining techniques for treatment of medial meniscal ramp lesions during anterior cruciate ligament reconstruction: A systematic review. *Arthroscopy* 2020;36:2921-2933.
17. D'Ambrosi R, Meena A, Raj A, et al. Good results after treatment of ramp lesions in association with ACL reconstruction: A systematic review. *Knee Surg Sports Traumatol Arthrosc* 2023;31:358-371.
18. Thauat M, Jan N, Fayard JM, et al. Repair of meniscal ramp lesions through a posteromedial portal during anterior cruciate ligament reconstruction: Outcome study with a minimum 2-year follow-up. *Arthroscopy* 2016;32:2269-2277.
19. Siboni R, Pioger C, Jacquet C, et al. Meniscal ramp repair: A 2-portal posteromedial approach. *Arthrosc Tech* 2022;11:e1163-e1169.
20. Gülenç B, Kemah B, Yaçın S, Sayar Ş, Korkmaz O, Erdil M. Surgical treatment of meniscal ramp lesion. *J Knee Surg* 2020;33:255-259.
21. Vadhera AS, Parvaresh K, Swindell HW, et al. Arthroscopic all-inside repair of meniscal ramp lesions. *J ISAKOS* 2022;7:82-83.
22. Gupta S, Hishikar P, Ray B. Arthroscopic ramp repair: "No-implant, pass, park, and tie technique" using knee scorpion. *Arthrosc Tech* 2023;12:e763-e770.
23. Brito de Alencar Neto J, Marinho de Gusmão Canuto S, Antônio da Silva Girão M, et al. All-inside technique for ramp lesion repair: Arthroscopic suture with knee scorpion suture passer. *Arthrosc Tech* 2022;11:e2091-e2096.
24. Barber FA, McGarry JE. Meniscal repair techniques. *Sports Med Arthrosc Rev* 2007;15:199-207.
25. Grant JA, Wilde J, Miller BS, Bedi A. Comparison of inside-out and all-inside techniques for the repair of isolated meniscal tears: A systematic review. *Am J Sports Med* 2012;40:459-468.
26. Stärke C, Kopf S, Petersen W, Becker R. Meniscal repair. *Arthroscopy* 2009;25:1033-1044.
27. Gousopoulos L, Hopper GP, Saithna A, et al. Suture hook versus all-inside repair for longitudinal tears of the posterior horn of the medial meniscus concomitant to anterior cruciate ligament reconstruction: A matched-pair analysis from the SANTI study group. *Am J Sports Med* 2022;50:2357-2366.
28. Alessio-Mazzola M, Lovisolo S, Capello AG, et al. Management of ramp lesions of the knee: A systematic review of the literature. *Musculoskelet Surg* 2020;104:125-133.
29. Stephen JM, Halewood C, Kittl C, Bollen SR, Williams A, Amis AA. Posteromedial meniscocapsular lesions increase tibiofemoral joint laxity with anterior cruciate ligament deficiency, and their repair reduces laxity. *Am J Sports Med* 2016;44:400-408.

30. Chen Z, Li WP, Yang R, et al. Meniscal ramp lesion repair using the Fast-Fix technique: Evaluating healing and patient outcomes with second-look arthroscopy. *J Knee Surg* 2018;31:710-715.
31. Heilpern G, Stephen J, Ball S, Amis A, Williams A. It is safe and effective to use all inside meniscal repair devices for posteromedial meniscal 'ramp' lesions. *Knee Surg Sports Traumatol Arthrosc* 2018;26:2310-2316.
32. Mostafa Zaky Abdelrazek BH, Waly MR, Abdel Aziz MA, Abdel Aziz A. Different techniques for the management of meniscal ramp lesions using standard anterior portals. *Arthrosc Tech* 2019;9:e39-e44.
33. Negrín R, Reyes NO, Iñiguez M, Pellegrini JJ, Wainer M, Duboy J. Meniscal ramp lesion repair using an all-inside technique. *Arthrosc Tech* 2018;7:e265-e270.
34. Arıcan G, Ercan N, Atmaca E, İltar S, Alemdaröđlu KB. During arthroscopic repair of medial meniscal tears: Do not be afraid to perform "pie crust" technique. *J Knee Surg* 2023;36:139-145.
35. Moran TE, Awowale JT, Werner BC, Fox MA, Miller MD. Associated morbidity after the percutaneous release of the medial collateral ligament for knee arthroscopy. *Arthroscopy* 2020;36:891-900.
36. Moran TE, Demers A, Awowale JT, Werner BC, Miller MD. The outside-in, percutaneous release of the medial collateral ligament for knee arthroscopy. *Arthrosc Tech* 2020;9:e393-e397.
37. Choi KY, Koh IJ, Kim MS, In Y. Medial meniscal ramp lesion repair through anterior portals using a medial collateral ligament pie-crusting technique. *Arthrosc Tech* 2021;10:e1073-e1077.
38. Kawada K, Furumatsu T, Tamura M, et al. Effectivity of the outside-in pie-crusting technique and an all-inside meniscal repair device in the repair of ramp lesions. *Arthrosc Tech* 2023;12:e273-e278.
39. Labarre C, Graveleau N, Bouguennec N. Meniscal ramp lesions repair: An under-meniscus all-inside suture in cases of isolated meniscotibial ligament tears. *Arthrosc Tech* 2021;10:e1417-e1424.
40. Sonnery-Cottet B, Mortati R, Gadea F, Thaumat M, Moyere F, Chouteau J. Osteolysis of the tibial plateau after meniscal repair with hybrid suture anchor. *Knee Surg Sports Traumatol Arthrosc* 2013;21:2137-2140.