

Editorial Commentary: Failure With Continuity: Redefining Healing With Meniscal Root Repair



Aravind Athiviraham, M.D., Editorial Board

Abstract: The importance of the medial meniscus posterior root for preserving knee joint kinematics, joint contact pressures, and articular cartilage integrity is well recognized. Medial meniscus root repair generally is associated with favorable clinical outcomes and radiographic changes compared with conservative treatment or subtotal meniscectomy; however, second-look arthroscopy often reveals some laxity at the repair site. Even in this latter situation of “failure with continuity” of the meniscus root repair, there may be benefit in delaying progression of radiographic degeneration changes. Given that the displacement of the repair often occurs with premature rehabilitative loading, it is important to delay the progression of weight-bearing until adequate healing has occurred.

See related article on page 3079

“The road to success and the road to failure are almost exactly the same.”

—Sir Colin R. Davis, former Conductor with the London Symphony Orchestra

Defining what constitutes a successful soft-tissue repair versus one that has failed often can be challenging. A fascinating example is in the setting of rotator cuff repair, where it has been shown many rotator cuff repairs retract away from their position of initial fixation during the first year after surgery.¹ The term “failure with continuity” has been used to describe this process of tendon retraction from its position of initial fixation without the formation of a recurrent defect.¹ Surprisingly, although patients with a recurrent defect had more tendon retraction within the first 6 weeks after surgery, the total magnitude of tendon retraction was not significantly different between the healed and re-rupture groups.

There are parallels that can be drawn between rotator cuff and meniscal root tears in that they are both enthesis-related pathologies and are susceptible to degenerative changes secondary to relative tissue avascularity. Previous studies have shown that medial meniscal root tears are indistinguishable from a subtotal

medial meniscectomy in terms of peak tibiofemoral contact pressures and are associated with increases in tibial translation, greater medial compartment excursion, and progression of medial tibiofemoral cartilage damage.²⁻⁵ Biomechanical experiments have shown that anatomic, transtibial pullout meniscal root repairs have the ability to restore time zero contact mechanics.⁵⁻⁷ Overall, meniscal root repairs are associated with favorable clinical results and patient satisfaction regardless of patient age and meniscus laterality.⁸ Risk factors for poor clinical outcomes after posterior medial meniscal root repair include pre-existing high-grade (Outerbridge grade ≥ 3) chondral lesions and severe varus knee alignment ($>5^\circ$).⁹ Patients treated without root repair, with either conservative treatment or subtotal meniscectomy, have a 30% to 35% risk of 5-year conversion to total knee replacement.^{10,11} However, despite clear indications in favor of meniscal root repair and positive clinical results, several studies have questioned our ability to reliably repair the meniscus root. In fact, second-look arthroscopy has demonstrated complete or stable healing in only 60% to 70% of repairs and persistent meniscal extrusion in the majority of cases.¹² Some authors have even suggested meniscal root repair outcomes are at the level of a salvage procedure.¹³

Furthermore, several biomechanical studies have shown that early rehabilitative loading of medial meniscus root repair causes substantial displacement and loosening of the posterior medial root.¹⁴⁻¹⁶ These findings suggest the need to consider slower

The author reports 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](#).

© 2019 by the Arthroscopy Association of North America
0749-8063/19844/\$36.00

<https://doi.org/10.1016/j.arthro.2019.07.004>

incorporation of weight-bearing protocols in the setting of medial meniscus root repair. Interestingly, similar findings have been reported in the setting of rotator cuff repair, where the majority of tendon marker movement occurred during the most intensive period of physical therapy, in the second and third months after surgery.¹⁷ Comparable findings also have been shown with other soft-tissue procedures, including distal biceps repair and anterior cruciate ligament reconstruction.¹⁸⁻²⁰

The present study “Clinical and Radiologic Outcomes of Patients With Lax Healing After Medial Meniscal Root Repair: Comparison With Subtotal Meniscectomy” by Kim, Lee, Gwak, Kim, Park, and Kwon compares the radiologic and clinical outcomes between patients who underwent medial meniscus root repair who were classified as “lax” on second-look arthroscopy and patients who underwent subtotal meniscectomy.²¹ The authors excluded patients with greater than Kellgren–Lawrence Grade 2 on a standing anteroposterior radiograph and 45° flexed posteroanterior radiograph, greater than 5° varus deformity, severe degeneration of the medial meniscus, and patients undergoing any concomitant surgery other than cartilage procedures. The authors found that 75% of the patients who received second-look arthroscopy following tibial pullout root repair had lax healing, analogous to the aforementioned “failure with continuity.” At minimum 2-year follow-up, the authors found that both the meniscectomy and repair with lax healing groups had similar improvements in patient-reported outcomes; however, the repair with lax healing group had less Kellgren–Lawrence grade progression on radiographs. In other words, although the medial meniscus root repair may go on to elongate and heal in a lax manner, there is still some benefit in delaying radiographic progression of knee osteoarthritis, which is further supported by previous studies.¹¹ The short-term follow-up period, small sample size, subjective nature of classification of laxity, and varied techniques used for the root repairs are some limitations of the study.

As Dr. LaPrade stated in his Editorial Commentary more than a year ago, the biggest challenges remaining for meniscal root repair is to perform these surgeries reproducibly and efficiently, and improve the biological milieu for healing.²² Until we are able to make advancements in these areas, patients should be counseled on the importance of compliance with non-weight-bearing restrictions for the first 6 weeks and the slow progression with weight-bearing thereafter. As the famous American psychologist B.F. Skinner once said, “A failure is not always a mistake, it may simply be the best one can do under the circumstances. The real mistake is to stop trying.” Indeed, “failure with continuity” of the meniscal root repair

may be preferable to subtotal meniscectomy or benign neglect, warts and all.

References

1. McCarron JA, Derwin KA, Bey MJ, et al. Failure with continuity in rotator cuff repair “healing”. *Am J Sports Med* 2013;41:134-141.
2. Marsh CA, Martin DE, Harner CD, Tashman S. Effect of posterior horn medial meniscus root tear on in vivo knee kinematics. *Orthop J Sports Med* 2014;2:2325967114541220.
3. Guermazi A, Hayashi D, Jarraya M, et al. Medial posterior meniscal root tears are associated with development or worsening of medial tibiofemoral cartilage damage: The multicenter osteoarthritis study. *Radiology* 2013;268:814-821.
4. Driban JB, Davis JE, Lu B, et al. Accelerated knee osteoarthritis is characterized by destabilizing meniscal tears and preradiographic structural disease burden. *Arthritis Rheumatol* 2019;71:1089-1100.
5. LaPrade CM, Foad A, Smith SD, et al. Biomechanical consequences of a nonanatomic posterior medial meniscal root repair. *Am J Sports Med* 2015;43:912-920.
6. LaPrade CM, Jansson KS, Dornan G, Smith SD, Wijdicks CA, LaPrade RF. Altered tibiofemoral contact mechanics due to lateral meniscus posterior horn root avulsions and radial tears can be restored with in situ pull-out suture repairs. *J Bone Joint Surg Am* 2014;96:471-479.
7. Padalecki JR, Jansson KS, Smith SD, et al. Biomechanical consequences of a complete radial tear adjacent to the medial meniscus posterior root attachment site: In situ pull-out repair restores derangement of joint mechanics. *Am J Sports Med* 2014;42:699-707.
8. LaPrade RF, Matheny LM, Moulton SG, James EW, Dean CS. Posterior meniscal root repairs: Outcomes of an anatomic transtibial pull-out technique. *Am J Sports Med* 2017;45:884-891.
9. Jiang EX, Abouljoud MM, Everhart JS, et al. Clinical factors associated with successful meniscal root repairs: A systematic review. *Knee* 2019;26:285-291.
10. Krych AJ, Reardon PJ, Johnson NR, et al. Non-operative management of medial meniscus posterior horn root tears is associated with worsening arthritis and poor clinical outcome at 5-year follow-up. *Knee Surg Sports Traumatol Arthrosc* 2017;25:383-389.
11. Chung KS, Ha JK, Yeom CH, et al. Comparison of clinical and radiologic results between partial meniscectomy and resection of medial meniscus posterior root tears: A minimum 5-year follow-up. *Arthroscopy* 2015;31:1941-1950.
12. Feucht MJ, Kühle J, Bode G, et al. Arthroscopic transtibial pullout repair for posterior medial meniscus root tears: A systematic review of clinical, radiographic, and second-look arthroscopic results. *Arthroscopy* 2015;31:1808-1816.
13. Lubowitz JH. Editorial commentary: Meniscal root avulsion repair outcomes are at the level of a salvage procedure. *Arthroscopy* 2015;31:1817-1818.
14. Steineman BD, LaPrade RF, Donahue TLH. Loosening of transtibial pullout meniscal root repairs due to simulated

- rehabilitation is unrecoverable: A biomechanical study. *Arthroscopy* 2019;35:1232-1239.
15. Cerminara AJ, LaPrade CM, Smith SD, Ellman MB, Wijdicks CA, LaPrade RF. Biomechanical evaluation of a transtibial pull-out meniscal root repair: Challenging the bungee effect. *Am J Sports Med* 2014;42:2988-2995.
 16. Stärke C, Kopf S, Lippisch R, Lohmann CH, Becker R. Tensile forces on repaired medial meniscal root tears. *Arthroscopy* 2013;29:205-212.
 17. Baring TK, Cashman PP, Reilly P, Emery RJ, Amis AA. Rotator cuff repair failure in vivo: A radiostereometric measurement study. *J Shoulder Elbow Surg* 2011;20:1194-1199.
 18. Marshall NE, Keller RA, Okoroha K, et al. Radiostereometric evaluation of tendon elongation after distal biceps repair. *Orthop J Sports Med* 2016;4:2325967116672620.
 19. Khan R, Konyves A, Rama KRBS, Thomas R, Amis AA. RSA can measure ACL graft stretching and migration: Development of a new method. *Clin Orthop Rel Res* 2006;448:139-145.
 20. Beynon BD, Johnson RJ, Naud S, et al. Accelerated versus nonaccelerated rehabilitation after anterior cruciate ligament reconstruction: A prospective, randomized, double-blind investigation evaluating knee joint laxity using roentgen stereophotogrammetric analysis. *Am J Sports Med* 2011;39:2536-2548.
 21. Kim CW, Lee CR, Gwak HC, et al. Clinical and radiologic outcomes of patients with lax healing after medial meniscal root repair: Comparison with subtotal meniscectomy. *Arthroscopy* 2019;35:3079-3086.
 22. LaPrade RF. Editorial Commentary: We know we need to fix knee meniscal radial root tears—but how best to perform the repairs? *Arthroscopy* 2018;34:1069-1071.