

# Editorial Commentary: Back to the Future With the Medial Patellofemoral Complex



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**Abstract:** The desire to better re-create the native anatomy in orthopaedic surgery—and especially knee ligament reconstruction—was an area of great debate and discussion approximately 10 years ago in anterior cruciate ligament (ACL) reconstruction. Our better and more detailed understanding of the anatomy, especially the insertional anatomy, of the ACL fueled the debate over the best surgical technique to maximize function, improve patient outcomes, and reduce long-term morbidity. While these discussions are still ongoing, detailed study of the medial patellofemoral complex (MPFC) anatomy is bringing us “back to the future” with similar discussions on how to best re-create this anatomy. Although specific techniques and surgical risks versus rewards will continue to be debated, our improved understanding of the anatomy of the MPFC, similar to our improved understanding of the ACL, ultimately will improve how MPFC reconstruction is performed and improve patient outcomes.

*See related article on page 3010*

Approximately in the 2009-2010 time frame, orthopaedic sports medicine began to experience a renaissance. This renaissance was framed within the paradigm that anterior cruciate ligament (ACL) reconstruction can and should be performed more anatomically. Arthroscopically assisted ACL reconstruction was initially made possible in the 1980s with the advancement of arthroscopic instrumentation and techniques.<sup>1</sup> Single-bundle, transtibial arthroscopically assisted ACL reconstruction became the standard of care for patients undergoing this operation for approximately 30 years.<sup>1-3</sup> In the 2009-2010 time frame, more detailed evaluation and study of the anatomy of the ACL, especially as it pertains to its origin and insertions, the tibial and femoral footprints, led to major innovation

and changes in the way this was understood and performed.<sup>4-6</sup> No longer were surgeons required to make femoral tunnels constrained by tibial tunnel placement, and no longer were ACL grafts placed with the primary goals of avoiding notch impingement and creating an isometric graft.<sup>4-8</sup> Now, detailed anatomy and radiographic and intraoperative landmarks were available to guide placement of ACL graft tunnels.<sup>4-6</sup> Through this renaissance, the concepts of independent femoral tunnel drilling, double-bundle ACL reconstruction, precision in tibial tunnel placement in addition to femoral tunnel placement, and anatomic single-bundle reconstruction came about.<sup>8</sup> And although these ACL reconstruction techniques continue to be debated as far as what is best, this renaissance in trying to better re-create the anatomy in our surgical techniques appears here to stay.<sup>8,9</sup>

And so it goes with medial patellofemoral ligament (MPFL) reconstruction. Understanding of the anatomy of the MPFL goes back to the original description of the medial anatomic layers of the knee by Warren and Marshall.<sup>10</sup> In the early 2000s, this structure gained significantly increased interest as studies showed its frequency of injury in lateral patellar dislocations and instability.<sup>11,12</sup> Techniques for repair and reconstruction grew rapidly, and numerous studies describing differing tunnels, grafts, and methods of fixation for MPFL reconstruction have been published over the past 2 decades.<sup>13</sup> Over the past several years, there has been

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growing interest in the anatomy of the MPFL, especially the origin and insertional anatomy, because complications including arthrofibrosis and pain have been shown with nonanatomic graft placement.<sup>14,15</sup> In this issue, Tanaka<sup>16</sup> takes our understanding 1 step further in her study titled “Femoral Origin Anatomy of the Medial Patellofemoral Complex: Implications for Reconstruction.” Tanaka notes that this ligamentous restraint on the medial side of the knee should be more appropriately called the “medial patellofemoral complex” (MPFC) because there are distinct fibers with both static and dynamic components on the femur, with a broad “ribbon-shaped” footprint on the femur. Although reconstruction techniques were not specifically discussed, according to the author the anatomy of the proximal footprint and the separate fibers that constitute this ligamentous complex should be given consideration during reconstruction with potentially differential femoral fixation and graft placements.

Our improved understanding of this detailed anatomy and of the differential function within the MPFC is important, and it is studies such as that of Tanaka<sup>16</sup> that will ultimately improve our ability to perform reconstructive surgery with more anatomic accuracy, less surgical morbidity, and fewer complications. But I cannot help but think back to the discussions of ACL reconstruction during the 2010 time frame as we began, similarly, to understand more of the details of the insertional anatomy of the ACL. Many centers and surgeons began to perform double-bundle ACL reconstructions to better re-create the native 2-bundle insertional anatomy and function of the native ACL.<sup>9</sup> Although some surgeons continue to perform this procedure, most have abandoned it in favor of a more “anatomic” single-bundle technique because it was shown that double-bundle ACL reconstruction was more complex, took more time, was more challenging to revise, and was more expensive than single-bundle ACL reconstruction, with no significant effect on clinical outcomes or risk of graft failure.<sup>8</sup> Will the additional understanding of the insertional anatomy of the MPFC coerce us into adding additional grafts and/or femoral fixation points that may add additional opportunities for surgical morbidity, overconstraint, and arthrofibrosis? Will the cycle seen in ACL reconstruction techniques play out again in our evolution of MPFL and/or MPFC reconstructions? Only time will tell.

In the end, although double-bundle ACL reconstruction did not gain widespread favor, our understanding of the detailed anatomy of the ACL on which double-bundle reconstruction was based has led to improved surgical techniques even in our single-bundle ACL reconstructions. Time will tell whether our

improved understanding of the MPFL and MPFC anatomy similarly will go through these types of technique discussions and this type of evolution.

## References

1. Chambat P, Guier C, Sonnery-Cottet B, Fayard JM, Thaumat M. The evolution of ACL reconstruction over the last fifty years. *Int Orthop* 2013;37:181-186.
2. McCulloch PC, Lattermann C, Boland AL, Bach BR Jr. An illustrated history of anterior cruciate ligament surgery. *J Knee Surg* 2007;20:95-104.
3. Duquin TR, Wind WM, Fineberg MS, Smolinski RJ, Buyea CM. Current trends in anterior cruciate ligament reconstruction. *J Knee Surg* 2009;22:7-12.
4. Siebold R, Ellert T, Metz S, Metz J. Femoral insertions of the anteromedial and posterolateral bundles of the anterior cruciate ligament: Morphometry and arthroscopic orientation models for double-bundle bone tunnel placement. A cadaver study. *Arthroscopy* 2008;24:585-592.
5. Siebold R, Ellert T, Metz S, Metz J. Tibial insertions of the anteromedial and posterolateral bundles of the anterior cruciate ligament: Morphometry, arthroscopic landmarks, and orientation model for bone tunnel placement. *Arthroscopy* 2008;24:154-161.
6. Ferretti M, Ekdahl M, Shen W, Fu FH. Osseous landmarks of the femoral attachment of the anterior cruciate ligament: An anatomic study. *Arthroscopy* 2007;23:1218-1225.
7. Provencher MT. *Editorial Commentary: Anatomy of the anterior cruciate ligament—Are we up to date?* *Arthroscopy* 2016;32:213.
8. Lubowitz JH. *Editorial Commentary: ACL reconstruction: Single-bundle versus double-bundle.* *Arthroscopy* 2015;31:1197-1198.
9. Mascarenhas R, Cvetanovich GL, Sayegh ET, et al. Does double-bundle anterior cruciate ligament reconstruction improve postoperative knee stability compared with single-bundle techniques? A systematic review of overlapping meta-analyses. *Arthroscopy* 2015;31:1185-1196.
10. Warren LF, Marshall JL. The supporting structures and layers on the medial side of the knee: An anatomical analysis. *J Bone Joint Surg Am* 1979;61:56-62.
11. Nomura E. Classification of lesions of the medial patellofemoral ligament in patellar dislocation. *Int Orthop* 1999;23:260-263.
12. Nomura E, Inoue M. Surgical technique and rationale for medial patellofemoral ligament reconstruction for recurrent patellar dislocation. *Arthroscopy* 2003;19:E47.
13. Stupay KL, Swart E, Shubin Stein BE. Widespread implementation of medial patellofemoral ligament reconstruction for recurrent patellar instability maintains functional outcomes at midterm to long-term follow-up while decreasing complication rates: A systematic review. *Arthroscopy* 2015;31:1372-1380.
14. Tscholl PM, Ernstbrunner L, Pedrazzoli L, Fucentese SF. The relationship of femoral tunnel positioning in medial patellofemoral ligament reconstruction on clinical

- outcome and postoperative complications. *Arthroscopy* 2018;34:2410-2416.
15. Aframian A, Smith TO, Tennent TD, Cobb JP, Hing CB. Origin and insertion of the medial patellofemoral ligament: A systematic review of anatomy. *Knee Surg Sports Traumatol Arthrosc* 2017;25:3755-3772.
16. Tanaka MJ. Femoral origin anatomy of the medial patellofemoral complex: Implications for reconstruction. *Arthroscopy* 2020;36:3010-3015.