

CORR Insights®: Is There a Disadvantage to Early Physical Therapy After Multiligament Surgery for Knee Dislocation? A Pilot Randomized Clinical Trial

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Where Are We Now?

For many surgeons, the numbers game for multiligamentous knee injuries is small, and so we often rely on our years of experience [2, 3, 5-7, 10] rather than robust data based on large randomized clinical trials. Furthermore, the complexity of the knee injury is worsened by the patient's psychological trauma from the injury, often causing poorer than expected results from the ligament tears alone

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[3, 5, 7, 9]. The stiff, painful knee after multiligamentous knee injury surgery clearly has every surgeon's attention [2, 12]. We can go back 35 years to the classic CORR publication, "Complete Knee Dislocation: A Follow-Up Study of Operative Treatment," [12], which I first read as a junior attending in 1990. In their paper, authors Sisto and Warren [12] cautioned that "a stiff knee is worse than an unstable knee." This warning bears repeating. Avoiding a stiff, painful knee after multiligamentous knee surgery is a key goal in the management of the dislocated, bicruciate, or multiligamentous knee injury. What we knew then remains true now; some stiffness persists in approximately one out of five patients undergoing multiligamentous knee surgery.

Stiffness prevention rather than stiffness treatment is the best approach. A 1995 study by Cosgarea et al. [1] noted the safety of immobilization of the knee in extension after ACL surgery, which prevents stiffness by keeping the posterior capsule under tension. But over time, we learned that adding weight-bearing and early ROM allows for functional recovery using closed chain or weightbearing exercises, maximizing postoperative ACL knee function [8,

11]. The goal for any ligament surgery is to create a fully functional knee with pain-free motion (or arc) and a stable, normal kinetic chain of the lower extremity. We all advocate for early ROM with a torn ACL, but it is the application of early motion to the simultaneously torn and reconstructed bicruciate knee (torn posterior cruciate ligament [PCL] and ACL, at a minimum), which creates concern for instability with stretching of grafts and repairs.

Lastly, the graft types and use of open incisions have implications for the development of stiffness. Early open surgery and use of autografts both have a slightly higher risk of stiffness than an all-arthroscopic approach using all-allograft tissue for reconstructions. It is with the all-allograft approach for reconstructing a three-ligament knee (for example, PCL, ACL, medial collateral ligament) that pushed many multiligamentous knee injury surgeons to use immobilization in extension for 3 to 4 weeks after surgery. As an aside, extension loss (early flexion contracture) is much more limiting than flexion loss. Close follow-up in the early postoperative course after multiligamentous knee injury surgery to recognize a flexion contracture pushes the surgeon to critically promote weightbearing, prone stretching, and aggressive ROM exercises. As shown by many surgeons, posterior capsular contraction results in

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loss of normal mechanics, pain, and an inability to regain a normal gait.

We now know that a multi-ligamentous knee injury is different from a dislocated knee [3]. Knee dislocations are multiligamentous knee injuries, but the reverse is not always true. Many studies on multiligamentous knees, although valuable, are single-cruciate knee injuries and often only involve that of an injury to the ACL and a collateral ligament [3, 5, 6]. The authors of the current study [2] focus on the spectrum of injury of a dislocation, where all patients experienced at least a PCL injury combined with at least one other ligament.

Indeed, the current study shows that early motion after surgery for a bicruciate knee dislocation does not result in failure of the reconstruction and has a tendency to decrease the need for manipulations. In other words, it appears that early motion after bicruciate knee ligament surgery is safe and decreases stiffness.

Where Do We Need To Go?

The current study helps clarify what many of us who actively treat patients with bicruciate multiligamentous knee injuries want to know: “When should we start motion, and will early motion create an unnecessary need for ligament revision surgery?” Only in a larger randomized trial can we take these early pilot data and get some answers.

Some of the gaps in our knowledge relate to our personal preferences in the management of a patient with a dislocated knee. Generally, the patient presentation should determine the appropriate clinical pathway [4]. At the University of New Mexico, I am one of five surgeons who have been successful at creating multiligamentous knee injury pathways that are patient-specific and not driven by surgeon preferences. We use

similar procedures perioperatively, namely surgical reconstructions, chemotherapy with tranexamic acid and low-molecular-weight heparin, and one single rehabilitation protocol. But in our group of well-aligned surgeons, we have our differences with a variety of PCL reconstruction types of double-bundle, single-bundle, and inlay all being used. It’s normal for surgeons to differ on technique elements like that, but the differences add to the difficulty in comparing procedures when multiligamentous knee injury surgery often involves three or four ligament reconstructions. Use of allografts, timing of surgery, implementation of motion, and weightbearing are highly experiential (not experimental) when one looks at the multiligamentous knee injury from a global perspective [9]. The availability of technology and allografts can make one surgeon’s experience completely different from another’s. Future studies should examine similar procedures and rehabilitation protocols to minimize those variables.

With few patients with this type of injury, enrollment and follow-up are often fraught with difficulties. The authors of the current study had excellent follow-up, losing only one patient in each study group at 1 year. Those of us doing studies on patients with multiligamentous knee injuries understand the difficulty of patient follow-up [6, 7]. Patients with these types of injuries or trauma often have complicating social factors that can make access and follow-up much more challenging. Understanding and coaching patients on the importance of follow-up starts at the first patient encounter, which will help further our understanding of the surgical treatment of the bicruciate knee.

How Do We Get There?

We have started this process by participating in the Surgical Timing and

Rehabilitation (STaR) Trial ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT03543098) – NCT03543098) organized at the University of Pittsburgh. The STaR Trial involves surgeons across the United States, the US military, and Canada [6]. The University of New Mexico participates in this trial (as do I). The STaR Trial is funded by the Department of Defense (DoD; DoD contract # W81XWH-17-2-007).

The STaR Trial is a randomized clinical study that examines early versus late surgery and early versus delayed motion. Even with the STaR Trial, we still need regular communication and involvement of investigators to ensure investigator equipoise, patient follow-up, and careful avoidance of protocol deviations. With a large multicenter trial such as this, the time to enroll adequate numbers of patients with multiligamentous knee injuries and avoid Type II errors requires continued focus. The concern that Hoit et al. [2] is underpowered was a consideration for closing the study.

Lastly, a collaborative spirit is required to fully understand the dislocated knee. The idea that patient variables determine treatment of the bicruciate knee injury is critical for a better understanding of such injuries. As we learn from each other, the use of similar procedures, timing of surgery, and even quite possibly the removal of ego from surgical management so as to allow movement toward evidence-driven, protocol-based approaches will allow us to compare similar surgical procedures, ligament graft selection, techniques, and rehabilitation protocols. Sharing these ideas, processes, and similar approaches will allow randomized trials to give credible information. Understanding the value of an ingenious technique should not take precedence over the need to look for similar approaches and protocols

since the goal of our research is to provide real answers and applicable solutions for multiligamentous knee injuries.

References

1. Cosgarea AJ, Sebastianelli WJ, DeHaven KE. Prevention of arthrofibrosis after anterior cruciate ligament reconstruction using the central third patellar tendon autograft. *Am J Sports Med.* 1995;23:87-92.
2. Hoit G, Rubacha M, Chahal J, Khan R, Ravi B, Whelan D. Is there a disadvantage to early physical therapy after multiligament surgery for knee dislocation? A pilot randomized clinical trial. *Clin Orthop Relat Res.* 2021;479:1725-1736.
3. Kahan JB, Schneble CA, Li D, et al. Increased neurovascular morbidity is seen in documented knee dislocation versus multiligamentous knee injury. *J Bone Joint Surg Am.* Published online February 12, 2021. DOI: [10.2106/JBJS.20.01151](https://doi.org/10.2106/JBJS.20.01151).
4. Kee JR, Edwards PK, Barnes CL. Effect of risk acceptance for bundled care payments on clinical outcomes in a high-volume total joint arthroplasty practice after implementation of a standardized clinical pathway. *J Arthroplasty.* 2017;32:2332-2338.
5. Levy BA, Fanelli GC, Whelan DB, et al. Knee Dislocation Study Group. Controversies in the treatment of knee dislocations and multiligament reconstruction. *J Am Acad Orthop Surg.* 2009;17:197-206.
6. Lynch AD, Chmielewski T, Bailey L, et al. Current concepts and controversies in rehabilitation after surgery for multiple ligament knee injury. *Curr Rev Musculoskelet Med.* 2017;10:328-345.
7. Moatshe G, Dornan GJ, Ludvigsen T, Løken S, LaPrade RF, Engebretsen L. High prevalence of knee osteoarthritis at a minimum 10-year follow-up after knee dislocation surgery. *Knee Surg Sports Traumatol Arthrosc.* 2017;25:3914-3922.
8. Noyes FR, Mangine RE, Barber S. Early knee motion after open and arthroscopic anterior cruciate ligament reconstruction. *Am J Sports Med.* 1987;15:149-160.
9. Richter DL, Held M, Campos T, Wascher DC, Schenck RC. The management of knee dislocations in the limited-resource setting. *J Bone Joint Surg Am.* 2020;102:e136.
10. Schenck RC, Richter DL, Wascher DC. Knee dislocations: lessons learned from 20-year follow-up. *Orthop J Sports Med.* 2014;2:2325967114534387.
11. Shelbourne KD, Gray T. Anterior cruciate ligament reconstruction with autogenous patellar tendon graft followed by accelerated rehabilitation. A two- to nine-year followup. *Am J Sports Med.* 1997;25:786-795.
12. Sisto DJ, Warren RF. Complete knee dislocation: a follow-up study of operative treatment. *Clin Orthop Relat Res.* 1985;198:94-101.