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ORBIT Award Presented to Robert L. LaPrade, MD, PhD, FAAOS, for 20 Years of Research to Advance Posterior Cruciate Ligament Injury Diagnosis, Treatment and Rehabilitation

NEW ORLEANS (March 4, 2026)—The 2026 Orthopaedic Research Bridging Innovation and Translation (ORBIT) Award was presented to principal investigator Robert F. LaPrade, MD, PhD, FAAOS and his research team for their foundational work to advance the diagnosis, surgical treatment and rehabilitation of posterior cruciate ligament (PCL) injuries. This body of work has resulted in 34 peer-reviewed publications, five invited publications in medical journals, and 14 book chapters on PCL reconstructions (PCLR).

To read more about the award, please click here.

Isolated PCL injuries commonly result from a dashboard injury during a car crash, falls onto a flexed knee, or hyperextension of the knee.[i, ii] Complete PCL deficiency (where posterior stress radiographs demonstrate > 8 mm side-to-side difference) exposes the knee to abnormal kinematics and contact pressures in the medial compartment and the patellofemoral joint.[iii] When left untreated, isolated PCL tears are associated with a significantly higher risk of symptomatic arthritis, with a 3.2-fold increased likelihood of requiring total knee arthroplasty compared with individuals without PCL tears.[iv]

“Approximately 24 years ago, outcomes following PCLR were generally fair to poor, largely due to postoperative stretching and residual laxity (excessive looseness or movement),” said Dr. LaPrade. “Some literature, and even some surgeons, suggested avoiding PCLR altogether. We knew that meaningful improvements were needed for assessment, surgical technique and rehabilitation to truly help patients.”

Over two decades, Dr. LaPrade and his team conducted numerous bench-to-bedside studies using a research pyramid approach to address these clinical deficiencies. This included:

- Defining surgically relevant quantitative and qualitative anatomy of the PCL
- Refining biomechanical understanding of PCL function based on updated anatomic insights
- Establishing objective diagnostic standards using radiographs and MRI
- Developing anatomically based reconstruction techniques
- Optimizing postoperative rehabilitation and dynamic bracing strategies to reduce graft stretching and stiffness.

Identifying Surgical Landmarks for Accuracy

“When I began my orthopaedic career, the anatomy of the PCL was largely taught through pictures, but those images didn’t provide the precise measurements surgeons need in the operating room,” said Dr. LaPrade. “Our accuracy was hindered without defining consistent, surgically relevant landmarks. Therefore, understanding the qualitative and quantitative anatomy became the base of our research pyramid, allowing us to systematically perform comprehensive research until we reached the top of the pyramid with clinical outcomes studies that validated the supporting pyramid tiers.”

Because the PCL is composed of two bundles, the anterolateral (ALB) and posteromedial (PLB) bundles, the team identified three distinct femoral bony landmarks that reliably correspond to the anatomic positions of the PCL bundles. These included the trochlear point, the medial arch point, and the posterior point. They also defined the bundle ridge, a horizontal bone ridge separating the ALB and PMB, and found that the center of the PCL consistently aligns with the center of the bundle ridge.

These findings led to the recommendation that the bundle ridge serve as the tibial arthroscopic and radiographic landmark for PCLR surgery. These results were subsequently used to improve anatomic tunnel placement for double-bundle (DB) PCLRs.

Redefining PCL Biomechanics to Enhance Surgical Outcomes

Traditionally, the ALB was viewed as the most important PCL bundle regarding posterior knee stability, and therefore, it was recommended that it was the only bundle that was necessary to reconstruct in a PCL reconstruction.[v]

Through biomechanical and robot studies, and later through clinical outcome studies, Dr. LaPrade's team demonstrated that the ALB and PMB function in a codependent manner. Their findings showed that reconstructing both bundles using a DB PCLR technique, developed by the team, is necessary to restore near-native knee kinematics. They also discovered that optimal fixation angles for PCLR grafts should be performed at 90 degrees for the ALB, and in full extension for the PMB, to avoid stretching.

"We learned that the two bundles have a codominant functional relationship," said Dr. LaPrade. "While single bundle reconstruction is still used by some surgeons today, it is important to note the clear difference in outcomes between single-bundle and double-bundle PCLR based on our robotic and clinical studies."

Additionally, the team used biomechanical evidence to provide an objective diagnosis of PCL tears based on stress radiographs and MRI scans.

"PCL tears can be difficult to diagnose on standard imaging because the PCL might appear intact on an X-ray, but in reality, the patient has a sloppy, stretched ligament upon clinical exam," said Dr. LaPrade. "Our work showed that stress radiographs and MRIs can reveal so much more. The tibia is actually slipping backward in the medial compartment. This information allows radiologists to make a more objective diagnosis than solely relying on the appearance of the PCL, which may look healed but functions poorly."

Advancing Postoperative Rehabilitation and Bracing

The team also explored the long-standing assumptions that gravity negatively affects PCL healing.

"When a patient with a PCL tear lies down, and their knee is bent to 90 degrees, gravity causes the tibia to slip backward," said Dr. LaPrade. "Therefore, we changed the rehabilitation with gravity in mind. We began with patients lying on their stomachs, bending their knees, a position called prone knee flexion. These exercises counteracted gravity's effects and protected the healing ligament."

The team collaborated with a company to develop a dynamic PCL brace designed to push the tibia forward by applying pressure to the calf when the patient bends their knee. This brace mimics the function of the native PCL, reduces stress on the healing ligament and promotes more favorable healing without stretching. This brace has allowed some patients to avoid surgery by allowing the PCL to heal properly.

"We are now at a point where the surgical outcomes of isolated PCLRs can be considered equivalent to those of isolated anterior cruciate ligament reconstruction outcomes, and we are incredibly proud of this accomplishment," said Dr. LaPrade. "With advances in rehabilitation and bracing, our next body of work will study early weightbearing (prior to six-weeks postoperative) and its impact on recovery."

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Disclosure/Funding and Conflicts of Interest

For a list of disclosures, funding and conflicts of interest, email media@aaos.org.

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