# *Editorial Commentary*: Magnetic Resonance Imaging Is Helpful in Predicting High-Grade Knee Rotatory Instability: But When in Doubt, Always Examine the Patient

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**Abstract:** Unrecognized rotatory instability as evidenced by a high-grade pivot shift is well known to compromise anterior cruciate ligament (ACL) reconstruction results. By measuring which patients have anterior tibial subluxation of the lateral compartment $\geq$ 6 mm on a preoperative MRI, surgeons may be better able to counsel patients on postoperative expectations, as well as prepare for additional procedures to treat high-grade rotatory instability. Additionally, as there is an increased incidence of lateral meniscus tears in high-grade rotatory ACL lesions, surgeons should be vigilant and prepared to repair lateral meniscus root and ramp lesions. Furthermore, early identification of those patients with anterior tibial subluxation of the lateral compartment $\geq$6 mm will provide the opportunity for early surgery, as it is known that patients with high-grade rotatory instability are likely to sustain further intra-articular damage and have poorer outcomes if surgery is delayed. However, when there is doubt of high-grade rotatory instability after an ACL injury, examining the patient with a pivot shift maneuver should still be the "gold standard".

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Although significant advancements have been made in our understanding of anterior cruciate ligament (ACL) injuries, resulting in improved results, there are still those patients that fail despite a satisfactory procedure.[1-4] One explanation is that this is due to concomitant injuries and instability patterns. Unrecognized rotatory instability, as evidenced by a high-grade pivot shift, is well known to compromise ACL reconstruction results.[5-7] However, testing for a pivot shift in the office on an awake patient is difficult to perform and not well tolerated. Although a magnetic resonance image (MRI) can identify additional structural pathology (i.e., injury to the lateral collateral ligament and posterolateral corner) and raise awareness to rotatory instability, it is not a dynamic test like the pivot shift maneuver. Other indirect findings on MRI, such as lateral compartment "bone bruising" may also suggest that a pivot shift event took place.[8-10] But is there another way to identify rotatory instability preoperatively, rather than intraoperatively, to ensure that the correct surgical procedure is properly planned and executed?

Liu, Cui, Yang, Li, Yan, Xin, and Wu in their study "Anterior Tibial Subluxation of Lateral Compartment Is Associated With High-Grade Rotatory Instability for Acute but Not Chronic Anterior Cruciate Ligament Injuries: A Magnetic Resonance Imaging Case Control Study" have postulated that an MRI could predict differences in those ACL injured patients with high grade versus low-grade/no rotatory instability.[11] By comparing the MRIs of 30 patients with an ACL injury and a grade 2 or 3 intraoperative pivot shift to age 60 and sex-matched patients with an ACL injury but grade 0 or 1 pivot shift, the authors sought to identify distinguishing radiographic parameters. MRI comparison showed that patients with grade 2 or 3 pivot shift had a larger anterior tibial subluxation of the lateral compartment (8.1 mm vs 5.9 mm; $P = .004$), but no significant difference in anterior subluxation of the medial compartment. Additionally, anterior tibial subluxation of the

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lateral compartment ≥6 mm was associated with an increased incidence of meniscal tears (OR 12.992; $P = .011$). However, subgroup analysis showed that these results were only valid for acute injuries (<3 months), but not for chronic injuries (>3 months).

Although this study does provide valuable information, there are some limitations. Not all patients are able to undergo a preoperative MRI due to incompatible implants, cost, or access. Additionally, standardization of leg position when performing the MRI is required. And finally, MRI was compared to the pivot shift examination of two experienced surgeons but may not be generalizable to all surgeons.

So, how is this information helpful? By identifying preoperatively which patients may have high-grade rotatory ACL instability prior to the surgical procedure, surgeons may be better able to counsel patients on postoperative expectations, as well as prepare for additional procedures to treat the high-grade rotatory instability. Procedures, such as double bundle ACL reconstruction, anterolateral ligament reconstruction, and lateral extra-articular tenodesis are known to improve ACL outcomes in patients with high-grade rotatory instability. As some of these procedures require additional graft choices and tunnels, proper preparation can be ensured. Additionally, because there is an increased incidence of lateral meniscus tears in high-grade rotatory ACL lesions, surgeons should, therefore, be vigilant and prepared to repair lateral meniscus root and ramp lesions. Furthermore, early identification of those patients with anterior tibial subluxation of the lateral compartment ≥6 mm will provide the opportunity for appropriate counselling and early surgery, as it is known that patients with high-grade rotatory instability are likely to sustain further intra-articular damage and have poorer outcomes if surgery is delayed. However, when there is doubt of high-grade rotatory instability after an ACL injury, examining the patient with a pivot shift maneuver should still be the "gold standard".

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