

# Editorial Commentary: Evaluation of Patellofemoral Instability Is Complex and Multifactorial



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**Abstract:** The work-up of patellofemoral instability is complex and multifactorial. Patient factors (i.e., age, activity demand, goals/expectations), clinical presentation (pain, instability, or both), and physical examination (i.e., J-sign, apprehension into flexion), must be correlated with imaging findings (radiographs, magnetic resonance imaging, computed tomography) and anatomic risk factors, including patella alta, trochlear dysplasia, patellar tilt, lateralized force vector, valgus, femoral anteversion, and tibial torsion. Thus, developing a standard battery of reliable and reproducible radiographic measures of patellofemoral instability is a challenge. Imaging cut-offs provide insight into relative risk of recurrent instability. We still fall short in using imaging parameters to predict when to operate, what procedure(s) to perform, and how the patient might do. Future directions include the use of artificial intelligence and 3-dimensional measurements to help simplify a complex problem.

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*“Everything should be made as simple as possible, but not simpler”*

—Albert Einstein

Patellofemoral instability (PFI) is a complex and multifactorial problem. With an abundance of anatomic risk factors, including patella alta, trochlear dysplasia, patellar tilt, lateralized force vector, valgus, femoral anteversion, and tibial torsion, it can be difficult for the clinician to efficiently and effectively work-up these patients. It is even more challenging to use this information in a standardized way to inform surgical treatment decisions. The “menu a la carte” philosophy, popularized by Dejour, suggests that each of the comorbidities should be surgically addressed when present.<sup>1</sup> However, several other authors have suggested that isolated medial patellofemoral ligament

reconstruction can achieve excellent outcomes, even in the setting of significant comorbidities.<sup>2-4</sup> Despite ongoing treatment controversy, the critical first step is to correlate patient factors with a reliable and reproducible radiographic evaluation.

We commend the work of Gobbi, Cavalheiro, Giglio, Hinckel, and Camanho,<sup>5</sup> entitled “Patellar Tilt and Patellar Tendon—Trochlear Groove Angle Present the Optimum Magnetic Resonance Imaging Diagnostic Reliability for Patients With Patellar Instability.” Their retrospective review compared 142 knees with PFI with 181 knees without PFI and sought to determine magnetic resonance imaging measurements associated with PFI and to determine their normal cut-off values. The authors found that patellar tendon—trochlear groove angle and patellar tilt were the only measurements with high interobserver reliability. Several measurements, such as patellotrochlear index and tibial tubercle—posterior cruciate ligament distance, were not found to be different between control and PFI groups.

The aforementioned study helps to establish normal magnetic resonance imaging cut-off values for commonly used measures of patellofemoral instability. This information will supplement data obtained from previous imaging studies. Limitations include use of “control” patients with tibiofemoral pathology who were often of different age and sex than the PFI cohort. Nonetheless, the use of measures with both high

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inter-rater reliability and correlation with PFI (i.e., patellar tendon–trochlear groove angle, patella tilt) makes sense and should be strongly considered.

It remains a challenge to standardize a comprehensive yet “simple” battery of reliable and reproducible measures of PFI. Accurate measurements that are easy to perform and differentiate normal from abnormal are an important first step. Although some of these values may provide insight regarding the relative risk of recurrent instability, they cannot currently be used to predict when to operate, what procedure(s) to perform, and how the patient might do. Decision-making for PFI remains complex and multifactorial. It must take into account patient factors (i.e., age, activity demand, goals/expectations), clinical presentation (pain, instability, both), physical examination (i.e., J-sign, apprehension into flexion) with clear correlation to imaging findings (radiographs, magnetic resonance imaging, computed tomography). Future directions that will help simplify the work-up include automated image measurement and use of artificial intelligence to create preoperative planning apps, harnessing the power of big data from ongoing multicenter studies (JUPITER, i.e., Justifying Patellar Instability Treatment by Early Results). Similarly, validating novel 3-dimensional measurements to help describe complex bony geometry (i.e., trochlear dysplasia) is critically important. It is an evolutionary time for patellofemoral surgeons. Similar

to Albert Einstein’s approach, we strive to make this “as simple as possible, but not simpler.”

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