

Editorial Commentary: Posterior Tibial Slope: The “Unknown Size” of the Knee Joint



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Abstract: The posterior tibial slope (PTS) plays an immensely important role in almost every orthopaedic operation on the knee joint. The PTS is a decisive factor in the reconstruction of a torn anterior or posterior cruciate ligament, in high tibial osteotomy and, of course, in total knee arthroplasty. It is therefore all the more surprising that in current clinical practice relatively little emphasis is placed on the exact measurement of PTS. If the true value is not known, the influence of the same is pure coincidence. In the coronal plane, it is clinically valid practice to determine the hip–knee–ankle angle and thus to be able to determine the mechanical and anatomical axes at the tibia and femur. In the sagittal plane, however, an in-depth analysis is often dispensed with and only a short lateral knee radiograph is used. Different axes are described to determine the PTS. In addition, it is often overlooked that a determination of the PTS on lateral radiographs can only represent an average, since the medial and lateral tibial plateau shows considerable differences purely anatomically. In the future, we should place more emphasis on an analysis of the sagittal plane in the knee joint including PTS at least as profound as the analysis of the frontal plane. Here, radiographs of the entire lateral tibia must be requested to determine the true axis and thus the true PTS.

See related article on page 243

It is undisputed that posterior tibial slope (PTS) is a decisive factor in almost every procedure in knee surgery.¹⁻³ It is therefore all the more surprising that the orthopaedic community does not yet agree on how to correctly determine true PTS. We therefore commend the current study, “Posterior Tibial Slope Measurements Using the Anatomic Axis Are Significantly Increased Compared to Those That Use the Mechanical Axis” by Dean, DePhillipo, Chahla, Larson, and LaPrade.⁴ The authors present a prospective radiographic study in which 144 patients were included. The number of patients enrolled suggests that the power of the study was sufficient, especially since the authors had performed an a priori power analysis. Furthermore, this is a multicenter study. Three different tibial axes were compared to measure PTS. A significant difference between the actual mechanical tibial axis and 2 different anatomical axes (on the lateral knee

radiograph and on the lateral tibial radiograph) could be described ($9.5^\circ \pm 3.4^\circ$ vs $11.8^\circ \pm 3.1^\circ$ and $11.6^\circ \pm 3.3^\circ$, respectively). The authors assume a clinical relevance with a difference of 2° and were thus able to demonstrate relevance. Given the growing awareness of the importance of bony morphology in reconstructive knee surgery and total knee arthroplasty (TKA), many efforts have been made in recent years to increase the knowledge of the role of PTS.^{2,5,6}

In the case of the PTS, similar to the question of alignment in TKA, it is absolutely necessary to take a step back and first define the goal and insist on uniform reporting. We are still unclear what the real “true PTS” is. If a uniform method of measurement cannot be established here, be it for financial reasons, efficiency reasons, or availability, at least a uniform nomenclature must be demanded!

A striking feature of the study by Dean et al. was that 2 different radiographs were made (full lateral tibia and short lateral knee) to consider the different central X-ray beam. This is certainly an improvement over the second important PTS study by Faschingbauer et al.⁷ A major limitation of the study was briefly mentioned: the rotation of a lateral radiograph is difficult to control, which is also reflected in the reported reduced intraclass correlation coefficient. In the Methods section, it might

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have been possible to define the exclusion criterion that radiographs are excluded if the femoral condyles do not project exactly over each other and deviate more than 5 mm.

In our approach, due to various factors (availability, efficiency), we have not yet been able to bring ourselves to the decision to have a full-length tibia radiograph automatically made for all patients undergoing anterior cruciate ligament reconstruction, high tibial osteotomy, or TKA. However, we are aware that we overestimate the tibial slope by about 2° in every patient. However, we are registering in our daily practice that we are having more and more full-limb lateral radiographs (femur and tibia, analogous to anterior-posterior hip-knee-ankle angle) made to analyze our cases.

In summary, current studies have made us more aware of the clinical importance of PTS in many knee joint procedures. It is therefore all the more important to finally demand a clear and unambiguous definition of PTS and thus to create a uniform nomenclature of this “unknown size” in the knee joint. This consensus will allow the orthopaedic community to focus on further research and understanding of the immensely important role of PTS in reconstructive knee joint surgery.

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