Posterior cruciate ligament anatomy and length-tension behavior of PCL surface fibers


Abstract: The location of the most nearly isometric region of the PCL has remained a controversial issue. Our data indicate that there is an entire region close to the PCL's proximal edge that is isometric; however, the majority of the PCL is anisometric. This concurs with the work of Grood et al, Ogata and McCarthy, and Sidles et al. However, other authors believe that the posterior-proximal region of the PCL contains the most isometric fibers. These differences could be explained in part through the differences in experimental design. It is important to note that all of these studies placed the most nearly isometric area within the substance of the ligament. What is equally important to understand from all of these studies is the complex length change pattern of fibers comprising the PCL. The function of PCL fibers is not accurately described by the traditional model of an anterolateral bundle and a posteromedial bundle that have reciprocal functions. Further kinematic studies testing potential femoral attachment sites are needed to ascertain the optimal placement for PCL graft substitutes. An earlier study performed in our laboratory suggested that PCL graft placement distal to the isometric region, 4 mm from the proximal edge (within the PCL footprint), provided the most optimal position for correcting abnormal posterior translation after PCL division. We reported that isometric placement at the time of surgery would lead to incorrect positioning of the graft. We are currently investigating alternative graft configurations (eg, two-bundle and multiple-bundle grafts) to determine if PCL function can be reproduced more ideally; however, more analysis is required before definitive recommendations can be made. At present, the ideal operative procedure for PCL reconstruction requires continued biomechanical analysis followed by carefully designed clinical trials