Factors affecting the region of most isometric femoral attachments. Part II: The anterior cruciate ligament


Abstract: During flexion of the intact knee, we measured the changes in distance between possible tibial and femoral attachments of an intraarticular ACL substitute. The change in distance during motion was described by the difference between the longest and shortest distances measured. Using knees from eight cadaver donors, we studied the effects of varying tibial and femoral attachment locations, applying anterior and posterior forces, and altering the range of flexion. We found that altering the femoral attachment had a much larger effect than had altering the tibial attachment. No femoral attachments were completely isometric. Femoral attachments that produced the smallest change in tibiofemoral distance, 2 mm and less, formed a band whose greatest width ranged from 3 to 5 mm. The axis of the 2 mm region was nearly proximal-distal in orientation and located near the center of the ACL’s femoral insertion. Attachments located anterior to the axis moved away from the tibial attachment with flexion, whereas attachments located posterior to the axis moved toward the tibia. The AP position of the tibial attachment affected the orientation of the 2 mm region. Moving the tibial attachment posteriorly caused the proximal part of the region to move anterior, with little change in the location of the distal part of the region. Changing the applied joint force from anterior to posterior was similar to moving the tibial attachment posteriorly, but the effect was less pronounced. Increasing the range of flexion from 90 degrees to 120 degrees caused the 2 mm region to become narrower and changed its orientation.