Two-bundle posterior cruciate ligament reconstruction. An in vitro analysis of graft placement and tension


Abstract: This study had two purposes: first, to determine how femoral attachment location affects the load sharing between the two bundles of a Y-type posterior cruciate ligament reconstruction, and second, to determine how the bundles, separately and in combination, control posterior tibial translation throughout the full range of knee flexion. One and two-bundle reconstructions were performed in 12 cadaveric knees. The one-bundle reconstructions were attached within the femoral posterior cruciate ligament footprint at one of three locations, high and shallow (S1), mid and shallow (S2), or mid and deep (D). The two-bundle reconstructions comprised an S1 bundle with either an S2 or a D bundle. Posterior translation and bundle tension were measured as the knee was flexed from full extension to 1,200 of flexion while a posterior force of either 50 or 100 N was applied to the proximal tibia. The shallow one-bundle reconstruction restored posterior translation to within 2 mm of that of the intact knee over the entire range of knee flexion. The deep reconstruction did not control abnormal posterior translation above 45 degrees. The tension in the shallow bundles increased with knee flexion, and the deep bundle tension remained nearly constant throughout knee flexion. Both two-bundle reconstructions controlled posterior translation, but with different load-sharing characteristics. The S1-S2 configuration resisted posterior tibial translation as both bundles became taut in flexion. In contrast, the S1-D configuration resisted posterior translation in a reciprocal fashion with the D bundle tension being the greatest in extension and the S1 bundle tension being the greatest tension in flexion.