Abstract

Modern total knee arthroplasty (TKA) has proven to be an effective procedure to treat pain and disability due to osteoarthritis, but some patients may experience quadriceps weakness after surgery and have difficulty performing important activities of daily living. The success of TKA depends on many factors, but malalignment of the prosthetic components, in particular, is a major cause of post-operative complications. Significant variability is associated with femoral and tibial component rotational alignment, but how this variability translates into functional outcome remains unknown. We used a forward-dynamic computer model of a simulated squatting motion to perform a parametric study of the effects of variations in component rotational alignment in TKA. A cruciate-retaining and posterior-stabilized version of the same TKA implant were compared within the model. We found that femoral rotation had a greater effect on quadriceps forces, collateral ligament forces, and varus/valgus kinematics, while tibial rotation had a greater effect on anterior/posterior translations. Our findings may support the tendency for orthopaedic surgeons to bias the femoral component into external rotation and avoid malrotation of the tibial component.

Keywords: knee, total knee arthroplasty, component rotation, computer simulation