In Vivo Adduction and Reverse Axial Rotation (External) of the Tibial Component Can Be Minimized

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abstract

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Mechanical alignment with conventional total knee arthroplasty (TKA) instruments often requires collateral ligament releases, which result in a high prevalence of adduction and reverse axial rotation (external rotation) of the tibial component during knee flexion with a variety of component designs. We used a radiographic image-matching technique to determine the contact kinematics during standing and kneeling at 90° and maximum flexion in a series of 35 patients in which a new image-guided, custom cutting block system was used to kinematically align a cruciate-retaining prosthesis with the intent of restoring the 3 kinematic axes of the knee. The kinematically aligned prosthesis had a minimal prevalence of adduction (3%) and reverse axial rotation (8.5%). The anteroposterior contact positions of the lateral and medial femoral condyles did not edge load the tibial liner. The moderate association between abduction and internal rotation, the degree of knee flexion, and the contact position of the medial femoral condyle suggest that abduction was not a sign of lift-off of the medial femoral condyle, but the result of the medial femoral condyle moving up the anterior slope of the tibial liner. These more normal contact kinematics were achieved without release of the collateral ligaments or lateral retinaculum. In contrast to mechanical alignment with conventional surgical techniques, the use of kinematic alignment with custom-fit cutting guides and a cruciate-retaining, symmetric medial and lateral femoral–tibial bearing surface minimizes the undesirable consequences of adduction and reverse axial rotation (external rotation).

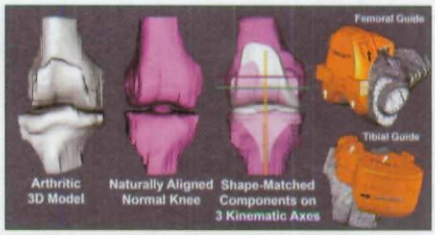

Figure: Composite showing the sequential steps of the naturally aligned TKA process progressing from left to right.

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