ABSTRACT INTRODUCTION

Previously, fluoroscopy has been used to determine the in vivo kinematics during gait, step-up maneuvers and flexion to ninety degrees. The results from these studies have been mixed as the average weight-bearing knee flexion varied between 90 to 110 degrees, dependent upon implant type and surgical technique [1]. More recently, TKAs have been designed for deep flexion maneuvers. Therefore, the objective of this study is to determine the in vivo kinematics for subjects implanted with either a fixed or mobile bearing deep flexion TKA from full extension to maximum knee flexion.

METHODS

Three-dimensional femorotibial contact positions for thirty-nine subjects, implanted by two surgeons, were evaluated using fluoroscopy into deep flexion. Nineteen subjects had a fixed bearing PS deep flexion TKA and 20 subjects were implanted with a mobile bearing deep flexion TKA. Both TKA designs have similar design features, including condylar geometries. All subjects were analyzed using a three-dimensional (3D) computer model-fitting technique (Figure 1). Femorotibial contact anterior to the midcoronal plane of the tibial component was denoted as positive and contact posterior was denoted as negative [1,2].

RESULTS SECTION

Seventeen of nineteen subjects implanted with a fixed bearing deep flexion TKA experienced posterior femoral rollback, while all 20 subjects having a mobile bearing deep flexion TKA experienced posterior femoral rollback. On average, subjects experienced -5.1 and -8.1 mm of posterior femoral rollback, for the fixed and mobile bearing TKA, respectively (Figures 1 and 2). The maximum amount of posterior femoral rollback was -11.8 and -12.4 mm for subject’s having a fixed and mobile bearing TKA, respectively. On average, subjects experienced 6.5 and 5.4 degrees of normal axial rotation for a fixed and mobile bearing TKA, respectively. The average amount of weight-bearing range of motion was 116 and 125 degrees for a fixed and mobile bearing TKA, respectively (Figure 3). Also, subjects having both TKA types evaluated in this study experienced patellofemoral separation and the kinematic patterns for patellofemoral contact and patellar tilt were similar to the normal knee.

DISCUSSION

This is the first study to evaluate femorotibial and patellofemoral knee kinematics into deep flexion for a fixed and mobile bearing TKA, designed for deep flexion activities. Both groups in this study experienced excellent patellofemoral kinematics. No subjects in this study experienced patellofemoral separation and the kinematic patterns for patellofemoral contact and patellar tilt were similar to the normal knee.

REFERENCES


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IN VIVO DETERMINATION OF DEEP FLEXION KNEE KINEMATICS FOR A FIXED AND MOBILE BEARING DEEP FLEXION TKA

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Figure 1. Average motion for Mobile Bearing TKA subjects.

Figure 2. Average motion for Fixed Bearing TKA subjects.

Figure 3. Example of two subjects experiencing deep flexion.