# Effects of femoral component sagittal alignment on functional outcomes of total knee arthroplasty

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**Background:** While much is known about coronal alignment of total knee arthroplasty (TKA), little is known about sagittal alignment. In particular, few studies elucidated the effects of sagittal alignment of a femoral component on functional outcomes of TKA. This study was conducted to determine whether sagittal alignment of a femoral component influences functional outcomes of TKA. In addition, we attempted to determine whether the effects of sagittal alignment of femoral component, if any, differ with implant type. We hypothesized that sagittal alignment of a femoral component influences the function outcomes and its effects differ with implant types.

**Methods:** 151 TKAs with a fixed bearing prosthesis (Genesis II) using conventional technique and 104 TKAs with a mobile bearing system (e.motion-PS) using navigation were evaluated for the sagittal alignment of femoral component with reference of the anterior cortical line and mid-medullary line of distal femur on a true lateral view of the femur. Correlation analyses were carried out separately in the two groups (Genesis II and e.motion-PS) to elucidate the association between sagittal alignment of femoral component and functional outcomes in terms of ROM, AKS knee and function scores, WOMAC scores, and SF-36 scores. In addition, the functional outcomes were compared among the 3 subgroups divided by the femoral component flexion angle (FCFA) with reference to the anterior cortical line (extended, FCFA $< 2^o$ vs. paralleled, $2^o \leq$ FCFA$\leq 4^o$ vs. flexed, FCFA $> 4^o$). The correlation analyses and subgroup comparisons were carried out in two phases. Analyses in the first phase were done for all knees included in the study, but the analyses in the second phase were performed separately for the fixed bearing knees and the mobile bearing knees.

**Results:** In the first analyses for all knees, FCFA had only weak correlations for pain and function scales of WOMAC (correlation coefficient, CC= 0.14 and 0.07, respectively) and physical component summary (PCS) of SF-36 (CC=0.11), and the flexed group tended to have better WOMAC pain score (2 in the flexed vs. 3 in the extended vs. 3 in the paralleled, p=0.086) and SF-36 PCS (44 in the flexed vs. 42 in the extended vs. 41 in the paralleled, p=0.057). However, the second phase analyses revealed remarkable differences in the effects of femoral component flexion angle on functional outcomes. The knees with mobile bearing prostheses had stronger correlations between FCFA and functional outcomes scales (CC=0.16 for AKS knee, 0.30 for AKS function, 0.42 for WOMAC pain, 0.32 for WOMAC stiffness, 0.46 for WOMAC function, 0.37 for SF-36 PCS, and 0.27 for SF-36 MCS) than the knees with fixed bearing prostheses (CC=0.20 for WOMAC stiffness and 0.19 for WOMAC function). Subgroup comparisons found no meaningful differences among the 3 subgroups in the knees with fixed bearing prostheses, but in the knees with mobile bearing prostheses, the flexed group had significantly better WOMAC pain (flexed = 1 vs. extended = 4 vs. paralleled = 3, p=0.003) and WOMAC function (flexed = 13 vs. extended = 23 vs. paralleled = 19, p=0.001).

**Conclusions:** Our study demonstrates that sagittal alignment of a femoral component influences functional outcomes of TKA and the effects differ with the implant type. Future studies are warranted to delineate this elusive but very important subject in TKA.

**Summary:** This study demonstrates that the sagittal alignment of a femoral component influences functional outcomes and its effects differ with the implant type.