Tibial Components Placed in Constitutional Varus in Primary Total Knee Arthroplasty: A Minimum 5-year Survivorship Analysis

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INTRODUCTION:
Alternative alignment concepts in TKA are garnering greater interest. Tibial components placed in constitutional varus has been controversial due to concerns of loosening and subsequent failure. The purpose of this study was to compare mid-term survivorship of tibial components placed in 3 degrees or greater of constitutional tibial varus (CTV) alignment versus those placed in neutral mechanical alignment (nMA).
METHODS:
This was a retrospective matched cohort study of 530 patients with 265 patients who underwent primary robotic-assisted TKA (RA-TKA) with tibial components placed in constitutional varus matched to a cohort of 265 patients based on gender, age, and BMI who underwent primary TKA with manual instrumentation and tibial components placed in neutral alignment with the same implant design. All patients in the CTV group had a minimum five-year postoperative follow-up. 33 patients (12.5%) in the nMA group were lost to follow-up and were excluded from final analysis. Each group included 154 male and 111 female patients. There was no difference between groups with respect to patient age, gender or BMI. The mean postoperative tibial varus alignment in the CTV group was 4.0 degrees (range -3.0 to -6.4, SD=1.2). The mean femoral valgus alignment was 1.1 degrees (range -3.7 to 7.9, SD=1.9) and the mean overall limb alignment was 2.9 degrees of varus (range -2.5 to -6.7, SD = 1.8). Outcome measures included complications, revisions, and PROMs.
RESULTS:
There was a significant difference in 5-year flexion (mean 123.4 vs. 116.8, $p<0.001$) and KOOS-JR (mean 88.0 vs. 84.5, $p=0.02$) in favor of the CTV group. FJS-12 tended to be higher in the CTV group though was not statistically significant (mean 77.9 vs 74.2, $p=0.17$). Five patients required revision in the CTV group versus fourteen in the nMA group ($p=0.02$). Etiology for revisions included: PJI (2 CTV, 5 nMA), extensor mechanism repair/patella revision (1 CTV, 3 nMA), instability (1 CTV, 2 nMA), periprosthetic fracture (2 nMA), aseptic loosening (1 nMA), arthrofibrosis (1 CTV), and wound dehiscence (1 nMA). There was a significant difference in non-revision intervention for stiffness between the two groups in favor of the CTV group (3 versus 14, $p=0.003$). There were no cases of aseptic loosening, subsidence, or fracture of either the tibial or femoral components in the CTV group. Implant survivorship was 98% at 5 years in the CTV group and 94% in the nMA group ($p=0.15$).
DISCUSSION AND CONCLUSION:
Given the concerns of early failure with tibial components placed in varus, the results of this study are encouraging. Tibial components placed in constitutional varus using RA-TKA to achieve the desired goal of approximating the native knee joint line demonstrated 98% survivorship at 5 years with no cases of aseptic tibial or femoral component failure. The CTV group also demonstrated improved KOOS-JR scores and knee motion. Further follow-up is needed to determine if long-term survivorship can be maintained with tibial components placed in constitutional varus alignment in primary TKA.