Outcomes of Kinematic Alignment Total Knee Arthroplasty in Valgus Knee Deformity

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INTRODUCTION: Kinematic alignment (KA) total knee arthroplasty (TKA) seeks to restore native joint line orientation and knee biomechanics, minimizing the need for soft tissue releases. While KA TKA has demonstrated comparable complication and survival rates to mechanical alignment (MA) in varus deformities, its role in valgus knees remains less defined. Valgus deformity, present in approximately 10% of TKA patients, presents unique technical challenges due to altered bony anatomy and ligamentous balance. This study investigates long-term outcomes and complication rates of KA TKA in patients with valgus knee deformity.

METHODS: Following IRB approval, a retrospective review was performed on patients who underwent primary KA TKA for valgus knee deformity between 2014 and 2024 in a single institution. Data collected included patient demographics, intraoperative data, complications, and postoperative outcomes. Valgus knee alignment was determined using preoperative reports and radiographic measurements. Short angle radiographic images were analyzed and measured in PACS, with femoro-tibial angle used to estimate the hip-knee-ankle angle.

RESULTS: A total of 178 kinematic alignment knees were collected and analyzed, with 27 meeting valgus alignment criteria. Two patients were excluded due to incomplete preoperative imaging and loss to follow up. The mean age of patients was 65.1±10.7 years, 52% were female, mean BMI 34.4±7.6. Preoperative Ranawat classifications included 11 class I, 14 class II, and 2 class III, all patients were classified Ranawat I postoperatively. The average valgus correction was 11.7 ± 6.2 ° to 4.2 ± 2.3 °. The average length of stay was 2±1.5 days. The complication rate was 3.7% (1/27), consisting of a patient requiring readmission for a periprosthetic femoral shaft fracture. At 6 month follow up, no clinical symptoms or radiographic evidence of implant wear, hardware failure, or mechanical loosening were observed. Average ROM at 6 months was 121.2±17.4 °.

DISCUSSION: Our study found that KA TKA in valgus knee deformity demonstrated promising outcomes, with complication and revision rates comparable to those seen in neutral and varus knees. In the cohort of 27 patients, sustained correction deformity was achieved (from 11.7°±6.2° pre-op to 4.2°±2.3° post-op) and universal improvement in Ranawat classification to grade I. Complication rate of 3.7% was measured, with no evidence of implant related failure at 6 months. This is comparable to national readmission rate of 3-5% in primary TKA. Our studies favorable deformity correction, low readmission rate, and absence of mechanical failure support KA TKA in valgus knee deformities as a viable alignment strategy.

CLINICAL RELEVANCE: This study demonstrated that kinematic alignment (KA) in total knee arthroplasty (TKA) provides reliable deformity correction and low complication rates in valgus knees, a population traditionally considered technically challenging. These findings support KA TKA as a safe and effective alignment strategy, broadening the techniques clinical applicability.

IMAGES AND TABLES:

Table 1. Summary of patient demographics, alignment correction, and clinical outcomes

Category	Variable	Value
Demographics	Total KA knees	178
	Valgus knees	27
	Mean Age (years) ± SD	65.1 ± 10.7
	Female	52%
	Mean BMI ± SD	34.4 ± 7.6
Alignment	Pre-Op Ranawat classification	11 Class I, 14 Class II, 2 Class III
	Post-Op Ranawat classification	27 Class I
	Average Valgus Correction ± SD	11.7 ± 6.2 → 4.2 ± 2.3
Outcomes	Average LOS (days) ± SD	2.0 ± 1.5
	Complication rate	3.7% (1/27)
	Average ROM at 6 months (°) ± SD	121.2 ± 17.4