

Kinematic and mechanical alignment result in similar outcomes in total knee arthroplasty: a systematic review and meta-analysis of randomized controlled trials

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INTRODUCTION:

Patient dissatisfaction following total knee arthroplasty (TKA) has been widely noted in the literature, occurring in up to 20% of cases. While mechanical alignment (MA) has long been considered the gold standard technique, kinematic alignment (KA) has emerged in an effort to improve clinical outcomes. This review aimed to synthesize clinical outcomes and patient-reported outcome measures (PROMs) from randomized controlled trials (RCTs). We also sought to quantify ceiling effects for the PROMs utilized in trials considered.

METHODS: A systematic review and meta-analysis were performed according to PRISMA criteria. PubMed, Embase, Medline, and Scopus were searched for RCTs investigating TKA using KA versus MA. Data pertaining to patient demographics, operative technique, objective outcomes, and PROMs were analyzed. Meta-analysis of extracted data was conducted by a university-affiliated statistician. Ceiling effects were considered with a 15% cut-off for significance.

RESULTS: Eleven studies met inclusion criteria for this review, comprising 972 patients with a mean follow-up of 3.9 years (1-13 years). A non-significant increase in all cause re-operation rate for patients treated with KA was found (RR: 1.34, 95% CI: 0.71, 2.52, $I^2=0%$, $p=0.37$), with pooled re-operation estimates of 4.8% and 3.4% in the KA and MA groups, respectively. Meta-analysis of two studies with greater than 10-year follow-up found a non-statistically significant increase in all cause re-operations (RR: 1.21, 95% CI: 0.6, 2.47, $I^2=0%$, $p=0.59$) and component revisions (RR: 1.26, 95% CI: 0.38, 4.14, $I^2=0%$, $p=0.71$) in the KA group. There was no statistically significant difference in PROMs between groups. Half of the studies reporting PROMs were found to have significant ceiling effects.

DISCUSSION AND CONCLUSION:

Existing data from RCTs shows no significant difference in clinical outcomes or PROMs when comparing KA to MA. Non-significant PROM data should be interpreted with caution as there are ceiling effects observed in trials where they are considered. Future long-term studies and registry data analyses are warranted to better understand the application of alignment strategies in TKA.