Symmetric versus Asymmetric Medio-Lateral Gaps in Total Knee Arthroplasty: A Systematic Review and Meta-Analysis

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INTRODUCTION:

Historically, total knee arthroplasty (TKA) used resection and balancing techniques to target symmetric medial and lateral gaps throughout range of motion. With modern awareness on alternate alignment concepts, one area of ongoing debate is whether asymmetric medial and lateral compartment gaps improve outcomes. Proponents of an asymmetric looser lateral compartment gap philosophy postulate that this phenotype re-creates native knee kinematics with lateral femoral condylar rollback pivoting through a tighter medial compartment during knee flexion. To date there is no comprehensive review comparing outcomes with respect to symmetric versus asymmetric gap targets. The purpose of this study was to evaluate patient reported outcomes (PROs) and range of motion (ROM) with respect to symmetric or asymmetric gaps.

METHODS: We performed a systematic review and random-effects meta-analysis of prospective and retrospective studies. We compiled all comparative studies reporting symmetric and asymmetric gaps, irrespective of directional or non-directional gap asymmetry. However, we performed a meta-analysis only between a cohort of directional asymmetric gaps (i.e looser lateral than medial gap) and symmetric gaps (equal medial and lateral gaps). Gaps were compared in flexion and extension. ROM and PROs were evaluated through standardized mean difference (SMD), with statistical significance defined by 95% confidence interval.

RESULTS: A total of 17 studies with 3319 knees were included. Four studies reported non-directional gap asymmetry, whereas 13 studies reported directional gap asymmetry, of which eight shared common outcome variables and were therefore included indeed in the meta-analysis. Analysis of gaps in flexion revealed significantly increased ROM favoring asymmetric looser lateral gaps over symmetric gaps (SMD -0.19 [95% CI -0.29 to -0.09]). Analysis of gaps in extension also revealed increased ROM favoring asymmetric looser lateral gaps (SMD -0.10 [95% CI -0.36 to 0.16]). Improved Forgotten Joint Scores (FJS) also favored looser lateral gaps in flexion over symmetric gaps (SMD -0.13 [95% CI -0.41 to 0.15]). However, differences in the latter two analyses were non-significant.

DISCUSSION AND CONCLUSION: This is the first meta-analysis evaluating the postoperative outcomes as a function of symmetric versus asymmetric medio-lateral gaps. We report improved FJS and ROM favoring asymmetric looser lateral gaps in flexion. The evidence on targeting asymmetric gaps in extension is not as robust.