# Medial Stabilized vs. Medial Congruent vs. Posterior Stabilized: Comparing Newer and Traditional Liner Designs in Total Knee Arthroplasty

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**INTRODUCTION**: Recent advances in total knee arthroplasty (TKA) include polyethylene liners engineered to improve medial stability and more closely replicate native knee kinematics without a cam-post.[1] The medial-stabilized (MS) and medial congruent (MC) design facilitates lateral femoral condyle rollback while limiting anterior-posterior medial condylar translation during flexion.[2] These liners differ from true medial pivot designs and allow for the use of J curve femoral component.[3,4] There is a paucity of longitudinal comparative outcomes between these new polyethylene liners and traditional posterior stabilized (PS) liners. This study compares clinical and patient-reported outcomes between MS design, MC, and a PS design.

**METHODS**: We retrospectively reviewed primary TKAs performed from 2018–2023 at a single high-volume academic center using MS (Depuy), MC (Zimmer Biomet), or PS (Zimmer Biomet) liners. A total of 955 TKAs were included: 81 MS, 365 MC, and 509 PS. Mean patient age was 70 years (range 50–85) for MS and 68 years (range 35–88) for MC. Range of motion (ROM) and Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS-JR) were assessed preoperatively at 6 weeks, and 1 year postoperatively. Independent-sample t-tests compared patient-reported outcome measures (PROMs). Achievement rates for minimal clinically important difference (MCID) and patient acceptable symptom state (PASS) were analyzed via Newcombe confidence intervals.

**RESULTS** : A total of 81 MS, 365 MC, and 509 PS liners were available for analysis. When comparing preoperative ROM, the MS cohort had a mean ROM of 5° extension (SD 4.7°) to 105° flexion (SD 10.4°), the MC cohort had a mean ROM of 1° extension (SD 2.0°) to 114° flexion (SD 10.2°), and the PS cohort ROM was 1.8° (SD 3.3°) to 107° (SD 10.7°). At six weeks, the MS group ROM was 0-113°, the MC group ROM was 1-110°, and the PS group ROM was 1-105°. At one year, there was no significant difference in knee extension or flexion, with a mean ROM of 0-115° in the MS and MC groups, and ROM of 0-118° in the PS group. In the MS cohort, one patient (1.2%) underwent manipulation under anesthesia (MUA), with no reoperations due to infection. In the MC cohort, there were 20 reoperations (5.5%), including 13 MUAs (3.6%) and seven superficial wound infections. The PS cohort experienced 23 reoperations (4.5%), including ten MUAs (2.0%), nine infections, and four arthroscopic debridements for crepitus. Regarding PROMs at one year, 70% of PS patients reached the KOOS-JR PASS threshold, compared to 67% in the MC cohort and 64% in the MS cohort. The MC cohort had the highest MCID achievement (82 patients). After adjusting for age, BMI, sex, preoperative alignment, and preoperative flexion via multivariable linear regression, these differences were not statistically significant.

**DISCUSSION**: Contemporary polyethylene liners with increased medial constraint aim to optimize knee kinematics and in turn improve patient outcomes. This study directly compared new polyethylene designs (MS and MC) to traditional PS liners. Although early postoperative ROM differences were observed among groups, these disparities resolved by one year. Additionally, patient-reported outcomes showed no statistically significant differences in achieving PASS or MCID thresholds among cohorts at one year. The PS liner group exhibited the lowest MUA rate, followed by the MS liner, whereas the MC liner demonstrated a higher MUA rate; however, these findings lacked statistical significance. Overall, all liners provided equivalent ROM, PROMs, and clinical survivorship outcomes at one-year post-TKA.

**SIGNIFICANCE/CLINICAL RELEVANCE:** This study contributes to the understanding that medial stabilized and medical congruent polyethylene designs demonstrated no difference in short-term clinical outcomes and survivorship compared to traditional posterior stabilized liners in primary TKA. These findings may inform clinical decision-making regarding implant selection, though longer-term follow-up is needed.

**REFERENCES**: [1] Murphy et al, Arthritis Rheum, 2008; [2] Noble et al, Clin Orthop, 2006; [3] Nam et al, Bone Joint Journal, 2014; [4] Parvizi et al, Clin Orthop, 2014

Table 1 – Baseline demographics and 12-month outcomes varied across liner types in primary total knee arthroplasty

| Cohort | Age, mean ± SD (yrs) | BMI, mean ± SD (kg/m²) | Female, n (%) | Preoperative Flexion, mean (°) | 1Year Flexion, mean (°) | 1Year KOOS JR, mean ± SD | PASS, n (%) | MCID, n (%) | MUA, n (%) | Reoperation, n (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| MS (n=81) | 70 ± 8 | 30 ± 5 | 39 (48%) | 105.1 | 118.3 | 77.6 ± 14.4 | 21 (64%) | 19 (70%) | 1 (0.01%) | 1 (1.2%) |
| MC (n=365) | 68 ± 9 | 31 ± 6 | 246 (67%) | 113.9 | 114.8 | 78.2 ± 16.1 | 154 (68%) | 170 (82%) | 13 (3.6%) | 20 (5.5%) |
| PS (n=509) | 69 ± 9 | 32 ± 6 | 332 (65%) | 107.4 | 117.6 | 80.0 ± 15.2 | 205 (70%) | 209 (79%) | 10 (2.0%) | 23 (4.5%) |

Fig 1. - Clinical threshold achievement rates at 1-year follow-up varied across total knee arthroplasty liner designs

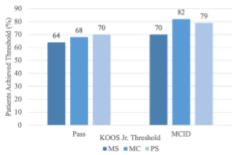


Fig. 2 – Knee flexion recovery trajectories differed between liner designs over 1-year follow-up