# Impact of laxity and balance on early KOOS pain outcomes of a posterior stabilized Total Knee Arthroplasty

Amber L Randall, Edgar A Wakelin, James Kah[1], Jeffrey M Lawrence, John M Keggi[2], Jan A Koenig[3], Jeffrey H DeClaire, Corey Eugene Ponder, Christopher Plaskos[4]
[1]Engineering, [2]Orthopedics New England, [3]NYU Langone Healthcare Winthrop Hospital, [4]Corin

INTRODUCTION:
Optimal balance and laxity throughout flexion for minimizing pain in posterior stabilized (PS) total knee arthroplasty (TKA) is not well understood. The objective of this study was to investigate associations between intra-operative balance and laxity measurements with early outcomes in PS TKA and define clinically relevant thresholds for optimal outcomes.

METHODS: One hundred eight PS TKAs were prospectively enrolled and received robotically assisted PCL sacrificing tibia-first gap-balancing workflow with a digital joint tensioner (age 68±8.9 years, BMI: 29.9±5.3 kg/m$^2$, sex 64% F, side: 50.5% left). Final gap and balance data was captured during trialling using a ligament tensioner that applied a load of 70 – 90 N. KOOS scores were recorded between 12 to 24 months post TKA (average: 22.4 months). Spearman correlations and Wilcox t-tests were used to identify associations and compare groups respectively.

RESULTS: Significant correlations were found between medial laxity in midflexion and flexion, and lateral laxity in extension, midflexion and flexion and KOOS pain outcomes. Laxity windows for improved pain outcomes are: Lateral extension (-3.0mm to -0.5mm, p=0.0055), lateral midflexion (-1.5mm to 2.0mm, p=0.0053), medial midflexion (-2.0mm to 1.5 mm, p=0.0427), lateral flexion (-0.5mm to 2.0mm, p=0.0031), medial flexion (-1.5mm to 0.0mm, p=0.0089). Balance windows for improved pain outcomes were: Midflexion (±1.0mm, p=0.0466) and Flexion (2.5mm tighter medially to neutral, p=0.0500). Further improved outcomes were identified when all laxity (94.3 vs 83.0, p=0.0023) or all balance targets (89.7 vs 83.1, p=0.0049) were combined, see Figure 1.

DISCUSSION AND CONCLUSION: Intraoperative joint balance and laxity impacts early patient reported outcomes in PS TKA. Clinically relevant balance and laxity windows were defined that were associated with improved patient reported outcomes, which when combined resulted in further improved outcomes.

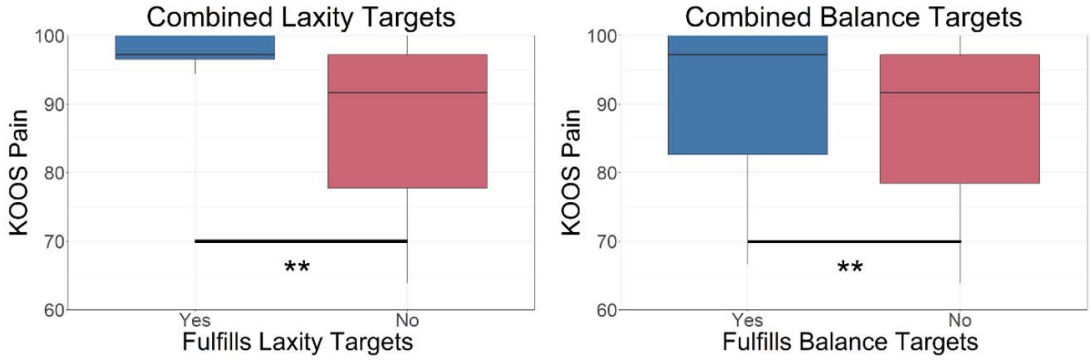


*Figure 1 Comparing KOOS pain score for knees which satisfy all laxity (left) or all balance (right) targets. ** indicates p < 0.01*