Accuracy of Balance in Tibia and Femur First Total Knee Arthroplasty using Digital Balancing Tools
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INTRODUCTION: Achieving a well-balanced knee is a universal goal in total knee arthroplasty (TKA). Technology for balancing gaps has progressed from manual to digital ligament tensioning tools integrated with robot-assisted navigation. However, there has been no comparison between femur first and tibia first techniques with this technology. We prospectively investigated joint balance accuracy, precision, and early outcomes between a femur first measured resection and tibia first gap balancing technique utilizing a digital gap balancing tool.

METHODS: One hundred patients were prospectively enrolled (age: 69.7±9.0, BMI: 30.6±3.6kg/m², gender: 62%F) and underwent posterior cruciate ligament (PCL) sacrificing TKA using a digital gap balancing tool. The cohort was divided into four sequential groups with varying degree of visibility to the gap data generated with the digital ligament tensioning tool: 1) Femur-first blinded to gap data, 2) Femur-first non-blinded to gap data, 3) Tibia-first blinded to gap data, 4) Tibia-first non-blinded to gap data. Mediolateral (ML) gap difference was used to calculate joint balance. KOOS and UCLA scores were obtained 3 months postoperatively.

RESULTS: Group 4 reported significantly less midflexion imbalance (40°) compared to groups 2 and 3 (1: 1.5mm, 2: 1.7mm, 3: 1.7mm, 4: 0.9mm, p<0.02) (Figure 1). Group 4 also reported reduced variance compared to all other groups at 90° (p=0.0002, Figure 1), resulting in a reduced frequency of outlier balance in group 4 (1: 30%, 2: 35%, 3: 33%, 4: 12%, p=0.017). No significant differences were found between 3-month KOOS and UCLA scores with technique.

DISCUSSION AND CONCLUSION: A tibia-first approach with digital balancing allows surgeons to more accurately achieve a target joint balance in TKA.