Surgeon Sense of Balance During Primary Total Knee Arthroplasty: How Good Are We at Assessing the Gaps?

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INTRODUCTION:
Robotic assistance has become widely utilized in TKA to help determine accurate bone resections and quantify soft tissue balance. This study aimed to compare the surgeon's ability to kinesthetically determine soft tissue laxities using manual methods to the objective measures of laxity determined by robotic assistance.
METHODS: This was a multicentered, prospective, observational study that included 150 primary TKA cases performed by arthroplasty attending surgeons and clinical fellows. For each case, the surgeon's kinesthetic assessment of intraoperative soft-tissue balance while trialing components was documented, followed by the robotic measurement of soft tissue balance. Any changes in implant sizing, soft tissue releases, or bone cuts made after robotic feedback were recorded. Intraclass correlation coefficient (ICC) agreement testing was performed to examine the relationship between surgeon and robotic measurements. Agreement was categorized as slight (0–0.2), fair (0.2–0.4), moderate (0.4–0.6), strong (0.6–0.8), almost perfect (0.8–0.99), or perfect (1).
RESULTS: Analysis showed fair agreement between the surgeon and robotic assessment of medial (ICC=0.312) and lateral (ICC=0.351) extension gaps, and medial flexion gaps (ICC=0.363), with moderate agreement for lateral flexion gaps (ICC=0.529). On average, attending surgeon measurements differed from robotic measurements for the medial and lateral extension gaps by 0.52 and 0.43 mm, respectively, which was significantly different than the clinical fellow measurements, which differed by 0.90 and 0.72 mm ($P<0.001$, $P=0.003$). Surgical adjustments were performed in 43% of attending surgeon cases and 44% of clinical fellow cases ($P=1.000$).
DISCUSSION AND CONCLUSION: On average, kinesthetic evaluation of soft tissue balancing by arthroplasty surgeons is within 1 mm of the quantified measurements determined by robotic navigation. There appears to be the greatest discrepancy in laxity measurements between surgeon and robot for the medial and lateral flexion gaps, which prompted a surgical adjustment in 43.3% of cases.