

Prospective Randomized Blinded Intraoperative Sensor-Balanced Total Knee Arthroplasty Study Assessed by Wearable Sensors

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INTRODUCTION: Complications reported by post-total knee arthroplasty (TKA) patients include pain, instability, and joint stiffness which are problems possibly attributable to soft-tissue imbalance. Use of a tibial trial with pressure sensors allows objective intraoperative load measurements to guide releases to achieve knee pressure balance between the medial and lateral compartments, throughout the knee range of motion. The purpose of this study is to use wearable sensor technology to assess initial recovery outcomes after using intraoperative load sensors.

METHODS: This prospective, randomized, patient-blinded study of 80 patients undergoing primary TKA with use of an intraoperative soft-tissue balance sensor was performed in Group 1 of 40 patients with soft-tissue releases performed to achieve company's recommended goal pressures. Group 2 of 40 patients had knee balance achieved by surgeon technique only, without use of sensor influence, and pressure data collected at the end of procedure with the surgeon blinded to results.

RESULTS: Intraoperative and final postoperative knee motion was similar between groups. Group 1 sensor patients achieved ROM goals sooner, with less reported pain up to 6 weeks ($p < 0.02$). Patients discontinued narcotics sooner, with fewer total pills used in sensor group. Sensor-balanced patients ambulated with less aids, and unassisted sooner. Group 1 had greater percentage of pressure-balanced knees and avoided low/high extremes of Group 2 ($p < 0.002$).

DISCUSSION AND CONCLUSION: In this prospective randomized study, TKA balanced with intraoperative compartment pressure measurements to guide releases showed less reported pain, lower and shorter narcotic requirement, earlier unassisted ambulation, and more rapid exercise progression. Intraoperative sensor technology seems to more reliably achieve relative compartment pressure similarities better than conventional surgeon manual assessment. Immediate recovery benefits of a load sensing technology warrant larger studies, with wearable technology possibly revealing these earlier outcome differences.