Title: Investigating Patient and Implant Performance in Satisfied and Dissatisfied Total Knee Replacement Patients

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Structured Abstract:

Introduction: Total knee replacement (TKR) is the only solution for treating end stage arthritis of the knee joint. While the procedure itself has been a great success in reducing pain and returning function to the affected joint, 20% of patients are not satisfied following their operation. It is unclear why many patients feel this way, but there are thought to be multiple contributing factors. Wearable sensors and radiostereometric analysis (RSA), a stereo x-ray technique commonly used for obtaining implant migration and joint kinematics are two modalities available that can potentially uncover potential factors in patient dissatisfaction. The goal of this study was to compare the implant migration and joint kinematics obtained from RSA and the objective measurements of patient function from the wearable sensors between satisfied patients and dissatisfied patients to determine which, if any, have a role in postoperative patient dissatisfaction following TKR.

Methods: TKR patients from an ongoing study answered the Knee Society Score questionnaire and were split into "Satisfied" and "Dissatisfied" groups based on their response to questions on functional satisfaction. RSA imaging occurred at a 2-week baseline, and at 6-weeks, 3-months, 6 months, and 1-year post-operatively to measure the implant migration relative to bone. At 1-year postoperatively, an additional series of RSA images were acquired at different knee flexion angles, ranging in 20° increments from 0° to 120° to gather data on the joint kinematics, which include anteroposterior (AP) contact position on the medial and lateral condyles, as well as axial rotation. A Timed-Up-and-Go (TUG) performance test will be performed with wearable sensors pre- and post-operatively to obtain objective measures of function, including total test time and mean flexion range.

Results: There were 31 patients in the "Satisfied" group and 18 in the "Dissatisfied" group. No differences were found in implant migration between "Satisfied" and "Dissatisfied" groups for the femoral component, and only at the 6-week time point was there a difference in tibial migration (mean difference (MD)=0.12 mm, p=0.002). However, all migration values were within the acceptable migration threshold. No differences were present in AP position on the medial condyle, and different on the lateral condyle at only 20° of flexion (MD=1.86 mm, p=0.03), with the "Dissatisfied" group more anteriorly positioned. No differences were found in axial rotation between groups. No differences were found between groups in total TUG test time or mean flexion range both pre- and post-operatively.

Discussion: Our study found no major difference between satisfied and dissatisfied TKR patients when considering implant migration, joint kinematics, and objective measurements of patient function. This suggests that the high dissatisfaction rate is due more to patient subjectivity rather than objective factors of implant and patient performance.