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"Kinematic and Mechanical Alignment Randomized Trial (KMART): A Technology-Focused Randomized Controlled Trial"

In the KMART trial, we are exploring ways to improve the results of knee replacement surgery. Knee replacement surgery is commonly done to relieve pain and help people with serious advanced knee arthritis once all non operative interventions have been exhausted. The goal of the knee replacement surgery is to relieve the patient's pain and allow them to move more comfortably. While knee replacement surgery is usually successful, about 20% of patients still experience ongoing pain or difficulty moving their knee, leading to dissatisfaction with the surgery.

In this study, we are comparing two different approaches to performing knee replacement surgery: mechanical alignment (MA) and restricted kinematic alignment (rKA). The traditional MA method involves placing the knee implant aligned perpendicular to the mechanical axis of the leg in the frontal plane for all patients. However, this approach doesn't always take into account the different shape and movement patterns of each person's knee. The rKA method, on the other hand, is designed to align the knee implant more closely with the patient's original knee anatomy and natural movement. This could lead to a knee that feels more natural and functions better after surgery.

We will be recruiting 80 patients who need knee replacement surgery, and randomly assigning them to receive either the MA or rKA technique robotic total knee replacement with 40 participants per group. All surgeries will be done using the Stryker Mako robotic system, which helps surgeons place the implant with great accuracy. Our main goal is to find out if the rKA method helps patients walk better one year after their surgery. We will measure walking ability in a gait lab using advanced motion capture technology, which allows us to see how well the knee is moving during different activities. Additionally, we will look at other important factors, such as overall quality of life, how much the patient notices their artificial knee during daily activities, and chronic pain after surgery.

This study is important because it could help us understand which surgical method—MA or rKA—provides better outcomes for different types of patients. By identifying the technique that leads to better satisfaction and recovery, we aim to help surgeons choose the best approach for each patient, ultimately improving the results of knee replacement surgery and the quality of life for those undergoing the procedure.