

Allen CL, Hooper GJ, et al. Does computer-assisted total knee arthroplasty improve the overall component position and patient function? International Orthopaedics (SICOT) 2014;38:251–257.

Design: nonrandomized controlled clinical trial

Study question: In patients having bilateral total knee arthroplasty (TKA), and one knee has computer-navigated surgery while the other knee has conventional TKA, are the radiographic and patient-rated outcomes different between the two knees?

Population/sample size/setting:

- 37 patients (mean age 67, sex not specified) undergoing bilateral TKA at an orthopedic hospital in Christchurch, New Zealand
- Patients were consecutively approached and enrolled in the study over the course of two years (between 2005 and 2007), and consented to have one knee replaced with computer navigation with conventional navigation in the other knee
- No exclusion criteria seem to have applied; all patients needing both knees replaced were eligible for the study
- No accounting is given of whether any patients declined to participate in the trial

Interventions:

- The 37 patients (74 knees) were replaced by the same surgeon with the same anesthetic
- The same uncemented mobile bearing implant was inserted on each side, and patient blinding was maintained through avoiding external skin markings which would indicate which knee had which technique
- The first knee operated was done with computer navigation with the second knee having conventional replacement
 - o The knee operated on first was chosen by the nursing staff depending on how the operating room was set up; the surgeon had no input which side was operated on with computer navigation

Outcomes:

- Two sets of outcomes were assessed postoperatively, in 2010, and at 5 years postoperatively: one radiographic and the other patient-rated
- Radiographic outcomes were done with low-dose CT which measured external rotation, femoral flexion, varus/valgus alignments of the femur and tibia, sagittal

- alignment of the tibial component, and rotation of the tibial compared to the femoral prosthetic component
- More patients had computer navigation on the left knee (62.5%) than on the right knee
 - The main patient-reported outcome was the High Activity Arthroplasty Score (HAAS), which was developed to assess how well an arthroplasty patient does high-demand activities (Talbot 2010) on four dimensions:
 - o Walking: 5 points for walking more than one hour over rough ground; 0 points for using a walker over short distances
 - o Running: 4 points for running more than 5 km; 0 points for cannot run
 - o Stair climbing: 3 points for climbing two stairs at a time, 0 points for cannot climb stairs
 - o Activity level: 6 points for complete sports such as singles tennis, running more than 10 km, or cycling more than 80 km; 0 points for housebound
 - o Patients were also asked which knee was better: the right, the left, or whether both knees were equal
 - The CT-measured alignment measures did not differ between knees, and coronal alignment was 0-3° from neutral in all but four knees with alignment from 4-5° (two computer navigated and two conventional navigated knees)
 - The HAAS was reported preoperatively (where the left and right knees were the same) but not postoperatively
 - At 5 years, 32 patients remained (3 deceased and 2 emigrated of the original 37 patients), and 13 rated their conventionally navigated knee as better, 7 thought their computer navigated knee was better, and 12 thought their knees were the same

Authors' conclusions:

- Computer navigation did not improve alignment of the operated knee
- More patients had a better subjective outcome with the conventionally navigated knee than with the computer navigated knee

Comments:

- For reasons not explained, the HAAS, which would be a useful instrument for assessing outcomes of TKA, was measured preoperatively but not postoperatively
- Although the allocation of knees was not randomized, there is no readily apparent source of bias in how the operating room had been set up, and the preoperative HAAS scores for the patients' knees was nearly equal, such that selection bias is not likely to be measurable
- There is an advantage in having each patient act as his or her own control, and in blinding the patients as to which knee had which technique

- The fact that few patients (7 of 32) rated the computer knee as better at five years adds credibility to the hypothesis that computer navigation does not improve functional outcomes, in spite of the fact that the authors missed an opportunity to repeat the HAAS at the later followup assessments

Assessment: Adequate for some evidence that in patients having bilateral total knee replacements, there are no radiographic alignment differences postoperatively and no functional differences at five years between the knee which was operated on with computer navigation and the knee which was operated on without computer navigation

Reference:

Talbot S, Hooper G, et al. Use of a New High-Activity Arthroplasty Score to Assess Function of Young Patients With Total Hip or Knee Arthroplasty J Arthroplasty 2010;25(2): 268-273.