Do we need computer assistance to improve the survival of primary total knee arthroplasty? A minimum ten years follow-up

KIM YH, PARK JW, KIM JS

The Joint Replacement Center, Ewha Womans University School of Medicine, Seoul, Korea

younghookim@ewha.ac.kr

Background: Computer-assisted total knee arthroplasty (TKA) is reported to improve the overall accuracy of positioning of the femoral and tibia components. However, an acceptable target for alignment remains a matter for debate. A mechanical axis within 3° of neutral axis has been used as the primary outcome measure in many clinical trials comparing computer-assisted- and conventional TKA. However, the evidence supporting this arbitrary value is unreliable because previous reports are limited by their small sample size, inadequate radiographs, short follow-up and lack of clarity when defining a margin of accuracy.

Purpose of Study: We asked: (1) Do computer-assisted TKAs provide better alignment and clinical function? (2) Do computer-assisted TKAs provide better survivorship of implants and less complication? and (3) Do correction of the mechanical axis of the lower limb to within 3° of neutral is a prognostic marker for late revision surgery due to aseptic loosening?

Methods: Sequential simultaneous bilateral TKAs were carried out in 520 patients (1040 knees). One knee was replaced using a computer-assisted surgical navigation system, and the other was replaced conventionally without using a computer-assisted surgical navigation. The two methods were compared for accuracy of orientation and alignment of the components, loosening and osteolysis as determined by radiographs and computer tomographic scan. There were 452 women and sixty-eight men with a mean age of 63.6 years (range, forty-nine to eighty-eight years). The body mass index was 27.4 kg/m^2 (range, 22 to 38 kg/m^2). The mean follow-up was 10.5 years (range, ten to twelve years). The patients were assessed clinically and radiographically using the rating system of the Knee Society and Western Ontario and McMaster Universities Osteoarthritis (WOMAC) scores at three month, one year, and yearly thereafter. Computered tomographic (CT) scanning was carried out to determine the rotational alignment of the tibial and femoral components and osteolysis.

Results: The mean preoperative Knee Society knee score was 28 points, with an improvement to 93 points postoperatively, in the computer-assisted TKA group and 27 points, with an improvement to 94 points postoperatively, in the conventional TKA group. The preoperative and postoperative ranges of motion of the knees were similar in both groups. The operating and tourniquet times were significantly longer in the computer-assisted TKA group than in the conventional TKA group. The two groups were not significantly different with regard to the accuracy of component positioning and the number of outliers for the various radiographic parameters. The rotational alignment of the femoral and the tibial components was not statistically different between the two groups. CT scan shows no evidence of osteolysis in either group. Three knees (0.6%) were revised for infection in the computer-assisted TKA group and two knees (0.4%) were revised for infection in the conventional TKA group. One knee (0.2%) in each group was revised for aseptic loosening of the femoral component. Survivorship of implant at 10.5 years with revision as the end point for failure was similar (99.2% vs 99.4%) between the two groups. There was no relationship between the survival of a primary TKA and mechanical axis of the lower limb.

Conclusions: After a minimum duration of follow-up of ten years, we found no significant differences between computer-assisted and conventional TKA groups with regard to Knee society knee and function scores, range of motion, alignment of the components, the incidence of osteolysis, and the survivorship of the implants. There was no relationship between survival of a primary TKA and mechanical axis of lower limb.