Complications in conventional versus computer-assisted navigation in sequential bilateral total knee arthroplasty

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Introduction: Risks and benefits of bilateral total knee arthroplasty (TKA), whether simultaneous, sequential single-staged, or staged is a topic of debate. Similarly, computer-assisted navigation for TKA is controversial regarding complications, cost-effectiveness, and benefits over conventional TKA. To our knowledge, no studies have compared computer-assisted and conventional techniques for sequential bilateral TKA. By analyzing the clinical outcomes as well the complication rates, we aim to study the role of computer-assisted navigation plays with bilateral total knee arthroplasties. We hypothesize that because of the lack of intramedullary femoral canal cutting guides in the computer assisted navigation systems, bilateral total knee replacements assisted by computer navigation will demonstrate a significantly lower complication rate due to its decreased systemic emboli and blood loss.

Methods: A retrospective study of 40 computer-assisted and 36 conventional bilateral sequential TKAs from 2007-2011 with at least a 1-year follow-up were reviewed for complications. We define bilateral sequential as performing both TKAs under the same anesthesia but completing the first replacement and then prepping and draping for the second replacement using new instruments. Patients were matched by age, gender, body mass index (BMI), Charlson Comorbidity Index (CCI), and American Society of Anesthesiologists Classification (ASA). Pearson's Chi-square, Fisher's exact test, and independent samples t-test were used to compare groups using SPSS for Windows, version 19.0 (SPSS Inc., Chicago, IL).

Results: Our populations' mean age was 65.9 years, BMI 31.6, CCI 3.4, ASA 2.3, and a male to female ratio of 1:2. Computer-assisted TKA demonstrated significantly better postoperative day (POD) 1 hemoglobin ($p = .001$), decreased number of blood transfusions ($p = .001$) and fewer complications ($p = .023$). Mean preoperative hemoglobin for both groups was 12.4 g/dL, but mean POD 1 hemoglobin was 10.2 g/dL and 9.3 g/dL, for computer-assisted and conventional groups respectively. Total blood transfusion units were a mean of 1.0 and 1.7 for computer-assisted and conventional groups respectively. Seven (19%) patients in the conventional group had lethargy, altered mental status, or syncope versus none in the computer-assisted group during their postoperative hospitalization. Other outcomes including subsequent hemoglobin levels, tourniquet time, length of stay, postoperative range of motion and alignment, readmissions, and reoperations were not significantly different with numbers available between the two groups ($p > .05$).

Conclusions: Computer-assisted navigation for sequential bilateral TKAs had higher hemoglobin on POD 1, decreased blood transfusions, and fewer complications compared to conventional sequential bilateral TKA. This may be due to violation of the femoral canal for placement of intramedullary guide during conventional TKA causing increased bleeding. Fat emboli from the femur may have caused the increased incidence of altered mental status, but did not increase incidence of pulmonary embolism in the conventional group. Symptomatic anemia also likely had a role in the increased amount of lethargy and syncope in the conventional TKA cohort. Our study is limited due to its retrospective analysis, small cohort sizes and short follow up. The study does however show a significant difference in early perioperative complications between the groups. Prospective studies with a larger number of patients and

longer follow up are required to further evaluate differences between computer-assisted navigation and conventional technique for sequential bilateral TKA.