Uncemented vs Cemented Cruciate Retaining Total Knee Arthroplasty in Patients with a Body Mass Index over 30

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Introduction: Asptic loosening of both cemented and uncemented total knee arthroplasty (TKA) implants continues to be a source of failure after TKA. Uncemented total knee arthroplasty has the advantages of decreased operative time, shorter tourniquet time, and the potential for boney ingrowth leading to a more durable implant-bone interface. There is limited literature reviewing uncemented cruciate retaining components in the obese population. We sought to evaluate the outcomes associated with a single cruciate retaining TKA implant in the obese population when comparing uncemented versus cemented groups for (1) incidence of revisions due to tibial component aseptic loosening, (2) overall revision rate for all etiologies, (3) pre versus post operative range of motion, (4) Forgotten Joint Score (FJS) and Lower Extremity Activity Scale (LEAS) clinical outcome scores.

Methods: After obtaining institutional review board approval, we retrospectively reviewed 1312 patients who underwent a TKA between January 2010 through December 2014 by four fellowship trained adult lower extremity reconstruction surgeons at a single institution. We identified 364 patients who underwent a cemented or uncemented primary unilateral TKA with a cruciate retaining (CR) total knee prosthesis (Triathlon total knee system; Stryker Orthopaedics, Mahwah, NJ) secondary to osteoarthritis with a body mass index (BMI) ≥ 30 kg/m². All three components were either uncemented or cemented respectively. Patellae were resurfaced in all patients. Patients were excluded if they had a BMI less than 30 kg/m², an implant other than the Triathlon knee, or had a posterior stabilized knee implant. Long standing hip to ankle radiographs were assessed preoperatively and postoperatively along with AP, lateral, and merchant views of the knee using standardized digital radiography. The modified version of the Knee Society Total Knee Arthroplasty Radiographic Scoring System for assessment of radiolucent lines was used to assess postoperative radiographs. Knee range of motion was evaluated with a goniometer in all patients. There were 158 patients in the uncemented group with a mean age of 60.30 ± 8.01 years and 206 patients in the cemented group with a mean age of 64.79 ± 8.78 years (p < 0.0001). The mean BMI in the uncemented group was of 37.2 kg/m² (range 30-56.9 kg/m²) and the mean BMI in the cemented group of 37.33 ± 5.60 kg/m² (range, 30.1-56.1 kg/m², p=0.86). All patients had a minimum of 2-year follow-up with a mean follow up in the uncemented group of 5.5 years (range, 4.0-10.1 years) and a mean follow-up in the cemented group of 7.8 years (range, 6.0-10.2 years; p<0.0001). The primary outcome measure was incidence of revision due to aseptic loosening of the tibial baseplate in the uncemented and cemented groups. Secondary outcome measures were postoperative flexion and extension, and patient reported outcome scores as evaluated by the FJS and LEAS.

Results: The overall success rate in the uncemented group was 97.5% and 98.5% in the cemented group with 4 patients in the uncemented group and 3 patients in the cemented group undergoing revision for any reason (n = 4; 2.5% vs n = 3; 1.5%; p = 0.47). Of the 4 revisions in the uncemented group, one revision was due to aseptic loosening of the tibia, while no revisions in the cemented group were performed for aseptic loosening of the tibial component (n = 1; 0.6% vs n = 0; 0.0%; p = 0.45). In the uncemented group, one patient was revised due to aseptic loosening of the uncemented patellar component (n = 1; 0.6% vs n = 0; 0.0%; p = 0.45) and one patient underwent revision to a total stabilized implant due to lateral laxity and incompetence after lateral collateral ligament reconstruction. There was one patient in the uncemented group and 3 patients in the cemented group that were revised due to periprosthetic joint infection (n = 1; 0.6% vs n = 3; 1.5%; p = 0.64). The FJS and LEAS clinical outcome measures were similar between groups (10.2 ± 3.6 vs 9.7 ± 3.6; p = 0.33 and 63.10 ± 29.62 vs 64.95 ± 26.62; p = 0.64, respectively). Overall preoperative mechanical alignment was similar between groups, varus or valgus (8.28 ± 4.75 vs 8.86 ± 4.75). Postoperative knee flexion was similar between groups (115.0 ± 9.95 vs 114.3 ± 9.27; p = 0.48). A higher number of patients developed flexion contractures in the cemented group (n = 16) when compared to the uncemented (n = 3) group (7.7% vs 1.9%; p = 0.01).

Discussion: We conducted this study to investigate the outcomes of an uncemented versus cemented cruciate retaining total knee arthroplasty in the obese patient population. To our knowledge, there is limited literature evaluating only cruciate retaining components in the obese population with and without the use of tibial component cementation in a single study. Previous literature evaluated the outcomes of cemented and uncemented posterior stabilized (PS) components along with cemented cruciate retaining components in the morbidly obese patient population, which found a significantly higher incidence of aseptic loosening in the cemented cohort vs the uncemented cohort (9 vs 0 TKAs). Our study had one patient in the uncemented group with a BMI of 55.7 kg/m² and an active smoker, who underwent revision for tibial component aseptic loosening one year after the initial procedure where the tibial component subdis and collapsed into varus with medial incompetence. The uncemented group did have higher FJS outcome scores and equal LEAS scores when compared to the cemented group however the modest increase in FJS score may not be clinically significant. Postoperative range of motion was similar between groups with fewer incidences of knee flexion contractures in the uncemented group. Our findings demonstrate equivalent success rates for obese patients undergoing an uncemented or cemented cruciate retaining total knee arthroplasty with regards to aseptic loosening. Early failure in an uncemented cruciate retaining component design may theoretically result from excessive femoral rollback, tibial polyethylene impingement, and anterior lift off of the tibial baseplate due to the influence of the posterior cruciate ligament. In addition, increased tibial contact forces seen in the obese patient population may result in tibial subsidence with ingrowth failure. Development of a biologic interface may be beneficial in the obese population due to the improved durability of an implant-bone interface, which may not be subject to the same mechanical failure mechanisms as seen in a cement-bone interface at long-term follow up.

Significance: Uncemented cruciate retaining total knee arthroplasty may be used in the obese patient population as a reliable treatment option for end stage knee osteoarthritis.

References: