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Early comparative outcomes of unicompartmental and total knee arthroplasty in severely obese patients☆

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ABSTRACT

Background: Medial unicompartmental knee arthroplasty (UKA) may have advantages over total knee arthroplasty (TKA) in the setting of obesity. There has been no direct comparison between the two cohorts. This study compares outcomes and complications of severely obese patients undergoing medial UKA versus TKA.
Methods: Six hundred and fifty medial UKA and 1300 TKA were performed in patients with BMI >35 kg/m^2 (mean 41 kg/m^2) between 2007 and 2012. Pre- and postoperative ROM, Knee Society scores, perioperative factors, complications and reoperations were compared.
Results: UKA patients had higher preoperative ROM, and Knee Society pain (KSP), functional (KSF), and clinical (KSC) scores ($p < 0.001$, $p = 0.0008$, $p = 0.0003$, $p = 0.051$ respectively). Mean tourniquet times, operative times, and lengths of stay were lower after UKA. Four TKA patients required transfusion. Mean follow-up was 2.3 years. The frequency of manipulation under anesthesia was higher in TKA patients ($p < 0.001$), while the rate of component revision was similar between the two groups (1.2% vs. 1.7%, $p = 0.328$). Frequency of deep infection was lower in the UKA group ($p = 0.016$). Postoperative KSF, change in KSF, and ROM were higher ($p < 0.0001$) after UKA, but KSP and KSC were equivalent.
Conclusions: Severely obese patients who underwent medial UKA demonstrated equal survivorship with substantially fewer reoperations, reduced deep infection, and less perioperative complications at short term follow-up. Severely obese patients had improved KSF scores and maintenance of ROM after UKA compared with TKA.

1. Introduction

There is significant debate regarding the best treatment option for isolated degenerative arthritis of the medial compartment of the knee. Treatment options include high tibial osteotomy, unicompartmental knee arthroplasty (UKA), and total knee arthroplasty (TKA). Since the 1970s, UKA has been used for treatment of medial compartmental osteoarthritis of the knee. As technology advanced and techniques improved, success rates for medial UKA have improved [1–3]. There is evidence that medial

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UKA may have advantages over TKA. These advantages include improved kinematics, range of motion and functional outcome scores [4–6]. In addition, UKA has been shown to have low rates of transfusion and symptomatic thromboembolic events [7]. These benefits of UKA have not been studied extensively in the obese population.

Due to these high complication risks, many surgeons are cautious to offer joint replacement surgery to the severely obese. Generally, arthroplasty in the obese patient is associated with higher complication rates, including increased wound complications, infections and revisions [8]. Blood loss and transfusion rates are typically higher [9], and outcome scores are typically lower compared to non-obese matched controls [10].

The purpose of this study was to investigate the outcomes of UKA and TKA in severely obese patients using standardized outcome measures. Additionally, we report complications such as return to operating room, reoperation, infection, revision, blood loss, number of transfusions, tourniquet time, operative time, and length of stay. We hypothesize that obese patients undergoing UKA will have better improvement in outcome measures and lower complication rates than those undergoing TKA.

2. Materials/methods

Retrospective review revealed 504 consecutive patients (650 knees) with a body mass index (BMI) of 35 kg/m^2 or greater who underwent medial UKA performed by the senior authors between 2007 and 2012 at their institution. Knees in patients with BMI of 35 kg/m^2 represented 28% (650 of 2348) of knees treated with medial UKA during the study period. Indications for medial unicompartmental knee arthroplasty were primary anteromedial osteoarthritis with intact cruciate ligaments and with correctable deformity on valgus stress radiograph. Exclusion criteria for this study was BMI of less than 35 kg/m^2, and for medial UKA were tricompartmental osteoarthritis confirmed by radiograph, arthroscopy or intraoperatively, failure of stress radiographs, active infection and patients who had not failed initial conservative therapy.

A 2:1 control group of 963 patients (1300 knees) undergoing primary TKA with a BMI of 35 kg/m^2 or greater at our institution during the same time period was then matched by gender, height, weight, BMI and age for comparison analysis. Knees in patients with BMI of 35 kg/m^2 represented 40% (2312 of 5848) of knees treated with primary TKA during the study period. TKA was performed for a diagnosis of osteoarthritis in 1281 knees (98.5%), post-traumatic arthritis in eight knees (0.6%) and inflammatory arthropathy in 11 knees (0.8%). Patient demographics, including height, weight, BMI, and age were collected from the preoperative records. Clinical assessment was performed using the Knee Society Clinical Rating System, with pain component (KSP), clinical score (KSC), and functional score (KSF) recorded. Range of motion (ROM) was measured using an electronic goniometer. All research herein was conducted in accordance with ethical standards in compliance with privacy guidelines and in accordance with our institution and independent institutional review board. No outside funds were received in support of this study.

We used a minimally invasive midline approach with medial parapatellar arthrotomy for both procedures. UKA was performed without extension to the vastus medialis obliquus and without patella eversion. All patellae were resurfaced in the TKA group. We used the Oxford Partial Knee mobile-bearing unicompartmental knee prosthesis (Zimmer Biomet, Inc., Warsaw, Indiana) for all UKA and the Vanguard Complete Knee System (Zimmer Biomet, Inc.) for all TKA. All patients underwent the same multimodal rapid recovery preoperative and postoperative protocols as previously published [11,12]. Operative notes were obtained and investigated for tourniquet time, procedure time, estimated blood loss, and transfusion requirement. Routine discharge criteria included medical stability, achievement of physical therapy and ambulatory goals, and adequate pain control. Patients were seen initially at six weeks postoperatively and annually thereafter.

We compared differences in the continuous variables (age, follow-up duration, BMI, ROM, length of stay and clinical scores) between groups using the non-paired, two-tailed Student t test. We compared differences in the non-parametric variables (revision and infection occurrences, incidence of manipulation and complications, return to the operative suite) between the two groups using Pearson's chi-square test. Significance set at an alpha $= 0.05$.

3. Results

Mean follow-up time for UKA patients was 2.6 years (range, one to eight years) and TKA patients 2.1 years (range, one to eight). Mean age at surgery was similar between groups with UKA patients 59.7 years-old (range, 36–86 years) and TKA patients 59.7 years-old (range, 36–83 years) ($p = 0.97$). The mean BMI in both groups was also similar with UKA patients having a BMI of 40.5 kg/m^2 (range, 35–59 kg/m^2) and TKA patients 40.5 kg/m^2 (range, 35–59 kg/m^2) ($p = 0.91$). Fifty-eight percent of patients were female (850 of 1467) and 42% were males (617 of 1467). Preoperatively, patients in the UKA group compared with the TKA group had greater ROM (112° versus 106°, $p < 0.001$), higher KSP (eight versus six, $p < 0.001$), higher KSC (37 versus 35, $p = 0.05$), and higher KSF (53 versus 50, $p < 0.001$ scores) (Table 1).

Postoperatively, obese patients who underwent UKA had greater ROM at most recent evaluation than obese patients who underwent TKA (115° versus 108°, $p < 0.001$), and higher KSF (68 versus 61, $p < 0.001$) (Table 2). Further, UKA patients had greater improvement in KSF from preoperative to most recent evaluation compared with TKA patients (11 versus 15, $p < 0.001$). There was no difference between UKA and TKA groups in postoperative KSP (40 versus 40, $p = 0.759$) or postoperative KSC (86 versus 85, $p = 0.395$), or in improvement of KSC from preoperative levels (49 versus 50, $p = 0.593$). However, there was greater improvement in KSP in TKA patients (34) compared with UKA patients (32, $p = 0.025$).

The need for return to the operating room for any reason including manipulation under anesthesia was higher in the TKA group (9.2%, 120 of 1300) versus the UKA group (3.7%, 24 of 650; $p < 0.001$) (Table 3). The major reason for a return to the operating room was manipulation under anesthesia for treatment of arthrofibrosis, which was more frequent after TKA (6.5%, 84 of 1300) than UKA

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