

No Difference in 90-Day Complications Between Bilateral Unicompartmental and Total Knee Arthroplasty

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Abstract

This study compares the 90-day complication rate of 28 patients who underwent simultaneous bilateral unicompartmental knee arthroplasty (UKA) with a matched control group of 56 patients who underwent simultaneous total knee arthroplasty (TKA.) We matched the groups 2:1 for age, gender, and American Society of Anesthesiologists scores and reviewed their medical records to identify complications, reoperations, and hospital readmission during the first 90 days after surgery as well as the operative times and length of hospital stay.

The bilateral UKA group had shorter operative times ($p = 0.06$) and shorter length of hospital stay ($P < 0.001$). Ninety-day complications in the UKA group included 1 wound infection and 1 deep vein thrombosis (3.57%). The TKA group had 2 complications including 1 superficial wound infection and 1 pulmonary embolism (1.79%) ($P = 0.60$). One knee in each group required irrigation and debridement for wound infection. These patients requiring additional surgery for wound infection were the only 2 patients that required readmission within 90 days. Despite being a less invasive procedure, we found that the bilateral UKA group had a similar risk of complications to a matched group of bilateral TKA patients.

Partial knee arthroplasty procedures have become a reliable treatment for significant knee pain. The number of unicompartmental knee arthroplasties (UKAs) has increased at a rate of 32.5% annually over the last few years.^{1,2} UKA has emerged as an attractive alternative to total knee arthroplasty (TKA) in the proper setting as it can potentially spare more bone, is associated with better knee kinematics,

provides a more rapid postoperative recovery, and potentially allows for an easier revision if needed.³⁻⁷

Bilateral UKA is an alternative in the patient with symptomatic bilateral knee arthritis isolated to 1 compartment of the tibiofemoral articulation. Previous studies have shown conflicting data on the complication rates of simultaneous bilateral UKA. One recent paper showed an 8.2% rate of major complications following simultaneous bilateral UKA compared to no major complications in staged bilateral UKA.⁸ In contrast, another paper showed no difference in perioperative complications between simultaneous and staged bilateral UKA.⁹ The purpose of our study was to compare the 90-day complication rates in a select group of patients undergoing simultaneous bilateral UKA when compared to matched controls undergoing bilateral simultaneous TKA. Since patients undergoing bilateral TKA are considered a high risk group, we hypothesized that those undergoing bilateral UKA would have an increased rate of complications.

Materials and Methods

Between January 2003 and December 2009, 487 UKAs (415 patients) were performed at our institution. Seventy-two patients underwent bilateral UKA (Figure 1). We divided these 72 patients into 3 distinct groups. Group 1 underwent bilateral UKA simultaneously under 1 anesthetic and consisted of 28 patients. Group 2 underwent staged bilateral arthroplasty within 3 months and consisted of 13 patients. Group 3 underwent staged bilateral arthroplasty after 3 months and consisted of 31 patients. Our study focused on the group of 28 patients that underwent simultaneous bilateral UKA. Sixteen males and 12 females underwent simultaneous bilateral UKA. These patients had a mean age of 64 ± 10 years.

Six different surgeons performed the simultaneous bilateral UKA surgeries (Table 1). Two different types of implants were used in the surgeries. Twenty of the 28 patients had Miller-Galante implants (Zimmer, Warsaw, IN) and the remaining 8 had Oxford implants (Biomet, Warsaw, IN).

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Figure 1. Radiograph of bilateral UKAs.

All patients had standard postoperative mechanical deep vein thrombosis (DVT) prophylaxis. DVT chemoprophylaxis was surgeon dependent and either warfarin or aspirin was used.

During the same time period, 439 simultaneous bilateral TKAs were performed at this institution. These were performed by 17 different surgeons (Table 2). DVT prophylaxis for the TKA group included either warfarin or low-molecular weight heparin and was surgeon dependent.

The bilateral UKA cases were matched 2 to 1 to a cohort of 56 bilateral TKA (112 knees) according to age, gender, and American Society of Anesthesiologists (ASA) score. There were 32 males and 24 females. In this group, the average age was 64 ± 9 years. The medical records of these patients were reviewed to identify complications, reoperations, and hospital readmission during the first 90 days after surgery.

Statistical Analysis

The simultaneous bilateral UKA cases were matched 2 to 1 to a cohort of 56 bilateral TKA (112 knees) according to age (within 5 years), gender, and exact ASA scores. Data were described using mean \pm SD, median (interquartile range (IQR)), or count (percent) as appropriate, by surgical technique. For patient-level continuous characteristics, such as operative time and hospital length of stay, comparisons were made using Wilcoxon rank sum tests. For per knee level complication rates, comparisons were made using Fisher's exact test. Analyses were performed using SAS v9.2 (SAS Institute Inc, Cary, NC) and GraphPad QuickCalcs website (<http://www.graphpad.com/quickcalcs/contingency1.cfm>, accessed

Table 1. Number of Bilateral UKA Cases per Surgeon

Surgeon	Number of Cases	Percentage of Total
1	12	42.8
2	7	25
3	4	14.3
4	3	10.7
5	1	3.6
6	1	3.6

Table 2. Number of Bilateral TKA Cases per Surgeon

Surgeon	Number of Cases	Percentage of Total
1	96	21.9
2	95	21.6
3	67	15.3
4	54	12.3
5	33	7.5
6	19	4.3
7	17	3.9
8	14	3.2
9	12	2.7
10	11	2.5
11	8	1.8
12	8	1.8
13-17	1 each	0.2

November 2011). All tests were 2 sided, and $P < 0.05$ was considered statistically significant.

Results

The median operative time was 150 (114, 206) minutes for bilateral UKA and 171 (127, 269) minutes for bilateral TKA and this difference was not significant ($P = 0.06$). The mean length of stay was 3.9 ± 1.2 days for bilateral UKA and 5.2 ± 2.1 days for bilateral TKA ($P < 0.001$).

In the first 90 days after surgery, there were 2 complications in the UKA group. These complications included 1 wound infection and 1 DVT that gave an overall complication rate of 3.6%. There were 2 complications in the 112 TKA knees, and included 1 superficial wound infection and 1 pulmonary embolism for a complication rate of 1.8%. With the numbers available, there was no statistically significant difference in the 90-day complication rate between these 2 groups ($P =$

0.60). Included in the above mentioned complications were 1 knee in each group that required irrigation and debridement for wound infection. These wound washout patients were the only 2 patients that required readmission within 90 days. Each of these patients healed without complications and required no further intervention. There were no deaths, fractures, or revisions in the first 90 days in either group.

Discussion

Conflicting data exist in the literature regarding the safety of bilateral UKA. We aimed to compare the complication rate in this group to what has been traditionally considered a high risk group, that is, those undergoing bilateral TKA. We found that bilateral UKA has a low complication rate, and has lower operative times and hospital length of stays when compared to an age, gender, and ASA-score matched group of bilateral TKA patients. There was no statistically significant difference in complication rate between the 2 groups.

Few studies have been published discussing simultaneous bilateral UKA. Chan and colleagues⁸ compared the immediate postoperative complications of simultaneous versus 2-stage bilateral UKA. This retrospective study compared 159 patients (318 knees) treated with simultaneous bilateral UKA and 80 patients (160 knees) treated with staged UKA over a 10-year period. The 2 groups were comparable in age and ASA grade. They tracked major complications including death, pulmonary embolism (PE), proximal DVT, and adverse cardiac events as well as minor complications including wound infection and distal DVT within the first 30 days after surgery. They found 13 patients (8.2%) of the simultaneous group had major complications while none of the staged group had a major complication, indicating a statistically significant difference in major complication rates. There were 5 minor complications in the staged group and 4 in the simultaneous group. The authors concluded that there was a significantly higher risk of major complications associated with simultaneous bilateral UKA and caution surgeons who plan to undertake the procedure.

One significant aspect of their study is that their patients did not receive thromboembolic chemoprophylaxis postoperatively. Nine of their 13 major complications were either a proximal DVT or PE. As such, their results and conclusions may not be applicable in centers in the United States where chemoprophylaxis is routinely used postoperatively.

Berend and colleagues⁹ compared a group of patients who underwent simultaneous bilateral TKA (35 patients, 70 knees) to a group of patients who underwent staged bilateral TKA (141 patients, 282 knees.) Patients in the simultaneous group had a shorter cumulative operative time (109 minutes versus 122 minutes), shorter cumulative hospital stay (1.7 versus 2.5 days), higher Lower Extremity Activity Scale scores (12.0 versus 10.2), and a higher Knee Society Functional score (87.9 versus 72.9). They found no difference in the perioperative complication rate between the 2 groups. In this study, however, the simultaneous cohort was significantly younger and less obese than the staged group and this could have accounted for the difference between the groups as the younger patients could

likely do better than the older patients and could be a surrogate for comorbidities. A comorbidity measure was not used in the above study that differentiates it from our study, in which we used ASA score as a measure of comorbidity.

When comparing unilateral TKA to bilateral TKA, studies have shown that there is a higher risk of cardiac and pulmonary complications as well as an elevated postoperative 30-day mortality in the bilateral group.¹⁰⁻¹⁵ In 2007, a meta-analysis of simultaneous bilateral TKA was performed that showed an increase in the prevalence of PE, cardiac complications, and mortality when compared to staged bilateral TKA.¹³ Because of this published data on bilateral TKA, we felt it would be a good comparison group to compare to our group of bilateral UKA patients.

In spite of the reported risks of performing bilateral arthroplasties simultaneously, there are several advantages as well. Two of the most obvious advantages are administering a single anesthetic and having a single hospitalization. These can benefit the patient's overall recovery and health, but also have economic benefits. Though the cost-effectiveness of simultane-

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ous bilateral UKA has not been reported, a study by Reuben and colleagues²⁰ compared the costs of performing bilateral simultaneous versus staged TKA. They concluded that bilateral simultaneous TKA can save more than \$10,000 for each total knee replacement patient.

At our institution, we compared costs associated with patients who underwent simultaneous bilateral UKA to those who underwent staged bilateral UKA. The overall cost increased 37% in the staged group versus the simultaneous group. Among these costs were a 20% increase in operating room costs, 28% increase in hospital and nursing costs, and 25% increase in surgeon reimbursement. The hospital net revenue was 39% more for the staged versus the simultaneous procedure.¹⁶

In addition to the economic benefit, several studies have advocated that better functional outcomes are possible with symmetric rehabilitation.^{13-15,17-21}

Our study was limited in that it was a retrospective case control study. The indications for performing UKA are often different than performing TKA. We hypothesized that bilateral UKA would be a safer procedure than bilateral TKA, but this was not shown in the data.

In conclusion, unilateral UKA provides a faster recovery and less risk of perioperative complications when compared to unilateral TKA. Despite its lower isolated morbidity, bilateral UKA was found to have similar complications to a group of bilateral TKA patients. Surgeons should use this data to counsel patients undergoing bilateral simultaneous UKA.

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