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Unilateral vs. bilateral total knee arthroplasty with 90-day morbidity and mortality: A retrospective cohort study

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ABSTRACT

Background: The decision to adopt a unilateral vs. a bilateral approach while performing a total knee arthroplasty (TKA) for a patient with bilateral knee involvement remains a matter of much debate. Previous literature has claimed the supremacy of unilateral surgery in terms of complications where as some evidence supporting no significant difference between the two approaches also exists. In this study, we aim to compare the morbidity and mortality of unilateral with bilateral TKA.

Methodology: A review of 658 patients who underwent TKA (2005–2015) was carried out. Details of patient characteristics, hospital course and complications occurring within 90 post-operatively were recorded. Data was analyzed using both univariate testing and multivariate regression analysis with a threshold for significance at $p < 0.2$ and $p < 0.05$ respectively.

Results: The study showed that there is no statistically significant difference in the mortality and major complication between unilateral TKA and bilateral TKA. Further analysis revealed that only higher ASA status (3-4) is associated with higher risk of SSI (RR = 3.42,p-value = 0.034). No variables were found to be significant predictors for cardiac complications and UTI. Interestingly, all 3 cases of DVT occurred in bilateral TKR.

Conclusions: There is no significant difference between unilateral and bilateral TKA in terms of mortality and morbidity except for DVT. This tips the balance in favor of the simultaneous bilateral approach owing to the added benefits of a combined lower cost of surgery, faster recovery, less work absence, single anesthesia session, single hospital admission and fewer follow-ups. Hence, it can be preferred in selected patients with bilateral osteoarthritis.

1. Introduction

Total Knee Arthroplasty (TKA) remains the treatment of choice for end stage knee osteoarthritis after all conservative management options have failed. The procedure is very effective in pain reduction, enhances mobility and is relatively safe in terms of complications and mortality, making it one of the most successful and frequently performed procedures in orthopedics.

Although osteoarthritis generally involves both knees, the damage can vary. One knee maybe affected predominantly such that some patients may require either one or both knees to be replaced. Whether to adopt a bilateral or a unilateral approach is currently based on individualized decision making as even after decades of this surgery being in practice, the question of doing both knees simultaneously is a matter of much debate. Several studies suggest that unilateral TKA is associated with fewer complications [1–5] while others claim that there is no difference between the two approaches [6–9].

We hypothesized that bilateral total knee arthroplasty is associated with higher morbidity and mortality. The objective of our study was to calculate the 90-day morbidity and mortality associated with unilateral vs. bilateral TKA. Furthermore, we also analyzed the risk factors associated with a higher risk of morbidity and mortality.

2. Methodology

2.1. Study design and data extraction

A retrospective review of patients who underwent Total Knee

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Arthroplasty (TKA) between May 2005 and December 2015 was conducted at a tertiary care hospital. Medical record files of 715 patients who underwent primary TKA during this period were reviewed. The data for this study was collected and reported in line with STROBE criteria [10].Patients who underwent revision knee arthroplasty or an additional surgery with TKA under the same anesthesia were excluded from the study. Patients with missing data were also excluded from the study. A total number of 658 total knee replacements fulfilled our selection criteria out of which 272 were unilateral and 386 were bilateral. Patients undergoing bilateral staged TKA were grouped with the unilateral category whereas those undergoing surgery of both knees simultaneously were categorized as bilateral. The hospital's medical record files were used to obtain information regarding the patient demographics and details of their admission. The variables that were recorded include patient demographics, BMI, co-morbid conditions (Asthma, chronic kidney disease, chronic obstructive pulmonary disease, coronary heart disease, dyslipidemia, diabetes mellitus, hypertension and thyroid disease), preoperative and postoperative hemoglobin, length of stay, type of anesthesia, American Society of Anesthesiologists (ASA) score, operative time and length of special care stay. The morbidity associated with the surgery was recorded in terms of postoperative complications that included Deep vein thrombosis (DVT), Cardiac complications, Urinary tract infection (UTI), Pneumonia, GI bleed and surgical site infection (SSI). Cardiac complications, urinary tract infection (UTI), deep vein thrombosis (DVT), Pneumonia, GI bleed and SSI within 90 days was considered a positive finding. Expiry within 90 days was considered mortality associated with the surgery.

2.2. Clinical course

Patients were counseled for surgery after all conservative managements had failed. All patients were evaluated and relevant preoperative workup and optimization was done by the orthopedic surgeon and the anesthesia team with relevant consults for cardiology, endocrinology or as dictated by the patient's comorbidity. All patients received standard preoperative, intra-operative and post-operative care including antibiotics, DVT prophylaxis, rehabilitative physiotherapy and routine monitoring of their vitals and respective comorbidities, while those requiring extra monitoring were shifted to special care units. Patients were discharged following attainment of a stable hemodynamic status with independent, pain free mobilization and asked to follow-up with their respective orthopedic surgeon.

2.3. Statistical analysis

Data was analyzed using SPSS version 22. Patient characteristics and features of hospital stay for unilateral TKA and bilateral TKA were recorded in Table 1. For a more accurate comparison of the two groups, independent T-test was used to calculate the difference in the means of continuous variables for the two groups while the chi-square test was used to compare categorical data. The percentage of mortality and morbidity in the two groups was recorded in Table 2. Cardiac complications, SSI and UTI were the only complications that were sufficient in number to qualify for further analysis. Univariate testing and multivariate regression analysis was used to identify significant risk factors for these complications. Relative risk was used to access the risk of several variables that could possibly affect the morbidity. For univariate testing, the threshold for qualifying for further analysis was p-value<0.20. All variables with p-value<0.05 in multivariate regression analysis were declared significant risk factors for total knee arthroplasty.

3. Results

The characteristics of patients in the unilateral group were compared to those in the bilateral group (Table 1). The mean age, number of co-morbid conditions, pre-operative hemoglobin, ASA status, admissions to the special care unit and complications within 90 days were not significantly different between the two groups. The patients in bilateral group had a BMI of 31.60 compared to 30.03 for the unilateral group (p-value <0.001). Interestingly, males were predominant (51.4%) in the unilateral group whereas majority of the women (61.4%) underwent bilateral TKA (p-value = 0.006). The most common type of anesthesia in both groups was general anesthesia (41.9% in unilateral and 49% in bilateral TKA) followed by a combination of general and regional anesthesia.

Out of the 658 patients, there was a total of 3 mortalities within

Table 1
Comparison between unilateral and bilateral TKA.

	Unilateral (n = 272)	Bilateral (n = 386)	P-value
Age*	62.66 ± 10.57	62.37 ± 9.05	0.713
Gender			
Male	74 (27.2%)	70 (18.1%)	0.006[a]
Female	198 (72.8%)	316 (81.9%)	
BMI*	30.03 ± 4.84	31.60 ± 5.63	<0.001
Number of Comorbidites*	1.12 ± 0.97	1.16 ± 0.98	0.635
Diagnosis			
Rheumatoid Arthritis	11 (4%)	13 (3.4%)	
Osteoarthritis	256 (94.1%)	373 (96.6%)	
Pre-op Hemoglobin*	12.41 ± 1.44	12.29 ± 1.33	0.265
ASA*	2.14 ± 0.52	2.19 ± 0.49	0.144
Type of Anesthesia			
General	114 (41.9%)	189 (49%)	
Regional	70 (25.7%)	48 (12.4%)	
General + Regional	88 (32.4%)	149 (38.6%)	
Use of homeostatic agent	229 (84.2%)	345 (89.4%)	0.050[a]
Post-op Hemoglobin*	10.81 ± 1.43	10.09 ± 1.31	<0.001
Length Of stay*	7.96 ± 2.96	9.73 ± 2.83	<0.001
Admitted to special care unit	8 (2.9%)	23 (6.0%)	0.072[a]
Major Complications within 30 days	17 (6.3%)	32 (8.3%)	0.326[a]
Mortality	1 (0.37%)	2 (0.52%)	1.000[b]

* Mean ± Standard deviation are reported.
[a] Pearson chi-square values are reported.
[b] Fisher's Exact test used.