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18(8) 2023
Research Article

Retrospective analysis of clinical outcomes and complications of one-stage versus two-staged bilateral total knee arthroplasty

SALIHU MUHAMMED NUHU (1), AROJURAYE SOLIUDEEN ADEBAYO (2)

(1) Department of Orthopaedics, University of Abuja Teaching Hospital, Abuja, Nigeria
(2) Department of Orthopaedics, National Orthopaedic Hospital Dala, Kano, Nigeria

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Received: 04.08.2023; Manuscript No. jotsrr-23- 109281; Editor assigned: 06.08.2023, PreQC No. jotsrr-23-109281 (PQ); Reviewed: 14.08.2023, QC No. jotsrr-23-109281 (Q); Revised: 16.08.2023, Manuscript No. jotsrr-23- 109281 (R); Published: 23.08.2023, DOI. 10.37532/1897-2276.2023.18(8).99

Address for correspondence:
Arojuraye Soliudeen Adebayo Department of Orthopaedic Hospital Dala, Kano, Nigeria
doctoraroju@yahoo.com

Abstract

Introduction: The safety of single staged bilateral TKA has been issue of debates due to concerns of morbidity and mortality. The advantages attributed to one-stage bilateral TKA include shorter recovery time, shorter hospital stay and perhaps reduced total cost of treatment. The aim of this study was to analyze the clinical outcomes and complications following one-stage versus two-staged bilateral TKA for severe osteoarthritis of both knees.

Methods: This retrospective comparative analysis was carried out between January 2018 and December 2022 at a government orthopaedic referral hospital in Nigeria. Clinical outcomes using KSS scoring system and rate of complications were recorded. Patients' satisfaction using Likert scale was also documented. The statistical analysis was performed using SPSS version 23.0.

Result: There was no significant difference between the postoperative KSS in the two groups ($p = 0.717$) The mean postoperative KSS in OS and TS groups were 97.78 ± 1.78 and 97.76 ± 1.74 respectively. Postoperative complications do not also significantly differ in the two groups ($P=0.712$)

Conclusion: In properly selected cases, one-stage bilateral TKA has the same good outcome and excellent patients' satisfaction as two-staged procedure without significant increase in complication rates.

Keywords: Bilateral total knee replacement, one stage, two stage

INTRODUCTION

Total Knee Arthroplasty (TKA) is a cost-effective elective orthopaedic procedure that provides significant pain relief and improved quality of life for patients with severe osteoarthritis of the knee [1]. In these patients, unilateral TKA can significantly affect rehabilitation, and this may result in poor outcome [2]. The safety of single staged bilateral TKA has been issue of debates due to concerns of increased morbidity and mortality [3-5]. Bilateral TKA can be done as one-stage or two-staged surgery. The advantages that have been attributed to one-stage TKA include shorter recovery time, shorter hospital stay and perhaps reduced total cost of treatment [6,7]. However, opponents of one-stage surgery reported a greater risk of postoperative complications [8-10].

Total knee replacement has become a routine procedure in most orthopaedic hospitals in Nigeria. To the best of our knowledge, there is scarcity of published studies about bilateral TKA in Nigeria. The aim of this study therefore was to analyze the clinical outcomes and complications following one-stage versus two-staged bilateral TKA for severe osteoarthritis of both knees. Our hypotheses were that the clinical outcomes of one-stage bilateral TKA would be poorer, and the rate of complication would be higher than two-staged bilateral TKA.

MATERIALS AND METHODS

This retrospective comparative analysis was carried out between January 2018 and December 2022 at a government orthopaedic referral hospital in Northern Nigeria. The study was performed after approval from Hospital Research Ethics Committee (HREC). Patients' information was retrieved from the hospital electronic medical record. Patients were also contacted on the phone where necessary for additional information.

The study involved all consecutive patients with bilateral severe osteoarthritis of the knees who had bilateral TKA either as one or two-staged surgery within the study period. The inclusion criteria were: Adult patients males and females aged 50 years and above with severe osteoarthritis of both knees who had bilateral TKA and were followed up for a minimum of 1 year. The decision to do one or two-staged surgery was based on the surgeon and anaesthetist assessment for fitness for the surgery. The exclusion criteria were patients less than 50 years of age, unilateral osteoarthritis, patients with a history of myocardial infarction, severe obesity, significant history of smoking, poorly controlled diabetes, and revision TKA. Patients were divided into two groups: One-Stage (OS) and Two-Stage (TS) groups.

Clinical outcomes using Knee Society Scoring system and rate of complications were recorded. Patients' satisfaction using Likert scale was also documented. The statistical analysis was performed using SPSS version 23.0 (SPSS Inc., Chicago, IL, USA). Means, ranges, and standard deviation were calculated for quantitative variables and compared using Student's t tests. Frequencies were calculated for qualitative variables and compared using Chi-square. The results were considered statistically significant at $p<0.05$.

RESULTS

A total of 291 bilateral TKA were performed by four surgeons during the study period. One hundred and ninety-five patients in Two-Staged procedure (TS group) and ninety-six patients in One-Stage procedure (OS group) were followed up for a minimum of 12 months. The mean ages of patients in OS and TS groups were 63.73 years ± 7.03 years and 62.39 years ± 7.46 years respectively. More females were operated in both groups. There was no significant difference in the demographic characteristics of both groups (Table 1).

There was no significant difference between the postoperative KSS in the two groups (p=0.717). The mean postoperative KSS in OS and TS groups were 97.78 ± 1.78 and 97.76 ± 1.74 respectively. Postoperative complications do not significantly differ in the two groups (P=0.712). Table 2 below shows the postoperative complications in the OS and TS groups.

DISCUSSION

The safety of one-stage bilateral TKA has been a topic for discussion for a while in orthopaedic surgery due to documented relative increased postoperative morbidity and mortality [3, 4]. There are however some advantages of single stage procedure especially when cases are well selected. One stage bilateral TKA requires only one anaesthetic session and one hospital admission. It also aids quick rehabilitation in patients with severely deformed bilateral knees, thereby leading to a better outcome. In our setting, we regularly do bilateral arthroplasty under the same anaesthesia for selected cases. Some of the exclusion criteria include patients with more than one comorbidity, morbid obesity, complex primary TKR and revision TKR among others (Table 3).

At 12 months postoperative, we did not find significant difference in terms of knee functions between the patient who had bilateral TKA as one-stage procedure and those who had bilateral TKR as a two-staged procedure. Patients were also similarly satisfied with the surgery. Although there were selection criteria for patients operated on one-stage procedure, the preoperative demographic characteristics of the patients in both groups do not significantly differ.

Similarly, postoperative complications in one-stage and two-staged bilateral TKR are not significantly different (p =0.842). This might be because there is a difference in the number of patients in each cohort (195 in two-stage group, 96 in one-stage group) and because there was no randomization into each group, though there was no significant difference in demographics of both groups.

Two patients died in one stage group. The first died 3 days postoperative due to pulmonary embolism while the other died from diabetes complications 3 months after surgery. In the two-staged group, one patient died of cardiac arrest 12 hours postoperative. One patient in one-stage group developed chronic knee pain which persisted even after 1

Table 1. Demographic characteristics of patients in One-stage and Two-staged groups

Characteristics	One-stage	Two-staged	p-value
Age (year)	63.73 ± 7.03	62.39 ± 7.46	0.078
Gender			
Male	26 (27.1%)	43 (22.1%)	0.172
Female	70 (72.9%)	152 (77.9%)	
BMI (Kg/m^2)	33.63 ± 5.91	34.18 ± 5.60	0.94
Comorbidities			
Nil	34 (35.4%)	63 (32.3%)	0.882
DM	22 (22.9%)	32 (16.4%)	
Cardiac dx	40 (41.7%)	77 (39.5%)	
DM + Cardiac	34 (35.4%	23 (11.8%)	

Table 2. Postoperative Complications in one-stage and two-staged bilateral total knee replacement.

Complications	One-stage (n = 95)	Two-staged (n = 195)	p-value
Mortality	2 (2.1%)	1 (0.5%)	
Deep Venous Thrombosis	1 (1.0%)	1 (0.5%)	
Deep Surgical Site Infection	0 (0%)	1 (0.5%)	
Chronic Knee Pain	1 (1.0%)	0 (0%)	
	4 (4.2%)	3 (2%)	0.842

Table 3. Patients satisfaction (using Liker type scale) after one-stage versus two-staged bilateral TKA

Patients' Satisfaction	One-stage	Two-staged	p-value
Very Satisfied	63 (65.6%)	108 (55.4%)	
Satisfied	31 (32.3%)	85 (43.6%)	
Neutral	0 (0%)	0 (0%)	
Dissatisfied	2 (2.1%)	2 (1%)	
Very Dissatisfied	0 (0%)	0 (0%)	
	96 (100%)	195 (100%)	0.712

year postoperative. She was 66 years old woman with severe deformities of both knee and feet due to rheumatoid arthritis. Other complications noted were prosthetic joint infection and deep veinous thrombosis. The insignificant difference in complication rates noted in our study is consistent with previous other studies by Hadley et al , Hooper et al , and Fortin et al [11-13] . On the contrary, studies have also shown that one-stage bilateral TKA is more prone to postoperative complications compared with staged surgery. Fu D et al in a systematic review found that simultaneous bilateral TKA had higher rates of mortality, pulmonary embolism, and blood transfusion rates [14]. Similarly, Bolognesi et al found higher mortality and myocardial infarction rates for simultaneous bilateral TKA but no significant difference in infection and revision rates [15]. Lack of difference in complication rates of our study may be due selection of patients for one-stage group. Other complication that has been previously noted with TKR is fat embolism [16]. We did not find any patient in either group with this complication in our study.

This study has several limitations. Different surgeons operated on the patients, though they follow the same hospital protocol for patient care. There was no randomization of the subjects into the groups, instead there were definite criteria preoperatively for selecting patients into one-stage surgery. In addition, there was disparity in the numbers of patients in each group, though there was no significant difference in the demographic characteristics of the patients in the two groups. Finally, this is a retrospective study, with all the limitations associated with it.

CONCLUSION

In conclusion, for properly selected cases, one-stage bilateral TKA has the same good outcome and excellent patients' satisfaction as two-staged procedure without significant increase in complication rates.

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