

Original Research Article

MORTALITY AND MORBIDITY IN SIMULTANEOUS BILATERAL TOTAL KNEE ARTHROPLASTY : A RETROSPECTIVE SINGLE CENTRIC STUDY

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ABSTRACT

Background: Single-stage bilateral total knee replacement offers one hospitalization, single anesthesia exposure, accelerated rehabilitation, and lower costs. Concerns persist about increased perioperative risk. This study was conducted to test the hypothesis that single-stage bilateral TKR does not result in higher early perioperative mortality and that its early morbidity rate is comparable to that observed in patients undergoing staggered bilateral TKR.

Materials and Methods: A single-center retrospective cohort of ASAI–II patients undergoing bilateral TKR from 2011 to 2024 was reviewed. Two groups of 2,000 patients each received simultaneous or staggered bilateral TKR, with minimal loss to follow-up. The mean age was 67 years; 37.7% were ASAI and 62.3% ASA II. Early outcomes—mortality, complications within one year, and readmissions—were tracked using the institutional electronic medical record system. Follow-up visits occurred at 6 weeks, 3 months, 6 months, and 1 year.

Results: Early postoperative mortality was 0.5% in the simultaneous group versus 0.3% in the staggered group. Major complications occurred in 1.1% versus 0.65%, and minor complications in 2% versus 1.8%. Despite blood-sparing strategies, 32% of simultaneous patients required homologous transfusion.

Conclusion: Simultaneous bilateral TKR carries a slightly higher early mortality risk compared to staggered procedures. However, rates of perioperative complications—including thromboembolism, cardiac events, and infections—were similar between groups. Level of Evidence: Level IV – Retrospective cohort study.

Keywords: Simultaneous bilateral TKR, staggered TKR, perioperative mortality, early morbidity.

INTRODUCTION

Total knee arthroplasty (TKA) is a widely performed orthopedic intervention for the management of degenerative joint disease among diverse patient population. The procedure has been extensively documented in the literature as a cost-effective means of mitigating pain and restoring functional capacity.^[1,2] It is noteworthy that nearly one-third of patients presenting for knee arthroplasty exhibit bilateral symptoms, necessitating surgical intervention on both knees.^[3] In these cases, patients and surgeons must consider two primary surgical

strategies: simultaneous bilateral total knee arthroplasty (SBTKA), in which both knees are replaced under a single anesthetic event, and staggered bilateral total knee arthroplasty (StBTkA), in which the procedures are performed sequentially over a defined interval.

Proponents of SBTKA emphasize several advantages, including reduced anesthesia exposure, early postoperative rehabilitation, better recovery and shorter overall hospital stays, potentially resulting in lower healthcare expenditures.^[4-7]

Horne G et al. and Ritter MA et al. have concluded in their study that the surgery carries no more risk for

postoperative complications than unilateral TKA.^[8-14] The functional outcomes and patient satisfaction scores are comparable, or higher, in persons undergoing simultaneous bilateral vs unilateral TKA. However, emerging evidence has associated SBTKA with higher rates of perioperative complications and mortality. Restrepo et al,^[8] and Fu et al,^[9] observed elevated early mortality and a higher incidence of serious complications, including pulmonary embolism and cardiac and neurological issues similarly, Memtsoudis et al,^[10] found increased mortality and morbidity in high risk patients (those over 80 years old with conditions like heart failure or pulmonary hypertension), suggesting that the simultaneous bilateral TKR procedure can be detrimental for patients with an ASA score 3 or 4. Yoon et al. (11) corroborated these findings, reporting higher mortality and morbidity in patients with ASA score of 3 or 4.

A key limitation in comparing these two approaches lies in the current evidence base, which is often constrained by methodological issues. In particular, many studies are underpowered due to small sample sizes, limiting their ability to detect significant differences in clinical outcomes. This paucity of robust data presents a challenge for clinicians in making evidence-informed decisions regarding surgical strategy.

So our main aim of study is to evaluate whether mortality and morbidity in the patients undergoing simultaneous bilateral total knee replacement arthroplasty is same as the patients undergoing staggered bilateral tkr or still higher.

MATERIALS AND METHODS

Patient characteristics: This single-center retrospective study examined a cohort of consecutive patients who underwent simultaneous bilateral total knee replacement (SBTKA) over a 14-year period (2011–2024). Inclusion criteria consisted of patients presenting with functionally limiting bilateral knee arthropathy who were suitable candidates for simultaneous bilateral TKR. Preoperative risk stratification was conducted during the anesthesia consultation approximately two weeks prior to surgery, utilizing the American Society of Anesthesiologists (ASA) physical status classification system. Patients classified as ASA-1 or ASA-2 were recommended for simultaneous bilateral TKR. Patients classified as ASA-1, 2, 3 and ASA-4 were recommended for staggered bilateral TKR. A standardized preoperative blood conservation protocol was then initiated, consisting of iron supplementation and/or administration of recombinant human erythropoietin (EPO) in individuals with baseline hemoglobin (Hb) levels below 11 g/dL after evaluation.

Patient cohort: The study cohort comprised 2000 patients, out of which 20 people were lost to follow-up in simultaneous bilateral TKR (n=1980) and 15

people in staggered bilateral TKR (n=1985) out of whom 33% were classified as ASA-1 and 67% as ASA-2. The mean preoperative hemoglobin (Hb) level recorded during the anesthesia consultation was 11.8 g/dL, with a range of 10.5 to 15.4 g/dL. Iron supplementation was administered to 13.7% of patients, while 11.7% received recombinant human erythropoietin (EPO) after evaluation.

Procedure: Epidural anesthesia was utilized in 70% of cases and general anesthesia was used in the remaining 30% of cases. Surgical intervention was performed using a pneumatic tourniquet, with the medial parapatellar approach, primarily indicated for varus deformities and grade 1, 2, 3 valgus deformities, was used in 94% of cases, whereas the Keblish anterolateral approach, typically selected for grade 4 valgus deformities, was employed in 6% of cases. All patients received the same prosthesis: the cemented, fixed-bearing, posterior-stabilized system. tourniquet was deflated, haemostasis achieved before closure. post operative routine physiotherapy protocol was initiated. On day 14 th suture removal was done.

Assessment of results: Medical records of patients who underwent surgery consecutively between January 2011 and December 2024 were reviewed. Clinical and paraclinical data were collected from the inpatient hospital stay, the convalescent care center, and follow-up visits at 6 weeks and 3 months, 6 months and 1 year postoperatively. Data analysis was conducted using the institutional electronic medical record system, which enabled comprehensive tracking of each patient's clinical course. All complications occurring within the first year postoperative, as well as early hospital readmissions, were documented. Mortality counts were documented in cases of occurrence. Complications were categorized as either major or minor which is shown in the table below.

The postoperative assessment of the blood-sparing protocol included evaluating the proportion of patients who received blood transfusion, erythropoietin (EPO), and iron supplementation. Hemoglobin (Hb) levels were recorded preoperatively and on postoperative days 1 and 5. Additionally, the influence of age and body mass index (BMI) on these outcomes was examined.

Statistical analysis: Statistical analysis was performed using EasyMedStat software (<http://www.easymedstat.com>). The Wilcoxon signed-rank test was employed to compare preoperative and postoperative values, with a significance threshold set at an alpha level of 0.05.

RESULTS

Patient demographics:

Table 1: showing patient demographics in each groups

	Simultaneous b/l tkr	Staggered b/l tkr
No. of patients	1980	1985
Age 50-60	n=783(39.55%)	n=785(39.55%)
60-70	n=1042(52.63%)	n=1044(52.57%)
70-80	n=153(7.83%)	n=156(7.85%)
Mean age at surgery	67 years	67 years
Sex male	647(32.68%)	649(32.69%)
female	1333(67.32%)	1336(67.31%)
BMI	25.8(18-30)	25.8(18-30)
ASA 1	n=747	n=748
ASA 2	n=1233	n=1237
indications	Primary oa knee =1717(86.72%) Rheumatoid knee=254(12.83%) Psoriatic arthritis=9(0.45%)	Primary oa knee =1721(86.68%) Rheumatoid knee=254(12.79%) Psoriatic arthritis=9(0.45%)

Assessment of Postoperative Complications:

Table 2: showing list of major and minor complications included in the study

Major complications	Minor complications
mortality	Surgical site infection
Cardiovascular - MI, pulmonary embolism, pulmonary oedema, arrhythmia	Chronic stiffness of knee
Pulmonary - pulmonary oedema, pleural effusion, acute respiratory failure	Knee instability
Neurological - cva, transient ischemic accident	Dvt, cellulitis, foot drop
Renal- aki, renal failure	
Sepsis, multiple organ dysfunction syndrome	

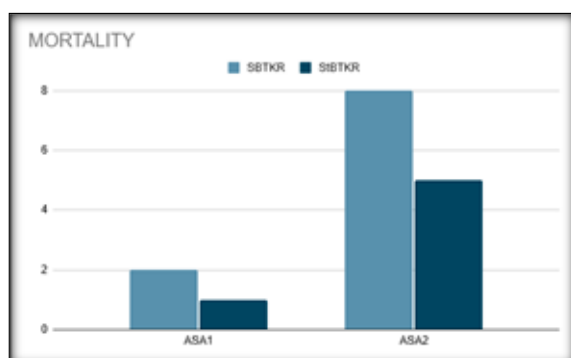


Figure 1: showing number of mortality cases in each group according to ASA grades



Figure 2: showing mortality rates in each group

The early postoperative mortality rate among patients undergoing simultaneous bilateral TKR was 0.5%, compared to 0.3% in those undergoing staggered bilateral procedures.

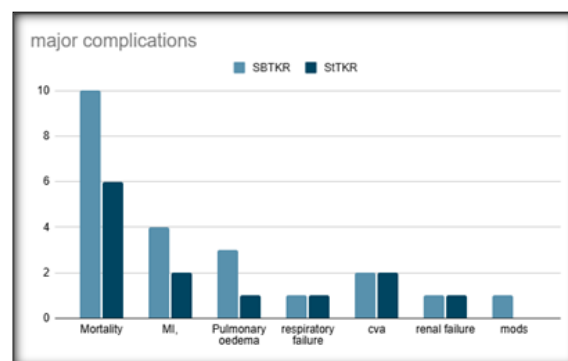


Figure 3: showing major complications in each group

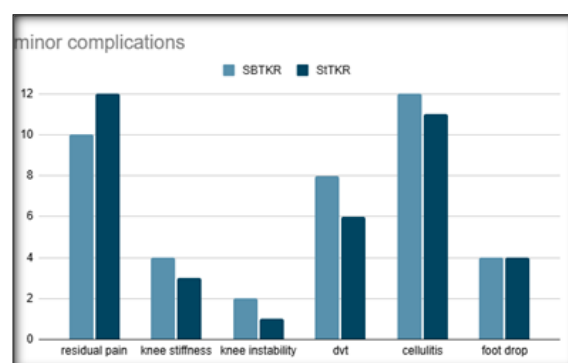


Figure 4: showing minor complications in each group

A total of 22 major complications (1.1%) and 40 minor complications (2%) were recorded among patients undergoing simultaneous bilateral TKR compared to 13 major complications (0.65%) and 37 minor complications (1.8%) of those undergoing staggered bilateral procedures. Homologous blood transfusion was required in 32% of patients, despite the application of blood-sparing strategies.

DISCUSSION

This retrospective study evaluated mortality and morbidity of patients undergoing single-stage simultaneous bilateral total knee replacement (TKR) in a cohort of ASA I and II patients over a 14-year period. The findings suggest that while the early perioperative mortality rate was slightly higher in the single-stage simultaneous bilateral group (0.5%) compared to reported rates for staggered procedures (0.3%), the overall early morbidity profile remained comparable.

The slightly elevated mortality observed in our cohort, although still low in absolute terms, reinforces the importance of preoperative selection and perioperative optimization. All patients included in this study were classified as ASA I or II, reflecting a relatively healthy surgical population. This is consistent with other reports suggesting that outcomes for single-stage bilateral TKR are highly

dependent on careful patient selection, particularly regarding cardiopulmonary comorbidities and functional reserve.^[18-20]

A meta-analysis conducted by Restrepo and colleagues,^[8] examined outcomes similar to those discussed in the present study and found a significantly higher risk of cardiac events and mortality following simultaneous bilateral total knee replacement, compared to unilateral and staggered bilateral procedures. Similarly, another meta-analysis by Hu and colleagues,^[16] and Nasir Hussain et al.,^[17] reported findings consistent with ours, noting significantly higher 30-day mortality and increased rates of neurological complications in patients who underwent simultaneous total knee arthroplasty. However, like our study, they found no significant difference in overall complication rates between the simultaneous and staggered groups. These findings highlight the importance of careful patient selection and individualized surgical planning to minimize perioperative risks. Similarly, there are several studies which corroborated the same.^[21-30]

Importantly, the rate of major complications (0.65%) and minor complications (1.8%) remained within acceptable limits and comparable to outcomes previously reported for staggered bilateral TKR. These findings support the feasibility of single-stage bilateral TKR in appropriately selected low-risk patients, particularly when performed in high-volume centers with experienced surgical and anesthetic teams.

Blood management remains a significant concern in bilateral procedures, given the greater potential for intraoperative blood loss. Despite the implementation of a blood-sparing protocol, homologous transfusions were required in 32% of cases. This highlights the need for continued optimization of perioperative anemia management, including earlier identification and treatment of suboptimal hemoglobin levels preoperatively. It also suggests that while erythropoietin and iron supplementation may reduce the need for transfusions, they may not entirely eliminate it in high-demand bilateral procedures.

Age and BMI were evaluated as potential contributors to mortality and morbidity rates. This finding aligns with recent literature suggesting that while age and obesity may influence perioperative management, they are not, in isolation, contraindications to simultaneous bilateral TKR in carefully selected patients.

CONCLUSION

In conclusion, our study reinforces existing evidence that simultaneous bilateral total knee arthroplasty is associated with an increased or similar risk of perioperative mortality when compared to unilateral and staggered bilateral procedures. While overall complication rates may not differ significantly, careful patient selection and preoperative assessment

is needed. These findings support a more individualized approach to surgical planning, emphasizing the need to balance procedural efficiency with patient safety. Ongoing research, particularly prospective and randomized studies, is essential to further refine best practices and guide decision-making in total knee arthroplasty.

The benefits of reduced hospitalization, faster rehabilitation, and cost savings must be weighed against the slightly elevated, though still low, risk of early mortality. Shared decision-making, supported by thorough preoperative evaluation, remains crucial in identifying candidates most likely to benefit from this approach.

Limitations: This study is limited by its retrospective design and reliance on a single-center dataset, which may limit generalizability. Future prospective, multicenter studies are needed to further validate these findings and explore long-term functional outcomes.

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