

Which Patient Factors other than Comorbidities Influence the Choice Between Simultaneous and Staged Bilateral Total Knee Arthroplasty? A Propensity Matched Study Using a National Database

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INTRODUCTION: Radiographic imaging studies demonstrate the presence of bilateral knee osteoarthritis in as high as 87.4% of patients who present with unilateral knee pain. In the United States, simultaneous (both knees replaced in a single procedure) bilateral knee replacements account for approximately 6% of all TKAs. Although this approach may be associated with higher perioperative risks, it offers advantages over staged TKA, including a single recovery period and reduced overall hospital stays. Previous studies have shown that patient medical comorbidities are the predominant factors that determine whether a patient is indicated for simultaneous or staged TKA. However, the potential role of patient factors other than medical comorbidities in surgical decision-making remains unclear as there is currently no consensus on the patient selection criteria. This study aims to assess the potential association of patient factors other than medical comorbidities in simultaneous versus staged bilateral TKA using propensity matching in a large national dataset.

METHODS: This retrospective cohort study utilized data from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database (2007–2023). We identified patients with bilateral knee osteoarthritis who underwent primary TKA and categorized them into two groups: simultaneous bilateral TKA and staged bilateral TKA. To minimize the confounding influence of baseline health factors, we performed 1:1 propensity score matching based on patient comorbidities and health status, including chronic obstructive pulmonary disease, congestive heart failure, hypertension, diabetes (insulin-independent and -dependent), and American Society of Anesthesiologists (ASA) classification. Following matching, the cohorts were compared for age, sex, race, and ethnicity to determine whether these patient factors are associated with the selection of simultaneous versus staged TKA.

RESULTS SECTION: Among the 57,125 with bilateral knee osteoarthritis, 44,148 (77.3%) underwent staged bilateral TKA, while 12,977 (22.7%) underwent simultaneous bilateral TKA (Table 1). After matching based on comorbidities and health status, 7,778 patients remained in each cohort (Table 2). Patients in the simultaneous TKA group were younger than those in the staged TKA group (64.3 ± 8.4 vs. 66.7 ± 8.7 years; p < 0.001). The proportion of male patients was higher in the simultaneous TKA cohort (44.9% vs. 40.2%; p < 0.001). Regarding racial and ethnic distribution, Hispanic patients represented a smaller proportion of the simultaneous TKA group compared to the staged group (4.4% vs. 6.4%; p < 0.001; Table 2).

DISCUSSION: These findings suggest that patient factors other than comorbidities influence the selection of simultaneous versus staged bilateral TKA. Specifically, patients who underwent simultaneous bilateral TKA were more likely to be younger, male, and White. While younger, male, and/or White patients tend to undergo simultaneous bilateral TKA, multiple studies have demonstrated no significant differences in postoperative complication rates after simultaneous bilateral TKA based on biological sex, age, and race. This suggests that patient factors other than medical comorbidities are being considered in the decision to offer simultaneous bilateral TKA, which may potentially decrease access to simultaneous bilateral TKA in eligible patients.

SIGNIFICANCE/CLINICAL RELEVANCE: Comorbidities are not the only patient factors considered when selecting simultaneous bilateral primary total knee arthroplasty, potentially limiting access in certain patient populations.

	Simultaneous N (%)	Staged N (%)	Total N (%)
Race			
White	9,412 (85.2)	18,866 (81.5)	28,278 (82.7)
Asian	437 (4.0)	1,247 (5.4)	1,684 (4.9)
Black	1,054 (9.5)	2,598 (11.2)	3,652 (10.7)
Other	150 (1.4)	439 (1.9)	589 (1.7)
Ethnicity			
Hispanic	439 (4.0)	1,804 (9.2)	2,243 (6.6)
Non-Hispanic	10,614 (96.0)	21,346 (92.2)	31,960 (93.4)
Sex			
Female	6,213 (56.2)	14,226 (60.9)	20,439 (59.8)
Male	4,839 (43.8)	8,923 (38.5)	13,762 (40.2)
Non-binary	0	1 (0.0)	1 (0.0)
Mean Age (± SD)	64.2 ± 8.6	66.7 ± 8.6	65.9 ± 8.8

Table 1. Comparison of demographics between patient undergoing simultaneous and staged primary total knee arthroplasty before propensity score matching.

	Simultaneous (N=7,778)	Staged (N=7,778)	Total (N=15,556)	P-value
Sex				
Female	4,283 (55.1%)	4,654 (59.8%)	8,937 (57.5%)	
Male	3,495 (44.9%)	3,124 (40.2%)	6,619 (42.5%)	< 0.001
Mean Age (± SD)	64.3 ± 8.4	66.7 ± 8.7	65.5 ± 8.6	< 0.001
Race				
White	6,535 (84.0%)	6,489 (83.4%)	13,024 (83.7%)	
Asian	333 (4.3%)	437 (5.6%)	770 (4.9%)	< 0.001
Black	807 (10.4%)	759 (9.8%)	1,566 (10.1%)	
Other	105 (1.3%)	111 (1.4%)	203 (1.3%)	
Ethnicity				
Hispanic	346 (4.4%)	494 (6.4%)	840 (5.4%)	
Non-Hispanic	7,432 (95.6%)	7,284 (93.6%)	14,716 (94.6%)	< 0.001

Table 2. Comparison of demographics between patients undergoing simultaneous and staged primary total knee arthroplasty after propensity matching.