

The Impact of Tourniquet Duration on Postoperative Opioid Use, Stiffness, and Patient Outcomes After Total Knee Arthroplasty

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INTRODUCTION: The use of a tourniquet during total knee arthroplasty (TKA) remains a topic of ongoing debate, particularly regarding its effects on complications, postoperative pain, and opioid consumption. While tourniquets are commonly used to reduce intraoperative blood loss and improve surgical field visibility, emerging evidence suggests they may also influence postoperative recovery. This study aimed to evaluate how varying durations of tourniquet use affect pain- and stiffness-related outcomes during the early recovery period such as opioid utilization, rates of manipulation under anesthesia (MUA), and patient-reported outcome measures (PROMs).

METHODS:

A total of 17,850 patients who underwent unilateral TKA between 2016 and 2023 were categorized into four groups based on the ratio of tourniquet inflation time to total surgical time (procedure start to postoperative acute care unit [PACU] alert): No-tourniquet (n=1,243); Short-tourniquet (Ratio < 0.6; n=2,914); Tourniquet-Until-Arthrotomy-Closure (Ratio 0.6 to <1; n=10,003); and Full-tourniquet (Ratio ≥1; n=3,690).

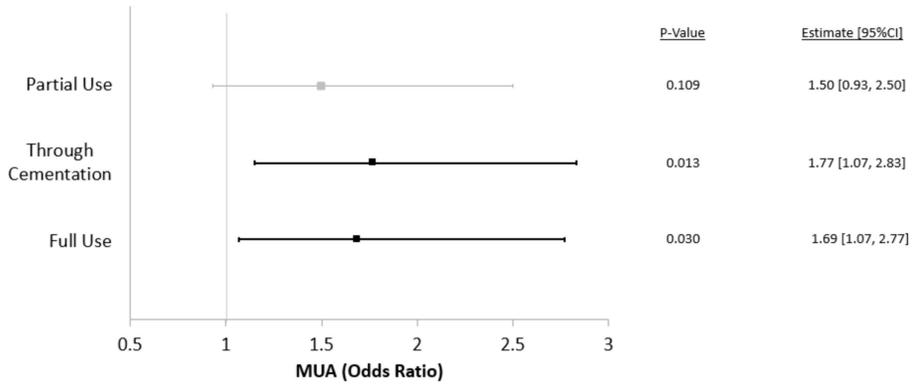
Opioid usage was measured at discharge and through the 90-day postoperative period and converted to morphine milligram equivalents (MMEs). Additional outcomes included PROMs and stiffness requiring MUA. Statistical comparisons between the four groups were made using ANOVA and post-hoc Tukey tests, and multivariable regression analyses were performed to adjust for demographic and clinical covariates.

RESULTS: Patients in the Short-tourniquet group had significantly lower 90-day opioid consumption compared to those in the Full-tourniquet and Tourniquet-Until-Closure groups, with estimated differences of 89.48 MMEs (p=0.0001) and 81.85 MMEs (p<0.0001), respectively. Interestingly, after adjusting for confounding variables, the Short-tourniquet group also had lower 90-day opioid use than the No-tourniquet group (difference estimate: -66.96 MMEs; p=0.0256).

Regarding stiffness, the No-tourniquet group had a 2.01% rate of MUA. In contrast, the Tourniquet-Until-Closure and Full-tourniquet groups demonstrated significantly higher rates of MUA—1.69 times greater (p=0.030) and 1.77 times greater (p=0.013), respectively—indicating a possible association between prolonged tourniquet use and increased stiffness requiring intervention. While PROMs were generally comparable across groups, the Full-tourniquet group showed a modest but statistically significant greater improvement in mental health PROMs compared to the Short-tourniquet group (difference estimate: 0.87; p=0.0368).

DISCUSSION AND CONCLUSION: Our findings highlight the nuanced impact of tourniquet duration on pain- and stiffness-related postoperative outcomes in TKA. Short-duration tourniquet use was associated with reduced opioid consumption and a lower likelihood of postoperative stiffness requiring MUA, without compromising patient-reported mental or physical outcomes. Conversely, prolonged tourniquet use (Full-tourniquet) was associated with increased opioid consumption and higher rates of MUA, and No-tourniquet use was also associated with higher 90-day opioid consumption compared to Short-tourniquet. These results suggest that selective, limited-duration tourniquet protocols may optimize pain management and functional recovery following TKA, and should be considered when tailoring surgical strategies to individual patients.

Logistic Regression: MUA



Reference Group: No Tourniquet