

Tourniquet Application Effects on Blood Loss in Osteoarthritis Patients Undergoing Primary Total Knee Arthroplasty: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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INTRODUCTION: Although tourniquets are commonly applied to reduce intraoperative bleeding and improve surgical visualization during primary total knee arthroplasty (TKA), their overall benefit remains controversial—particularly concerning hidden and total blood loss. Prior reviews often neglected hidden blood loss, which can account for a significant portion of total volume loss. This systematic review and meta-analysis aims to evaluate the impact of tourniquet use on intraoperative, postoperative, hidden, and total blood loss in patients undergoing primary TKA.

METHODS: A systematic search was conducted across PubMed, Scopus, Web of Science, Cochrane Library, and ClinicalTrials.gov up to 11 February 2025, in accordance with PRISMA guidelines. Randomized controlled trials (RCTs) comparing any form of tourniquet use to no tourniquet in adults undergoing unilateral primary TKA for osteoarthritis were included. Studies involving revision procedures, other types of knee arthroplasty, or lacking relevant blood loss outcomes were excluded. Risk of bias was assessed using the Cochrane RoB 2.0 tool. Data analysis was conducted using RevMan 5.4, with continuous outcomes reported as mean differences (MD) and dichotomous outcomes as risk ratios (RR), both with 95% confidence intervals. Heterogeneity was assessed using the I^2 statistic.

RESULTS: Twenty-seven RCTs were included, involving patients aged 50–80 years undergoing unilateral primary TKA. Tourniquet use resulted in significantly lower intraoperative blood loss (MD = -90.71 mL; 95% CI [-117.25, -64.17]; $p < 0.00001$; $I^2 = 99\%$). However, no statistically significant differences were observed in postoperative blood loss (MD = 35.11 mL; $p = 0.06$; $I^2 = 99\%$), total blood loss (MD = -23.91 mL; $p = 0.60$; $I^2 = 96\%$), or calculated blood loss (MD = 18.05 mL; $p = 0.59$; $I^2 = 96\%$). Postoperative hemoglobin levels (MD = 0.03; $p = 0.87$; $I^2 = 86\%$) and transfusion rates (RR = 0.86; $p = 0.52$; $I^2 = 51\%$) with and without tourniquet use.

DISCUSSION AND CONCLUSION: While tourniquet use during primary TKA significantly reduces intraoperative blood loss, it does not offer meaningful advantages in terms of postoperative, total, or calculated blood loss. Postoperative hemoglobin levels and transfusion rates were also unaffected. These findings highlight that the perceived blood-sparing benefit of tourniquet use is limited primarily to the intraoperative period and does not translate into overall blood conservation.