

Effect of Cannabis and Tobacco Use on Post-operative Outcomes in Total Knee Arthroplasty Patients

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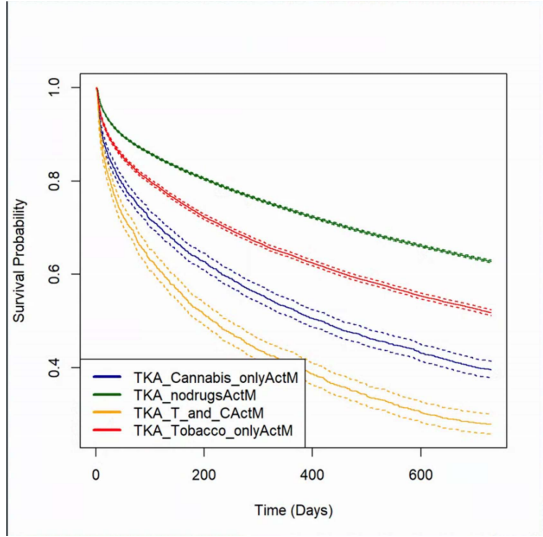
INTRODUCTION: Despite the documented success of total knee arthroplasty (TKA), optimizing post-operative care remains a crucial objective. Factors influencing the trajectory of recovery, such as cannabis and tobacco use, are emerging as critical considerations in perioperative management. As cannabis has been proven to modulate immune system activity for acute, chronic, and auto-immune inflammatory processes, we recognize how these substances may impact pain management, functional recovery, and potential complications – all impacting the high success rates associated with TKA.

Prior studies have shown the deleterious effects of tobacco use in orthopaedic surgery patients. Additionally, since the legalization of cannabis in much of the country, there has been an increased prevalence of cannabis use. However, there is not enough research surrounding cannabis use in orthopaedic patients, and likewise even fewer studies comparing tobacco vs. cannabis or the comorbid use of both substances. Here we examine the effects of tobacco and cannabis use in total knee arthroplasty patients. We analyzed the association between cannabis with and without tobacco use and various outcomes following TKA. We hypothesize that clinical outcomes will show a stronger correlation between cannabis use and post-operative complications relative to tobacco use only, with concurrent use of both showing greater complications relative to non-smokers.

METHODS: We used the PearlDiver Mariner 165 database to conduct this study. The dataset included 123,028 patients that underwent primary TKA from 2010-2022 with varying types of smoking. The PearlDiver database was then used to extract post-operative complications (e.g. wound, infection, pulmonary embolism (PE), revisions, 90 day readmissions, periprosthetic fractures) following TKA to calculate incidence. Pearson's Chi-square test was used to compare the proportion of patients for each measure type by use of tobacco or cannabis products.

RESULTS: The study revealed strong statistical correlations between both tobacco and cannabis use and post-operative complications, with cannabis displaying a more pronounced impact than tobacco use. For 90 day ED visits, tobacco users exhibited a 1.5 times greater incidence and cannabis users 2.2 times greater incidence than non-smokers, while comorbid users displayed a 2.75 greater incidence than non-smokers ($p<0.001$) (Figure 1). Similarly, for prosthetic joint infections, tobacco and cannabis users showed a 1.6 - 1.7 times greater incidence than nonsmokers, while comorbid users displayed over a 2 times greater incidence than non-smokers ($p<0.001$). Looking at wound disruption, tobacco led to a 1.4 times greater incidence and cannabis a 1.5 times greater incidence than non-smokers, while the comorbid group showed over a 2 times greater incidence than non-smokers ($p<0.001$). Tobacco use appeared protective of acute kidney injury (AKI) complications (OR: 0.9, CI: 0.88 - 0.94, $p<0.01$), and although isolated cannabis use led to a mild increase (OR: 1.15, $p<0.01$), the comorbid use accentuated the incidence up to nearly 1.5 times greater ($p<0.001$). Results are outlined in Table 1.

DISCUSSION AND CONCLUSION: This study examined how cannabis and tobacco use impacts several key outcome measures following TKA. Upon review, several metrics prevailed with a clear confirmation that tobacco use greatly increases incidence of infection, 90-day ED visits, wound disruptions, and prosthetic joint infections. Even more so, cannabis use displayed a higher incidence in nearly all these categories, and when used in conjunction with tobacco, the impact was further amplified. Although postoperative risks exist, analyzing the relationship between prevalent social behaviors that ultimately impact medical and surgical outcomes is imperative. Our results show that surgeons must continue to educate patients on these risks in the postoperative period.



Comparison of Post-Operative Complications in TKA Patients:
Non-Smoking Patients vs. Tobacco Only Patients

Post Operative Complications		Control (N = 98,401)	Variable (N = 2,4627)	Odds Ratio (95% CI)	p-value
Cardiovascular	Pulmonary Embolism	Non-Smoker	Tobacco Only	0.62 (0.56 - 0.68)	<0.001
Infection / Wound Disruption	Prosthetic Joint Infection	Non-Smoker	Tobacco Only	1.56 (1.46 - 1.67)	<0.001
	Wound Disruption	Non-Smoker	Tobacco Only	1.40 (1.32 - 1.48)	<0.001
Renal	Acute Kidney Injury	Non-Smoker	Tobacco Only	0.91 (0.88 - 0.94)	<0.01
Orthopaedic & Musculoskeletal	Periprosthetic Fracture	Non-Smoker	Tobacco Only	1.24 (1.08 - 1.40)	<0.01
Clinical Outcomes	90 Day ED Visit	Non-Smoker	Tobacco Only	1.57 (1.51 - 1.62)	<0.001
	Revision	Non-Smoker	Tobacco Only	1.01 (0.95 - 1.08)	0.78

Non-Smoking Patients vs. Cannabis Only Patients

Post Operative Complications		Control (N = 11,282)	Variable (N = 2,826)	Odds Ratio (95% CI)	p-value
Cardiovascular	Pulmonary Embolism	Non-Smoker	Cannabis Only	0.76 (0.61 - 0.97)	0.03
Infection / Wound Disruption	Prosthetic Joint Infection	Non-Smoker	Cannabis Only	1.69 (1.41 - 2.02)	<0.001
	Wound Disruption	Non-Smoker	Cannabis Only	1.53 (1.31 - 1.78)	<0.001
Renal	Acute Kidney Injury	Non-Smoker	Cannabis Only	1.15 (1.04 - 1.26)	<0.01
Orthopaedic & Musculoskeletal	Periprosthetic Fracture	Non-Smoker	Cannabis Only	1.20 (0.77 - 1.89)	0.49
Clinical Outcomes	90 Day ED Visit	Non-Smoker	Cannabis Only	2.15 (1.96 - 2.37)	<0.001
	Revision	Non-Smoker	Cannabis Only	1.03 (0.87 - 1.23)	0.75

Non-Smoking Patients vs. Tobacco + Cannabis Patients

Post Operative Complications		Control (N = 6,691)	Variable (N = 1,680)	Odds Ratio (95% CI)	p-value
Cardiovascular	Pulmonary Embolism	Non-Smoker	Both Tobacco + Cannabis	0.78 (0.57 - 1.06)	0.13
Infection / Wound Disruption	Prosthetic Joint Infection	Non-Smoker	Both Tobacco + Cannabis	2.07 (1.68 - 2.55)	<0.001
	Wound Disruption	Non-Smoker	Both Tobacco + Cannabis	2.13 (1.78 - 2.54)	<0.001
Renal	Acute Kidney Injury	Non-Smoker	Both Tobacco + Cannabis	1.49 (1.33 - 1.67)	<0.001
Orthopaedic & Musculoskeletal	Periprosthetic Fracture	Non-Smoker	Both Tobacco + Cannabis	1.85 (1.14 - 3.01)	0.02
Clinical Outcomes	90 Day ED Visit	Non-Smoker	Both Tobacco + Cannabis	2.75 (2.45 - 3.08)	<0.001
	Revision	Non-Smoker	Both Tobacco + Cannabis	1.14 (0.93 - 1.39)	0.24