While Cannabis Use Alone Does Not Increase Perioperative Complications and Two Year Surgical Complications after Ankle and Hindfoot Arthrodesis, Combined Use with Tobacco Worsens Outcomes Compared to Tobacco Alone

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INTRODUCTION: Ankle and hindfoot arthrodesis are commonly performed procedures to relieve pain and improve function in patients with debilitating joint disease. While the influence of factors like cigarette smoking on surgical outcomes is well-documented, the impact of cannabis use remains poorly understood. Given the increasing prevalence of cannabis consumption and its potential effects on postoperative complications, this study aimed to investigate the association between cannabis use and postoperative outcomes following ankle and hindfoot arthrodesis.

METHODS: A retrospective cohort study using a large national insurance database from 2010 to 2022 was conducted. All patients who underwent ankle or hindfoot arthrodesis for osteoarthritis with at least two years follow up were included. For patients who underwent multiple procedures, only the first instance was used. Patients were divided into 4 groups: cannabis only users, tobacco only users, cannabis and tobacco users, and non-user controls. Groups were matched 1:4 with non-user controls based on demographics and comorbidities. Also, both cannabis and tobacco users were matched 1:4 with tobacco only users based on demographics and comorbidities. Medical complications within 90 days of surgery and surgery specific complications within 2 years were compared between groups. Multivariable logistic regressions, controlling for any demographic variable or comorbidity statistically significant between groups, were used to compare complications. A Bonferroni correction was applied, and statistical significance was set to p≤0.005.

RESULTS: After applying exclusion criteria, there were 61,705 ankle or hindfoot arthrodesis patients eligible for analysis. Of these, there were 380 (0.62%) that used cannabis only, 25,774 (42%) that used tobacco only, and 2,299 (3.7%) that used both cannabis and tobacco. Compared to non-user controls, cannabis users were not at increased risk of 90-day medical complications or 2-year surgical complications. Tobacco use was associated with increased risk of postoperative admission (OR: 1.32; 95% CI: 1.21-1.43, p<0.001) and emergency department (ED) utilization (OR: 1.57; 95% CI: 1.48-1.66, p<0.001) within 90 days as well as infection (OR: 1.24; 95% CI: 1.18-1.30, p<0.001), hardware removal (OR: 1.12; 95% CI: 1.07-1.18, p<0.001), nonunion (OR: 1.33; 95% CI: 1.27-1.40, p<0.001), and wound dehiscence (OR: 1.38; 95% CI: 1.27-1.49, p<0.001) within 2 years of surgery compared to non-user controls. Similarly, compared to non-user controls, people who used both tobacco and cannabis had an increased risk of postoperative admissions (OR: 1.43; 95% CI: 1.16-1.76, p<0.001) and ED visits (OR: 2.86; 95% CI 2.51-3.27, p<0.001) within 90 days as well as infection (OR:1.72; 95% CI: 1.51-1.97, p<0.001), hardware removal (OR:1.24; 95% CI: 1.08-1.42, p=0.002), nonunion (OR: 1.90; 95% CI: 1.64-2.20, p<0.001), and wound dehiscence (OR: 1.86; 95% CI: 1.52-2.27, p<0.001) within 2 years of surgery. Compared to tobacco only use, combined cannabis and tobacco use was associated with increased risk of ED visits within 90 days (OR: 1.45; 95% CI: 1.30-1.62, p<0.001) and nonunion within 2 years of surgery (OR: 1.19; 95% CI 1.05-1.35, p=0.005).

DISCUSSION AND CONCLUSION: Cannabis use alone was not associated with increased odds of perioperative complications or 2-year surgical complications compared to non-user controls. However, its combined use with tobacco was associated with increased adverse outcomes, including higher ED utilization and rates of nonunion compared to tobacco alone. These findings suggest that while cannabis use alone may not exacerbate postoperative risk, it may enhance the negative effect of tobacco use on postoperative outcomes.

Table 1. Dem	ographic Vari	iables and Co	morbidity	Characteristics	s of Each Cohor	t						
	Cannabis (n=380)	Control (n=1,520)		Tobacco (n=25,114)	Control (n=33,250)		Both Tobacco and Cannabis (n=2,294)	Control (n=8,776)		Both Tobacco and Cannabis (n=2,291)	Tobacco (n=8,320)	
Comorbidities	Number (%)	Number (%)	P- value	Number (%)	Number (%)	P- value	Number (%)	Number (%)	P-value	Number (%)	Number (%)	P- value
Age (SD)	39.5 (17.7)	39 (18.0)	0.63	55.8 (13.4)	54.2 (17.6)	<0.001	44,3 (13,3)	43.3 (19.0)	0.005	44.3 (13.3)	45.5 (13.2)	<0.001
Male	214 (56.3)	861 (56.6)		12487 (49.7)	13427 (40.4)	<0.001	1293 (56.3)	4887 (55.7)		1291 (56.4)	4549 (54.7)	
Female	166 (43.7)	659 (34.4)	0.95	12627 (50.3)	19823 (59.6)	-0.001	1001 (43.6)	3889 (44.3)	0.58	1000 (43.6)	3771 (45.3)	0.16
ECI (SD)	3.83 (3.65)	3.57 (3.51)	0.20	4.53 (3.44)	3.64 (3.15)	<0.001	5.53 (3.94)	5.02 (4.08)	< 0.001	5.52 (3.95)	5.34 (4.21)	0.05
Alcohol Abuse	101 (26.6)	93 (6.1)	<0.001	3789 (15.1)	1467 (4.4)	<0.001	1099 (47.9)	568 (6.5)	< 0.001	1097 (47.9)	1726 (20.7)	<0.001
CKD	52 (13.7)	231 (15.2)	0.51	5744 (22.9)	6635 (20.0)	<0.001	413 (18.0)	2070 (23.6)	< 0.001	412 (18.0)	1666 (20.0)	0.03
COPD	133 (35.0)	51 (33.6)	0.64	12502 (49.8)	10718 (32.2)	<0.001	1300 (56.7)	3522 (40.1)	< 0.001	1299 (56.7)	4246 (51.0)	<0.001
CHF	25 (6.6)	103 (6.8)	0.98	2627 (10.5)	2787 (8.4)	<0.001	167 (7.3)	1028 (11.7)	< 0.001	167 (7.3)	982 (11.8)	<0.001
CAD	52 (13.7)	240 (15.8)	0.35	8818 (35.1)	8258 (24.8)	<0.001	620 (27.0)	2120 (24.2)	0.005	622 (27.1)	2387 (28.7)	0.16
Obesity	198 (52.1)	816 (53.7)	0.62	14703 (58.5)	17073 (51.3)	<0.001	1232 (53.7)	4776 (54.4)	0.56	1233 (53.8)	4809 (57.8)	<0.001
Diabetes	123 (32.4)	454 (29.9)	0.38	12148 (48.4)	13861 (41.7)	<0.001	985 (42.9)	3679 (41.9)	0.39	984 (43.0)	3749 (45.1)	0.08
RA	20 (5.3)	81 (5.3)	1.00	2299 (9.2)	2816 (8.5)	0.004	158 (6.9)	689 (7.9)	0.13	158 (6.9)	664 (8.0)	0.09
HTN	211 (55.5)	825 (54.3)	0.70	20559 (81.9)	23998 (72.2)	<0.001	1681 (73.3)	5760 (65.6)	<0.001	1679 (73.3)	6225 (74.8)	0.14

	1						Both			Both		
							Tobacco			Tobacco		
							and			and	Tobacco	
	Cannabis	Centrol		Tobacco	Control		Cannabis	Centrol		Cannabis	(n=8320)	
	(n=380)	(n=1,520)		(n=25,114)	(n=33,250)		(n=2,294)	(n=8,776)		(n=2,291)		
						Medical Complicat						
	Number	Number		Number	Number		Number	Number		Number	Number	
Complications	(%)	(%)	OR (95% CI)	(%)	(%)	OR (95% CI)	%)	(%)	OR (95% CI)	(%)	(%)	OR (95% CI)
Cardiac Arrest	0(0)	<11	<0.001 (NA)	14 (0.06)	17 (0.05)	0.81 (0.38-1.71)	<11	<11	0.82 (0.03-8.08)	<11	<11	0.37 (0.02-2.17)
PE	0(0)	<11	<0.001 (NA)	123 (0.5)	174 (0.5)	0.75 (0.59-0.96)	<11	34 (0.4)	1.08 (0.44-2.36)	<11	37 (0.4)	0.83 (0.37-1.71)
DVT	<11	19 (1.3)	1.68 (0.60-4.03)	330 (1.3)	404 (1.2)	0.96 (0.82-1.11)	27 (1.2)	103 (1.2)	0.98 (0.59-1.60)	27 (1.2)	136	0.70 (0.45-1.06)
JV1	50	19 (1.5)	1.68 (0.00-4.03)	330(1.3)	404 (1.2)	0.96 (0.82-1.11)	27(1.2)	103 (1.2)	0.98 (0.39-1.00)	27(1.2)	(1.0)	0.70 (0.42-1.06)
neumonia	<11	<11	2.22 (0.64-6.66)	338 (1.3)	328 (1.0)	1.05 (0.89-1.23)	36(1.6)	133 (1.5)	0.86 (0.55-1.33)	35 (1.5)	(1.6)	1.05 (0.70-1.55)
											234	
AKI	<11	19 (1.3)	1.22 (0.40-3.29)	533 (2.1)	507 (1.5)	1.08 (0.95-1.24)	47 (2.0)	222 (2.5)	0.94 (0.64-1.38)	48 (2.1)	(2.8)	0.87 (0.61-1.21)
											213	
л	<11	27 (1.8)	0.59 (0.20-1.46)	634 (2.5)	817 (2.5)	0.94 (0.84-1.05)	59 (2.6)	251 (2.9)	0.91 (0.64-1.26)	59 (2.6)	(2.6)	1.08 (0.79-1.47)
											600	
Admission	17 (4.5)	57 (3.8) 191	1.04 (0.55-1.85)	1458 (5.8)	1205 (3.6)	1.32 (1.21-1.43)	193 (8.4)	488 (5.6) 1072	1.43 (1.16-1.76)	191 (8.3)	(7.2)	1.13 (0.94-1.35)
ED Visits	(13.9)	(12.6)	1.04 (0.72-1.47)	3683 (14.7)	2888 (8.7)	1.57 (1.48-1.66)	683 (29.8)	(12.2)	2.86 (2.51-3.27)	(29.7)	(20.9)	1.45 (1.30-1.62)
D VDBS	(13.9)	(12.0)	1.04 (0.72-1.47)	3683 (14.7)				(14.4)	2.46 (2.51-5.27)	(27.7)	(20.9)	1.45 (1.50-1.62)
	1.60	100			2-yea	r Joint Complication	18	Linia		1.694	1684	
Infection	53 (13.9)	198 (13.0)	1.04 (0.72-1.47)	4109 (16,4)	3926 (11.8)	1.24 (1.18-1.30)	534 (23.3)	1319 (15.0)	1.72 (1.51-1.97)	534 (23.3)	(20,2)	1.16 (1.03-1.31)
fardware	55	247	1704 (0.72-1747)	4107(10.4)	3920 (11.8)	1.24 (1.18-1.50)	334(23.3)	1413	1.74(1.5141.97)	465	1514	1.10(13)2-1.31)
emoval	(14.5)	(16.3)	0.89 (0.64-1.23)	3973 (15.8)	4579 (13.8)	1.12 (1.07-1.18)	467 (20.4)	(16.1)	1.24 (1.08-1.42)	(20.3)	(18.2)	1.08 (0.95-1.21)
	42	161		(12.0)			(20.4)	948		449	1361	
Nonunion	(11.1)	(10.6)	1.04 (0.71-1.51)	3888 (15.5)	3687 (11.1)	1.33 (1.27-1.40)	450 (19.6)	(10.8)	1.90 (1.64-2.20)	(19.6)	(16.4)	1.19 (1.05-1.35)
Wound								· · · ·		· · · ·	623	
Dehiscence	23 (6.1)	51 (3.4)	1.66 (0.95-2.84)	1578 (6.3)	1337 (4.0)	1.38 (1.27-1.49)	217 (9.5)	453 (5.2)	1.86 (1.52-2.27)	217 (9.5)	(7.5)	1.24 (1.04-1.47)

*ECI: Elixhauser Comorbidity Index, CKD: Chronic Kidney Disease, COPD: Chronic Obstructive Pulmonary Disease, CHF: Congestive Heart Failure, CAD: Coronary Ar Disease, RA: Rheumatoid Arthritis, HTN: Hypertension

^{*} PE: Pulmenary Embolism, DVT: Deep Venous Thromboembolism, AKI: Acute Kidney Injury, UTI: Urinary Tract Infection, ED: Emergency Department, <11 indicates that there were between 1-10 patients as <u>PoulDirgr</u> does not report on groups <11 patients for patient privacy concerns. Bold indicates statistical significance (p<0.005).</p>