

The Influence of Cannabis Use on Tibia Shaft Fracture Healing: A Retrospective Matched Cohort Study

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INTRODUCTION:

Tibia fractures are relatively common, accounting for up to 40% of long-bone fractures in adults. Fractures of the tibial shaft are at risk for impaired or delayed healing even when fixed with modern surgical devices such as intramedullary (IM) nailing. Previous literature has demonstrated that smoking tobacco can delay healing and increase the risk of nonunion. Cannabis use is becoming increasingly more prevalent; however, its potential effects on fracture healing are largely unknown. The purpose of this study was to determine whether union rate and rate of revision surgery were different between marijuana users and non-marijuana users in patients with tibial shaft fractures treated with intramedullary nailing.

METHODS:

A retrospective chart review of patients with tibial shaft fractures who presented to two, large, tertiary academic hospitals between February 2016 and February 2022 was conducted. Patients were queried by CPT codes for tibial shaft fractures treated operatively with intramedullary nail. Inclusion criteria was age >18, and treatment with IM nail. Patients were excluded if they sustained a Type III open tibial shaft fracture, if they did not reach union or undergo revision surgery prior to their most recent follow up visit, or if their index operation at presentation was a revision surgery. Patients were grouped based on usage or non-usage of marijuana. A patient was considered a marijuana user if they self-reported marijuana use at the time of presentation or if they had a positive urine toxicology screen for marijuana. Patients that used marijuana were propensity matched 1:1 with non-marijuana users based on age, sex, tobacco use, diabetes, end stage renal disease (ESRD), and Gustilo-Anderson classification. Demographic and medical data were collected. Follow-up clinic visits were reviewed for complications and postoperative radiographs were reviewed for healing using the Radiographic Union Scale in Tibial (RUST) fractures. Patient demographic and baseline clinical characteristics were reported as median for continuous variables and frequencies, percentages for categorical variables. A logistic regression was conducted to examine the association between marijuana use, tobacco use, and the outcome of healing.

RESULTS:

One thousand sixty-two charts with CPT codes consistent with tibial IMN were reviewed. Fifty-three patients who met inclusion criteria were identified as marijuana (MJ) users and were matched with 53 non-marijuana users for a total of 106 patients. Because a propensity “best” match based on multiple demographic and clinical variables was used, not all variables, including sex and age, are equally matched between groups. Mean follow up was 10.3 months. There were no differences between the two groups regarding age, sex, length of stay, presence of diabetes, ESRD, or other comorbidities. There was a statistically significant difference in time to definitive operation (mean 1.0 days for MJ users and 0.6 days for non-MJ users, $p=0.002$). There was a statistically significant difference in tobacco use between groups (57% in MJ users and 32% in non-MJ users, $p=0.011$). There were no differences between groups regarding gunshot injuries, open versus closed fracture, Gustilo-Anderson grade. There was no statistically significant difference between groups for the following clinical outcomes: superficial infection, deep infection, other complications, planned or unplanned return to the OR. The rate of union was different between the two groups which approached statistical significance (89% of marijuana users vs. 98% of non-MJ users, $p=0.05$), as did the rate of revision surgery to promote union (11% in MJ users vs 2% in non-MJ users, $p=0.05$). There were no significant differences between groups in RUST score at 3 months or 6 months. A logistic regression was performed to determine if tobacco use was a confounder, given the statistically significant difference in tobacco use between groups. In this analysis, marijuana users had an odds ratio of union of 0.22 ($p = 0.17$), suggesting a decreased likelihood of healing compared to non-users, although this was not statistically significant. Tobacco users had an odds ratio of 0.16 ($p = 0.10$), also indicating a decreased likelihood of healing, but this result was not statistically significant. This indicates that tobacco was not a confounder.

DISCUSSION AND CONCLUSION:

In this matched cohort study, the use of marijuana was associated with decreased fracture union and increased need for revision surgery to promote union. Revision surgery in the marijuana group was 6 times higher than that of the non-marijuana group. It may be beneficial to discuss limiting marijuana use with patients in the immediate postoperative period to promote fracture union. This is the first cohort study to date examining the effect of marijuana on tibial shaft fracture union with moderate sample size in each group. There is a statistically significant difference between groups in tobacco use, although this did not result in confounding. This study is inherently limited as a retrospective chart review. Larger, prospective studies on tibial shaft fractures treated with IMN are needed, as well as further study on other fracture types.

Table 1: Demographics

	Total (N=106)	Non-marijuana users (N=53)	Marijuana users (N=53)	<i>p-value</i>
Age at admission				
Median (IQR)	31 (25-44)	30 (25-46)	31 (25-41)	0.96
Mean (SD)	34.6 (13.4)	34.3 (13.2)	34.9 (13.7)	
Sex				
Female	28 (26.42%)	15 (28.30%)	13 (24.53%)	0.83
Male	78 (73.58%)	38 (71.70%)	40 (75.47%)	
Length of stay				
Median (IQR)	2 (1-4)	2 (1-4)	2 (2-4)	0.46
Mean (SD)	3.5 (3.6)	2.9 (2.3)	4.1 (4.6)	
Days from injury to definitive operation				
Median (IQR)	1 (0-1)	1 (0-1)	1 (1-1)	0.002 (*)
Mean (SD)	0.8 (0.8)	0.6 (0.8)	1.0 (0.7)	
Tobacco user	47 (44.34%)	17 (32.08%)	30 (56.60%)	0.011 (*)
DM dx	3 (2.83%)	3 (5.66%)	0 (0.00%)	0.24
ESRD	4 (3.77%)	1 (1.89%)	3 (5.66%)	0.62
Other Comorbidities	42 (39.62%)	15 (28.30%)	27 (50.94%)	0.017

Table 1: Interquartile range (IQR), standard deviation (SD), diabetes (DM), end-stage renal disease (ESRD). Significance (*). Other Comorbidities: Including mental illness (anxiety, bipolar disorder, schizophrenia), asthma, HIV, HTN, Hepatitis, etc.

Table 2: Clinical Outcomes

	Total (N=106)	Non-marijuana users (N=53)	Marijuana users (N=53)	<i>p-value</i>
Superficial infection	6 (5.71%)	3 (5.77%)	3 (5.66%)	1
Deep infection/ Osteomyelitis	8 (7.55%)	2 (3.77%)	6 (11.32%)	0.27
Other complications	20 (18.87%)	11 (20.75%)	9 (16.98%)	0.62
Planned Return to OR	1 (0.95%)	0 (0.00%)	1 (1.92%)	0.5
Unplanned Return to OR	1 (0.94%)	0 (0.00%)	1 (1.89%)	1
United	99 (93.40%)	52 (98.11%)	47 (88.68%)	0.05
Revision Surgery	7 (6.60%)	1 (1.89%)	6 (11.32%)	0.05
3 month RUST score				
Median (IQR)	9 (8-10)	9 (8-10)	9 (7-10)	0.92
Mean (SD)	8.7 (2.0)	8.7 (1.7)	8.6 (2.2)	
6 month RUST Score				
Median (IQR)	11 (10-11)	11 (10-11)	10 (9-11)	0.91
Mean (SD)	10.0 (2.0)	10.2 (1.5)	9.8 (2.4)	

Table 2: Operating room (OR), Interquartile range (IQR), standard deviation (SD). Significance set to $p < 0.05$ (*).