Original Article

Recreational Drugs and Outcomes in Trauma Patients

Quinn Fujii, Andrew McCague[1]

Department of Surgery, Touro University, Vallejo, [1]Natividad Medical Center, Salinas, California, USA

Abstract

Objective: The objective of the study is to determine if marijuana, methamphetamine, or cocaine is associated with worse outcomes following trauma. **Methods:** A retrospective cross-sectional study was conducted on 731 trauma patients. Data collected from Natividad Medical Center's trauma registry were used to analyze reports of adult patients from July 1, 2014, to July 1, 2017. Analyzed endpoints were mortality, rates of major trauma, mean Injury Severity Score (ISS), and length of stay (LOS). **Results**: Odds ratios for mortality contained null value in each group. Odds ratios for suffering major trauma for marijuana and amphetamines were 1.2 and 2.6, respectively. *P* values for ISS were >0.05 for each group. *P* values for LOS were >0.05 for marijuana and cocaine and 0.01 for amphetamines. **Conclusions:** A positive screen for marijuana, amphetamine, or cocaine is not associated with increased mortality for victims of trauma. Amphetamines are associated with higher rates of major trauma and longer LOS. Marijuana is associated with higher rates of major trauma. Cocaine is not associated with the likelihood of suffering major trauma or length of stay.

Keywords: Amphetamines, cocaine, marijuana, toxicology, trauma

Introduction

It is well-established that recreational drug use is related to risk-taking behavior. It impairs baseline mentation and predisposes users to unintentional trauma, but there are limited data on the impact of these substances on outcomes following trauma. Our objective with this study was to discover if certain drugs (i.e., marijuana, cocaine, and methamphetamine) are associated with higher Injury Severity Scores (ISS), longer overall hospital length of stay (LOS), higher rates of mortality, and higher incidence of major trauma

Methods

Natividad Medical Center (NMC) located in Salinas, CA, has a Level II Trauma Center that serves Monterey County and surrounding areas along California's Central Coast. It receives a large variety of trauma patients, ranging from high-risk motor vehicle collisions to gunshot wounds. We abstracted data and obtained our endpoints of interest from a de-identified dataset from our trauma registry, which is maintained by dedicated trauma registrars. Our study analyzed demographics and individual trauma criteria collected from all patients admitted to NMC's trauma service from July 1, 2014, to July 1, 2017. ISS, overall hospital LOS, and mortality were our measured endpoints. Endpoints were followed for the duration that the patient was being evaluated at our facility – transfer patients were followed for the duration of evaluation at the transfer facility. Eighteen patients were lost to follow-up and were not included in the mortality and LOS analyses ($n = 731$) but were, however, included in the analysis of ISS ($n = 749$). This study was approved by the Touro University-California Institutional Review Board.

There were 3861 trauma patients evaluated at NMC in total. Patients were included if they were 18 years or older and had toxicology screening results available. Nearly all of the patients excluded from the study did not have toxicology screening results available in our trauma registry. Patients testing positive for polysubstance or positive toxicology screen with blood alcohol content (BAC) >0.08% were excluded from the study as well. The remaining 731 patients were categorized into the following groups: marijuana, amphetamines, cocaine, and control. Our control group consisted of patients with negative

Address for correspondence: Dr. Andrew McCague, Natividad Medical Center, 1441 Constitution Blvd., Salinas, California 93901, USA.
E-mail: mccaguea@gmail.com

Access this article online

Quick Response Code:

Website: www.onlinejets.org

DOI: 10.4103/JETS.JETS_86_18

How to cite this article: Fujii Q, McCague A. Recreational drugs and outcomes in trauma patients. J Emerg Trauma Shock 2019;12:98-100.

Received: 31.08.18. **Accepted:** 15.12.18.

toxicology screen and BAC <0.08%. Of note, an alcohol group was not included in the study because a majority of patients with BAC >0.08% did not have toxicology screening results available through our registry. In addition, our facility's toxicology screens are unable to discern between recreational opioids and opioids being taken as part of a pain management regimen. For this reason, an opioid group was not included either.

Patients were between the ages of 18 and 100 and made up of 24% women and 76% men. Mean ISS was 8.2 ± 0.8, mean LOS was 4.1 ± 0.5 days, and overall mortality was 2.9%. Table 1 describes our control and study groups in further detail.

Data were entered in Microsoft Excel 2011. Outcome frequency tables were generated to calculate odds ratios for injury severity and mortality [Tables 2 and 3]. Student's *t*-test was used to compare mean ISS and LOS between patients with positive toxicology screens and those without [Tables 4 and 5]. ISS >15 was defined as "major trauma."[1]

Results

Table 2 outlines the mortality rates associated with selected substances. The odds of mortality was not significantly different from control for any group. Table 3 outlines the risk of suffering major trauma for each selected substance. The odds of suffering major trauma as defined by ISS >15 was significantly higher in patients with BAC >0.08% (odds ratio [OR]: 1.9, 95% confidence interval [CI]: 1.1–3.4) and in patients positive for marijuana (OR: 1.2, 95% CI: 1.1–3.6) or amphetamines (OR: 2.6, 95% CI: 1.4–4.8) – they were not significantly different for patients positive for cocaine (OR: 2.1, 95% CI: 0.78–5.8).

Table 4 outlines the mean ISS associated with each selected substance – ISS was not significantly different for any group compared to control. Table 5 outlines mean LOS associated with each selected substance – patients positive for amphetamines had significantly longer LOS ($P = 0.01$ and 0.01, respectively).

Discussion

Substance abuse use dramatically increased over the last two decades. The misuse and abuse of both prescription and illegal drugs have increased by over 13%.[2] It has been previously documented that substance abuse may predispose users to unintentional injury. Here, we hoped to further elucidate which substances were associated with worse or better outcomes following trauma.

As marijuana has become increasingly available nationwide by new laws allowing for either medical use of marijuana or recreational use, the concern of its effects on injury has come to the forefront. Singer *et al*. reported "a positive marijuana screen is associated with decreased mortality in adult trauma patients admitted to the ICU" and may theoretically provide a neuroprotective effect in the setting of traumatic brain injury (TBI).[3] Abdel Fattah showed similar findings in their 2017 paper where cannabis users with severe injury did show an increased morbidity compared to nondrug users.[4]

Multiple studies have addressed preinjury use of amphetamines and cocaine. These substances have been shown to be associated with increased hospital length of stay, increased mortality, and increased intensive care unit (ICU) admission.[2] However, a 2017 study by Cheng *et al*. interestingly reported a lower mortality and decreased ICU stay for these patients despite an increased length of stay.[2]

Currently, there is limited research on the effects of marijuana as compared to other substances on outcomes in trauma patients.

Our study attempted to address this question. We compared patients who had positive toxicology screens but negative blood alcohol levels. Patients were grouped into either marijuana, amphetamine, cocaine, or control groups. While our results show significantly higher rates of suffering major trauma (OR: 1.2, 95% CI: 1.1–3.6), we were unable to prove that marijuana is associated with significantly lower or higher rates of mortality (OR: 0.96, 95% CI: 0.21–4.4), mean ISS ($P = 0.15$), or LOS ($P = 0.10$) when compared to control. Previous studies were unable to find an association between stimulants (i.e., cocaine and amphetamine) and mortality in trauma patients.[5,6] Our results similarly were equivocal in all domains for cocaine. Our methamphetamine group, however, did have significantly higher rates of major trauma (OR: 2.6, 95% CI: 1.4–4.8) and longer LOS ($P = 0.01$).

Several limitations in our study merit discussion. Since our study is retrospective in nature, we are unable to comment on a causal association between positive toxicology and outcomes following trauma. In addition, since we were only able to follow our endpoints until patient expiration or discharge and we were not able to evaluate for any changes in functional status beyond ISS, our results may be slightly skewed toward improved outcomes; In addition, our study may include patients awaiting placement in long-term care facilities. Median values for LOS were included to help determine if there were such outliers. The drug screen

Table 1: Descriptive table of control and study groups

	Control ($n=209$)	Marijuana ($n=243$)	Amphetamines ($n=212$)	Cocaine ($n=67$)
Mean LOS (days)	2.8	3.9	4.5	6.0
Mean ISS	7.3	8.7	8.9	9.4
Mortality (%)	2.8	2.1	5.0	0

LOS: Length of stay, ISS: Injury Severity Score

Table 2: Odds ratios for mortality following trauma, categorized by toxicology

	Expired (%)	Survived	OR	95% CI
Negative toxicology	6 (2.8)	204	-	-
Marijuana	3 (2.1)	146	0.96	0.21–4.4
Amphetamines	6 (5.0)	118	2.4	0.66–8.6
Cocaine	0 (0)	31	0.66	0.03–12

OR: Odds ratio, CI: Confidence interval

Table 3: Odds ratios for suffering major trauma, categorized by toxicology

	ISS >15 (%)	ISS ≤15	OR	95% CI
Negative toxicology	20 (12)	170	-	-
Marijuana	28 (23)	122	1.2	1.1–3.6
Amphetamines	30 (30)	99	2.6	1.4–4.8
Cocaine	6 (25)	24	2.1	0.78–5.8

ISS: Injury Severity Score, OR: Odds ratio, CI: Confidence interval

Table 4: Mean Injury Severity Scores and *P* values for trauma patients, categorized by toxicology

	Mean ISS with 95% CI	*P*
Control	7.3±1.2	-
Marijuana	8.7±1.6	0.15
Amphetamines	8.9±1.5	0.10
Cocaine	9.4±3.0	0.20

ISS: Injury Severity Score, CI: Confidence interval

Table 5: Mean and median overall hospital lengths of stay and *P* values for trauma patients, categorized by toxicology

	Mean LOS with 95% CI (days)	Median LOS	*P*
Control	2.8±0.51	1	-
Marijuana	3.9±1.2	2	0.10
Amphetamines	4.5±1.2	2	0.01
Cocaine	6.0±3.2	2	0.06

LOS: Length of stay, CI: Confidence interval

immunoassay itself has limitations, namely its relatively low specificity for the drugs in question. Many cross-reactivities exist and can cause false-positive results.[7] Finally, because this is a single-center study, our pool of patients was not large enough to utilize matching strategies that would allow us to include patients with polysubstance.

Conclusions

A positive screen for marijuana, amphetamine, or cocaine is not associated with increased mortality for victims of various types of trauma. Amphetamines are associated with both higher rates of suffering major trauma and longer LOS. Marijuana is associated with higher rates of suffering major trauma but not LOS. Cocaine is not associated with the likelihood of suffering major trauma or length of stay.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Copes WS, Champion HR, Sacco WJ, Lawnick MM, Keast SL, Bain LW. The injury severity score revisited. J Trauma 1988;28:69-77.
2. Cheng V, Inaba K, Johnson M, Byerly S, Jiang Y, Matsushima K, *et al.* The impact of pre-injury controlled substance use on clinical outcomes after trauma. J Trauma Acute Care Surg 2016;81:913-20.
3. Singer M, Azim A, O'Keeffe T, Khan M, Jain A, Kulvatunyou N, *et al.* How does marijuana affect outcomes after trauma in ICU patients? A propensity-matched analysis. J Trauma Acute Care Surg 2017;83:846-9.
4. Abdel Fattah KR, Edwards CR, Cripps MW, Minshall CT, Phelan HA, Minei JP, *et al.* Cannabis use has negligible effects following severe traumatic injury. J Trauma Nurs 2017;24:141-5.
5. Yeung JT, Williams J, Bowling WM. Effect of cocaine use on outcomes in traumatic brain injury. J Emerg Trauma Shock 2013;6:189-94.
6. Hadjizacharia P, Green DJ, Plurad D, Chan LS, Inaba K, Shulman I, *et al.* Methamphetamines in trauma: Effect on injury patterns and outcome. J Trauma 2009;66:895-8.
7. Saitman A, Park HD, Fitzgerald RL. False-positive interferences of common urine drug screen immunoassays: A review. J Anal Toxicol 2014;38:387-96.