

OBJECTIVE

The purpose of this open-label, proof-of-concept trial was to examine the ability of cannabis to reduce opiate use in patients who sustained isolated rib fractures.

INTRODUCTION

Rib fractures are painful injuries that can cause substantial pain, typically for 6-8 weeks, negatively affect respiratory mechanics and lead to respiratory collapse when not treated appropriately. Aggressive pain management is important, and typically consists of opiates. In fact, prior studies have estimated that each rib fracture increases a patient's opioid use by 11.2%.¹

Opioids have serious known complications. It is estimated that as many as 2.5 million Americans are opioid dependent.² Opioids are also estimated to be responsible for 75% of overdoses in the United States and 80 deaths per day.²⁻⁴ In addition to possible dependence or addiction, there are many side effects of opioid use including sedation, drowsiness, dizziness, nausea, vomiting, constipation, tolerance, and respiratory depression.⁵

Cannabis has a significant analgesic effect and has been proven to decrease the opiate requirements in patients with chronic pain syndromes.^{5,6-8} The predominant ingredient in cannabis, Δ9-tetrahydrocannabinol (THC), has been shown to work indirectly on the noradrenergic and k-opioid systems to adjust the sensation of pain via cannabinoid receptors in both the central and peripheral nervous system (CB1 and CB2 receptors).⁹ In addition, cannabis has been observed to have synergistic effects with opioids.^{10,11} Although cannabis has demonstrated efficacy in treating chronic pain, it has never been studied for the management of acute pain.

METHODS

Consecutive patients who met inclusion criteria and were admitted to the trauma surgery service were approached and consented from 12/27/2016-6/1/2018. Patients chose the arm of the study they wished to participate in.

36-Item Short Form Survey (SF-36) scores were obtained before hospital discharge in both groups. Patients in the control arm were given a prescription for oxycodone with or without Oxycontin. Patients in the intervention arm received a prescription for oral cannabis in tablet form and a sublingual spray, in addition to an opiate prescription.

Patients recorded their daily pain score (0-10) and opiate usage in a journal for six weeks. Patient journals were reviewed by study staff in follow-up visits. At the end of the study period, the SF-36 was administered.

We compared patient age using student's t-test; gender using Fisher's Exact test; hospital length of stay (HLOS) and number of rib fractures per patient using the Kruskal-Wallis test. A mixed model was used to compare the effects of cannabis use and inpatient rehabilitation placement on opiate use.

The need for tube thoracostomy, morphine milligram equivalents per day (MME/day), Emergency Department (ED) visits, and inpatient rehabilitation placement were analyzed using a Chi Square test. Pain scores were compared using Wilcoxon two tailed test, and the difference between SF-36 scores at enrollment and six weeks were evaluated with a pooled t-test.

RESULTS

Thirty-six patients were recruited, 21 in the intervention arm and 15 in the control arm. Patients were similar in regard to age, gender, number of ribs fractured, proportion requiring a tube thoracostomy, ED visits, median HLOS (table 1), and pain scores throughout the study period (data not shown in tabular form). The control group had significantly more patients discharged to inpatient rehabilitation units compared to the cannabis group (p=0.048). Opiate use was found to be higher during periods of inpatient rehabilitation.

By univariate analysis, opiate consumption was significantly less in the intervention group in the third, fourth, fifth, and sixth weeks following discharge (table 3). Additionally, patients in the intervention group demonstrated a significant positive increase in the physical functioning section of the SF-36 at the end of the study period in comparison to their baseline scores, when compared to the control group, which demonstrated a decrease in physical functioning score over the study period (table 2). Mean changes in all other sections of the SF-36 showed no significant difference when compared between the control and intervention groups (table 2).

Table 1: Patient Demographics, Control and Intervention Group

	Control (n = 15)	Intervention (n = 21)	(p)
Age (years) ± SD	70.3 ± 17.0	62.4 ± 16.5	0.17
Gender (M/F)	40.0% Male	71.4% Male	0.06
Median Number of Ribs Fractured	4	4	0.60
Proportion Requiring Tube Thoracostomy	26.7%	52.4%	0.12
ED visits	28.6%	85.0%	0.29
Median HLOS	3	4	0.59

(SD= Standard Deviation, ED= Emergency Department, HLOS=Hospital Length of Stay)

Table 2: Mean Change in SF-36 Section Scores, Control and Intervention Group

SF-36 Section	Control (n = 7)	Intervention (n = 16)	(p)
Physical Functioning ($\bar{x} \pm SD$)	-11.4 ± 45.1	29.24 ± 41.9	0.0474
Role Limitations from Physical Health ($\bar{x} \pm SD$)	-3.57 ± 50.9	-17.2 ± 53.0	0.57
Role Limitations from Emotional Problems ($\bar{x} \pm SD$)	4.76 ± 40.5	16.7 ± 54.4	0.36
Energy/Fatigue ($\bar{x} \pm SD$)	-0.71 ± 34.6	-3.13 ± 16.7	0.82
Emotional Well-being ($\bar{x} \pm SD$)	4.57 ± 12.1	-1.06 ± 11.2	0.29
Social Functioning ($\bar{x} \pm SD$)	-5.36 ± 45.2	10.2 ± 41.6	0.43
Pain ($\bar{x} \pm SD$)	0.71 ± 45.2	8.44 ± 38.2	0.68
General Health ($\bar{x} \pm SD$)	13.6 ± 21.0	4.69 ± 14.4	0.25
Perceived Change in Health ($\bar{x} \pm SD$)	0.00 ± 47.9	1.56 ± 36.0	0.93

(SF-36= 36 Item Short Form Survey, SD= Standard Deviation)

Table 3: Weekly and Overall Opiate Use, Control and Intervention Group

	Control (n = 15)	Intervention (n = 21)	(p)
Week 1 (Median MME/day)	6.43	8.57	0.39
Week 2 (Median MME/day)	4.82	0.82	0.23
Week 3 (Median MME/day)	6.43	0	0.029
Week 4 (Median MME/day)	16.07	0	0.004
Week 5 (Median MME/day)	16.07	0	0.008
Week 6 (Median MME/day)	16.07	0	0.019
Overall ($\bar{x} \pm SD$)	28.3 ± 3.1	10.7 ± 2.7	<0.0001

(MME=Morphine Milligrams Equivalents, SD=Standard Deviation)

LIMITATIONS

- Many patients were unable to obtain cannabis prescription on the day of discharge
- Local inpatient rehabilitation facilities would not dispense cannabis to patients due to lack of institutional policies regarding cannabis
- Patients self-selected which arm of the trial they participated in

CONCLUSIONS

- Cannabis use resulted in less opiate use
- Cannabis use provided equivalent pain control to opiates alone
- Patients in the intervention group self-reported an improvement in their physical functioning at the end of the study period
- Patients in the control group self-reported a decrease in their physical functioning at the end of the study period
- Future directions: randomized control trial with larger sample sizes

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