Surgery Article

HAND
2017, Vol. 12(6) 541–545

DOI: 10.1177/1558944716677535
hand.sagepub.com

Postoperative Pain Management Following Carpal Tunnel Release: A Prospective Cohort Evaluation

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Abstract

Background: Managing postoperative pain in hand surgery is important for both patients and surgeons. However, there is growing concern over prescription opioid abuse. We hypothesized: (1) that pain medications after carpal tunnel release (CTR) surgery are over-prescribed; and (2) that opioids are unnecessary in the majority of patients. **Methods:** We prospectively studied 2 demographically similar patient cohorts receiving either opioid or tramadol for CTR performed by 2 hand surgery fellowship-trained orthopedic surgeons over a 1-year period. The first cohort of patients undergoing CTR received opioids pills postoperatively. The second cohort of patients received a standard prescription of 10 tramadol pills postoperatively. Student *t* tests were performed to evaluate statistically significant differences between the tramadol and opioid cohorts in total pill consumption and number of postoperative days the medication was used. **Results:** The opioid cohort consisted of 159 patients with a mean opioid consumption of 4.9 pills for 2.3 days. Eleven of these patients declined the use of opioids postoperatively and instead substituted for nonsteroidal anti-inflammatories and/or acetaminophen. The tramadol cohort consisted of 110 patients with a mean tramadol consumption of 3.3 pills for 1.8 days. Seven of these patients requested opioids postoperatively, and 14 substituted for nonsteroidal anti-inflammatory drugs and/or acetaminophen. When comparing the postoperative consumption of opioids and tramadol for CTR, there was a statistically significant difference in total pill consumption based on both intention to treat as well as the medication ultimately prescribed. There was no difference in the duration of postoperative utilization. **Conclusion:** Following CTR, pain medications are being over-prescribed, with patients receiving more than double the amount of pills than they consume. Tramadol appears to be equally effective in managing postoperative pain compared with opioids.

Keywords: carpal tunnel release, opioids, prescription amount, tramadol

Introduction

Postoperative pain control in orthopedic surgery is a multifactorial issue that affects patient satisfaction, outcomes, and safety.[2,4,6] Although adequate pain control affords improved patient satisfaction and extends faster rehabilitation potential, there is growing evidence that patients are being over-prescribed opioids with potentially negative consequences for both individual patients and the community at large.[10,11,16,18] The Centers for Disease Control and Prevention estimate that nearly 15 000 people die each year in the United States from prescription painkillers including hydrocodone and oxycodone.[3,5]

Although opioids have long been prescribed for postoperative pain control, more recently partial μ-opioid receptor activators, such as tramadol, have been used to treat acute, chronic and postoperative pain.[8,13,14,25] In several comparative studies, tramadol has been found to be an efficacious and safe analgesic with less clinically relevant adverse effects compared with opioids.[9,12,19,23] Furthermore, tramadol has a substantially lower rate of abuse and risk of withdrawal, with a prevalence of approximately 1 in 100 000.[1,7,20,22]

To our knowledge, no study has prospectively evaluated the consumption of nonopioid analgesics compared with opioid analgesics for patients undergoing carpal tunnel release (CTR). To determine optimal postoperative pain medication prescribing guidelines, we performed a prospective cohort study of opioid consumption following CTR surgery with either an opioid or nonopioid (tramadol)

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oral agent. Our hypothesis was 2-fold: (1) that opioids are over-prescribed relative to postoperative consumption; and (2) that there are no differences in consumption between opioid and nonopioid medications.

Methods

After obtaining institutional review board (IRB) approval, we prospectively evaluated all patients undergoing CTR over a 1-year period by 2 hand surgery fellowship-trained orthopedic surgeons. From May 2014 through October 2014, all patients undergoing CTR were prescribed an average of 20 opioids for postoperative pain ("opioid group"). From November 2014 through April 2015, all patients undergoing CTR were prescribed a standardized 10 tramadol pills for postoperative pain control ("nonopioid group").

Inclusion criteria included all patients undergoing isolated, primary, unilateral CTR via an open or endoscopic technique. Exclusion criteria included revision CTR, bilateral CTR, patients who simultaneously underwent additional procedures of the upper extremity, patients with a known history of preoperative opioid usage, and patients who refused completion of the postoperative survey. A total of 269 patients met the inclusion criteria with 159 patients in the opioid group and 110 patients in the nonopioid group.

Postoperatively, patients recorded the number of pain medication pills consumed as well as the total number of postoperative days during which pills were used. Additional variables collected included age, gender, procedure type, and the number/type of supplemental over-the-counter medications consumed. All patients in both cohorts were given the same postoperative instructions to avoid heavy lifting for the first 10 days postoperatively.

To assess differences in the pain medication consumption and side effects between the tramadol and opioid groups, the 2 cohorts were analyzed first as randomized groups (intention-to-treat) and then as the final prescription filled groups (cross-over). To assess clinical significance, a Student's *t* test was utilized for continuous variables, and chi-squared analysis was used for categorical variables. A power analysis determined that a total patient sample size of 130 would be adequate to detect a 0.5 pill difference in total pill consumption at the 95% level. After performing a univariate analysis, variables were tested for independent association with total pill consumption in a multivariate reverse stepwise linear regression analysis. Variables included in this analysis were age, gender, insurance type, procedure type, anesthesia type, and total pill consumption. Statistical significance was set at $P < .05$. All statistical analyses were performed using SPSS (IBM SPSS Statistics, 2015, Armonk, New York).

Results

There were 159 patients in the opioid group. (Table 1). Within this group, 10 (6.3%) of these patients did not fill their prescription, while 87 (55%) supplemented their prescription with either nonsteroidal anti-inflammatory drugs (NSAIDs) or acetaminophen. There were 110 patients in the nonopioid group, who received a prescription for 10 tramadol alone. Within this group, 7 (6.4%) patients requested opioids instead, 14 (12.7%) patients did not fill their script for tramadol, and 53 (48%) supplemented their prescription with either NSAIDs or acetaminophen (Figure 1). There was no difference in NSAID/acetaminophen supplementation between cohorts ($P = .57$). There were no differences in age or gender between the 2 groups (Table 1). Moreover, there were no reported adverse reactions to anesthesia nor postsurgical complications for any patient in the study.

The most commonly prescribed opioids in the opioid group, in descending order of frequency, were: hydrocodone, 5 mg (Vicodin, Lortab, Norco), codeine, 30 mg (Tylenol #3), and oxycodone, 5 mg (Percocet). On average, 20 opioids were prescribed in the opioid group (range, 10-32). A significantly greater proportion of patients taking opioids had medication-related side effects compared with the nonopioid group taking tramadol (39.7% vs 13.4%; $P < .001$). The most common complaints were nausea, constipation, and drowsiness.

When evaluating opioid and tramadol consumption based on intention-to-treat, there was a statistically significant difference in pill consumption (mean opioid and tramadol consumption: 4.9 pills and 3.3 pills; $P = .03$). With respect to duration of postoperative consumption, there was no difference (mean opioid and tramadol duration of consumption: 2.3 and 1.8 days, $P = .10$). When adjusting for the actual medication that was prescribed and consumed (ie, cross-over analysis), the statistically significant difference in pill consumption persisted (mean opioid and tramadol consumption: 5.4 pills and 3.4 pills; $P = .01$). No difference in duration of consumption existed (mean opioid and tramadol duration of consumption: 2.5 and 1.9 days, $P = .08$).

A multivariate regression analysis including the aforementioned variables demonstrated that a tramadol prescription was an independent predictor of decreased total pill consumption ($P < .001$). Finally, in this study, all patients with an opioid prescription consumed only 28% (779 pills) of the filled prescription, leaving 2024 unused pills. This is compared with 36% (355 pills) consumption for tramadol ($P < .001$), leaving 640 unused pills.

Discussion

Postoperative pain control remains an important postsurgical concern for both patients and surgeons. However, finding the optimal pain medication and quantity can prove to be a challenging task, and often, the bias is to over-prescribe rather than under-prescribe to avoid patient dissatisfaction or phone calls. Unfortunately, in the United States, opioid prescribing has grown at a concerning rate. In particular, orthopedic surgeons are the third highest prescriber of

Table 1. Comparison of Pain Medication Groups.

		By allocation			By prescription			
Variable	Entire cohort	Opioid	Tramadol	*P* value	Opioid	Tramadol	None	*P* value
Age (median)	59.43 (59.0)	59.82 (59.0)	58.85 (57.5)	.57	59.9 (59.5)	58.1 (57.0)	61.2 (61.5)	.51
Gender (%)								
Male	117 (43.5)	70 (44.0)	47 (42.7)	.83	67 (42.9)	42 (47.2)	8 (33.3)	.47
Female	152 (56.5)	89 (56.0)	63 (57.3)		89 (57.1)	47 (52.8)	16 (26.6)	
Procedure (%)								
Open	121 (45.0)	89 (56.0)	32 (29.1)	.34	92 (59.0)	24 (27.0)	5 (20.8)	<.001
Endoscopic	148 (55.0)	70 (44.0)	78 (70.9)	.25	64 (41.0)	65 (73.0)	19 (79.2)	
Opioid type (%)								
Hydrocodone	88 (32.7)	87 (54.7)	1 (0.9)	<.001	88 (56.4)	0	0	<.001
Oxycodone	28 (10.4)	25 (15.7)	3 (2.7)		28 (17.9)	0	0	
Tylenol 3	39 (14.4)	36 (22.6)	3 (2.7)		39 (25.0)	0	0	
Own script	1 (0.3)	1 (0.6)	0		1 (0.6)	0	0	
Tramadol	89 (33.1)	0	89 (80.9)		0	89 (100)	0	
None	24 (8.9)	10 (6.3)	14 (12.7)		0	0	24 (100)	
Anesthesia (%)								
Local	116 (43.1)	71	45	0.07	73	33	10	.33
Monitored anesthesia care	153 (46.9)	88	65	0.24	83	56	14	
Total medication use (median)								
Total pills used	4.26 (2.0)	4.90 (2.0)	3.30 (2.0)	.03	5.39 (2.5)	3.38 (2.0)	—	<.001
Days used	2.07 (1.0)	2.30 (1.0)	1.75 (1.0)	0.10	2.52 (2.0)	1.87 (2.0)	—	<.08
Medication side effects (%)	74 (27.5%)	61 (38.3)	13 (11.8)	<.001	62 (39.7)	12 (13.4)	—	<.001

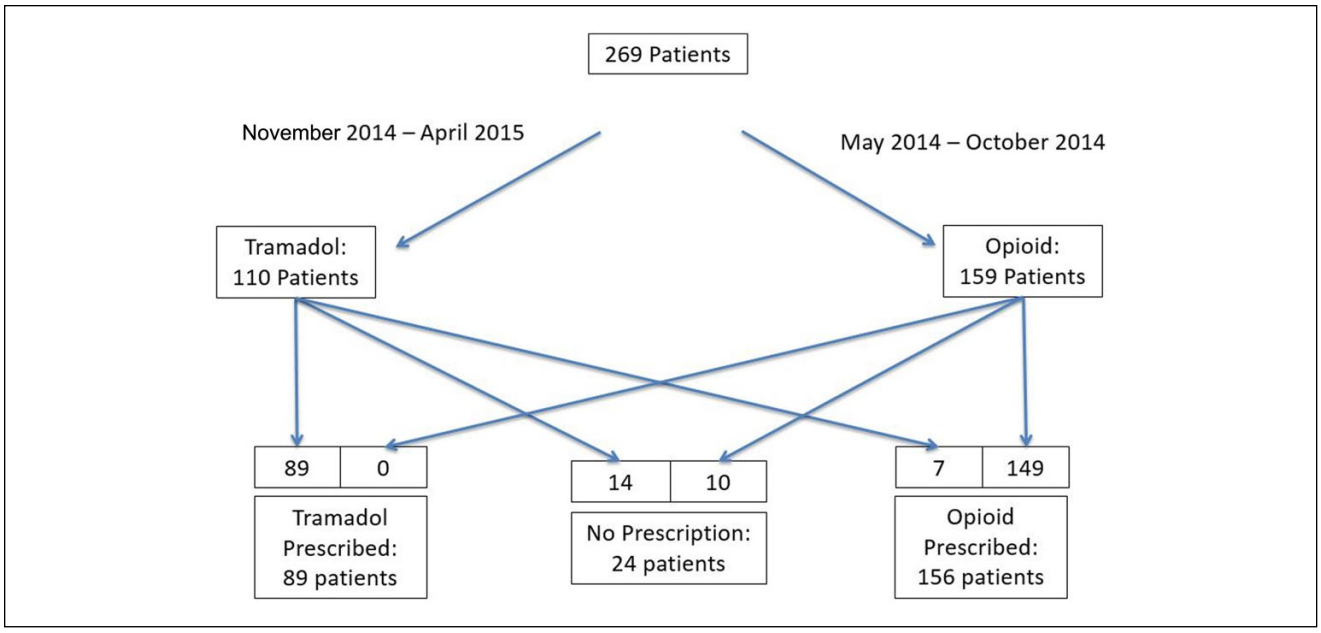

Figure 1. Postoperative pain medication assignment.

opioids among all physicians in the United States, and attention is increasing on the need for more thoughtful prescribing.[15] This concern is no different for hand surgeons. CTR is the most common surgery performed by hand surgeons with up to 500 000 operations performed each year.[17] Methodical administration of postoperative pain medication after surgeries such as CTR should be taken seriously to satisfy patient satisfaction and pain relief while balancing against medication side effects, costs, and the potential for abuse.

The results of our study indicate that not only are pain medications over-prescribed based on mean consumption but that opioids may be unnecessary to provide safe and efficacious postoperative pain control for the majority of patients undergoing CTR. Although we found a statistically significant decrease in total pill consumption in the tramadol cohort compared with the opioid cohort, both groups consumed an average of less than 5 pills postoperatively. This low requirement for postoperative pain medication subsequently resulted in a high number of leftover pain medications. In the opioid group, 72% of the prescription was leftover and potentially available for the unintended consequence of diversion and abuse. Similarly, even with a smaller number of pills being prescribed, 64% of tramadol pills were left unused. Given that patients in both cohorts took very few prescribed pills and used a similar percentage of over-the-counter medications (48% of the tramadol cohort and 55% of the opioid cohort), it may be possible for most patients undergoing CTR to achieve appropriate pain control utilizing only NSAIDs and/or acetaminophen.

In a recent study, Rodgers et al found that opioids are over-prescribed for a variety of upper extremity surgeries and advocated reducing the prescription amount, especially for soft tissue procedures of the hand and wrist. They recommended a pill reduction of 50% for clinicians that typically prescribe 30 opioid pills postoperatively.[21] Given that our patients consumed on average less than 5 pills following CTR, we recommend considering an even further reduction in the quantities prescribed.

Stanek et al found substantial variation in the quantity of opioids prescribed for common procedures and noted poor guidelines for determining how much to prescribe.[24] By offering educational assist tools and reminders, the authors noted a positive impact on reducing prescription amounts. In our study, we similarly converted our variable opioid prescription to a standard tramadol prescription, and this change resulted in a decrease in average pills consumed. Although our study was limited to CTR, we posit that patients undergoing other similar soft tissue procedures, such as trigger finger release, first dorsal compartment release, mass excision, and ulnar nerve decompression would equally tolerate the reduction in quantity of pain medication prescribed and a transition to nonopioid medications.

The strength of our study is the prospective evaluation of 2 large consecutive cohorts of patients undergoing CTR. Furthermore, we accounted for several variables including age, gender, and supplemental over-the-counter medications to allow comparison of homogeneous cohorts. Although our groups were not randomized, the automation of patient to prescription was independent of physician influence by virtue of surgery date. Although it was possible for patients to self-select for opioid prescriptions postoperatively, only 7 patients (6.4%) in our nonopioid patient cohort did this, which limited bias.

A few weaknesses of our study are worth noting. First, we did not collect either preoperative or postoperative pain scores. Preoperative pain may help to predict postoperative pain and subsequently pill consumption. However, because of the similarities between the cohorts and the automation of the patients to their respective cohorts, this variable is less likely to confound the results. Instead, we relied on total pill consumption and the number of postoperative days that pain medication was used as a proxy for pain control. Furthermore, we did not standardize the prescription amount between our 2 cohorts. Instead, we compared the previously employed method of prescribing an average of 20 opioid pills to the new method of prescribing 10 tramadol pills. This difference would have affected the residual pill amount and may have influenced the amount of pills patients would consume postoperatively. Moreover, fewer patients undergoing open CTR received tramadol compared with patients undergoing endoscopic CTR. This discrepancy was due to enrollment differences by the individual surgeons over the 6-month period that tramadol was allocated to patients. Finally, patients supplemented their postoperative pain management with both acetaminophen and ibuprofen. Although we recorded the incidence, we did not record the amount of nonopioid pill consumption.

Despite these limitations, we believe that this study has several important conclusions. First, physicians should consider reducing the number of pain medications prescribed postoperatively following CTR, which supports related studies in the literature.[12,19] In addition to reducing the amount of pills prescribed, surgeons should consider transitioning from opioids to nonopioid medications, such as tramadol and NSAIDs. These changes would decrease medication-induced side effects as well as decrease the unnecessary and potentially harmful circulation of unused opioid medications among the general public.

Ethical Approval

This experimental protocol was approved by our institutional review board at Thomas Jefferson University.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 and 2008.

Statement of Informed Consent

Informed consent was obtained from all patients for being included in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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