Postoperative Use of Opioid Analgesic in Foot and Ankle Surgery: A Retrospective Cohort Study

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Statement of Purpose

Opioid analgesic (OA) use is common after foot and/or ankle surgery (FAS). Adverse effects of chronic OA use have led to recommendations to curb such practice, and clinical research suggests that persistent use beyond 4 weeks is associated with chronic OA dependence.[1] We undertook a retrospective cohort study that aimed to determine the incidence of, and risk factors for, persistent OA use at 4 weeks after FAS.

Methodology and Hypothesis

We reviewed the University of Pennsylvania Health System (UPHS) electronic medical record (EMR) for 1309 consecutive patients that underwent FAS at our institution between January 1, 2017 and December 31, 2017. We used the Pennsylvania Prescription Drug Monitoring Program (PDMP) to identify peri-operative OA use. All FAS patients ≥18 years of age were included, whereas those that underwent more than one FAS, and those residing outside of Pennsylvania or admitted to the hospital prior to surgery, were excluded. The outcome of primary interest was receipt of an OA prescription at 4 weeks postoperative, and exposures of interest (Table 1). We hypothesized that patients who underwent hindfoot and ankle surgery, surgery involving >2 pedal rays, those with anxiety/depression, and those with a history of prior OA use, would be more likely to continue OA use at or beyond 4 weeks postoperative.

Results

A total of 581 patients were included, and descriptive and inferential statistical methods were used to ascertain the associations of exposures with the outcome (persistent opioid prescription use ≥ 4 weeks postoperative). The cohort's mean age was 51.9 ± 14.2 years, their BMI 30.2 ± 7.5, and 378 (65.17%) were female. The incidence of OA use at 4 weeks postoperative was 31.33% (182 of 581 patients). If an OA prescription was filled during the year preceding the FAS, then 69.78% of FAS patients received OA at ≥ 4 weeks postoperative, and if more than one preoperative OA prescription had been filled, then 54.4% received OA at ≥ 4 weeks postoperative. Unadjusted analyses showed American Society of Anesthesiologist (ASA) class 2, diabetes mellitus, current smoker, lumbago, chronic pain; a history of alcohol, cocaine, marijuana, psychotropic medication, or intravenous drug use; and surgery lasting >2 hours, involving the ankle and/or leg, targeting both soft tissue and bone, use of a thigh tourniquet, and use of an ankle or popliteal nerve block, to be statistically significantly associated with the outcome. Fully adjusted analyses showed surgery targeting soft tissue and bone, tourniquet duration >2 hours, current smoker, diabetes mellitus, lumbago, and preoperative use of OA, to remain statistically significant (Table 3). Analyses for confounding variables, interaction and effect modification, as well as sensitivity analysis, indicated that surgery targeting both soft tissue and bone, tourniquet use >2 hours, current smoker, diabetes mellitus, and preoperative use of OA should be considered risk factors for ongoing use of OA at 4 weeks following FAS.

Table 1 Exposures analyzed in this study

Age (years)	Location of surgery
Female sex	Duration of surgery (hours)
Body mass index	Nerve surgery
Race	Tourniquet used
Surgeon	Tourniquet site
Comorbidity	Tourniquet use (hours)
Smoker (tobacco)	ASA classification
Illicit substance use	Anesthesia type
Lumbago	Nerve block used
Psychiatric history	Postop weight bearing
Psychotropic medicine	Ketorolac used in operating room
History of chronic pain	Type of nonsteroidal anti-inflammatory drugs
Chronic pain therapy	Hospital admission
Spinal stimulator	Length of stay (days)
Antiseizure medicine	Adverse event
Preop OA prescription	Postop OA Prescription
Methadone use	Tramadol postop
Workers compensation	Morphine milliequivalent 1st OA Prescription (MME)
Type of surgery	Duration first postop OA prescription (days)

Table 2 Prevalence of statistically significant exposures by the outcome (N = 581 patients)

Exposure	*p*-value^
Age (years)	0.002
Duration of surgery (hours)	0.005
Location of surgery	0.034
Type of surgery	0.031
Tourniquet used	0.0196
Tourniquet duration (hours)	0.0017
Local anesthetic block	0.0196
ASA classification	0.0013
Illicit substance use	0.0324
Smoker (tobacco)	0.0003
Comorbidity	0.0006
Lumbago	<0.0001
Psychiatric history	<0.0001
Chronic pain therapy	0.0001
Adverse event	0.009
Postop tramadol	0.024
Antiseizure medication	<0.0001
Preop OA prescription	<0.0001
Any preop OA use	<0.0001
Methadone use preop	0.01
MME 1st postop prescription	0.006

^Wilcoxon rank-sum test

Table 3 Statistically significant associations^ of exposures with the outcome (N = 581 patients)

Exposure	Odds ratio	p-value	95% confidence interval
Surgery targeting soft tissue and bone	4.91104	<0.0001	2.206683, 10.92967
Cuff duration ≥ 3 hours	11.10175	0.008	1.84887, 66.66171
Current smoker	3.297732	0.009	1.340708, 8.111409
Comorbidity diabetes mellitus	4.375267	0.002	1.714467, 11.16555
Back pain	3.580604	0.006	1.440271, 8.901605
Preoperative opioid analgesic use	14.66076	<0.0001	6.681798, 32.16768

^Fully adjusted logistic regression model

Literature Review

The precise duration of prescription OA use after FAS is unknown, and prolonged use may contribute to dependency. According to the CDC, 42,000 opioid overdose deaths occurred in 2016, and 40% of these were related to prescription OAs.[2] Use of OA in the early postoperative phase is commonplace in the United States,[3] and opiate-naïve patients can become chronic OA users after surgery. Analysis of surgical claims showed the duration of prescription OA use to have a greater association with OA misuse than did the dosage,[4] and psychological disorders are known to be associated with chronic OA use after surgery.[5-7] To regulate controlled substances, 49 states have enacted PDMPs, which allow prescribers to track the duration and dosage of dispensed OAs.[8]

Discussion

The incidence of prescription OA use at 4 weeks post FAS was 31.33%. Preoperative OA use is a strong indicator of dependence and may be an indication for OA counseling before elective FAS. Limitations of this work include use of the PDMP to identify when an OA prescription was filled, although we could not determine when and how much OA the patient was actually taking. Moreover, since the data were collected using the EMR, it was subject to inherent coding biases. Furthermore, we excluded patients with pre-existing admission/s and/or more than one surgery in 2017, which restricted our findings to primarily outpatient elective FAS in an urban medical center. To our knowledge, this is the first study that focuses on the incidence and risk factors for OA use at ≥ 4 weeks following FAS, and the findings were resistant to the potential influence of an unmeasured confounder. In conclusion, our findings indicated that FAS targeting both soft tissue and bone, tourniquet use >2 hours, current smoker status, diabetes mellitus, and preoperative use of OA should be considered risk factors for ongoing use of OA at ≥ 4 weeks following foot and/or ankle surgery.

References

1. Shah A, et al. Characteristics of Initial Prescription Episodes and Likelihood of Long-Term Opioid Use — United States, 2006–2015. MMWR Morb Mortal Wkly Rep 2017;66:265–269. DOI: http://dx.doi.org/10.15585/mmwr.mm6610a1, accessed 10/28/18.
2. Hedegaard H, et al. Drug overdose deaths in the United States, 1999–2016. NCHS Data Brief, no 294. Hyattsville, MD: National Center for Health Statistics. 2017/ CDC. Wide-ranging online data for epidemiologic research (WONDER). Atlanta, GA: CDC, National Center for Health Statistics; 2016. http://wonder.cdc.gov, accessed 05/29/18.
3. Kohring J, Orgain N. Multimodal analgesia in foot and ankle surgery. Orthop Clin N Am 48(4):495-505, 2017.
4. Brat G, et al. Postsurgical prescriptions for opioid naive patients and association with overdose and misuse: retrospective cohort study. BMJ360, j5790, 2018.
5. Helmerhorst G et al. Risk factors for continued opioid use one to two months after surgery for musculoskeletal trauma. J Bone Joint Surg 96(6):495–9, 2014.
6. Sun E,et al. Incidence of and risk factors for chronic opioid use among opioid-naive patients in the postoperative period. JAMA Internal Medicine 176(9):1286–93, 2016.
7. Brummett C, et al. New persistent opioid use after minor and major Surgical procedures in US Adults. JAMA Surgery 152(6):e170504, 2017.
8. PA Dept. Health. Prescription Drug Monitoring Program. http://www.health.pa.gov/Your-Department-of-Health/Offices%20and%20Bureaus/PaPrescriptionDrugMonitoringProgram/Pages/GeneralInfo.aspx#, accessed 05/29/18.

For supplemental results:

https://drive.google.com/file/d/1xxUqGBm7wN8hqL8PJUHzA0Ial_9bpkfO/view?usp=sharing

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