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A Prospective Evaluation of Postoperative Opioid Use in Otologic Surgery

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Abstract

Objective: To prospectively evaluate opioid consumption following adult outpatient otologic surgery.

Study Design: Prospective observational.

Setting: Single-tertiary referral center.

Patients: Patients scheduled for otologic surgery who did not have a history of chronic opioid use were recruited between February 2018 and February 2019.

Interventions and Main Outcome Measures: Opioid consumption was queried using telephone or in-person surveys administered between postoperative days 5 and 15. Patient demographics, surgical details, and opioid prescription patterns were abstracted from medical records. Opioid distribution was determined by querying records maintained by the California Department of Justice through a state-wide prescription drug monitoring program mandated since 2016.

Results: Seventy patients were prescribed an average of 68.9 ± 31.8 mg of morphine equivalents (MME) and consumed 47.3 ± 42.9 MME over 2.4 ± 2.3 days postoperatively. Patients who received a postauricular incision were prescribed significantly more than those who underwent transcanal procedures (86.2 vs 55.9 MME; *t* test, $p < 0.001$), consumed significantly more (72.2 vs 28.6 MME; *t* test, $p < 0.001$), and for a significantly longer duration (3.4 vs 1.6 days; *t* test, $p = 0.001$). In the postauricular group, there was no significant difference in consumption between mastoidectomy and nonmastoidectomy subgroups (64.9 vs 89.2 MME; *t* test, $p = 0.151$). Eighty percent of transcanal patients consumed 50 MME (10 pills) or less, while 80% of postauricular patients consumed 80 MME (16 pills) or less.

Conclusions: Patients in our cohort consumed approximately 3/4 of the prescribed opioids. Those with postauricular incisions used significantly more than those with transcanal incisions. Postoperative opioid prescription recommendations should be tailored according to the extent of surgery.

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Keywords

Opioids; Otolologic surgery; Pain; Postoperative

Prescription opioid abuse is an epidemic in the United States, where it was the cause of over 30,000 deaths in the United States in 2016 alone (1). Many factors have contributed to this epidemic, including an increasingly aggressive culture of pain management and lack of prescribing guidelines for physicians (2). Unused opioids leftover from postoperative prescriptions account for a significant portion of drugs diverted for abuse (3). Furthermore, use of postoperative opioids after ambulatory surgery is associated with chronic use (4). As such, reducing opioid prescriptions may limit the transition from appropriate postoperative use to chronic use or abuse (5). However, surgery-specific data is needed to guide opioid prescription reduction to ensure adequate postoperative pain management.

The purpose of this study is to prospectively evaluate opioid consumption following outpatient otologic surgery. The goal was to determine opioid utilization patterns to help inform postoperative prescription practices.

METHODS

The study was approved by the institutional review board of Stanford University School of Medicine. Subjects were prospectively recruited from three surgeons at the Stanford Ear Institute between February 2018 and February 2019. Inclusion criteria included being scheduled for outpatient otologic surgery independently of this study and accepting an opioid prescription during the preoperative visit. Opioid consumption was used as a proxy for postoperative pain experience, and patients refusing an upfront prescription were excluded because their experience was modulated by an aversion to opioid pain medication, thereby inappropriately skewing data toward decreased opioid requirements. There were five patients who were excluded for this reason. Other exclusion criteria included opioid use within 1 month before the day of surgery, history of chronic pain, and postoperative admission. Patients were approached by a member of the research team during the preoperative appointment if time allowed and consented for the study. Postoperative opioids were prescribed during the preoperative visit per the regular practices of the surgical team. All patients received lidocaine along the incision site and no patients received long-acting local anesthetics. Otherwise, no standardization of intraoperative anesthetic or perioperative medications were performed. Postoperative instructions varied between surgeons; notably, NSAIDs were not allowed by two surgeons given concerns for bleeding but were allowed by one. Opioid distribution was tracked through CURES 2.0 (Controlled Substance Utilization Review and Evaluation System) records maintained by the California Department of Justice.

Patients were initially queried in person or via telephone between postoperative days 5 and 7 and were asked to recall: 1) how many opioid pain pills they have taken since surgery, 2) how many days they required opioids, 3) if they have taken over-the-counter pain medications in addition to opioids for surgical pain and the type, 4) if they had a disposal plan for unused opioids if applicable. For patients with ongoing opioid consumption at the

time of initial contact, attempts to re-contact patients after cessation of opioids were made up to postoperative day 15.

Demographic information and surgical details were collected retrospectively from patient charts. Patients were classified into groups based on if they received a transcanal (TC) versus postauricular (PA) incision. Patients who could not be classified into TC or PA groups were excluded from the analysis. The PA group was further classified by if a mastoidectomy was performed or not.

Descriptive statistics were used to summarize distribution of variables across the study cohort. To account for different types of opioid medications, all quantities were converted into milligram morphine equivalents (MME) and the corresponding number of 5-mg hydrocodone pills for ease of interpretation. Comparison between groups was performed using two-tailed, unpaired Student *t* test statistics. Linear regression was used to assess if the quantity of opioids prescribed was predictive of the opiates consumed. An estimate was considered statistically significant at $p < 0.05$. Statistical analysis was performed using Stata 15 (StataCorp, 2018. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LP).

RESULTS

A total of 73 patients met inclusion criteria; 3 patients had ongoing postoperative opioid use at the time of initial survey but could not be contacted after cessation of opioid consumption, thus 70 patients were included in the analysis. Demographic and surgical characteristics of the 70 included patients are shown in Table 1. Of the patients who received TC procedures, 24 received tympanoplasty with or without ossicular chain reconstruction, 9 received stapes surgery, 5 received resection of middle ear mass, and 2 received canalplasty. Of the patients who received PA incisions, 15 received mastoidectomies for a cochlear implant, 6 received mastoidectomies for cholesteatoma or chronic otitis media, and 8 patients did not receive a mastoidectomy. Twenty-one patients in the cohort received surgery due to an infectious or inflammatory etiology.

Based on inclusion criteria, all patients received an opioid prescription. 22.8% (16/70 patients) took no opioids after surgery; of those patients, 31.2% (5/16 patients) filled the prescription according to CURES 2.0 records. 14.2% (10/70 patients) finished their initially prescribed course of opioid medication, while 4.3% (3/70 patients) received refills. There were no significant distinguishing demographic or surgical factors between patients who did not fill their prescriptions to those who received refills.

There were large variations in opioid prescription and consumption patterns (Table 2). Overall, an average of ± 31.8 MME (14 ± 6 hydrocodone [5-mg] pill equivalents) were prescribed per patient including refills, and 47.3 ± 42.9 MME (9 ± 9 hydrocodone [5-mg] pill equivalents) were consumed. The median amount of opioids prescribed per patient was 75 MME with an interquartile range of 37.5 to 125 MME including refills, and the median amount of opioids consumed was 50 MME with an interquartile range of 0 to 23 MME. There was no difference in opiate consumption between males and females (means: 47.6 vs

45.2 MME [10 vs 9 pills]; *t* test, $p = 0.819$) or between patients with an infectious or inflammatory etiologies of ear disease and those who did not (means: 54.8 vs 42.5 [11 vs 9 pills]; *t* test, $p = 0.245$). There was no correlation between opiate consumption and age (Pearson, $r = -0.031$, $p = 0.802$). PA patients were prescribed significantly more opioids than TC patients (means: 86.2 vs 55.9 MME [17 vs 11 pills]; *t* test, $p < 0.001$) and consumed significantly more (means: 72.2 vs 28.6 MME [14 vs 6 pills]; *t* test, $p < 0.001$) (Fig. 1A). When comparing mastoidectomy and no mastoidectomy subgroups, there was no significant difference in opioid prescription (means: 81.4 vs 97.2 MME [16 vs 19 pills]; *t* test, $p = 0.151$) or consumption (means: vs 89.2 MME [13 vs 18 pills]; *t* test, $p = 0.425$) patterns (Fig. 1B). Linear regression showed that opioid prescription was predictive of consumption overall ($r^2 = 0.066$, $p = 0.032$), but not within the PA group ($r^2 = 0.011$, $p = 0.577$) or TC group ($r^2 = 0.026$, $p = 0.402$) individually. The average duration of opioid consumption was 2.4 ± 2.3 days. Patients who received PA incisions consumed opioids for significantly longer after surgery (means: 3.4 vs 1.6 days; *t* test, $p = 0.0011$) (Fig. 2A). Within the PA group, there was no difference between duration of opioid use between mastoidectomy and no mastoidectomy groups (means: 3.1 vs 4 days; *t* test, $p = 0.407$) (Fig. 2B). Overall, 80% of TC patients consumed 50 MME (10 pills) or less, while 80% of PA patients consumed 80 MME (16 pills) or less.

Of the patients who had left over opioids, 71.7% (43/60 patients) did not have a plan to dispose the pills or actively planned on keeping them, 20.0% (12/60 patients) planned on returning the pills through a take-back program, 5.0% (3/60 patients) planned on throwing unused pills away, and 3.3% (2/60 patients) planned to flush the pills.

The majority of patients were prescribed combination hydrocodone-acetaminophen (5–325mg) (78.6%, 55/70 patients). Additional over-the-counter pain medication was used by 23.4% (41/70 patients). Of those patients, 68% (28/41 patients) used acetaminophen, 9.8% (4/41 patients) used ibuprofen, 14.6% (6/41 patients) used both acetaminophen and ibuprofen, and 7.3% (3/41 patients) used Excedrin (acetaminophen, aspirin, and caffeine). Of the patients who used ibuprofen or Excedrin, 30.0% (3/9 patients) had been asked to avoid NSAID medications in their postoperative instructions. There was no difference in amount of opioid consumed between patients who used over-the-counter pain medication and those who did not (44.1 vs 51.0 MME [9 vs 10 pills]; *t* test, $p = 0.554$).

DISCUSSION

Otolaryngology encompasses many different anatomical sites with a large variation in postoperative pain sensations (6). In a comparison of first postoperative day pain among 179 surgical procedures from all surgical specialties, tonsillectomy was ranked 24th most painful, while the next most painful procedure in otolaryngology was septoplasty, which came in at 122 (7). Inner and middle ear surgery was near the bottom at 155, but was labeled as a “heterogeneous surgical group” in acknowledgement of the great variation within otologic surgery. The current study explored these variations with the aim of identifying factors that would help tailor postoperative opioid prescription patterns.

This study describes opioid prescription and consumption patterns following outpatient otologic surgery at our institution. The existing prescription patterns were influenced primarily by the experience of the surgical team and secondarily by previous studies suggesting that a larger than necessary quantity of opioids may be prescribed after surgery (8-10). Typically, 5 to 10 pills of combination hydrocodone-acetaminophen (5–325 mg) were prescribed for TC surgeries and 15 to 20 pills prescribed for PA. Here, we show that patients receiving PA surgery use a greater amount of opioids and for a longer duration. The majority (80%) of patients with TC incisions consumed 10 pills or less while the majority of patients with PA incisions consumed 16 pills or less. While this may represent a true difference in postoperative pain sensation, it is possible that consumption is influenced by availability. For example, a limited prescription may lead patients to self-ration, or alternatively, may subconsciously cue patients as to what an appropriate postoperative pain level/opioid consumption pattern should be. Previous studies in different surgical fields have indicated that the amount of postoperative opioids prescribed is correlated with opioid use (11,12). In the current study, the amount of opioids prescribed was predictive of opioid use in the overall cohort. While this was not true when TC and PA surgeries were analyzed separately, this may be because the present sample size is underpowered to detect an association in this subanalysis. Nevertheless, this finding may further support the need to decrease opioid prescriptions after surgery. Within the PA group, there was no difference in opioid prescription or consumption patterns between the mastoidectomy and no mastoidectomy subgroups, suggesting that pain associated with PA surgery is incisional, rather than a consequence to bone drilling.

In the present study, sex and age were not associated with opioid prescription or consumption. Current literature is in disagreement regarding the roles sex and age play as risk factors for postoperative pain experience and opioid consumption (13 -15). While differences in sex and age may exist in postoperative pain experience following otologic surgery, it is possible that these differences were not detected given the relatively low amount of opioids prescribed and consumed following otologic surgery compared with other types of surgery and the relatively small size of the current sample compared with previous studies. There was also no difference in opioid consumption between patients who consumed over-the-counter pain medications and those who did not. This finding is confounded by the widespread use of combination hydrocodone-acetaminophen in our practice. Patients were deterred from taking additional acetaminophen in their postoperative instructions, and most patients were not allowed to take NSAIDs. These factors must be considered when interpreting the results.

With our practice described here, three quarters of prescribed opiates were consumed, which maintained a low number of unused opioids in circulation while being adequate to control pain in the vast majority of patients (as evidenced by less than 5% of all patients requesting additional pain medication). However, additional measures could be taken to reduce circulating opioids. The majority of patients with unused opioids did not plan on disposing them, suggesting that better counselling is necessary. While unused opioids are ideally returned through a take-back program, the FDA recommends that unused pills be promptly flushed down the toilet when take-back options are not readily available (16). The minority of patients with unused opioids planned on using a take-back program in this study (20%),

which is not unexpected since identification of and travel to a designated site may be an inconvenience. However, only two patients planned to flush their unused pills, suggesting that more patients should be made aware of this FDA recommendation.

The strength of this study is the prospective enrollment of patients. This allowed for excellent accuracy in reporting as consent for opioid distribution records through CURES 2.0 was obtained and patients were more inclined to keep track of their opioid consumption for the purposes of the survey. However, this study had several key limitations. The sample size was relatively small due to the prospective nature of the study. Additionally, there was no standardization in intraoperative techniques between surgeons, administration of perioperative analgesics between anesthesiologists, postoperative opioid prescriptions by the surgical team, and nonopioid pain medication recommendations after surgery. Specifically, some patients could use NSAIDs while others were not due to surgeon preference. While these measures would have reduced the number of variables affecting postoperative opioid consumption, they would not be practical to enforce and decrease the generalizability of the results. Furthermore, it is not known whether patients altered their postoperative opioid consumption because they knew they would be surveyed about this at a later date. Finally, while the study sample represents a wide range of socioeconomic status and educational attainment, the demographics of San Francisco Bay Area should be considered when generalizing the results to the overall population, as this study was limited to a single institution.

In conclusion, patients in our cohort consumed approximately 3/4 of their prescribed opioids. Patients with PA incisions used significantly more opioids than those with TC incisions. Of the patients who received PA incisions, there was no difference in opioid consumption between patients who received a mastoidectomy and those who did not. These factors should be considered when tailoring opioid prescription for otologic surgery.

REFERENCES

1. Seth P, Rudd RA, Noonan RK, Haegerich TM. Quantifying the epidemic of prescription opioid overdose deaths. *Am J Public Health* 2018;108:500–2. [PubMed: 29513577]
2. Cramer JD, Wisler B, Gouveia CJ. Opioid stewardship in otolaryngology: State of the art review. *Otolaryngol Head Neck Surg* 2018;158:817–27. [PubMed: 29437536]
3. Rudd RA, Seth P, David F, Scholl L. Increases in drug and opioid-involved overdose deaths — United States, 2010–2015. *MMWR Morb Mortal Wkly Rep* 2016;65:1445–52. [PubMed: 28033313]
4. Alam A, Gomes T, Zheng H, Mamdani MM, Juurlink DN, Bell CM. Long-term analgesic use after low-risk surgery. *Arch Intern Med* 2012;172:425. [PubMed: 22412106]
5. Bateman BT, Choudhry NK. Limiting the duration of opioid prescriptions. *JAMA Intern Med* 2016;176:583. [PubMed: 27043188]
6. Sommer M, Geurts JWJM, Stessel B, et al. Prevalence and predictors of postoperative pain after ear, nose, and throat surgery. *Arch Otolaryngol Neck Surg* 2009;135:124.
7. Gerbershagen HJ, Aduckathil S, van Wijck AJM, Peelen LM, Kalkman CJ, Meissner W. Pain Intensity on the first day after surgery. *Anesthesiology* 2013;118:934–44. [PubMed: 23392233]
8. Hill MV, Stucke RS, McMahon ML, Beeman JL, Barth RJ. An educational intervention decreases opioid prescribing after general surgical operations. *Ann Surg* 2018;267:468–72. [PubMed: 28267689]

9. Hill MV, McMahon ML, Stucke RS, Barth RJ. Wide variation and excessive dosage of opioid prescriptions for common general surgical procedures. *Ann Surg* 2017;265:709–14. [PubMed: 27631771]
10. Bartels K, Mayes LM, Dingmann C, Bullard KJ, Hopfer CJ, Binswanger IA. Opioid use and storage patterns by patients after hospital discharge following surgery. Costigan M, ed. *PLoS One* 2016;11:e0147972. [PubMed: 26824844]
11. Chen EY, Marcantonio A, Tornetta P. Correlation between 24-hour predischage opioid use and amount of opioids prescribed at hospital discharge. *JAMA Surg* 2018;153:e174859. [PubMed: 29238810]
12. Bateman BT, Cole NM, Maeda A, et al. Patterns of opioid prescription and use after cesarean delivery. *Obstet Gynecol* 2017;130:29–35. [PubMed: 28594763]
13. Zheng H, Schnabel A, Yahiaoui-Doktor M, et al. Age and preoperative pain are major confounders for sex differences in postoperative pain outcome: A prospective database analysis. *PLoS One* 2017;12:e0178659. [PubMed: 28586373]
14. Clarke H, Soneji N, Ko DT, Yun L, Wijesundera DN. Rates and risk factors for prolonged opioid use after major surgery: Population based cohort study. *BMJ* 2014;348:g1251. [PubMed: 24519537]
15. Sun EC, Darnall BD, Baker LC, Mackey S. Incidence of and risk factors for chronic opioid use among opioid-naïve patients in the postoperative period. *JAMA Intern Med* 2016;176:1286. [PubMed: 27400458]
16. Food and Drug Administration. Safe Disposal of Medicines - Disposal of Unused Medicines: What You Should Know. Available at: https://www.fda.gov/drugs/resourcesforyou/consumers/buyingusingmedicinesafely/ensuringsafeuseofmedicine/safedisposalofmedicines/ucm186187.htm#Medicines_recommended. Accessed January 31, 2019.

FIG. 1.

Comparison of opioid prescription and consumption patterns between (A) transcanal versus postauricular groups, and (B) mastoidectomy vs no mastoidectomy subgroups within the postauricular group. Bars represent means, error bars represent 95% confidence intervals, asterisks represent $p < 0.05$ in t test.

FIG. 2.

Comparison of postoperative opioid consumption duration between (A) transcanal versus postauricular groups, and (B) mastoidectomy versus no mastoidectomy subgroups within the postauricular group. Bars represent means, error bars represent 95% confidence intervals, asterisks represent $p < 0.05$ in t test.

TABLE 1.

Patient demographics

Characteristic	Data (n = 70)
Age, mean $\pm$ SD (range)	51 $\pm$ 18.4 (14–95)
Female, n (%)	35 (50%)
Surgery type, n (%)	
Transcanal incision	40 (57.1%)
Postauricular incision	30 (42.9%)
Mastoidectomy	21 (30.0% of total)

TABLE 2.

Opioid prescription and consumption patterns

	Prescribed per Patient, Median (IQR)		Consumed per Patient, Median (IQR)	
	In mg Morphine Equivalents	In Hydrocodone 5-mg Pill Equivalents	In mg Morphine Equivalents	In Hydrocodone 5-mg Pill Equivalents
Overall	75 (37.5–125)	15 (8–25)	50 (0–111.3)	10 (0–23)
Surgery type				
Transcanal incision	50 (28.1–81.3)	10 (6–17)	25 (0–75)	5 (0–15)
Postauricular incision	75 (50–150)	15 (10–30)	75 (11.3–148.1)	15 (3–30)
No Mastoidectomy	100 (50–150)	20 (10–30)	80 (25–150)	16 (5–30)
Mastoidectomy	75 (50–125)	15 (10–25)	75 (8.8–115)	15 (2–23)