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Variability in Opioid Prescription Following Primary Single-Level Lumbar Microdiscectomy

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Abstract

Study Design: Retrospective case series.

Objectives: To evaluate the variability in opioid prescription following primary single-level lumbar microdiscectomy.

Methods: We retrospectively reviewed consecutive patients who underwent primary single-level lumbar microdiscectomy. Only opioid-naïve patients ≥18 years old were included. Patients who had revision microdiscectomy, multilevel decompression, and/or any complication requiring prolonged hospital stay (>2 days) were excluded. The primary outcomes were the maximum daily dosage of opioids prescribed in morphine milligram equivalents (MME) and the number of pills prescribed (equivalent to 5 mg hydrocodone).

Results: Between 2014 and 2019, 169 patients (90 men, 79 women) met inclusion criteria, with a mean age of 46.9 years. Surgery resulted in a statistically significant improvement in VAS (Visual Analogue Scale) score (6.4 to 2.5, $P < .01$). At discharge, 8 patients (4.7%) did not receive any opioid prescription. Of the remaining 161 patients, 1 patient (0.01%) received hydromorphone, 30 (18.6%) Percocet, 43 (26.7%) oxycodone, and 87 Norco (54.0%). The length of opioid prescription was 6.7 days. The maximum daily dosage of opioids prescribed was 70.4 MME (SD 32.1). The total number of pills prescribed was 89.4 (SD 54.7). Twenty-five patients (15.5%) received a refill prescription. Multivariate analysis demonstrated the operating service, prescriber, and hospital admission were statistically significant predictors of maximum daily MME. The prescriber and hospital admission were statistically significant predictors of total number of pills prescribed.

Conclusions: We found significant variability in opioid prescription following primary single-level lumbar microdiscectomy. For standard spinal procedures like lumbar microdiscectomy, opioid-prescribing guidelines should be established to standardize postoperative pain management.

Keywords

opioid epidemic, opioid prescription, pain management, prescriptive, variability, spine surgery, lumbar microdiscectomy, morphine milligram, equivalent

Introduction

The opioid crisis is a major problem in today's health care system.[1,2] The rates of opioid misuse among patients with chronic pain averaged between 21% and 29%, and the rates of addiction averaged between 8% and 12%.[3] In the United States, orthopedic surgeons are the third highest prescribers of opioid medications.[4] In patients with sustained prescription opioid use, spinal conditions including lumbago, lumbosacral radiculitis, and displacement of lumbar intervertebral disc were the most common reasons for initial opioid prescription.[5] While the cause of the opioid epidemic is multifactorial, as providers we must be cognizant of and responsible for what and how we prescribe, both in the preoperative and postoperative settings.

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Lumbar microdiscectomy is one of the most common procedures performed by spine surgeons.[6] While this is a standard procedure, pain management following surgery varies significantly among surgeons. In light of the opioid epidemic, opioid prescription after spine surgery should be closely monitored and standardized.[7,8] In this study, we aimed to evaluate the variability in opioid prescription following primary single-level lumbar microdiscectomy. We hypothesized there was a significant prescriptive variability at discharge among prescribers.

Materials and Methods

This study was approved by our institutional review board (IRB). We retrospectively reviewed consecutive patients who underwent primary single-level lumbar microdiscectomy at a single academic institution between 2014 and 2019. Only opioid-naïve patients ≥18 years old were included. Opioid-naïve was defined as not receiving opioids in the 30 days prior to surgery. Patients who had revision microdiscectomy, multilevel decompression, and/or any complication requiring prolonged hospital stay (>2 days) were excluded. The electronic medical charts were evaluated for demographics (age, sex, body mass index [BMI], surgical service, case type), operative data (approach, level, estimated blood loss [EBL]), and clinical data (opioid prescription, prescriber, Visual Analogue Scale [VAS], and length of stay [LOS]). The primary outcomes were the maximum daily dosage of opioids prescribed in morphine milligram equivalents (MME) and the number of pills prescribed (equivalent to 5 mg hydrocodone). Comparison of continuous variables were performed using the Welch *t* test for 2 samples and one-way analysis of variance (ANOVA) test for 3 samples. Two multivariate linear regression models were separately performed to investigate what factors could significantly predict MME and pills prescribed.

Results

Between 2014 and 2019, 169 patients (90 men, 79 women) met inclusion criteria, with a mean age of 46.9 years (SD 14.5; Table 1). The mean BMI was 29.4 kg/m^2 (SD 6.2). Ninety-six (56.8%) and 73 cases (43.2%) were performed by orthopedic and neurosurgical providers, respectively. One hundred forty cases (82.8%) were elective, compared to 29 on-call cases (17.2%). There was nearly an equal distribution of tubular (n = 85, 50.3%) versus open (n = 84, 49.7%) microdiscectomy cases. The levels most commonly operated on were L4-5 (42.0%) and L5-S1 (49.1%). Surgery resulted in a statistically significant improvement in VAS score (6.4 to 2.5, $P < .01$). The mean EBL was 38.8 mL (SD 39.6). One hundred seven patients (63.3%) were discharged on the same day, while 62 patients (36.7%) were admitted for 1 or 2 days.

At discharge, 8 patients (4.7%) did not receive any opioid prescription. Of the remaining 161 patients, 1 patient (0.01%) received hydromorphone, 30 (18.6%) Percocet, 43 (26.7%) oxycodone, and 87 Norco (54.0%; Table 2). Forty scripts (24.8%) had fixed dosing, compared to 121 scripts (75.2%) with variable dosing. One hundred fifty-two scripts (94.4%) had fixed frequency while 9 scripts had variable frequency (5.6%). The mean length of opioid prescription was 6.7 days (SD 4.0). The prescribers were fellows (n = 23, 14.3%), midlevel providers (n = 67, 41.6%), or residents (n = 71, 44.1%). The mean maximum daily dosage of opioids prescribed was 70.4 MME (SD 32.1), and the total number of pills prescribed was 89.4 (SD 54.7). The first follow-up clinic visit was at

Table 1. Overview of Demographic, Operative, and Clinical Data of All Patients.

Characteristic	Value
Cases	169
Sex	Male, 90 (53.3%)
	Female, 79 (46.7%)
Age	46.9 years (SD 14.5)
Body mass index	29.4 kg/m^2 (SD 6.2)
Provider	Orthopedic, 96 (56.8%)
	Neurosurgery, 73 (43.2%)
Case type	Elective, 140 (82.8%)
	Call, 29 (17.2%)
Approach	Tubular, 85 (50.3%)
	Open, 84 (49.7%)
Level	L2-3, 6 (3.6%)
	L3-4, 9 (5.3%)
	L4-5, 71 (42.0%)
	L5-S1, 83 (49.1%)
Estimated blood loss	38.8 mL (SD 39.6)
Discharge date	Same day, 107 (63.3%)
	Postoperative day 1, 51 (30.2%)
	Postoperative day 2, 11 (6.5%)

Abbreviations: SD, standard deviation.

Table 2. Overview of Opioid Prescription Pattern.

Characteristic	Value
Prescription, n = 161	Hydromorphone, 1 (0.01%)
	Percocet, 30 (18.6%)
	Oxycodone, 43 (26.7%)
	Norco, 87 (54.0%)
Dosing	Fixed, 40 (24.8%)
	Variable, 121 (75.2%)
Frequency	Fixed, 152 (94.4%)
	Variable, 9 (5.6%)
Length of prescription	6.7 days
Prescriber	Midlevel, 67 (41.6%)
	Resident, 71 (44.1%)
	Fellow, 23 (14.3%)
First clinic follow-up	33.8 days (SD 11.6)
Refill prescription	25 of 161 (15.5%)
Maximum daily dosage of opioids prescribed	70.4 MME (SD 32.1)
Total number of pills prescribed[a]	89.4 pills (SD 54.7)

Abbreviations: SD, standard deviation; MME, morphine milligram equivalents.
[a]In 5 mg hydrocodone equivalent.

Table 3. Comparison of Opioid Prescription Between Various Groups.

Group		MME		Pills[a]	
Sex	Male: 85	72.2	$P = .45$	97.8	$P = .04$
	Female: 76	68.3		79.9	
Provider	Orthopedic: 90	76.3	$P = .005$	87.5	$P = .64$
	Neurosurgery: 71	62.9		91.7	
Approach	Open: 79	78.8	$P = .001$	101.9	$P = .004$
	Tubular: 82	62.3		77.2	
Disposition	Same day: 104	61.8	$P < .001$	74.3	$P < .001$
	Admission: 57	86.0		116.8	
Case type	Elective: 133	67.3	$P = .03$	86.2	$P = .12$
	Call: 28	84.9		104.5	
Refill	Yes: 25	71.0	$P = .89$	108.7	$P = .16$
	No: 136	70.3		85.8	
Prescriber	Midlevel: 67	80.7	$P < .001$	115.0	$P < .001$
	Resident: 71	65.9		72.9	
	Fellow: 23	54.0		65.4	

Abbreviations: SD, standard deviation; MME, morphine milligram equivalents.
[a]In 5 mg hydrocodone equivalent.

33.8 days (SD 11.6). Twenty-five patients (15.5%) received a refill prescription by the first follow-up appointment.

Table 3 summarizes the comparison in opioid prescription between various groups. Multivariate analysis demonstrated for maximum daily MME, the operating service ($B = 23.81$, $P < .01$), prescriber ($B = -16.35$, $P < .001$), and hospital admission ($B = 12.21$, $P = .048$) were statistically significant predictors. For total number of pills prescribed, prescriber ($B = -22.12$, $P = .002$) and hospital admission ($B = 29.25$, $P = .007$) were statistically significant predictors.

Discussion

Our study confirmed the high variability in opioid prescription patterns following what is considered a standard spinal procedure. In designing this study, we intentionally established strict inclusion and exclusion criteria to create a relatively homogenous sample population of opioid-naïve patients undergoing primary single-level lumbar microdiscectomy. We were surprised by the amount of opioids prescribed (maximum daily MME and total pills) as well as the variability in the prescriptions (opioid type, dosing, and frequency) for such a simple, typically same-day procedure. Patients from our study received similar quantity of opioids (hydrocodone 5 mg equivalents) compared to patients who had total hip (90 pills) and total knee arthroplasties (120 pills)[9] or orthopedic fracture fixation (90 pills).[10] Basilico et al found the discharge opioid quantity, not type, was associated with prolonged opioid use beyond 90 days after orthopedic surgery.[11] In a study from the Veterans Health Administration, decedents from unintentional opioid overdose were prescribed significantly higher daily opioid dosage for chronic pain compared to their matched control cohort (98.1 vs 47.7 MME, $P < .001$).[12] Approximately 60% of overdose cases were prescribed >50 MME/day. The authors emphasized the importance of treating dosage as a continuous rather than a categorical variable.[12]

It is important to note this study evaluated opioid prescription, not consumption. In fact, previous studies have shown patients typically do not finish their initial prescription.[13,14] In one observational cohort study, Lovecchio et al found the median opioid consumption following lumbar microdiscectomy or decompression was 48 pills (hydrocodone 5 mg equivalents), with a range from 0 to 177 pills.[13] The authors specified only 19 of 85 patients (22.4%) completed their prescription, and 8 patients (9.4%) obtained a refill. A systemic review by Bicket et al reported between 42% to 71% of all opioid tablets went unused after surgery.[14] This highlights the potential problem of initial over-prescription by discharging providers. We identified 3 statistically significant predictors of higher maximum daily opioid dosage prescribed (orthopedic service, midlevel prescriber, and hospital admission) and 2 statistically significant predictors of higher number of pills prescribed (midlevel prescriber and hospital admission). An understanding of these existing predictors is important in implementing appropriate strategies to prevent over-prescription following lumbar microdiscectomy.

Opioid dependence (OD) is a real problem for patients postoperatively. Wright et al documented an OD rate of 7.5% in previously opioid-naïve patients following lumbar spine surgery.[15] In our experience, we believe 3 primary factors contributed to the observed high quantity and variability in opioid prescription following lumbar microdiscectomy. First, there is no established service-based or institution-based guidelines for our providers on what and how to prescribe. Consequently, each provider had his or her own unique prescribing practice. Setting guidelines such as limits on prescribers have been shown to reduce initial opioid prescriptions. Reid et al found institution of a statewide legislation in Rhode Island limiting narcotic prescription led to reduction in initial and 30-day opioid prescriptions for patients undergoing lumbar spine surgery.[16] Establishing pain management guidelines for common surgical procedures is most effective when there is involvement of a multidisciplinary expert panel that includes surgeons, pain specialists, and pharmacists.[17] Second, we still do not know what the right dosage, frequency, and duration of opioids to prescribe are for various spinal procedures. For this reason, more studies are needed to quantify the "minimum necessary amount" of opioids to prescribe to effectively treat postoperative pain while mitigating the risks for opioid dependence and abuse.[13] Last, there needs to be formal training on opioid prescribing for providers at all levels.[18] In a survey of orthopedic residents across 4 programs by Bhashyam et al, only 36.5% of residents reported receiving opioid prescribing training.[19] Implementation of a mandatory educational program has been shown to effectively reduce the amount of opioids and pills prescribed after lumbar spine surgery.[20]

In summary, we found significant variability in opioid prescription following primary single-level lumbar microdiscectomy in both maximum daily MME and total number of pills prescribed. For standard spinal procedures like lumbar

microdiscectomy, opioid-prescribing guidelines should be established to standardize postoperative pain management. In addition, formal prescribing training is recommended to all providers to minimize prescriptive variability and prevent overprescription.

Declaration of Conflicting Interests

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