



Perioperative Opioid and Postoperative Outcomes: Study on Patients Undergoing Hip Fracture Repair Surgery at Military Hospitals in Jordan

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Abstract

This retrospective observational study investigated the impact of perioperative opioid use on postoperative outcomes in a cohort of 419 patients who underwent hip fracture procedures. The study aimed to assess the association between perioperative opioid use and hospital stay duration, ICU readmission rates, thromboembolic complications, and the need for revision surgery.

The results of the independent samples t-test revealed significantly shorter hospital stays in patients with perioperative opioid use ($P < 0.05$). Additionally, perioperative opioid use was independently associated with reduced hospital stay (coefficient estimate = -0.656, 95% CI -1.217 – -0.096, $P = 0.022$). Moreover, patients who received perioperative opioids had significantly fewer ICU readmissions within a month after surgery ($p = 0.024$). On the other hand, chi-square tests did not show any significant difference between perioperative opioid use and thromboembolic complications ($p = 0.759$), death within a year after surgery ($p = 0.089$), or the need for revision surgery ($p = 0.336$). Having a cardiovascular disease is an independent risk factor for hospital readmission within a month (OR = 1.509, 95% CI 1.026–2.220, $p = 0.037$).

The findings indicate that perioperative opioid use may not have a substantial impact on postoperative death, thromboembolic complications (DVT/PE), or revision surgery. However, there appears to be a significant association with ICU readmission rates and hospital stay duration, warranting further investigation and consideration in clinical decision-making.

While the results shed light on the relationship between perioperative opioid use and postoperative outcomes, the study acknowledges limitations related to its retrospective design. Future prospective research is needed to explore causality and address potential confounding factors.

Overall, this study contributes to the growing body of literature on perioperative opioid use and its implications for surgical recovery, offering valuable insights for healthcare practitioners to optimize patient care and enhance surgical outcomes.

Keywords: Thromboembolic complications; ICU; Opioids; Hip fracture; DVT; PE

Introduction

Opioids have been an essential component of perioperative pain management in recent decades [1]. They have proven to be highly effective

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in pain reduction in elderly patients with hip fractures [2]. However, the use of perioperative opioids has been found to have impacts beyond analgesia [3]. Therefore, the medical community strives to understand the effects of opioids that are not related to pain management. Some studies have investigated a potential anti-inflammatory role of opioids [4]. Moreover, there is well-established evidence of the anti-tussive effects of opioids (Codeine) [5].

The vast majority of literature has focused on the harmful aspects of prescribing opioids to patients in general and to orthopedic patients in particular [6,7], as the opioid epidemic continues to pose a challenge to healthcare worldwide. A study conducted on patients who underwent elective total joint arthroplasty in the United States found that preoperative opioids are significantly associated with an increased risk of readmission within a month, surgical site infections, and surgical revision [8]. According to a study involving symptomatic adult spine deformity, preoperative opioid use was also associated with worse preoperative and postoperative patient reported quality of life and decreased surgical cost-effectiveness [9]. As a result, investigating the effects of opioids on postoperative outcomes is of particular importance due to the lack of information on the subject. In pursuit of understanding the association, we conducted a retrospective cohort study comprising 460 hip fracture patients to identify the impact of opioids on hospital readmission, hospital stay length, thromboembolic complications, surgical revision, and death within a year.

Methodology

This research follows a retrospective observational design. The study involves the analysis of an existing dataset comprising 419 patients who underwent hip fracture surgical procedures from 2017 to 2020. Patients' medical records were anonymized to maintain confidentiality and adhere to ethical guidelines. The data used in this study were obtained from hospital databases. Information on patients' demographic characteristics (age, gender, and specific comorbidities), perioperative opioid use, hospital stay duration, ICU readmission, thromboembolic complications, and revision surgeries were extracted from the EHRs.

The study included patients who met the following criteria:

1. Underwent surgical procedures for hip fracture between 2017-2020.
2. Availability of complete medical records, including perioperative opioid use history.

Exclusion criteria: Patients with missing or incomplete data were excluded from the analysis.

Values 0 and 1 were assigned for the variables where 0

was labeled as "No" or "not present" and 1 was labeled as "Yes" or "present".

Descriptive statistics were calculated to summarize the demographic characteristics and postoperative outcomes of the study population. The primary analysis aimed to compare postoperative outcomes between patients with and without perioperative opioid use. Independent samples t-test was used to compare hospital stay duration between the two groups. Chi-square test was employed to analyze the relationship between the two groups and categorical variables (readmission rates, death within one year post-surgery, thromboembolic complications, and the need for revision surgery).

Multivariate analysis was used to test the association between perioperative opioid use and multiple independent variables (the previously mentioned postoperative outcomes) while adjusting for covariates (age, gender, smoking status, hypertension, diabetes, cardiovascular conditions, cerebrovascular accidents, Alzheimer's, Parkinsonism, dementia, pulmonary diseases, thyroid diseases and osteoporosis) to eliminate bias. Statistical significance was considered for a $p < 0.05$.

This study was conducted in accordance with ethical guidelines, and patient data were anonymized to ensure confidentiality. Ethical approval was obtained from the RMS ethical committee (46/1/2024) prior to data analysis.

Results

Patients' demographic information:

The total number of patients included was 419. Age ranged from 46 to 120. The mean (SD) age was 75.28 ± 9.67 . Males constituted 46.4% (195) of patients, whereas females were 53.6% (224). 28% (117) of patients were smokers. All patients enrolled were scheduled for hip surgery. Hypertension was the most prevalent comorbidity in the study sample (300 patients). This bar chart demonstrates different comorbid conditions that patients have.

univariate analysis

The mean hospital stay was 7.44 days. Using the independent samples t-test to assess the difference between the two groups regarding hospital stay yielded p-values from both t-tests (equal variances assumed and not assumed) that are less than 0.05 (0.011 and 0.014, respectively). The mean difference in hospital stay duration between the two groups is approximately 0.711 days (17.064 hours), with the non-opioid group having the longer stay. The 95% confidence interval of the difference ranges from 0.161 to 1.260 days. This means that we are 95% confident that the true difference in average hospital stay durations between the two groups lies within this interval (Figure 1).

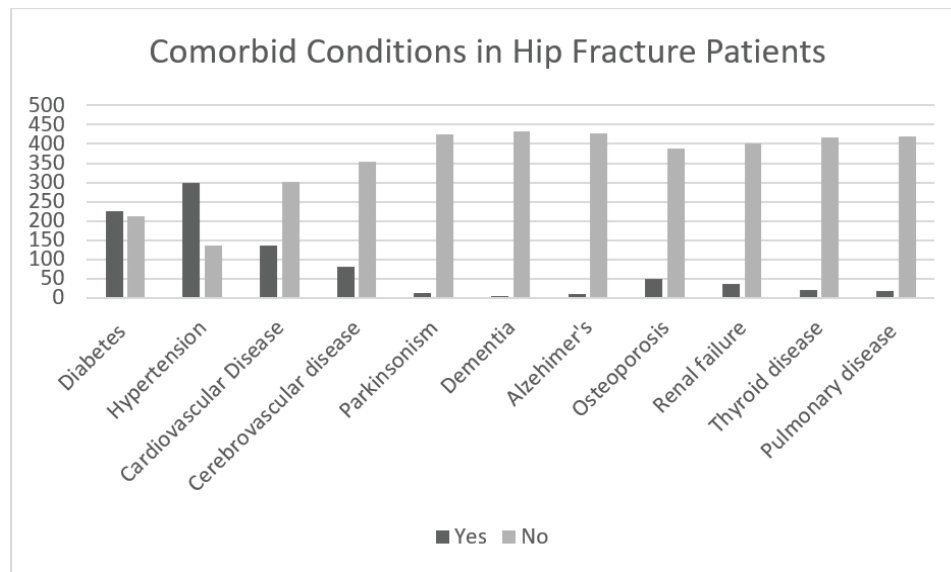


Figure 1: Comorbid conditions in hip fracture patients.

Patients with perioperative opioid use exhibited a slightly lower rate of ICU readmission (9%) compared to those without perioperative opioid use (12%). ($\chi^2 = 4.532$, $df = 1$, $p = 0.033$).

The analysis indicated that the risk of thromboembolic complications was not significantly different between the two groups. ($\chi^2 = 0.94$, $df = 1$, $p = 0.759$).

A small difference was observed between the two groups in terms of death within one year after surgery ($\chi^2 = 2.885$, $df = 1$, $p = 0.089$). The risk of death within a year after surgery was 14% for patients with perioperative opioid use and 11% for patients without perioperative opioid use.

The analysis also demonstrated that the two groups were not significantly different in rates of surgical revision ($\chi^2 = 0.926$, $df = 1$, $p = 0.336$). Table 1 demonstrates a comparison between both groups in different post-operative outcomes.

Multivariate Analysis

A multivariate logistic regression analysis was conducted to further explore the relationships between perioperative

opioid use and postoperative complications while controlling for potential confounding variables.

While holding potential confounding variables (age, gender, smoking status, and comorbidities) constant and assessing the relationship between perioperative opioid use and hospital readmission within one month, the study indicated that the coefficient estimate is -0.417. The p-value associated with this coefficient ($p = 0.024$) indicates that perioperative opioid use is statistically significant in predicting the outcome (hospital readmission within one month). An odds ratio of 0.659 suggests that patients with perioperative opioid use have approximately 0.660 times the odds of being readmitted compared to those without perioperative opioid use.

Having preexisting cardiovascular disease was an independent risk factor for hospital readmission within one month (OR = 1.509, 95% CI 1.026–2.220, $p = 0.037$).

Linear regression was used to further investigate the relationship between perioperative opioid use and the length of the hospital stay after surgery. All previously mentioned potential confounding variables were held constant. The constant term in the model is 7.024, representing the

Table 1: Multivariable Analysis: Independent Variables and Their Relationship with Hospital Readmission.

Post-operative outcome	No Perioperative opioids (N = 178)		Perioperative opioids administered (N = 241)		P value
	Count (N)	Percentage (%)	Count (N)	Percentage (%)	
Readmission	21	12%	22	9%	0.033
Thromboembolic complications	5	2.5%	7	2.7%	0.759
Surgical revision	5	2.5%	8	3%	0.336
Death	25	14%	26	11%	0.089

expected hospital stay when all predictor variables are zero. The p-value was 0.022, indicating a significant relationship between perioperative opioid use and the duration of hospital

stay. The coefficient for perioperative opioid use was also negative (-0.656), indicating that it is associated with a decreased hospital stay (95% CI -1.217 - -0.096) (Table 2).

Table 2: Multivariable Analysis: Independent Variables and Their Relationship with Hospital Readmission.

						95%CI	
	Estimate	S.E.	Wald	P value	OR	Lower	Upper
Perioperative Opioids	-0.417	0.185	5.069	0.024	0.659	0.459	0.947
Smoking	-0.097	0.208	0.219	0.640	0.907	0.603	1.364
Diabetes	0.054	0.196	0.075	0.784	1.055	0.719	1.549
Hypertension	0.272	0.225	1.465	0.226	1.312	0.845	2.038
Cardiovascular disease	0.412	0.197	4.370	0.037	1.509	1.026	2.220
Cerebrovascular disease	0.346	0.220	2.462	0.117	1.413	0.917	2.177
Pulmonary disease	-0.211	0.496	0.181	0.671	0.810	0.306	2.142
Thyroid disease	-0.040	0.450	0.008	0.929	0.961	0.398	2.321
Renal failure	0.447	0.295	2.302	0.129	1.564	0.878	2.787
Parkinson's	0.406	0.465	0.761	0.383	1.500	0.603	3.733
Dementia	-18.927	1.206E4	0.000	0.999	0.000	0.000	.
Alzheimer's	0.455	0.562	0.656	0.418	1.576	0.524	4.743
Osteoporosis	0.251	0.285	0.780	0.377	1.286	0.736	2.246
Constant	-2.370	0.228	107.943	0.000	0.094		

Discussion

Our study demonstrated possible postoperative consequences of perioperative opioid administration to hip fracture patients. To our knowledge, this study represents a rare investigation within the existing literature, delving into the relatively unexplored domain of perioperative opioid effects on postoperative outcomes in hip fracture patients. A relatively large dataset (419 patients) was used to establish rigorous statistical conclusions. A significant reduction in hospital stay was observed, which was also indicated by a previous study [10], as uncontrolled postoperative pain lengthens hospital stay. Moreover, the risk of hospital readmission in patients administered perioperative opioids is significantly lower than their cohort. This finding is not aligned with a previous study [11], which linked prescription opioid use with a higher rate of readmission after surgery. Another study mentioned a substantial reduction in 30-day and 90-day hospital readmission after opioid use in index admission [12]. Other postoperative outcomes, such as postoperative survival, were considered in our study. This particular outcome was studied in multiple other studies, which have pointed to either increased [13] or decreased [14] survival following perioperative opioid use. Differences between studies regarding the effect of perioperative opioids could be due to dissimilarities in the type of operation, opioid dosage or type [15], and patients' characteristics (e.g., age, baseline comorbidities, life expectancy, etc.). Our study

explored other independent variables, such as cardiovascular disease, which was significantly associated with increased hospital readmission after hip fracture surgery. This was also implicated by a study investigating reasons for readmission after total hip arthroplasty [16].

The dual impact of perioperative opioids poses a challenge for clinicians. While it appears to offer beneficial outcomes, the risk of opioid misuse cannot be overlooked, particularly in orthopedic patients [17]. Other harmful postoperative effects were the focus of a previous study, which demonstrated reduced postoperative pain with less postoperative nausea and vomiting in patients undergoing opioid-free anesthesia compared to their cohort [18]. Due to such findings, multiple studies recommended a multimodal pain management approach, which includes non-opioid medications in addition to opioids [19-21]. Therefore, further research is recommended to weigh the potential benefits against the risks of perioperative opioid use.

While our study provides valuable insights into the relationship between Perioperative opioid use and different postoperative outcomes, it is essential to acknowledge several limitations that should be considered when interpreting the results:

1. Our study relied on a specific cohort of participants (hip fracture patients), which may not be entirely representative of other patients.

2. Despite our efforts to control for potential confounding variables, it is possible that unmeasured or unknown variables influenced the observed associations.
3. The duration of follow-up in our cohort study was relatively limited. This may not allow us to capture longer-term effects or delayed outcomes that could be associated with perioperative opioid use.
4. As with other cohort studies, establishing a clear temporal relationship between the exposure and outcome is a challenge. Causality cannot be definitively inferred from this design.

Conclusion

Our study highlighted the effect of perioperative opioids on multiple postoperative outcomes. It revealed potential valuable benefits of utilizing opioids to reduce hospital stay and minimize rates of readmission after hip surgery. This promising result underscores the importance of opioid-related research and their potential future implications.

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