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ORIGINAL CONTRIBUTIONS

Outcomes of Bariatric Surgery in Patients on Chronic Opioids: Can Bariatric Surgery Assist with Decreasing Long-term Opioid Utilization?

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Abstract

Purpose The aim of our study was to assess long-term opioid use following bariatric surgery in patients on preoperative narcotics.

Methods We evaluated patients utilizing preoperative opioids (OP) who underwent primary laparoscopic Roux-en-Y gastric bypass (LRYGB) from 2013 to 2020. Patients were propensity-matched to those without preoperative opioid use (NOP) by demographics and comorbidities. Our objectives were to compare opioid use at 1 and 3 years after surgery and evaluate perioperative outcomes.

Results A total of 806 patients, matched 1:1 were evaluated, with 82.7% being females. Mean age was 46.5 years in the OP and 45.6 years in the NOP ($p=0.0018$), preoperative BMI was 45.8 in the OP and 46.1 in the NOP ($p=0.695$). All patients were followed up for 1 year. In the OP, 156 (38.7%) patients were taking opioids 1 year after surgery as opposed to 27 (6.7%) in the NOP ($p<0.0001$). Three years after surgery, 74 (37.5%) patients in the OP and 27 (14.4%) in the NOP were taking outpatient opioids ($p<0.0001$). There was no statistically significant difference between OP and NOP groups in terms of readmissions (9.4% vs. 5.7% $p=0.06$), reinterventions (3.7 vs. 1.7% $p=0.13$), reoperations (3.5% vs. 1.5% $p=0.11$), or emergency room visits (8.9% vs. 7.2% $p=0.44$). There were no mortalities.

Conclusion Most patients requiring preoperative opioids can be weaned off after bariatric surgery. Enhanced recovery pathways are key to obtaining these results. Preoperative opioid use is not associated with increased complications compared to opioid-naïve patients.

Keywords Opioid use · Opioid crisis · Morbid obesity · Bariatric surgery · Laparoscopic Roux-en-Y gastric bypass · Enhanced recovery after surgery · Multimodal analgesia

Key Points

- Most patients requiring preoperative opioids can be weaned after bariatric surgery.
- Enhanced recovery pathways in bariatric surgery can lower postoperative opioid use.
- Preoperative opioids are not associated with higher complications after LRYGB.

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Introduction

The opioid crisis has become a major public health crisis, with the USA having the highest opioid prescription rate in the world [1, 2]. Opioids have historically been the primary pharmaceutical agent to treat acute postsurgical pain. Despite the positive effects of pain control, opioids are associated with numerous negative side effects to include nausea, vomiting, constipation, and sedation. Prolonged use may lead to opioid abuse, accidental overdose, and death [1]. Preoperative opioid use has been associated with longer lengths of stay (LOS) and an increased rate of readmissions and morbidity after abdominal surgery [3, 4]. The incidence of new persistent opioid use, defined as their use more than 90 days after surgery in opioid naïve patients has been reported in 5.9–6.5% after minor and major surgical procedures [5]. Multiple studies have shown that the practice of opioid overprescription occurs in most surgical procedures and specialties. Overprescribing is in part due to the lack of knowledge about patients' opioid requirements following surgery [6]. Overprescribing is one of the main contributors to the misuse and diversion of these drugs, with up to 65% of patients with opioid misuse, reporting obtaining them from a source other than a physician's prescription [2].

Bariatric surgery has been proven to be the most effective and durable treatment option for morbid obesity. Some studies have reported that chronic opioid use in bariatric surgery candidates is higher than in the general population [7]. Because of the association between obesity and certain pain syndromes including osteoarthritis, fibromyalgia, chronic abdominal, pelvic, and neuropathic pain [8], it would be reasonable to assume that weight loss could potentially improve pain control and decrease the need for narcotics. In the longitudinal assessment of bariatric surgery prospective multicenter study, 14.7% of bariatric patients used opioids prior to surgery. This percentage decreased at 6 months postoperatively; but 7 years after surgery, 20.3% of patients were still using opioids [9]. Despite the potential opportunity to improve chronic pain and decrease chronic narcotics with bariatric surgery, very limited data exists regarding long-term chronic pain and narcotic usage [10, 11].

Enhanced recovery after surgery (ERAS®) programs provide a potential mechanism to reduce perioperative opioid use. ERAS® care pathways have been shown to reduce the LOS, readmissions, and overall hospital costs. One of the mainstays of these programs is to limit the utilization of opioids in the perioperative setting [12, 13] through routine use of transversus abdominis plane (TAP) block [14, 15] and multimodal non-opioid pain medications. Management of acute postoperative pain with opioids is associated with chronic opioid use (COU) in a small subset of patients. In a study at Veterans Affairs hospitals, bariatric surgery was associated with a greater risk of COU in patients without baseline opioid use [16].

In this study, we compared patients using OP who underwent primary LRYGB and compared them to those with NOP. The purpose of this study was to assess opioid use at 1 and 3 years after surgery. Secondary objectives were postoperative outcomes including perioperative complications, pain scores, and weight loss.

Materials and Methods

We conducted a retrospective cohort study of all patients who underwent primary LRYGB from January 2013 to January 2020 in a single institution. Patient characteristics including age, sex, preoperative body mass index (BMI), and American Society of Anesthesiologists (ASA) classification were collected during preoperative assessment. Comorbid conditions were selected for inclusion based on the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP).

Exclusion criteria included patients 18 years old or younger, conversion to open surgery, revisional bariatric surgery, and patients with missing data. Preoperative opioid use was defined as use 3 months prior to surgery based on the review of medical records. Opioids listed at postoperative visits and subsequent follow-up visits were used to determine postoperative use. The primary outcome was opioid use at 1 and 3 years after surgery. Secondary objectives included postoperative outcomes (length of stay, emergency room (ER) visits, readmissions, reinterventions, reoperations, morbidity, and mortality), weight loss at 1 and 3 years after surgery as well as postoperative pain scale.

All patients underwent a LRYGB by one of 4 surgeons following a standardized care pathway in a single institution. After placement of laparoscopic ports, a TAP block was performed with 0.25% bupivacaine with epinephrine. Postoperatively, a multimodal analgesia protocol based on acetaminophen (975 mg every 8 h) and celecoxib (400 mg daily) was used as part of our enhanced recovery program [17]. Oral oxycodone (5 and 10 mg) was used as a secondary option for breakthrough pain. Patients were discharged home on 1000 mg of acetaminophen every 8 h for 3 days and 5 tablets of oxycodone (5 mg) for those patients who required it while inpatient. A follow-up phone call was made 72 h after surgery to assess the patient's pain using a Likert pain scale. Patients were followed up 2 weeks, 4 months, and 12 months after surgery and yearly thereafter.

Propensity scores (predicted probability of preoperative opioid use) were estimated for gastric bypass patients and used to match preoperative opioid users to nonopioid users. Scores were estimated using logistic regression. The model included variables from the MBSAQIP database. Matching was determined within a caliper of 0.25 times the standard deviation of the propensity score. Descriptive statistics include mean, standard deviations, medians, and interquartile ranges (IQR) for continuous variables. Frequency and percentages were used for categorical variables. For continuous variables, a paired *T*-test was utilized when the data was normally distributed, and a Wilcoxon signed rank-sum test for non-normally distributed data. For categorical variables, McNemar's tests were utilized.

Results

Prior to matching, there were 550 patients in the OP group and 1059 in the NOP group. A total of 403 matched pairs was achieved given the set caliper, with 341 (84.6%) patients in the OP and 326 (80.9%) patients in the NOP being females. Baseline demographics including comorbidities as per MBSAQIP are described in Table 1. After matching, there was a statistically significant difference in age; however, the difference was not clinically significant.

All patients were followed up for 1 year. In the OP, 156 (38.7%) patients were taking opioids 1 year after surgery as opposed to 27 (6.7%) in the NOP ($p < 0.0001$). Opioid use data was available for 197 (48.8%) patients in the OP at the 3-year follow-up and demonstrated that 74 (37.5%) patients were taking outpatient opioids. In the NOP, 27 (14.4%) patients were taking opioids at 3-year follow-up ($p < 0.0001$), with data available for 187 (46.4%) patients.

Table 2 depicts postoperative outcomes 30 days after surgery. There were no statistically significant differences in complications between the 2 groups. The median length of stay in both groups was 1 day (range 1–15 in OP vs. 1–6 in NOP, $p < 0.0001$). There were no mortalities in either group. There was no significant difference in rates of readmissions, reinterventions, reoperations, and number of ER visits between the groups (Table 3).

The mean inpatient opioid use, morphine milligram equivalents (MME) was significantly higher in the OP compared to the NOP group (90.4 vs. 56.9 MME; $p < 0.0001$). Median pain scores on postoperative day 1 were higher in the OP than NOP group [8 (IQR 7–9) vs. 7 (IQR 6–8) $p < 0.0001$]. At the 72-h follow-up phone call, median scores were 4 (IQR 3–6) and 3 (IQR 2–4), respectively, $p = 0.67$. A comparison between change in BMI and percentage of total weight loss (%TWL) between groups before surgery and at 1 and 3 years postoperatively are shown in Table 4.

Discussion

Overprescribing narcotics has significantly contributed to the diversion of these drugs fueling the current opioid crisis [2]. This crisis has resulted in more than 33,000 opioid

Table 1 Demographics

Variables	Preop opioid use ($N = 403$)	No preop opioid use ($N = 403$)	p-value
Age[a], mean (SD)	46.5 (10.56)	45.6 (10.31)	0.0018
BMI[a], mean (SD)	45.8 (7.91)	46.1 (7.89)	0.6957
Preop weight[a], mean (SD)	277.7 (59.35)	281.0 (58.84)	0.4112
Sex			0.1674
Male	62 (15.4%)	77 (19.1%)	
Female	341 (84.6%)	326 (80.9%)	
ASA class			—
1	0 (0.0%)	0 (0.0%)	
2	124 (30.8%)	124 (30.8%)	
3	279 (69.2%)	279 (69.2%)	
4	0 (0.0%)	0 (0.0%)	
Comorbidities			
Nondiabetic	248 (61.5%)	248 (61.5%)	
Non-insulin dependent diabetes	114 (28.3%)	114 (28.3%)	
Insulin dependent diabetes	41 (10.2%)	41 (10.2%)	
History of MI	0 (0.0%)	0 (0.0%)	—
Previous PCI/PTCA	3 (0.7%)	3 (0.7%)	—
Previous cardiac surgery	1 (0.2%)	1 (0.2%)	—
Current smoker	53 (13.2%)	53 (13.2%)	—
COPD	3 (0.7%)	3 (0.7%)	—
GERD	225 (55.8%)	225 (55.8%)	—
Hyperlipidemia	125 (31.0%)	125 (31.0%)	—
Sleep apnea	253 (62.8%)	253 (62.8%)	—
Therapeutic anticoagulation	4 (1.0%)	4 (1.0%)	—
Chronic steroids	3 (0.7%)	3 (0.7%)	—
Dialysis	0 (0.0%)	0 (0.0%)	—
History of pulmonary embolism	1 (0.2%)	1 (0.2%)	—

[a]Paired *t*-test. *SD*, standard deviation; *MI*, myocardial infarction; *PCI*, percutaneous coronary intervention; *PTCA*, percutaneous transluminal coronary angioplasty; *COPD*, chronic obstructive pulmonary disease; *GERD*, gastroesophageal reflux disease; *PE*, pulmonary embolism

Table 2 Postoperative complications

Variables	Preop opioid use (*N* = 403)	No preop opioid use (*N* = 403)	*p*-value
Wound disruption[b]	0 (0.0%)	1 (0.2%)	> 0.9999
Superficial incisional SSI[b]	3 (0.7%)	1 (0.2%)	0.6250
Deep incisional SSI[b]	1 (0.2%)	1 (0.2%)	> 0.9999
Organ space SSI[b]	4 (1.0%)	1 (0.2%)	0.3750
UTI[b]	4 (1.0%)	3 (0.7%)	> 0.9999
Pneumonia[b]	0 (0.0%)	2 (0.5%)	0.5000
Septic shock[b]	2 (0.5%)	0 (0.0%)	0.5000
Acute renal failure[b]	0 (0.0%)	0 (0.0%)	—
Progressive renal insufficiency[b]	2 (0.5%)	0 (0.0%)	0.5000
Cardiac arrest[b]	0 (0.0%)	0 (0.0%)	—
Unplanned intubation[b]	2 (0.5%)	1 (0.2%)	> 0.9999
Extended ventilator[b]	0 (0.0%)	1 (0.2%)	> 0.9999
Coma (> 24 h) [b]	0 (0.0%)	0 (0.0%)	—
CVA[b]	0 (0.0%)	0 (0.0%)	—
MI[b]	0 (0.0%)	0 (0.0%)	—
Pulmonary embolism[b]	0 (0.0%)	0 (0.0%)	—
Peripheral nerve injury[b]	0 (0.0%)	0 (0.0%)	—
Transfusion[b]	4 (1.0%)	2 (0.5%)	0.6875
VTE[b]	0 (0.0%)	0 (0.0%)	—
Converted approach[b]	0 (0.0%)	0 (0.0%)	—

[b]McNemar's test; *SSI*, surgical site infection; *UTI*, urinary tract infection; *CVA*, cerebrovascular accident; *MI*, myocardial infarction; *VTE*, venous thromboembolism

Table 3 Readmissions, reinterventions, reoperations, and emergency room visits

Variable	Preop opioid use (*N* = 403)	No preop opioid use (*N* = 403)	*p*-value
30-day readmissions[b]	38 (9.4%)	23 (5.7%)	0.0674
30-day reinterventions[b]	15 (3.7%)	7 (1.7%)	0.1338
30-day reoperations[b]	14 (3.5%)	6 (1.5%)	0.1153
Emergency room visits[b]	36 (8.9%)	29 (7.2%)	0.4426

[b]McNemar's test

Table 4 Change in BMI and %TWL

Variable	Preop opioid use Mean (SD)	No preop opioid use Mean (SD)	*p*-value
BMI change at year 1	13.6 (4.9)	14.1 (5.3)	0.216
BMI change at year 3	13.2 (6.1)	12.3 (5.7)	0.300
%TWL at year 1	29.5 (9.1)	30.1 (8.6)	0.274
%TWL at year 3	29.0 (11.5)	26.0 (10.5)	0.090

SD, standard deviation; *BMI*, body mass index; *%TWL*, percentage of total weight loss

overdose deaths in 2015 with opioid-related deaths projected to increase to 81,000 by 2025 [18]. Previous studies have demonstrated persistent opioid use in up to 9% of narcotic naïve bariatric surgery patients 1 year after surgery. Enhanced recovery programs have significantly impacted surgical outcomes in multiple disciplines such as colorectal, gynecologic, and thoracic surgery with benefits that include decreased length of stay, use of opioids, and overall hospital costs [19, 20]. When it comes to bariatric surgery, these programs vary widely among different institutions [12]. Brethauer et al. described the feasibility of these enhanced recovery programs in a multicenter study that consisted of over 18,000 patients mainly decreasing the extended length of stay and decreasing opioid use [21]. In our institution, the implementation of the program started in 2013 and included the use of multimodal, non-opioid analgesia, TAP block, early postoperative diet, and ambulation demonstrating improved perioperative outcomes [17].

The involvement of the anesthesiology team is a key component in the success of enhanced recovery programs. Some institutions have limited the use of opioids not only in the pre- and postoperative periods but also intraoperatively using opioid-free protocols [22–24]. Narcotics are frequent contributors to perioperative nausea and vomiting after bariatric surgery [1]. Nausea and vomiting can cause dehydration after bariatric surgery which is the most common reason for hospital readmissions in bariatric patients [21, 25]. Anesthesia-driven opioid-free approaches have had a significant impact in decreasing the incidence of postoperative nausea and vomiting in patients with obesity [22–24].

Despite the well-recognized benefits of perioperative narcotic reduction, few studies have evaluated the impact of bariatric surgery on chronic opioid requirements. Raebel et al. demonstrated in a multicenter retrospective study that 77% of patients who were chronic opioid users before surgery continued their use in the year following surgery [10]. The Longitudinal Assessment of Bariatric Surgery-2 (LABS-2) study demonstrated a decrease in opioid use 6 months after bariatric surgery, with a subsequent increase to higher than baseline levels at 7 years [9]. In another population-based study, 2.1% of patients with preoperative low-dose opioid consumption became high-dose opioid consumers after bariatric surgery [26]. Our study is one of the largest in the literature from a single institution evaluating the long-term opioid use after LRYGB with an enhanced recovery pathway in patients with chronic preoperative use versus those opioid naïve. The current study demonstrates a reduction in opioid requirements at 1 and 3 years after surgery in patients requiring preoperative narcotics. In the opioid naïve group, their use was a slightly higher opioid requirement after 1 and 3 years consistent with previous studies [9].

Guidelines for opioid prescription after bariatric surgery have been developed. Practices to decrease their use include prescribing the lowest dose needed for pain control and for the shortest duration, patient education about safe disposal of unused opioids, use of non-opioid alternatives, and early referrals to pain management specialists in those patients with chronic use [7]. At our institution, only patients who required opioids for pain control in the postoperative period were discharged home with oxycodone (5 mg, $n=5$) tablets. Those on chronic opioids were maintained on their preoperative regiment. Patients are educated about the appropriate disposal of unused opioids. They receive a phone call within 72 h of discharge and are encouraged to contact our staff first for any postoperative concerns other than 911 emergencies. This practice has resulted in decreased emergency room visits to levels that are lower than those reported in other studies [25].

In our cohort of patients, the rates of readmissions, reinterventions, and reoperations were higher in the OP, however, these did not reach a statistically significant difference. An increase in the rate of emergency room visits up to 30% following bariatric surgery has been previously described [25]. The most common primary complaints about these visits include abdominal pain, nausea, and/or vomiting [21, 25]. In this study, there was no statistical difference in the number of ER visits between the OP and NOP groups. These findings could be attributed to both the use of a multimodal regimen of analgesia and reduction of opioids as well as the close follow-up. We maintain constant communication between our practice and patients shortly after discharge, providing advice and guidance in the initial stages after surgery to avoid unnecessary ER visits.

There are several limitations to this project. As a retrospective study, the authors were unable to determine the indication for opioids in the preoperative period as well as the reasons why they continued opioids postoperatively. In a similar fashion, the continued use of opioids 3 years after surgery may or may not have been due to reasons related to the surgery itself. Osteoarthritis and musculoskeletal disorders coexist in many patients with obesity and may explain in part the use of opioids following surgery [27, 28]. Another limitation is the number of patients with the available information at the 3-year follow-up (48.8% in the OP and 46.4% in the NOP).

Conclusion

This study demonstrates that the majority of patients requiring preoperative opioids can be effectively weaned after bariatric surgery. The implementation of an enhanced recovery pathway for bariatric surgery, close follow-up, and involvement of a multidisciplinary team are of paramount importance to obtain these results. We believe the reduction of opioids prescribed in the perioperative period and thus a decrease in long-term opioids would have a significant impact on opioid diversion. The authors believe that an active program to decrease perioperative opioids have the potential to significantly reduce opioid-related deaths in the USA. Contrary to previous studies, preoperative opioid use was not associated with a significant increase in complication rates, readmissions, or emergency room visits.

Declarations

Ethics Approval and Consent to Participate For this type of study, formal consent is not required. Informed consent does not apply.

Conflict of Interest The authors declare no competing interests.

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