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# Multimodal Pain Control Reduces Narcotic Use after Outpatient Abdominoplasty: Retrospective Analysis in an Ambulatory Surgery Practice

Melissa S. Price, MS4*
Richard H. Fryer, MD†

**Background:** Despite dominating fewer headlines, the opioid epidemic continues to plague society. Surgeons have the responsibility to change their opioid prescribing habits while maintaining adequate patient comfort. This study examines the transition to a multimodal, perioperative protocol in an ambulatory surgery setting for abdominoplasty patients. We hypothesized that using multimodal analgesia could significantly reduce narcotic consumption.

**Methods:** The authors retrospectively compared one surgeon's consecutive abdominoplasty patients over 24 months. The control group received primarily narcotic medications to manage pain, and the treatment cohort was given a multimodal protocol for perioperative analgesia.

**Results:** Demographic data, surgical time, and postanesthesia care unit time between the groups were similar. Although the mean intravenous narcotic decreased in the operating room and postanesthesia care unit for the treatment group, it failed to achieve statistical significance. The treatment cohort was prescribed two-thirds less oral narcotic than the control (251 versus 787 mean morphine milligram equivalents $P < 0.001$). Ten patients in the treatment cohort used no oral narcotics compared to one in the control ($P = 0.002$), and only four narcotic refills were given in the treatment group compared to 36 in the control ($P < 0.001$), suggesting that the treatment group had better pain control despite taking fewer narcotics.

**Conclusions:** Optimally utilizing multimodal medications effectively reduces narcotic consumption while effectively managing postoperative pain from abdominoplasty in a private practice, ambulatory surgery setting. Surgeons must change their prescribing habits if we are going to make progress in the war against the opioid crisis. *(Plast Reconstr Surg Glob Open 2023; 11:e4777; doi: 10.1097/GOX.0000000000004777; Published online 23 January 2023.)*

## INTRODUCTION

Consistent with national statistics, 6%–9% of opioid naive body-contouring patients develop persistent narcotic use after their surgery.[1] In addition to the risk of persistent narcotic use, a significant number of ambulatory plastic surgery patients experience an opioid-related adverse event.[2] The urgency to reduce narcotic prescribing creates a quandary for surgeons; how can we use less opiates to treat postoperative pain without adversely affecting patient comfort and satisfaction? Despite advances in technology and pharmacology aimed at improving patient comfort, surgical patients recently reported a similar lack of adequate pain treatment[3] as they did a decade previously.[4] We find ourselves mired in an opioid epidemic with patients demanding adequate pain control on one hand and state legislators restricting

*From the *Spencer Fox Eccles School of Medicine, University of Utah, Salt Lake City, Utah; and †Division of Plastic and Reconstructive Surgery, Department of Surgery, University of Utah School of Medicine, Salt Lake City, Utah.*

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our ability to prescribe narcotics on the other, and the effects of the pandemic have made the situation even worse.[5,6]

Our narcotic prescribing patterns shoulder a significant portion of the blame for the opioid epidemic. Rose et al[7] showed that plastic surgeons tend to prescribe almost double the number of pills our patients actually use for outpatient procedures. The number of narcotic pills prescribed has the highest predictive value on the amount of narcotic the patient consumes.[8] Overdose in cosmetic patients accounts for 10% of all surgery-related mortalities behind pulmonary embolus (33%), unspecified (31%), and heart attack (12%).[9] Mathematical models suggest that controlling the opioid epidemic is impossible without more stringent control over our prescribing habits.[10] Extrapolating an assumption from that same mathematical model, approximately one in every 1000 body contouring patients dies from a narcotic overdose months or years after their surgery because they develop an opioid use disorder from their perioperative exposure to prescription pain pills.

Advancements in patient comfort while accomplishing a reduction in opiate use through use of multimodal methods have been documented for inpatient, reconstructive surgery patients.[11–15] Implementation of similar methods for ambulatory surgery is encouraged in the literature but results of implementing these strategies are much less commonly reported.[16–24] The purpose of this article is to present compelling evidence that it is possible to successfully transition away from largely opiate-based postoperative pain management to a multimodal perioperative regimen in ambulatory abdominoplasty patients without reducing patient comfort.

## Takeaways

**Question**: How can we further reduce opioid prescriptions in outpatient abdominoplasty patients?

**Findings**: We performed a retrospective chart review comparing two different methods for pain control in 80 consecutive outpatient abdominoplasty patients. The multimodal approach to perioperative pain management reduced the morphine milligram equivalents prescribed and led to fewer refills overall while providing better overall pain control.

**Meaning**: Multimodal perioperative pain control should be considered the standard of care for all outpatient cosmetic surgery cases, including abdominoplasty.

## PATIENTS AND METHODS

Institutional review board approval was obtained from the University of Utah Health Science Center (IRB no: 00130783) for a retrospective review of the senior author's surgical database. From October 2017 to September 2018, 42 patients underwent abdominoplasty by the senior author (R.H.F) at a single clinical location. From October 2018 to September 2019, 38 patients underwent abdominoplasty by the same surgeon at the identical location, using the newly implemented, multimodal approach to managing pain.

The only qualifying criterion for inclusion was that the patient underwent a full abdominoplasty (defined as plication of anterior rectus sheath), and no patients were excluded. We reviewed patient charts and created a database using morphine milligram equivalents (MMEs) to standardize the amount of narcotic each patient received.[25] There is some ambiguity converting IV fentanyl to oral MMEs for clinical equianalgesia, but we compared the operating room and recovery room [post-anesthesia care unit (PACU)] separately from the oral narcotics used as an outpatient so that should have no effect in our analysis. No changes in anesthesia delivery or recovery room guidelines were implemented regarding opiates; patients were administered IV narcotics based on the clinical judgment of the anesthesia provider or recovery room nurse.

The surgical technique for abdominoplasty remained constant during the retrospective review and was performed under general anesthesia. All abdominoplasties included a multilayered plication of the anterior rectus sheath, progressive tension sutures, and usually included liposuction of the flanks. Most patients underwent additional procedures concomitantly that most frequently included breast procedures. Patients who underwent belt or fleur de lis techniques were also regarded as having undergone additional procedures.

Medical histories were reviewed to determine whether the patient was opioid naive and to record any prescription medications that patients were taking. We collected demographic information and data relating to the surgical and recovery room times and intravenous MMEs, prescribed oral MMEs, number of refills, and whether the patient did not use any oral opiates postoperatively. Because this was a retrospective review, patients did not track their pain or nausea levels.

### Control Group

Medical management of the initial group included prescribing 40 Percocet 7.5/325 mg tablets (450 MMEs total). Patients were instructed to take the medication as needed, up to two tablets every 4 hours. Some patients required higher narcotic doses to achieve adequate pain control and, in those cases, either generic oxycodone or hydromorphone was prescribed and cautiously titrated to achieve adequate comfort, and refills of narcotics were given if requested. Promethazine was prescribed as an antiemetic. Nonopioid oral analgesics (cyclobenzaprine, celecoxib, and/or gabapentin) were not given to any of these patients preemptively but were selectively used postoperatively as needed to augment the pain control provided by the narcotic. Patients in this initial group were offered a Marcaine pump or liposomal bupivacaine for an additional fee to help improve their pain control, but only three patients opted to use these resources. All other patients most often cited expense as the reason why they chose not to use these local anesthesia delivery options. Patients in the treatment group were not given the option for a Marcaine pump or liposomal bupivacaine because all patients automatically received the liposomal bupivacaine.

**Treatment Group**

Initiation of the multimodal pain control protocol included the use of preoperative and postoperative multimodal medications (Table 1). All patients were instructed to place the scopolamine patch behind their ear the night before surgery and to take acetaminophen (500 mg), celecoxib 200 mg, and gabapentin 300 mg 2 hours before surgery with a small sip of water. If patients were not compliant with this combination of medications when they arrived at the surgery center, the appropriate medications were administered before surgery. Postoperatively, patients were given instruction how to select and use these medications to optimize their pain control (Fig. 1).

All patients in the multimodal group received subfascial field blocks with liposomal bupivacaine (20 ml) mixed with 0.25% Marcaine (up to a maximum of 50 ml) and diluted in 200 ml of normal saline. If liposuction was performed to the flanks in addition to the abdominoplasty, then 0.25% Marcaine (up to a maximum of 50 ml) was used in the tumescent fluid (instead of the typical lidocaine tumescent) and 200 ml of this Marcaine tumescence was saved to dilute the liposomal bupivacaine. In this situation, the total amount of Marcaine used for the field block of the anterior abdominal wall constituted 20% of the total free Marcaine dose that the patient received during the surgery. The maximum dose of free Marcaine (2.5 mg/kg) was not exceeded in any patient. Narcotic refills were given if requested.

A single patient in the control group had a minor wound healing complication at the inverted-T junction of the abdominoplasty incision (fleur de lis technique) that was treated for several weeks with Iodoform packing until completely healed. One patient in the multimodal group required reoperation for evacuation of a stable, supraumbilical hematoma 1 week after her initial surgery. We believe the hematoma was a random occurrence of a well-recognized complication of abdominoplasty and was not related to the subfascial field block or any component of the multimodal analgesia regimen. No other complications were identified in the two groups during the minimum 3-month follow-up. All patients in both groups were discharged from the recovery room and none were admitted to short stay or other recovery centers. All patients were treated on a purely outpatient basis.

We analyzed the outcomes of total MMEs given intravenously, and MMEs prescribed. We did not estimate partial

**Table 1. Medications Used by Each Cohort**

| Control | Multimodal Analgesia |
|---|---|
| Percocet 7.5/325 #40 (450 MMEs); 1–2 orally q 6 h prn | Oxycodone 5 mg #42 (315 MMEs); 0.5–2 tablets orally q 6 h prn |
| Cefadroxil 500 mg #28; 1 orally twice daily | Cefadroxil 500 mg #28; 1 orally twice daily |
| Promethazine 25 mg #30; 1 orally q 6 h prn | Ondansetron ODT 4 mg #15; 1 sublingually q 6 h prn |
| *Enoxaparin 40 mg #7; 1 subcutaneously daily | *Enoxaparin 40 mg #7; 1 subcutaneously daily |
| | *Celecoxib 200 mg #20; 1 orally twice daily |
| | *Gabapentin 300 mg #30; 1 orally three times daily prn |
| | *Scopolamine 1 mg patch: one behind ear before surgery |
| | *Acetaminophen 500 mg; 1 orally q 4 h |
| | Over the counter omeprazole or famotidine; follow package instructions |

*Administered before surgery.

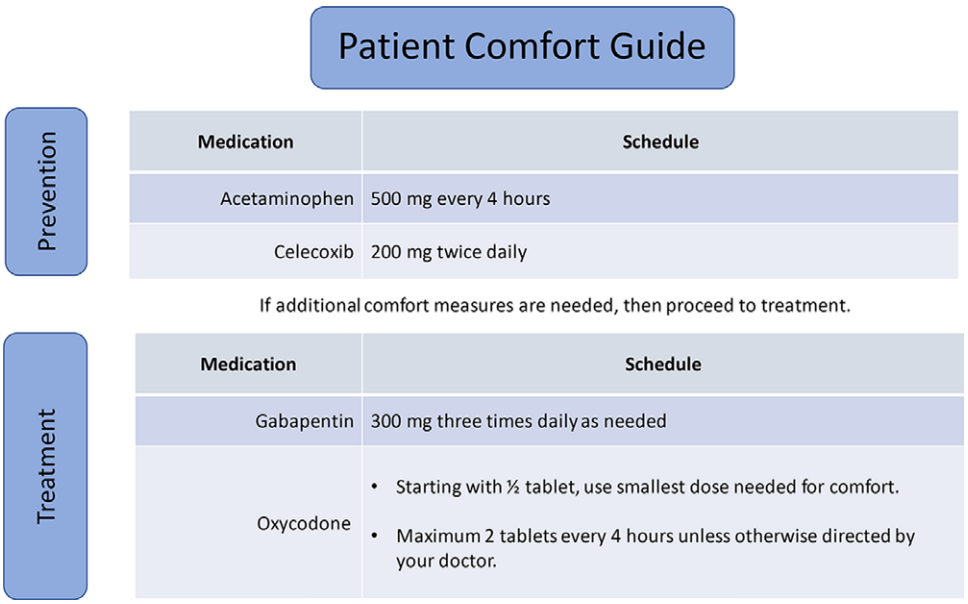


**Fig. 1.** Multimodal analgesia patient instructions.

prescription use, but rather assumed 100% usage of each prescription unless the patient stated specifically that they took none, in which case the MMEs were recorded as zero. Additional outcomes evaluated were the number of patients getting narcotic refills and patients who took no oral opiates during their recovery.

## STATISTICAL ANALYSIS

Demographic data were summarized and compared between the two treatment cohorts using independent samples *t* tests. Levene's test for equality of variance was used to check for equal variances between the two treatment cohorts for intravenous MMEs received in the operating room, intravenous MMEs received in recovery room, and MMEs prescribed postoperatively. Appropriate independent samples *t* tests were used to test for differences in the mean MMEs between the two treatment cohorts based on the results of Levene's tests. Fisher exact tests were used to test for differences between the two treatment cohorts in the number of refills written and the number of patients who received no oral narcotics. We used a Bonferroni corrected alpha value of $\alpha = 0.01$ to adjust for the multiple hypothesis tests conducted on all our outcome variables to decrease the possibility of a type I error. Analyses were done using Microsoft Excel and PSPP statistical analysis software.

## RESULTS

Eighty consecutive abdominoplasty patients were identified through retrospective review of the senior author's surgical database; 42 were evaluated as controls and 38 as the multimodal analgesia cohort. The cohorts were very similar in almost all categories (Table 2). Age was the only statistically significant demographic data that was different with mean age of the control 37 years versus 42 for treatment ($P = 0.002$). Although age heterogeneity was different between the two groups, age was not used as an inclusion criterion, and age was not used to guide subsequent treatment of the patients' perception of pain. Gender, BMI, naivete to narcotics, use of selective norepinephrine reuptake inhibitor (SNRI) or selective serotonin reuptake inhibitor (SSRIs), the number of additional surgical procedures performed simultaneously, operative time, and time to discharge from recovery room were insignificant in our analysis ($P > 0.01$).

Intravenous MMEs received in the operating room and in the recovery room were evaluated independently. Although the amount of intravenous narcotic received in the operating room (25.15 versus 22.78 mean MMEs; $P = 0.365$) and recovery room (2.83 versus 1.64 mean MMEs; $P = 0.104$) decreased in the multimodal analgesia group, neither achieved statistical significance (Table 3). After

**Table 2. Cohort Comparison**

| | Control | | Multimodal Analgesia | | *P* |
|---|---|---|---|---|---|
| Sex | | | | | |
| Female | 41 | 97.6% | 38 | 97.4% | 0.958 |
| Male | 1 | 2.4% | 1 | 2.6% | — |
| Age, y | | | | | |
| Mean age | 37.3 | | 42.6 | | 0.002 |
| ≤25 | 1 | 2.4% | 0 | 0.0% | — |
| 26–35 | 18 | 42.9% | 5 | 12.8% | 0.002 |
| 36–45 | 20 | 47.6% | 23 | 59.0% | 0.312 |
| 46–55 | 2 | 4.8% | 7 | 17.9% | 0.060 |
| >55 | 1 | 2.4% | 4 | 10.3% | 0.145 |
| Body mass index | | | | | |
| ≤20 | 4 | 9.5% | 2 | 5.1% | 0.457 |
| 21–25 | 25 | 59.5% | 20 | 51.3% | 0.462 |
| 26–30 | 13 | 31.0% | 16 | 41.0% | 0.351 |
| >30 | 0 | 0.0% | 1 | 2.6% | — |
| Opiate naive | | | | | |
| Yes | 42 | 100.0% | 38 | 97.4% | 0.302 |
| No | 0 | 0.0% | 1 | 2.6% | — |
| SSRI/antidepressant | | | | | |
| Yes | 8 | 19.0% | 9 | 23.1% | 0.661 |
| No | 34 | 81.0% | 30 | 76.9% | 0.661 |
| Procedure | | | | | |
| Abdominoplasty ± flank liposuction | 13 | 30.2% | 14 | 35.9% | 0.642 |
| Abdominoplasty plus breast procedure | 24 | 55.8% | 22 | 56.4% | 0.948 |
| Belt abdominoplasty | 4* | 9.3% | 0 | 0.0% | 0.488 |
| Fleur de lis abdominoplasty | 2* | 4.7% | 2 | 5.1% | 0.940 |
| Abdominoplasty plus rhinoplasty | 0 | 0.0% | 1 | 2.6% | 0.302 |
| Average time (h:min) | | | | | |
| Operating room | 5:41 | | 6:24 | | 0.082 |
| Recovery room | 1:27 | | 1:21 | | 0.442 |

*One case included both fleur de lis and belt abdominoplasties
SSRI, selective serotonin reuptake inhibitor.

**Table 3. Multimodal Analgesia Effect on Narcotic Usage**

| | Control | Multimodal Analgesia | *P* |
|---|---|---|---|
| Operating room intravenous narcotics | | | |
| Mean MME | 25.2 | 22.1 | 0.365 |
| Recovery room intravenous narcotics | | | |
| Mean MME | 2.6 | 1.4 | 0.104 |
| Outpatient oral narcotics | | | |
| Mean MME | 787.1 | 265.3 | <0.001 |
| Total number of narcotic refills | 36 | 4 | <0.001 |
| No narcotic consumed | 1 2.4% | 10 26.3% | 0.002 |

discharge to home, the mean oral MMEs decreased by two-thirds from 787.08 to 251.45 ($p < 0.001$). Likewise, the number of patients receiving refills declined dramatically ($p < 0.001$). Thirty of the 42 patients in the control group received a total of 36 refills while four of the 38 multimodal patients each received one refill. Our analysis of this outcome did not consider that the control group received 450 MMEs with their initial prescription compared to 315 for the multimodal arm, already a 30% reduction in baseline narcotic equivalents. Inclusion of this information could only increase the significance of our findings. The number of patients who did not use oral narcotics during their recovery increased from one (2%) to 10 (26%; $P = 0.002$). The three patients in the control group who elected for either Marcaine pumps or liposomal bupivacaine (but did not receive the other multimodal medications) showed no decrease in narcotic use; all three received a refill of their opiate prescription.

## DISCUSSION

Despite encouragement in the literature to adopt multimodal approaches for postoperative pain control in ambulatory aesthetic surgery, there are few reports of successful transition away from opiates.[19,24,26] These reports either included very few abdominoplasty cases (two control and three treatment patients in Bartlett et al), indicated that the reduction in opiates applied only to the "breast" subcategory (Nguyen et al), or only studied breast surgery (Barker et al). This article is the first to report successful transition away from opiates in outpatient abdominoplasty.

Although we did not track pain scores in this retrospective study, we analyzed the number of refill requests and the number of people not consuming any oral narcotics as indirect measures of patient comfort. These indirect measurements both indicated statistically meaningful improvement in pain control. Despite using significantly less narcotics, the patients appeared to be considerably more comfortable.

We did not track the actual MMEs consumed but rather assumed 100% consumption of each prescription unless the patient indicated that no pills were used. Many patients in the multimodal arm indicated they only used "a few" of the narcotic pills; despite these statements, we considered their consumption as 100%. Interestingly, the control group was prescribed 40 pills, and the treatment group received 42. Since the total number of pills prescribed has the strongest association with the number of pills patients reported using according to Howard et al, the treatment group should have been inclined to use more narcotics, but they were not.[8]

These results indicating a decrease in the opiates necessary to maintain comfort simply underscore the necessity for changes in our prescribing patterns because surgeons in the United States overprescribe.[27,28] The patients in our study receiving multimodal analgesia were more comfortable and consumed far less opiates by our observation, but they were given significantly more narcotic pills in their initial prescription than they ultimately required. Here, we were successful in managing one battle in the war against opiates (reducing patients' dependence on narcotics) but at the same time managed to worsen the opioid predicament in a different way (more unused pills available for diversion).[29] If we are going to curb the opioid epidemic, we must change both how our patients use narcotics and the way we prescribe them.

A major tenet of the multimodal approach is using medications from several different classes to minimize exposure to harmful side effects. One can assume that if our treatment group consumed less narcotics, then they experienced fewer complications related to opiate-induced nausea, constipation, pruritis, and others. The safety and efficacy of combining these elements of this multimodal strategy have, however, been well documented in other reports.[15,22,23,30–38]

Some may refer to this multimodal strategy with the historically pejorative term "polypharmacy" or claim that it is too confusing for patients to follow accurately. Perhaps, we should reconsider our bias against polypharmacy in specific situations—especially those where it is not intended for long-term management of a condition, but rather short-term treatment of acute pain. We also need to give our patients and their caregivers some credit for being able to follow written instructions. If the instructions are not followed, then perchance it may be our inability to describe our intentions accurately and simply enough.

Cost must also be considered when analyzing any treatment recommendations to ensure the benefits outweigh the cost. One may argue on face value that preventing a single patient from developing opioid use disorder or avoiding a single narcotic overdose is worth the increased cost. One must also weigh the economic burden to society of $1 trillion/year that is a direct result of our failure to curb or resolve this epidemic.[39,40] The potential increased cost to the physician is isolated to the cost of liposomal bupivacaine and the operating room time to administer it. A recent web search revealed the cost of a 20 ml vial to be $354.53 and I estimate the time to administer to be significantly less than 5 minutes.[41] The increased cost to the patient for the medications contained in the new protocol is nominal because even without insurance, the total cost of all prescriptions in our market is usually less than $150.

The timing of pharmacological intervention continues to generate some controversy with mixed reports regarding

efficacy of preoperative dosing.[26,42–45] Contrarians to preoperative administration of multimodal medications cite only lack of efficacy in their findings and do not claim increased complications or risk; therefore, we elected to administer the multimodal medications preoperatively. There is a general consensus that postoperative use of these multimodal analgesics is beneficial.[14,18,19,24,26,31,32,35,44,46–49]

While the mean intravenous MMEs in the operating room and recovery room both decreased in the multimodal group, and the recovery room time was shortened by 7%, none of them achieved significance ($P = 0.365$, $P = 0.104$, and $P = 0.442$, respectively). Failure to achieve significance in our review could be caused in part by the healthcare providers' usual methods and procedures in dosing narcotics. Another potential confounding factor for the insignificant shortening of recovery time in our review is that the criteria for discharge to home are different than those for admission to the hospital. The documented decrease in operating room and recovery room opiates and the shortening of recovery time are hard to dispute in many inpatient, reconstructive procedures.[11–15] Further prospective analysis is necessary to more accurately document this in large, outpatient procedures.

It is important to note that all patients in our retrospective review received narcotics intravenously in the operating room even if they chose not to use any oral opiates postoperatively. This may seem insignificant, but there is a chance that by routinely administering narcotics as an essential component of general anesthesia in the absence of objective evidence that the patient is aware of painful stimulus, we could be increasing our patients' perception of pain once they become conscious. This is known as opioid-induced hyperalgesia and, although a potentially controversial subject, warrants further investigation.[50–56]

We are gaining a better understanding of the physiology, and pathophysiology, of pain and recognize that the better and earlier that we intervene in managing acute pain decreases the incidence of chronic pain.[57,58] More investigation is necessary to further determine how much more we can decrease our dependence on narcotics in ambulatory plastic surgery while maintaining excellent patient comfort. Well-designed, prospective, controlled studies need to be performed to better document further attempts at decreasing our reliance upon opiates for postoperative pain management.

## CONCLUSIONS

This study evaluated the effectiveness of transitioning away from largely opiate-dependent postoperative recovery regimens toward a multimodal perioperative approach in outpatient abdominoplasty patients. Significantly less opioids are necessary when optimizing nonnarcotic medications, and some of our outcomes point toward even higher patient comfort levels. When patients have only one narcotic pain pill to manage their pain, they are likely to take that pill when their subjective pain score is a two or a nine. When patients have multiple different pills to treat their pain, a multimodal analgesia regimen allows sufficient relief of pain using different medications, and narcotics are used only for breakthrough pain. Future prospective evaluations of different multimodal combinations are necessary to further optimize narcotic-sparing protocols in outpatient plastic surgery.

***Richard H. Fryer, MD***
Division of Plastic and Reconstructive Surgery
Department of Surgery
University of Utah School of Medicine
11762 S. State Street 220
Draper, UT 84020
E-mail: fryermd@hotmail.com

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