The Role of Peripheral Nerve Catheters in Buprenorphine/Naloxone Management in Elective Orthopedic Surgery: A Case Report

Michael N. Singleton, MD · Jo A. Hannafin, MD · Gregory A. Liguori, MD · Ellen M. Soffin, MD, PhD

Received: 21 August 2018/Accepted: 15 October 2018/Published online: 9 November 2018
© Hospital for Special Surgery 2018

Keyword regional anesthesia · opioid epidemic · substance abuse disorder · peripheral nerve catheter · peripheral nerve block · orthopedic surgery · buprenorphine · naloxone · Suboxone

Introduction

Buprenorphine/naloxone (sold as Suboxone, among other brands) is a highly effective treatment for opioid dependence [8]. As interventions to curb the opioid crisis become more prevalent, we anticipate the number of patients on buprenorphine/naloxone presenting for elective surgery to rise.

Buprenorphine/naloxone therapy requires special consideration in the peri-operative period. Balancing the risks of withdrawal and relapse with the need for analgesia is crucial to good outcomes after a painful procedure. There are two main strategies for acute pain management in patients on buprenorphine/naloxone [1–3, 6, 12, 13, 15]. One option is to stop therapy temporarily approximately 72 h prior to surgery to allow drug elimination and facilitate post-operative opioid efficacy. A second option is to continue buprenorphine/naloxone therapy throughout the episode of surgical care and to use short-acting opioid receptor agonists to treat acute pain. Unfortunately, each strategy has significant disadvantages.

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s11420-018-9648-y>) contains supplementary material, which is available to authorized users.

M. N. Singleton, MD · G. A. Liguori, MD ·
E. M. Soffin, MD, PhD (✉)
Department of Anesthesiology, Critical Care and Pain Management,
Hospital for Special Surgery,
535 East 70th Street,
New York, NY 10021, USA
e-mail: soffine@hss.edu

J. A. Hannafin, MD
Department of Sports Medicine, Hospital for Special Surgery,
New York, NY, USA

Discontinuing buprenorphine/naloxone therapy before surgery confers a high risk of opioid withdrawal and relapse [6, 12]. Additionally, stopping therapy with the goal of treating acute pain is not always associated with better pain control [5]. Conversely, patients who continue on buprenorphine/naloxone often require higher-than-usual doses of opioids to control acute pain [4, 5, 15]. In addition to suboptimal analgesia, the high opioid requirement increases the risk of opioid-related adverse effects, particularly respiratory depression. Indeed, recommendations for extended monitoring have been made on the basis of patient safety (up to 72 h in one case report) [6]. To date, there are no reports demonstrating whether and how buprenorphine/naloxone can be continued through the peri-operative period, while achieving optimal analgesia and minimizing patient risk.

Clinical and institutional guidelines for surgical patients on buprenorphine/naloxone typically include a recommendation to maximize regional anesthesia and analgesia [6, 9, 13]. Despite this, no publications have described the role of peripheral nerve block (PNB) or peripheral nerve catheter (PNC) in surgical patients maintained on buprenorphine/naloxone therapy.

Here, we report the first such case. We made use of a PNC and provided multidisciplinary care to allow uninterrupted buprenorphine/naloxone therapy in a patient undergoing a painful orthopedic procedure: arthroscopic repair of a large rotator cuff tear.

Case Presentation

We received the patient's written consent and institutional review board approval for publication of this case report.

A 42-year-old man was referred to our hospital for arthroscopic shoulder surgery and repair of a large rotator cuff tear. He described a history of substance-use disorder (SUD) of approximately 7 years' duration. He had sustained a work-related wrist injury leading to surgical intervention and prolonged post-operative opioid use; he developed an opioid-use disorder and eventually achieved remission after inpatient treatment. After a subsequent

shoulder injury at work, he relapsed and started to use illicitly obtained opioid medications. Two years ago, he sought treatment with an addiction specialist and started buprenorphine/naloxone therapy. On this therapy, he has remained abstinent from opioids and other controlled substances. He volunteered that he drinks alcohol weekly to avoid opioid use.

Consistent with our institution's practice [13], the surgeon referred this patient to our chronic pain, anesthesiology, internal medicine, and social work services for review. This team collaborated closely with the patient's addiction specialist to formulate a plan of care. The patient did not want to either interrupt buprenorphine/naloxone therapy or take additional opioids. The addiction specialist agreed and deemed the patient at extremely high risk of relapse if (1) buprenorphine/naloxone was withheld or (2) additional exogenous opioids were administered. The patient was counseled on the risks of alcohol use combined with buprenorphine/naloxone. Urinalysis results were consistent with his prescribed medications and were negative for other controlled substances. Buprenorphine/naloxone therapy was continued per the home regimen (8/2 mg, sublingual, twice daily).

The patient was hospitalized on the day of surgery. In the operating room, non-opioid conscious sedation (propofol 10- to 20-mg bolus; ketamine 10-mg bolus, titrated to effect) was provided. Using a 17-gauge Weiss introducer needle, an ultrasound-guided interscalene nerve block (1.5% mepivacaine 20 mL; 0.5% bupivacaine 15 mL) was performed, and a continuous PNC was placed at the same site. Post-operatively, the patient reported no pain, and motor and sensory examinations were consistent with an effective interscalene PNB/PNC. Ropivacaine (0.2%) was infused continuously via the PNC (8 mL/h). Non-opioid analgesics were administered, including acetaminophen (1 g every 6 h) and non-steroidal inflammatory drugs (toradol 30 mg every 6 h for 24 h, followed by naproxen 500 mg daily). Buprenorphine/naloxone was continued, with no omitted doses.

During post-operative days 1 and 2, the patient reported intermittent pain in the posterior shoulder but ongoing numbness (covering the C4 to C8 dermatomes) and inability to move the shoulder or elbow. A lidocaine patch (5%) and gabapentin (300 mg three times daily) were added to his analgesic regimen. On post-operative day 3 he reported symptoms consistent with withdrawal and craving for opioids. Physical findings were likewise concerning for alcohol withdrawal. Oral clonidine (0.1 mg twice daily) was given for alcohol withdrawal, and buprenorphine/naloxone dosing was increased to every 8 h for opioid craving, with improvement in clinical state.

On post-operative day 3, the PNC was stopped to test function and pain control. By post-operative day 4, strength and sensation in the extremity had returned to baseline, and the patient reported consistently acceptable pain scores on the analgesic regimen. He went home on this regimen, and his care was transitioned to the community. We provided a summary of peri-operative events to the patient's addiction specialist as part of his follow-up management.

At post-operative day 42, the patient returned for surgical follow-up. The incision was well-healed, he displayed good range of motion at the shoulder, and he was successfully engaged in outpatient physical therapy. Importantly, he denied any opioid cravings or relapse and remained compliant on buprenorphine/naloxone therapy.

Discussion

Buprenorphine is one of several agents approved for the treatment of opioid dependence and addiction [9, 13]. A sublingual preparation combining buprenorphine with naloxone was developed to reduce the misuse potential of buprenorphine. Buprenorphine is a partial agonist at the μ -opioid receptor and a full κ -opioid receptor antagonist. The antagonist properties prevent receptor binding by other opioids; consequently, acute pain can be extraordinarily difficult to control [2]. The partial agonism creates a ceiling for the euphoria associated with opioid misuse—and also caps the drug's analgesic effect [8].

As predicted by the pharmacology, the main drawback of continuation of buprenorphine/naloxone therapy is uncontrolled post-operative pain. On the other hand, temporarily holding therapy is associated with relapse and withdrawal—a risk that is further elevated when buprenorphine is rapidly tapered (under 3 days), pain is poorly controlled, and/or opioid therapy is required in the peri-operative period [12].

Thus far, the evidence for managing buprenorphine/naloxone therapy in surgical patients is based on case reports, cohort studies, and institutional experience [6, 9, 13]. Nonetheless, a set of evidence-based practice guidelines for the peri-operative management of these patients has recently been published [6]. Summary recommendations are stratified by the urgency of the surgery and the expected pain burden. The recommendation in advance of orthopedic procedures is to hold buprenorphine/naloxone for 3 to 5 days prior to surgery, maximize non-opioid analgesics, and consider regional anesthesia/analgesia.

These recommendations are reasonable in centers without developed regional anesthesia and pain management services. However, we suggest that where local expertise and the nature of the surgery permit, that consideration be given to continuing buprenorphine/naloxone and using opioid-free multimodal agents, featuring PNB/PNC. As our case illustrates, successful PNB/PNC may be sufficient to provide effective analgesia so that maintenance therapy need not be interrupted. In addition to superior post-operative pain control, this strategy may minimize the risk of relapse, withdrawal, and potential opioid-related adverse effects.

It is important to emphasize that where these resources are unavailable, this strategy will not be applicable. All members of the care team were aware and understood that if the PNB/PNC failed, pain would be difficult to treat, high-dose opioids would be required, and the patient would likely require extended monitoring. We were also prepared to repeat the interscalene nerve block and catheter in the event of failure. The patient was informed of these potential risks and agreed to the care plan.

We believe a key factor in the success of this case was ongoing multidisciplinary review. Additionally, formulation and implementation of the care plan relied on the perspectives of the patient and his addiction specialist. Earlier reports have emphasized the importance of a multidisciplinary approach to peri-operative care for patients taking buprenorphine/naloxone [5, 6]. Effective communication among providers has also been linked to successful transition between community and hospital care [7, 10]. A pain management model incorporating expertise from anesthesiology, surgery, nursing, and social work can be effective in improving pain outcomes and lowering opioid

consumption in patients on chronic opioid therapy [7, 10]. Such models have yet to be applied to surgical patients on buprenorphine/naloxone, but our case demonstrates that they may be beneficial.

This case also underscores the importance of identifying other SUDs. The patient was counseled pre-operatively on the hazards of concurrent alcohol and buprenorphine/naloxone use. Although he admitted alcohol use, he may have under-reported his consumption, which led to withdrawal at post-operative day 3. The prevalence of alcohol use disorder has recently been reported to be significantly higher in patients who also have opioid use disorder [16], and co-existing pain and SUD each make the other more difficult to treat [11, 16].

There are several drawbacks to our management of this patient. Chief among them is the considerable resources associated with an extended hospitalization for what is typically an outpatient procedure. Although our hospital has advanced regional anesthesia and analgesia services, we lack an outpatient PNC program [14]. An outpatient catheter service becomes essential to containing the costs of care as more patients present for elective surgery while taking buprenorphine/naloxone. A second contributor to the extended hospitalization was the patient's concurrent SUD and subsequent alcohol withdrawal. His pre-operative alcohol consumption implied that he was not a good candidate for buprenorphine/naloxone therapy and that he had substituted one dependence for another. An alternative would have been collaborating with the patient's addiction specialist pre-operatively to ensure treatment of alcohol-use disorder and abstinence prior to admission for the rotator cuff repair.

In summary, this case suggests a strategy that may permit uninterrupted buprenorphine/naloxone use and provide adequate analgesia for painful surgery. Careful pre-operative planning, close communication among members of a multidisciplinary care team, and the appropriate use of regional anesthesia and analgesia may control peri-operative pain while minimizing the risk of relapse under certain conditions.

Compliance with Ethical Standards

Conflict of Interest: Michael N. Singleton, MD, Jo A. Hannafin, MD, Gregory A. Liguori, MD, and Ellen M. Soffin, MD, PhD, declare that they have no conflicts of interest.

Human/Animal Rights: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2013.

Informed Consent: Informed consent was obtained from the patient included in this study.

Required Author Forms: Disclosure forms provided by the authors are available with the online version of this article.

References

1. Bryson EO. The perioperative management of patients maintained on medications used to manage opioid addiction. *Curr Opin Anaesthesiol.* 2014;27:359–364.
2. Chen KY, Chen L, Mao J. Buprenorphine/naloxone therapy in pain management. *Anesthesiology.* 2014;120:1262–1274.
3. Childers JW, Arnold RM. Treatment of pain in patients taking buprenorphine for opioid addiction. *J Palliat Med.* 2012;15:613–614.
4. Hansen LE, Stone GL, Matson CA, et al. Total joint arthroplasty in patients taking methadone or buprenorphine/naloxone preoperatively for prior heroin addiction: a prospective matched cohort study. *J Arthroplasty.* 2016;31:1698–1701.
5. Israel JS, Poore SO. The clinical conundrum of perioperative pain management in patients with opioid dependence: lessons from two cases. *Plast Reconstr Surg.* 2013;131:657e–658e.
6. Jonan AB, Kaye AD, Urman RD. Buprenorphine formulations: clinical best practice strategies recommendations for perioperative management of patients undergoing surgical or interventional pain procedures. *Pain Physician.* 2018;21(1):E1–E12.
7. Katz, J, Weinrib, A, Fashler, SR, et al. The Toronto General Hospital transitional pain service: development and implementation of a multidisciplinary program to prevent chronic postsurgical pain. *J Pain Res.* 2015;8:695–702.
8. Orman JS, Keating GM. Buprenorphine/naloxone: A review of its use in the treatment of opioid dependence. *Drugs.* 2009;69:577–607.
9. Perioperative management of buprenorphine (buprenorphine/naloxone/subutex). Available from www.bwhpikenotes.org/policies/Pharmacy/Drug_Administration/DAG/BuprenorphineGuide.pdf.
10. Philips BD, Liu SS, Wukovits B, et al. Creation of a novel recuperative pain medicine service to optimize postoperative analgesia and enhance patient satisfaction. *HSS J.* 2010;6(1):61–65.
11. Savage, SR, Kirsh KL, Passik S.D. Challenges in using opioids to treat pain in persons with substance use disorders. *Addict Sci Clin Pract.* 2008 4(2):4–25.
12. Sen S, Arulkumar S, Cornett EM, et al. New pain management options for the surgical patient on methadone and buprenorphine. *Curr Pain Headache Rep.* 2016;20:16.
13. Soffin EM, Waldman SA, Stack RJ, et al. An evidence-based approach to the prescription opioid epidemic in orthopedic surgery. *Anesth Analg.* 2017;125(5):1704–1713.
14. Soffin EM, YaDeau JT. Peripheral nerve catheters: ready for a central role? *Anesth Analg.* 2017;124(1):4–6.
15. Wasson M, Beirne OR. Buprenorphine therapy: an increasing challenge in oral and maxillofacial surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2013;116:142–146.
16. Witkiewitz K, Vowles KE. Alcohol and opioid use, co-use and chronic pain in the context of the opioid epidemic: a critical review. *Alcohol Clin Exp Res.* 2018;42(3):478–488.