CLINICAL CASE REPORTS

Clinical Case Reports Journal

ISSN: 2767-0007

Enhanced Recovery after Surgery and Regional Anesthesia for the Morbidly Obese

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Article Type: Case Report

Compiled date: December 29, 2021

Volume: 2

Issue: 5

Journal Name: Clinical Case Reports Journal

Publisher: Infact Publications LLC

Journal Short Name: Clin Case Rep J

Article ID: INF1000123

Keywords: Morbidly obese; ERAS; Regional anesthesia for obese; Opioid-sparing anesthesia

Cite this article: Tune B, Zhao S. Enhanced recovery after surgery and regional anesthesia for the morbidly obese. Clin Case Rep J. 2021;2(5):1–4.

Abstract

The rising rate of the morbidly obese population has created a need for intraoperative anesthetic management to be adjusted according to anatomic and physiological changes. In this case study, the goal is to explore and detail the beneficial effects of utilizing a combination of regional anesthesia and Enhanced Recovery After Anesthesia (ERAS) techniques to improve outcomes and decrease anesthesia-related morbidity and mortality.

Introduction

In the United States, treating obesity-related conditions is estimated to cost more than 147 billion [1]. Since 2000, the population of the morbidly obese has increased about 11.9%, and many health-related problems as a result of being obese now affect more than 2 billion people worldwide [1,2]. Since the outbreak of the COVID-19 virus, there is evidence that obesity rates have worsened due to the quarantine mandates and social distancing precautions, mental and psychological strain [3]. Obese individuals who contract the virus are also subject to a higher mortality rate due to comorbidities associated with obesity, such as decreased pulmonary compliance and respiratory reserve, hypertension and ischemic heart disease, altered pharmacokinetics, diabetes, and metabolic effects anesthesia conduction [4]. Therefore, techniques that generally work well for a normal-weight patient may be inappropriate and even unsafe for an obese individual [5].

One of the ways to combat these complications is the usage of Enhanced Recovery After Surgery (ERAS) protocols. ERAS offers this patient population a variety of non-opioid options for postoperative pain management and decreased risk of complications related to opioid consumption [6]. In addition, when coupled with Regional Anesthesia (RA), ERAS protocols offer many advantages to patients to include, but not limited to: little to no airway manipulation, limited or reduced need for general anesthetic drugs, limited to no cardiorespiratory depression, effective and high-quality postsurgical analgesia without the risk of opioid-related complications, decreased post-anesthesia care unit time, decreased duration of hospital stay, and improved patient satisfaction [6–8]. Although obesity can potentially make regional anesthesia difficult due to altered anatomical landmarks, the use of ultrasound has increased the success rate of such procedures with tremendous positive results in conjunction with an ERAS protocol [8]. This case study aims to explore those options that cater to this population. Further studies should continue to explore different options and provide for a standardized approach in taking care of this patient population.

Case Presentation

A 38-year-old, with a 147 kg female scheduled for an umbilical hernia repair, presented to a community hospital for outpatient surgery. The patient's past medical history includes positive diagnosis and treatment for hypertension, hyperlipidemia, diabetes, obstructive sleep apnea, gastroesophageal reflux disease, and an elevated BMI > 45. General anesthesia via endotracheal tube was discussed with the patient with a possible nerve block, and consent was obtained. Once the patient was in the operating room, the standard of care monitoring included noninvasive blood pressure, three lead electrocardiograms, and pulse oximetry. The patient was properly denitrogenated for three minutes prior to the induction of general anesthesia. Next, 100 mcg of Fentanyl, 100 mg of Lidocaine, 300 mg of Propofol, and 50 mg of Rocuronium were administered utilizing a rapid sequence induction technique. Direct laryngoscopy ensued, and a 7.5 endotracheal tube was passed through the vocal cords and inflated to proper manometer pressures. During rapid sequence intubation, patient oxygen saturation declined quickly to 89% but recovered back to baseline shortly after intubation and mechanical ventilation to 99%. General anesthesia was maintained with Sevoflurane at 1.8% to 2% end-tidal concentration. In addition, the patient received one gram of intravenous Acetaminophen and a weight-based dose of antibiotics preoperatively. The total time duration of general anesthesia for surgery was 98 minutes.

Once the surgery was completed, neuromuscular blockade was successfully reversed, and the patient was returned to spontaneous breathing. Emergence from general anesthesia occurred without incidence, and the patient was carefully extubated and transported to the post-anesthesia recovery area on 2 L/min of oxygen and a simple nasal cannula. Ten minutes into the recovery phase, the patient was admitted to 10/10 pain on a numeric rating scale. The patient described the pain to be dull, overall soreness and cramping. The patient received 30 mg of Ketorolac, another 100 mcg of Fentanyl IV, and 50 mg of Meperidine over a twenty-five-minute period in recovery. The patient was evaluated 20 minutes afterward and, at this point, would have intermittent obstructive and hypoxic episodes, yet still complained of pain. It was determined that more opioids would not be ideal for this patient, and a discussion with the patient about the option of a nerve block occurred. The patient's permission to perform a rescue QL block was received, and the patient was positioned in the left lateral position. A Sonosite SII ultrasound with a curvilinear probe was then utilized to scan the patient's truncal anatomy. The site was prepped in a sterile fashion with a chlorhexidine surgical prep. Sterile gloves were donned, and a sterile sheath was placed over the transducer probe.

The three layers of the abdominal wall muscles were identified. The transversus abdominis was then traced more posteriorly until the transversus aponeurosis was apparent. The peritoneum curves away from the muscle at this region and the QL muscle can be visualized. A 120 cm 21 g Pajunk echogenic needle traversed the muscle layers to reach the posterior QL muscle for a QL2 block. 15 ml of 0.5% Ropivacaine and 10 ml of normal saline was injected in 5 ml increments, aspirating every 5 ml until all 25 ml was delivered. The same process was repeated on the opposite side. Within 15 minutes, the patient's pain had become much more tolerable at 4/10 on the pain intensity scale, and no further analgesia was required. At the 24-hour mark, the patient received two doses of Ketorolac 30 mg and one dose of Acetaminophen 1000 mg by mouth (PO). No additional opioids were given since the time of the rescue QL block was initiated, totaling 200 mcg of Fentanyl and 50 mg of Meperidine for the entire procedure, and the postoperative 24 hours to follow.

Discussion

In 2015, the World Health Organization (WHO) announced that 2.3 billion people in the world would be overweight, and 800 million would be classified as obese [2]. As the prevalence of obesity increases worldwide, the number of obese surgical patients requiring anesthesia will also increase. Morbid obesity affects multiple vital organ systems requiring the anesthesia provider to be prepared to handle several challenges. These include a more extensive preoperative evaluation of the cardiac, respiratory, metabolic, pharmacokinetics or pharmacodynamics of drugs, and airway management [4,8,9]. In addition, traditional drugs innately possess sedative effects, which used in the intraoperative or postoperative period can promote obstruction of the upper airway, leading to postoperative hypoxemia [9,10]. These complications then might lead to severe respiratory decompensation requiring reintubation in PACU, prolonged wakeups, and other considerations that may potentiate obesity hypoventilation syndrome [5,6,8–12].

Regional anesthesia, paired with an opioid-sparing or opioid-free anesthetic technique, has the potential to avoid and minimize undesirable outcomes associated with morbid obesity [8,10,11,13]. The fundamental principle of anesthesia for obese patients is to use the shortest acting, least fat-soluble agents to ensure fast recovery to safe levels of alertness and mobility [10]. Since ERAS protocols are designed to help the patient achieve early recovery after surgery, it appears that the practice of ERAS protocols aligns with the goals of taking care of the patient population who are morbidly obese as well. The addition of a regional anesthetic ensures that postoperative pain in these patients remains minimal and manageable with the proliferative use of local anesthetics. The long-acting local anesthetic is injected near a specific nerve or nerve bundles to block any pain sensations from a specific area. These regional nerve blocks generally have a longer duration than local anesthesia infiltration alone [8,13]. Ideally, the morbidly obese patient will benefit from a combination of regional and preemptive analgesics throughout the perioperative period [8–11].

Multimodal analgesia strategies may include non-opioid analgesics, such as intravenous acetaminophen, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), ketamine, or other N-Methyl-D-Aspartate (NMDA) agonists such as magnesium sulfate, α-2 agonists (clonidine, dexmedetomidine), and local or regional anesthesia [5,6,8–13]. Strategies for ERAS and RA should be considered at the beginning of the preoperative period to anticipate the patient's needs better and implement better preventative measures.

Recommendations for Practice: To fully prepare the morbidly obese patient for any type of general anesthetic, it is advised to take certain prophylactic measures right from the beginning of the perioperative period. Non-opioid prophylaxis for pain in the preoperative area may include but are not limited to Gabapentin 600 mg or Pregabalin 300 mg, and Acetaminophen 1 gm by mouth (PO) [4,6,8,10,11,14]. Intraoperative management may include: Toradol 30 mg IV, Ketamine 0.5 mg/kg, Methocarbamol 500 mg–1 gm IV infusion (monitor for hypotension), Lidocaine 1 mg/kg –2 mg/kg bolus followed by an infusion of 0.5 mg/kg/hr–3.0 mg/kg/hr, Magnesium Sulfate 30 mg/kg infusion over 30 mins and 6 mg/kg/hr until the end of the surgery are also very good adjuncts if Methocarbamol is unavailable [6–9]. At this stage, the inclusion of RA is appropriate and encouraged to help minimize sympathetic response to surgical stimulation followed by the prolonged analgesia that RA can provide [8,11,13,15–17,18]. In the postoperative period, NSAIDs and other non-opioid analgesics should be considered first before any opioids. RA may also be recommended as rescue analgesia if the pain cannot be controlled with traditional opioids and the risk of complications increases.

It is apparent that the addition of a regional block is one of the more effective analgesic methods for this population; therefore, a nerve block that is appropriate for the surgical intervention should be evaluated and determined by the anesthesia provider. However, certain RA could be more difficult to perform because of patient habitus than others. In this case, the provider can successfully perform the Quadratus Lumborum (QL) block, which in any of its three variations is proven to be more effective in reducing pain scores than the TAP block [15]. However, the QL might be limited due to ultrasound capabilities and provider skills. In this case, the TAP block might present as the overall easier solution, despite it lacking the efficacy of the QL block [15,16]. Also, it is important to keep in mind where analgesic coverage is required. A TAP block generally covers pain more effectively from T10–12, while the QL block more effectively covers pain from T7–T12 [15]. These blocks can ideally be performed in the intraoperative period. However, they may also be utilized in the postoperative period as non-opioid rescue analgesia. Therefore, it is necessary to consider all of the above mentioned to make the best clinical decision for these patients.

With this case report, a RA should have been strongly considered as the first-choice for improved analgesia and patient comfort rather than a postoperative opioid, allowing the avoidance of intermittent respiratory obstruction episodes. Although TAP blocks are generally considered better for incisional pain and much easier to perform in the obese population, the anesthesia provider chose a QL block over the TAP because of its superior visceral analgesic coverage [15]. In addition, the QL block has demonstrated a wider dermatome coverage from T7–T12 while the TAP covers T10–T12 [15]. Lastly since the patient stated overall soreness, cramping, and dull pain, it was proposed that the QL block be a better candidate for visceral pain relief rather than the TAP block [14,15]. This patient did not receive a large number of opioids. However, performing a QL or TAP block preoperatively or at the start of the procedure likely would have greatly decreased or eliminated the patient's initial pain response in the postoperative care unit.

Conclusion

In this case report, the use of RA dramatically improved analgesia without compromising respiratory status. With the rising population of morbid obesity, the utilization of RA in combination with non-opioid analgesics should be strongly considered in anesthesia plans of care as they potentially could help decrease respiratory-related complications in the postoperative recovery, secondary to opioid related respiratory depression. This case report was an example of how ERAS coupled with RA is a potential adjunct that should be explored more diligently in future studies to promote early recovery, reduce pain, enhance mobility, and maintain preoperative physiological function for this population. In addition, further research should focus on more streamlined and standardized practices to help decrease intraoperative respiratory issues and proper analgesic management at each stage of the perioperative period.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Informed consent was obtained for this publication.

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