Opioid-Free Epidural-Free Anesthesia for Open Hepatectomy: A Case Report

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Opioid-free perioperative approaches hold promise to reduce opioid use after surgery and their associated side effects. Here, we report the perioperative analgesic plan of a patient who requested opioid-free care for an open partial hepatectomy. Opioid-free anesthesia care for abdominal surgery is usually dependent on epidural analgesia. However, as in this case, placing an epidural is not always an option due to contraindications such as infection, coagulopathy, or patient refusal. Our multimodal management plan provided an alternative opioid-free, epidural-free perioperative strategy that may prove useful for other patients undergoing similar surgeries. (A&A Practice. 2020;14:e01238.)

GLOSSARY

CVP = central venous pressure; **ERAS** = Enhanced Recovery After Surgery; **HR** = heart rate; **ICU** = intensive care unit; **IV** = intravenous; **MAP** = mean arterial pressure; **PCA** = patient-controlled analgesia; **PETCO₂** = end-tidal carbon dioxide partial pressure; **PO** = per os; **POD** = postoperative day; **PRN** = as needed; **PSI** = Patient State Index; **Q** = quartile; **Spo₂** = peripheral saturation of oxyhemoglobin; **TAP** = transverse abdominis plane

Analgesia for open abdominal surgery has traditionally relied on the use of opioids. Many patients are first exposed to opioids during surgery. In response to widespread opioid use in the United States,¹ multimodal analgesia is increasingly encouraged, including neuraxial and regional anesthesia combined with nonopioid adjuvant therapies.^{2,3} Open gastrointestinal surgical procedures performed without opioid or epidural analgesia have been reported.^{4,5}

Here, we present the case of a patient who specifically requested opioid-free anesthesia for an open partial hepatectomy. We routinely use epidural analgesia for patients undergoing this procedure. However, we avoided it in this case due to concerns of postoperative coagulopathy delaying the removal of the epidural catheter and recovery. This successful perioperative experience indicates an opioid-free, epidural-free anesthesia strategy that might be valuable for other patients undergoing an open hepatectomy. Health Insurance Portability and Accountability Act authorization

and personal perspective were obtained from the patient in writing before the submission of this report.

CASE DESCRIPTION

A healthy 44-year-old, 71-kg woman presented for an open partial hepatectomy for a living nonrelated left lobe liver donation. She had insulin resistance secondary to polycystic ovarian syndrome, which was treated with metformin. She reported anaphylactic reactions to sulfonamides, dystonia after promethazine and metoclopramide, and rhabdomyolysis following statin medications. She strongly requested opioid-free anesthesia because of opioid-induced nausea and vomiting in previous surgeries. The patient, an emergency room registered nurse, stated that “it is entirely possible to have significant surgeries performed without using opioids or even epidurals; patients can return to baseline function so much faster and heal better without so many of the potential complications from the use of those modalities.”

Following the patient’s opioid-free request, a multimodal regimen was designed with medications that are often used as adjuvants to opioid or epidural analgesia.²⁻⁴ Table 1 describes the perioperative planned and administered medications. She received oral pregabalin and acetaminophen preoperatively. After induction, we started intravenous (IV) infusions of dexmedetomidine (0.5–0.7 µg/kg/h, stopped approximately 1 hour before emergence), ketamine (15–20 mg/h, decreased to 5 mg/h for the last hour before emergence), and lidocaine (0.5–1 mg/min, stopped at hepatectomy completion to prevent plasma accumulation of amide local anesthetics). Bilateral ultrasound-guided transversus abdominis plane (TAP) blocks were performed after the closure of the supraumbilical midline incision, with 60 mL 0.25% bupivacaine with epinephrine and 100 µg clonidine. TAP catheters are not routinely placed at our institution

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Table 1. Summarized Analgesia Regimen Used for This Opioid-Free Epidural-Free Open Hepatectomy

Perioperative Phases of Care		Planned Medications (Including Doses and Routes of Administration)	Dosages Administered
Preoperative		Acetaminophen 500 mg PO	500 mg × 1 dose
		Pregabalin 75 mg PO	75 mg × 1 dose
Intraoperative		Dexmedetomidine (0.2–1.5 µg/kg/h) IV infusion	Rate: 0.5–0.7 µg/kg/h Total: 175 µg
		Ketamine (0–20 mg/h) IV infusion	Rate: 5–20 mg/h Total: 74 mg
		Lidocaine (0–1 mg/min) IV infusion	Rate: 0.5–1 mg/min Total: 84 mg
		Bupivacaine 0.25% with epinephrine (TAP blocks) after surgical closure	60 mL
		Clonidine (TAP blocks) after surgical closure	100 µg
Postoperative	POD0	Ketamine (0–20 mg/h) IV infusion	Not administered
		Fentanyl IV PCA (10 µg demand bolus)	Not used
		Fentanyl 25 µg IV PRN	Not administered
		Ketorolac 15 mg IV every 6 h starting 6–8 h after the end of surgery	Not administered
	POD1	Gabapentin 300 mg PO every 8 h PRN	300 mg × 1 dose
		Ketorolac 15 mg IV every 6 h	15 mg × 4 doses
		Ketamine (0–20 mg/h) IV infusion	Not administered
		Fentanyl IV PCA (10 µg demand bolus)	Not used
	POD2	Fentanyl 25 µg IV PRN	Not administered
		Ketorolac 15 mg IV every 6 h	15 mg × 4 doses
	POD3	Oxycodone 5–10 mg PO PRN every 4 h PRN	2.5 mg × 1 dose
		Ketorolac 15 mg IV every 6 h	15 mg × 3 doses
	POD4	Meloxicam 15 mg PO daily PRN	15 mg × 1 dose
		Meloxicam 15 mg PO daily PRN	15 mg × 1 dose

Abbreviations: IV, intravenous; PCA, patient-controlled analgesia; PO, per os; POD, postoperative day; PRN, as needed; TAP, transverse abdominis plane.

unless repeated TAP blocks are required. Postoperatively, 15 mg ketorolac IV was available every 6 hours as needed. Planned, but unneeded, analgesic therapies included intraoperative magnesium 2 g IV bolus followed by 1 g/h IV infusion, and postoperative IV fentanyl patient-controlled analgesia (PCA) boluses, ketamine 1 mg/h IV infusion, and TAP catheter placement.

Anesthesia was induced with propofol and maintained with desflurane, titrated to achieve adequate hemodynamic and electroencephalogram levels (Sedline; Masimo, Irvine, CA). Neuromuscular blockade was achieved with rocuronium, guided by qualitative train-of-four monitoring. Tracheal intubation was uneventful. Esmolol and lidocaine were available, but not needed, to attenuate the sympathetic response to intubation. Table 2 includes the intraoperative medications administered. The 292-minute surgical procedure was uneventful (perioperative vital signs in Table 2 and Figure 1) with 250 mL of estimated blood loss. Emergence and extubation were uneventful. The patient was transferred to the intensive care unit (ICU) per institutional protocol for all living liver donors. At ICU admission, the patient rated her abdominal pain as 5 of 10 on a visual analog scale and refused pain medications. Figure 2 describes the frequency of reported pain on postoperative days (PODs) 0–4. Floor nursing records are often limited to a categorical “patient reports/denies pain.” Pain was recorded as located in the abdomen. The highest pain intensity was 7 of 10 during the first 24 postoperative hours. The patient never used the IV fentanyl PCA (discontinued on POD2), but she received 2.5 mg oral oxycodone on POD2. Primary postoperative analgesia was ketorolac based (Table 1). Rescue TAP blocks were not required. Oxygen supplementation was discontinued 6 hours after surgery. She did not experience postoperative

nausea or vomiting during the hospital stay. The highest blood glucose concentration was 213 mg/dL in the ICU and resolved with insulin lispro 2 units subcutaneously. On POD1, diet was advanced to liquids, the urinary catheter and arterial line were removed, and the patient was transferred to the postoperative floor. The central line was removed on POD2. The patient ate a regular solid diet on POD3 and was discharged on POD4. She reported a “fast and relatively pain-free recovery” at home on oral ibuprofen, went back to part-time work on POD8, and had a normal postoperative follow-up visit on POD9.

DISCUSSION

Surgical pain is frequent and clinically significant. Approximately 80% of surgical patients report some postoperative pain, and 75% rank their worst pain as moderate, severe, or extreme. Fewer than half report adequate pain relief.⁶ Pain has negative physiological consequences that impair recovery from surgical trauma.^{7,8} Adequate analgesia attenuates the neuroendocrine and immunological effects of surgical stress and facilitates surgical healing, prevents postoperative morbidity, and optimizes the overall return to baseline activities.^{7,8} However, the ideal analgesic strategy is unclear and multimodal approaches are still being developed.³ Opioids provide safe and effective pain relief when used appropriately.⁹ Nevertheless, they often cause nausea, ventilatory depression, and other side effects; may lead to dependency; and are associated with longer hospital stays.^{3,8,9}

After hospital discharge, the overprescription of opioids for surgical pain contributes to their current widespread availability in the community and the opportunity for abuse and misuse.^{9–12} A 2017 review, including 6 studies with

Table 2. Summarized Intraoperative Medications and Vital Signs

Intraoperative medications	
Desflurane, exhaled %	4.8 [4.5, 5.2]
Lorazepam, mg	2
Propofol, mg	200
Rocuronium, mg	120
Ketamine, mg	115
Dexmedetomidine, µg	175
Lidocaine, mg	83.5
Dexamethasone, mg	8
Ondansetron, mg	4
Phenylephrine, µg	4342
Plasmalyte, mL	1500
Albumin 5%, mL	1000
Preoperative vital signs	
Heart rate, beats/min	84
Mean arterial pressure, mm Hg	92
SpO ₂ , %	100
Respiratory rate, breaths/min	16
Temperature, °C	36.5
Intraoperative vital signs	
Heart rate, beats/min	81 [74, 88]
Mean arterial pressure, mm Hg	78 [73, 84]
Central venous pressure, mm Hg	3 [2, 5]
SpO ₂ , %	98 [97, 98]
PETCO ₂ , mm Hg	39 [37, 41]
Electroencephalogram Sedline PSI	34 [27, 39]
Temperature, °C	36.5 [35.9, 37.2]
Initial postoperative vital signs	
Heart rate, beats/min	95
Mean arterial pressure, mm Hg	72
Central venous pressure, mm Hg	3
SpO ₂ , %	100 ^a
Respiratory rate, breaths/min	16
Temperature, °C	36.0

All numbers refer to total median [Q1, Q3] doses unless otherwise specified.
Abbreviations: PETCO₂, end-tidal carbon dioxide partial pressure; PSI, Patient State Index; Q, quartile; SpO₂, peripheral saturation of oxyhemoglobin.

^aOn 3L/min oxygen supplementation through nasal cannula.

810 patients after various surgical procedures, found that 67%–92% of patients had unused opioids postoperatively.⁹ Overall, 42%–71% of all opioid pills dispensed were unused because most patients reported adequate pain control.⁹ Another retrospective, population-based analysis of 2392 adults in 33 health systems found that, on average, only 27% of prescribed opioids were consumed.¹⁰ Patients in the United States and Canada fill opioid prescriptions within 7 days at 7-fold higher rates than in Sweden,¹³ with higher prescribed quantities of opioids in the United States than in Canada.¹³ These studies suggest the opportunity to reduce perioperative opioid use without affecting patient care.

Opioid-free or opioid-reduced perioperative efforts primarily rely on regional and neuraxial anesthesia for sensory neuropathic blockade tailored to the surgical incision site. For supraumbilical laparotomies, some multidisciplinary Enhanced Recovery After Surgery (ERAS) protocols include either a single dose of intrathecal morphine or a continuous thoracic epidural block with a combination of local anesthetic (eg, bupivacaine) and a low opioid concentration.^{2,3,14} However, neuraxial blockade is sometimes contraindicated because of coagulopathy, local or systemic infection, or patient refusal. An alternative for postoperative analgesia includes TAP or other truncal blocks or local wound infiltration to reduce nociceptive transmission through the T6–L1 spinal roots.¹⁵ A meta-analysis of 56 randomized trials and 3428 patients who had open abdominal surgeries found that TAP blocks were equally safe (equivalent or improved nausea and vomiting profiles) when compared to standard care and placebo comparators.¹⁵ This meta-analysis also found that patients receiving TAP blocks had decreased morphine consumption, delayed requests for rescue pain medication, and reduced or equivalent postoperative pain within 24 hours compared to all other analgesic regimens.¹⁵

All pharmacologic components in our perioperative multimodal analgesic protocol (Table 1) have been supported by ERAS efforts,^{2,3,14} mostly in combination with

Figure 1. Vital signs at certain perioperative time points. CVP indicates central venous pressure; HR, heart rate; ICU, intensive care unit; MAP, mean arterial pressure; PSI, Patient State Index.

Figure 2. Patient-reported postoperative pain frequency.

an epidural technique. Our plan's success in this patient offers an effective alternative in those individuals undergoing open abdominal surgery where neuraxial analgesia is not an option. Indeed, variations in patient expectations, pain tolerance, and contraindications may make opioid-free multimodal regimen inadequate for many abdominal surgery patients. Patient expectations are a critical component of this opioid-free approach. The American Society of Regional Anesthesia and Pain Medicine, the American Pain Society, and the American Society of Anesthesiologists Committee on Regional Anesthesia recommend preoperative education that is customized to the patient's age, general and health literacy, and cultural and linguistic competency.⁶ Preoperative counseling should include how and when to report pain via multiple assessment tools, a discussion of individualized pharmacologic and nonpharmacologic pain management options, as well as realistic pain control goal setting.⁶ Individually tailored education is associated with decreased preoperative anxiety, postoperative opioid consumption, and shorter hospital stays.⁶ However, current preoperative evaluation practices by anesthesiologists may present a challenge for adequate patient education due to the limited time for direct patient contact or the interview occurring immediately before the surgical procedure. Also, our approach requires additional personnel and resource time for the frequent postoperative visits and multidisciplinary rounding and communication, to achieve adequate postoperative opioid-free analgesia following opioid-free anesthesia.² Of note, the patient received an opioid on POD2 while on the floor after our opioid-free anesthesia.

Providing optimal individualized postoperative analgesia is important for surgical recovery and patient satisfaction. Opioids and epidural analgesia for open abdominal surgery are effective and safe when used appropriately; however, both may be contraindicated or undesirable in certain conditions. The successful experience of this patient undergoing an open partial hepatectomy with an opioid-free, epidural-free anesthesia suggests that this may be a feasible and effective approach for other patients. ■■

DISCLOSURES

Name: Kelsey M. Repine, BA.

Contribution: This author helped with drafting of the manuscript, critical revision of the manuscript, and approval of the final version of the manuscript.

Name: Adrian Hendrickse, MD.

Contribution: This author helped with conception of the work, critical revision of the manuscript, and approval of the final version of the manuscript.

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Contribution: This author helped with conception of the work, drafting of the manuscript, critical revision of the manuscript, and approval of the final version of the manuscript. She is accountable for the accuracy and integrity of all aspects of the work.

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