Continuous Intravenous Lidocaine as an Effective Pain Adjunct for Opioid-Induced Bowel Dysfunction: A Case Report

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This case study describes a patient with suspected opioid-induced bowel dysfunction who had improved pain control when treated with intravenous (IV) lidocaine. An 80-year-old man with failed back surgery syndrome managed with an intrathecal (IT) pump presented with protracted abdominal pain. The acute pain service initiated a lidocaine infusion at 1 mg·min⁻¹, and the patient reported significant pain relief. The patient experienced refractory abdominal pain with 3 attempts to wean the lidocaine infusion. Eventually, a successful transitional regimen was achieved with methylnaltrexone and transdermal lidocaine patches. Lidocaine infusions may be an effective and underutilized multimodal adjunct for nonsurgical pain conditions. (A&A Practice. 2019;13:335–7.)

GLOSSARY

IT = intrathecal; **IT-PCA** = intrathecal patient-controlled analgesia; **IV** = intravenous

Anesthesiologists use lidocaine infusions to improve pain control in the perioperative setting.¹ In addition, lidocaine infusions reduce postoperative ileus primarily through its opioid-sparing effect and potentially through its anti-inflammatory properties.^{2–4} Although lidocaine infusions are not routinely used in chronic pain management, they have potential as an adjuvant analgesic in this setting. In this case report, we describe a patient with suspected opioid-induced bowel dysfunction who had improved pain control when treated with intravenous (IV) lidocaine.

The patient provided written Health Insurance Portability and Accountability Act authorization to use this information for medical research.

CASE DESCRIPTION

An 80-year-old, 83-kg man was admitted to our hospital with a congestive heart failure exacerbation and new-onset abdominal pain. His medical history was significant for failed back surgery syndrome managed with an intrathecal (IT) pump, atrial fibrillation, and diabetes mellitus. The patient denied a history of gastrointestinal illness. On resolution of his acute cardiac issue, the abdominal pain persisted, prompting an inpatient pain consult.

The patient described the abdominal pain as dull, worse with eating, and fluctuating in intensity. Lipase level and liver function tests were unremarkable, and a computed

tomography scan of the abdomen showed no abnormalities. The gastroenterology consult team suspected that the patient's abdominal pain was likely functional in nature and met the criteria for opioid-induced bowel dysfunction (Table 1).

The patient reported that his IT pump was implanted 8 years ago, and there were no dosage changes within the past year. He received regular device monitoring from an outpatient pain management clinic. IT pump interrogation revealed morphine infusing at 1.9 mg·d⁻¹ and an intrathecal patient-controlled analgesia (IT-PCA) morphine demand dose of 0.2 mg up to 4 times daily. The patient reported using 2 demand doses per day on average.

The patient had no pain relief from using all of his allotted IT-PCA doses. The patient's symptoms worsened when the IT-PCA was stopped. In addition, a trial of methylnaltrexone did not provide relief. The patient reported somnolence with oxycodone but agreed to try one 5 mg tablet every 6 hours. As expected, he did not tolerate oxycodone. The patient's abdominal pain remained poorly controlled despite the addition of acetaminophen and gabapentin to his multimodal regimen.

Having explored multiple other treatment options, the acute pain service initiated an IV lidocaine infusion at 1 mg·min⁻¹. They also removed oxycodone from the multimodal regimen and instructed the patient to use 2 IT-PCA doses per day. With these new recommendations, opioids were only delivered through the IT pump.

On the following day, the patient reported significant relief in abdominal pain coinciding with the lidocaine treatment. His daily numeric pain score range decreased from 8 to 10 of 10 to 0 to 5 of 10. He also reported increased ease and frequency of bowel movements. On the third day of lidocaine treatment, a serum lidocaine level was ordered for quality review, which revealed a therapeutic level of 1.0 mg·L⁻¹. The patient denied any symptoms of local anesthetic systemic toxicity.

By the fourth day of treatment, the primary team requested the discontinuation of lidocaine to prepare the

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Table 1. Diagnostic Criteria for Opioid-Induced Bowel Dysfunction¹¹

Persistent abdominal pain with chronic high-dose opioid use
Pain that does not resolve with increased opioid dosage
Pain that worsens with reduction of opioid dosage
Pain that steadily increases in frequency, intensity, and duration
Pain that is not fully explained by a concomitant gastrointestinal condition

patient for hospital discharge. Over the next 3 days, 3 attempts to wean lidocaine were unsuccessful because the patient developed refractory abdominal pain relieved only by the resumption of lidocaine.

Ultimately, the acute pain service successfully weaned the patient from the lidocaine infusion with a repeat methylnaltrexone treatment and a transition to transdermal lidocaine patches placed on the abdomen. The patient did not have the same degree of relief with this transitional regimen, but pain control and frequency of bowel movements were adequate for hospital discharge. To treat opioid-induced constipation, the patient received a prescription for naloxegol, a peripherally selective opioid antagonist.

DISCUSSION

IV lidocaine is an effective nonopioid option in the postsurgical period.¹⁻⁵ Patients with chronic pain conditions, such as complex regional pain syndrome or phantom limb pain, may also benefit from lidocaine treatment.⁶ Lidocaine infusion protocols for inpatient pain management are increasingly popular, which presents an opportunity to extend lidocaine treatment beyond surgical wards.

A representative protocol from our institution is outlined in Table 2. In this protocol, patients are monitored for lidocaine toxicity during a routine bedside nursing examination and daily acute pain service rounds. Lidocaine levels are ordered at the discretion of the acute pain service attending. Telemetry monitoring is not required due to the low risk of lidocaine-induced arrhythmia at analgesic doses. In our institution, we performed a quality internal review and no lidocaine-induced arrhythmias were observed. To ensure hospital-ward safety, our acute pain service initiates lidocaine infusions without a loading dose. A lidocaine infusion at a rate between 0.5 and 3 mg·kg⁻¹·h⁻¹ reaches a steady state in 4 to 8 hours. After discontinuation of a prolonged infusion, the context-sensitive half-time of lidocaine is 20 to 40 minutes.⁷

Lidocaine has demonstrated analgesic efficacy at doses well below the toxic threshold, and its effect extends many hours beyond its half-life.^{8,9} This suggests that sodium channel blockade alone does not fully explain its therapeutic qualities. Proposed mechanisms of action include interaction with polymorphic granulocytes, interruption of inflammatory pain pathways, and prevention of central sensitization.^{10,11} For this patient, we hypothesize that the combination of anti-inflammatory effect and inhibition of central sensitization led to improved bowel function. Due to these mechanisms, lidocaine may also facilitate an opioid wean, but this effect was not apparent in this case study.

Opioid-induced bowel dysfunction develops from high-dose opioid exposure. This condition affects the regulatory system within the dorsal horn, results in pain facilitation

Table 2. Lidocaine Infusion Protocol for Acute Pain Management

Record vital signs every 4 hours, which include oxygen saturation, blood pressure, heart rate, and respiratory rate. If oxygen saturation is <92%, notify the primary team provider and apply oxygen via nasal cannula.
Perform a pain assessment every 4 hours while the patient is awake. Notify the primary team provider if pain is not well controlled.
Assess level of sedation every 4 hours using the Richmond Agitation-Sedation Scale.
Perform a neurological assessment every 4 hours and document for signs of local anesthetic systemic toxicity.
Notify the acute pain service when the patient arrives on the hospital wards or if a lidocaine infusion has been initiated.
Notify the acute pain service for signs of local anesthetic systemic toxicity. Stop the lidocaine infusion immediately.
Use a solution prepared by the institutional pharmacy. A recommended preparation would contain lidocaine 2000mg mixed in a 500mL bag of 5% dextrose in water.
A minimum recommended starting dose in a hospital ward setting is 0.5 mg·min⁻¹. The maximum dose at Virginia Commonwealth University Medical Center is 1 mg·min⁻¹.

This protocol is adapted from Virginia Commonwealth Medical Center and provides instructions for nursing staff.

Table 3. Treatment Recommendations for Opioid-Induced Bowel Dysfunction

Partial opioid antagonists, such as methylnaltrexone or naloxegol
Lidocaine transdermal patches
Planned opioid wean directed by pain physician
Cognitive behavioral therapy
Avoid habit-forming medications such as benzodiazepines
Avoid medications that may worsen constipation, such as tricyclic antidepressants

in the rostral ventral medulla, and activates glial cells that produce morphine tolerance and opioid-induced pain. When opioids bind to receptors in enteric neurons, gastrointestinal motility decreases. Opioid-induced bowel dysfunction has a variable presentation and is a diagnosis of exclusion. This patient exhibited all of the diagnostic criteria (Table 1).¹¹

Lidocaine infusion therapy is not widely available outside a hospital setting. Therefore, such patients require a transition to an outpatient regimen. Initiation of lidocaine transdermal patches, a repeat treatment of methylnaltrexone, and a prescription for naloxegol allowed this patient to be discharged with adequate pain control and bowel function. The pain relief achieved by a lidocaine infusion is transient, and long-term relief from opioid-induced bowel dysfunction requires a significant reduction in opioid exposure. An opioid wean may precipitate withdrawal symptoms and reduce functional status, but there is no consensus on how to mitigate these effects. The authors' recommendations are outlined in Table 3.

In conclusion, we recommend increased use of lidocaine infusion therapy for inpatient pain management, which may be effective in cases where traditional pain management modalities have failed. Lidocaine is not a definitive treatment for opioid-induced bowel dysfunction but may be a safe addition to a multimodal pain regimen. However, further research is needed to clarify the role of IV lidocaine in chronic pain conditions. ■■

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