Lidocaine Infusion for Refractory Pain from Rat Lungworm Disease — Honolulu, Hawai'i

Kirth Cucueco MD; Kristin Bathen APRN-Rx; Daniel Fischberg MD, PhD

Abstract

Human infection with Angiostrongyloides cantonensis*, or rat lungworm disease, manifests most commonly with neurologic symptoms that often include severe diffuse pain. While pain is reported by the majority of patients with rat lungworm disease, there are presently no published guidelines on the approach to pain management for these patients. Here we report a case of rat lungworm disease where severe refractory pain was the most prominent symptom and an intravenous lidocaine infusion was used as a successful treatment modality. Intravenous lidocaine has been shown to be safe and effective in neuropathic pain, refractory cancer pain, and peri-operative pain management. To our knowledge, this is the first case report on the use of lidocaine infusion for the management of refractory pain from rat lungworm disease, and among the first reports of any approach, to pain management for rat lungworm disease. We suggest that a lidocaine infusion protocol be considered when pain from rat lungworm disease fails to respond to first-line analgesics.*

Keywords

Angiostrongyloides cantonensis*, rat lungworm disease, lidocaine infusion, pain*

Introduction

Rat lungworm disease (RLWD), or human *Angiostrongyloides cantonensis* infection, is prevalent mostly in Southeast Asia and the Pacific Islands, but has recently also been reported in the continental United States.[1,2] It has been increasingly diagnosed in Hawai'i where there have been 77 cases from 2008 to 2017; 25% of these were reported in 2017.[1] RLWD is typically acquired by ingesting raw or undercooked food containing the larval stage of the worm. The larva migrates within the human brain and spinal cord prior to its death. Neural injury may follow from the host's immune response to the decaying larvae, resulting in varying degrees of pain and neurologic disability, described as neuroangiostrongyliasis.[3,4] Neurologic symptoms may include headache, visual disturbance, fatigue or hyperesthesias.[4] Clinicians who encounter patients with a history of travel from endemic areas such as Hawai'i, and presenting with pain and neurologic symptoms, should have a high index of suspicion for RLWD.[2,5,6] There are no recommended protocols to guide analgesic management. Published management strategies typically provide nonspecific recommendations for pain management.[3] Here we report a case of a patient diagnosed with RLWD, presenting with refractory pain.

Case Report

A 29-year-old man lettuce farmer without significant past medical history presented to The Queen's Medical Center in Honolulu, Hawai'i with 2 weeks of severe headache, joint pains, and fever. The patient described severe holocranial headache as well as a burning pain initially localized to the left upper extremity. The left upper extremity pains were also described as "stabbing" and "pins and needles" and were typically preceded by erythematous flushing with subsequent severe pain episodes. The pains became regional, at times affecting the lower extremities, at times the abdomen, although never in a dermatomal distribution. Over the course of the hospitalization, the quality of the pains also varied and additional descriptors included "cramping" and "crushing." Diffuse allodynia was prominent on exam. The patient was eventually confirmed to have RLWD with findings consistent with larval tracks in the brain using magnetic resonance imaging (Figure 1), and a positive polymerase chain reaction test of cerebrospinal fluid.

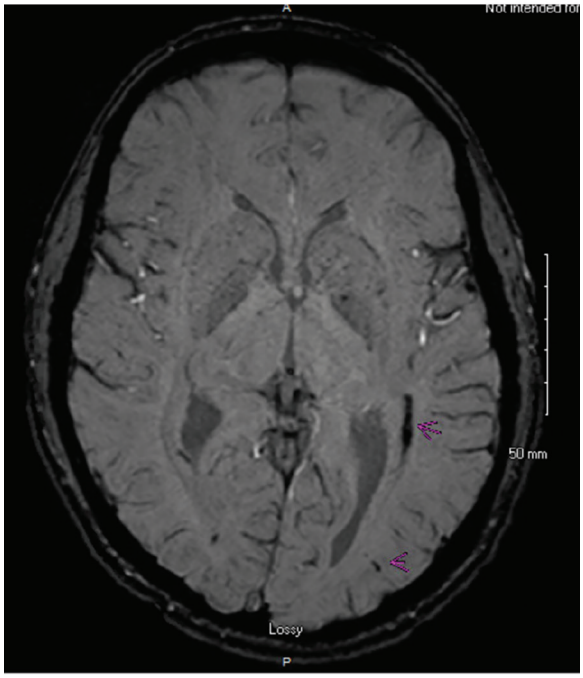

Figure 1. Magnetic Resonance Imaging of Patient Brain Using Suspectibility Weight Imaging. This image shows prominent dilated perivascular spaces in the cerebral hemisphere and cerebellum with multiple curvilinear tracks most prominent in the left temporal lobe consistent with eosinophilic meningitis.

For pain, the patient was initially treated with the oral non-opioid analgesics ibuprofen and acetaminophen. However, given the persistence of severe episodic, migratory, regional pain, gabapentin was added for a presumed neuropathic pain component along with the steroid prednisone and the oral opioid oxycodone. The headache, ascribed to increased intracranial pressure, was transiently relieved by serial lumbar punctures. However, the patient continued to report severe and incapacitating episodes of migratory, regional, burning pain throughout his body despite serial trials of gabapentin (titrated to 1200 mg every 8 hours), pregabalin (75mg 3 times a day), baclofen (5 mg every 8 hours), nortriptyline (50 mg at bedtime), oral hydrocodone/acetaminophen (10-325 mg every 4 hours as needed), and then intravenous fentanyl (via patient controlled analgesia bolus doses of 10 µg every 10 minutes as needed with clinician rescue boluses of 25 µg every 3 hours as needed). The patient was bedbound, unable to sleep, mobilize, or participate in physical therapy due to uncontrolled pain.

Given the patient's severe refractory and disabling pain, a lidocaine infusion was initiated on hospital day 12 utilizing our hospital's protocol for severe and/or neuropathic pain. A bolus of 1 mg/kg was administered intravenously over 30 minutes followed by a continuous infusion rate of 0.5 mg/kg/hr. At the time of the start of the infusion, pain was most severe in the lower extremities. Mean pain scores the day of and prior to initiation of the lidocaine infusion were 6 (range: 3-10). Pain was described as "all over," or 8 out of 10, with occasional sharp bursts of stabbing pain approximately 17 hours after the initiation of lidocaine, so the dose was increased to 1 mg/kg/hr on hospital day 13. Within 4 hours of dose titration, the patient, who was previously bed-bound, was able to ambulate 160 feet with physical therapy. That night, the nursing notes documented the patient was able to sleep. Mean and maximal pain scores declined over the course of the lidocaine infusion (Figure 2) as did intravenous fentanyl rescue doses (Figure 3). Lidocaine infusion was stopped after 6 days on hospital day 17. Sustained release oxycodone was discontinued and the patient was discharged on hospital day 19 on an analgesic regimen of low dose immediate release oxycodone (morphine equivalent daily dose of 30 mg or less on the 2 final days of hospitalization), gabapentin, nortriptyline, and cyclobenzaprine.

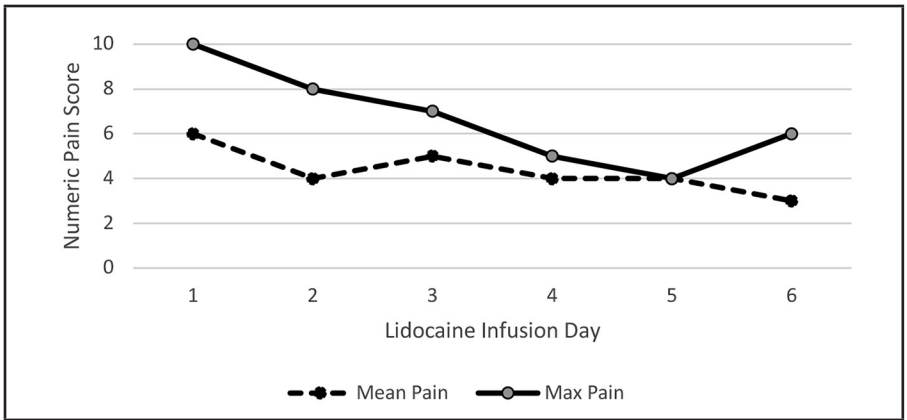

Figure 2. Mean and Maximum Daily Pain Scores Over the Course of Lidocaine Infusion. Lidocaine infusion was initiated on day 1, increased on day 2, and discontinued on day 6.

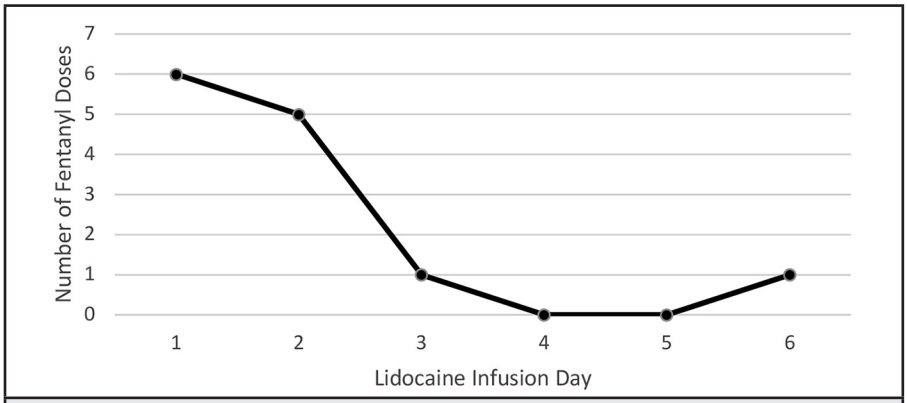

Figure 3. Number of Rescue Fentanyl Doses Received Over the Course of Lidocaine Infusion. Lidocaine infusion was initiated on day 1, increased on day 2, and discontinued on day 6.

Discussion

Pain associated with RLWD can be severe and difficult to control. However, there is no consensus on how to best manage pain due to neuroangiostrongyliasis.[2,3,7] The pain may present acutely within days and last several weeks or become chronic.[2,7] Given the lack of standardized pain management guidelines for patients with acute pain from RLWD, providers may be at a loss to treat pain that is refractory to standard approaches or rely heavily on opioid analgesics. Recent reports have described ketamine infusion to manage pain due to RLWD.[7,8] A lidocaine infusion is another option to treat refractory pain syndromes and was, therefore, offered to our patient.[9,10]

Lidocaine, an amide local anesthetic, is widely used topically and by local infiltration. However, physicians outside of the specialty of pain management or anesthesia may be less familiar with the use of intravenous lidocaine for acute and chronic pain. The inflammatory process in RLWD from the decaying larvae injures neurons that then may develop abnormal, spontaneously, and pathologically active sodium channels. The exact analgesic mechanism of action for lidocaine infusion is unknown, however has been postulated to be suppression of ectopic and aberrant sodium channel activity.[11-14] Intravenous lidocaine has been shown to be safe and effective in neuropathic pain, refractory cancer pain, and peri-operative pain management.[9,11] Because our patient had severe neuropathic pain that was refractory to multiple first-line treatments, we initiated our institution's lidocaine infusion protocol for severe and/or neuropathic pain with prompt decrease in pain and intravenous opioid requirement and improvement in function.

The protocol at our institution involves starting with a bolus dose of 1-2 mg/kg administered intravenously over 30 minutes. Continuous infusion rates typically range from 0.5-2 mg/kg/hr and are titrated to the lowest effective dose.[15] Opioids and other pain medications are then decreased. Vital signs, pain and clinical assessments for toxicity are monitored every 4 hours. Neither telemetry nor serum lidocaine level monitoring is considered necessary but may be ordered at the discretion of the treating physician. Typical analgesic therapeutic lidocaine blood levels occur at less than 3 μg /ml. Side effects of lidocaine toxicity are typically dose-related. At serum levels 4-6 μg/ml, a patient may experience lightheadedness, peri-oral numbness, metallic taste, hypertension, anxiety, restlessness, slurred speech or confusion. The infusion is slowed or stopped if a patient reports any of these symptoms. When used for analgesia, blood levels rarely approach 8 μg/ml, where more severe events may occur such as visual or auditory disturbances, muscle twitching, and hypotension. At increasing levels, above 12 μg/ml, patients are at risk for seizures, coma, and death.[16] Lidocaine infusions should be avoided in patients with hypersensitivity to lidocaine or amide-type local anesthetics. Caution is advised in patients with any degree of heart block, heart failure, or seizure disorder. Patients with impaired renal or hepatic function can be expected to have reduced lidocaine clearance and should be considered at increased risk for developing toxicity.[12]

Intravenous lidocaine has been recommended to treat refractory neuropathic pain and pain in the terminally ill.[11,14] More recently, its benefits have been reported to achieve early recovery after surgery and in the emergency department setting.[9,12] To our knowledge this is the first case report of the management of refractory neuropathic pain secondary to RLWD using a lidocaine infusion. We suggest that a lidocaine infusion protocol be considered when pain from RLWD fails to respond to first-line analgesics.

Conflict of Interest

None of the authors identify any conflicts of interest.

Authors' Affiliations:
- Department of Medicine, John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI (KC)
- Division of Palliative Medicine of the Department of Geriatric Medicine, John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI (DF)
- Pain & Palliative Care Department, The Queen's Medical Center, Honolulu, HI (KB, DF)

Correspondence to:
Kirth Cucueco MD; 1356 Lusitana St., 7th Fl., Honolulu, HI; Email: kirth@hawaii.edu

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