Intravenous lidocaine for renal colic in the emergency department

Dear Reader,

Renal colic is characterized by severe genitourinary and abdominal pain associated with nephrolithiasis. Approximately 9% of people experience renal colic, accounting for more than one million emergency department (ED) visits annually in the United States [1-4]. No formal guidelines exist for renal colic treatment; however nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids have traditionally been used.

Escalating doses of opioids have risks such as respiratory depression and hypotension. This along with the opioid epidemic and concern for opioid exposure has necessitated that non-opioid therapies be explored. Lidocaine prevents transmission of pain signals at the dorsal root ganglion and spinal cord primarily through sodium channel inhibition [5]. Intravenous (IV) lidocaine has been used in various pain syndromes and in the perioperative setting and demonstrated a reduction in opioid consumption [6]. Lidocaine IV has a desirable pharmacokinetic profile; fast onset and long duration of action (half-life = 1.5 h). In a case series of 8 patients with intractable renal colic receiving lidocaine IV, 75% of patients remained pain free at 24 h [7]. Small, randomized-controlled trials have evaluated lidocaine as an alternative or adjunct to opioids and observed similar efficacy to IV morphine and a low incidence of adverse events [8,9].

Lidocaine IV was incorporated into our ED 'alternatives to opioids' guidelines in November 2017 and is used at three EDs in the healthcare system. Lidocaine is recommended as a second-line agent for renal colic, following IV fluid, NSAID, and acetaminophen therapy, with opioid rescue as third-line. Lidocaine 1.5 mg/kg (maximum 200 mg/dose) is administered IV over 20 min. Repeat doses are not recommended on our guideline but considered on a case-by-case basis. All patients are on cardiac monitoring for 30 min following administration.

As evidence supporting the use of lidocaine IV for renal colic is limited to small, randomized-controlled trials conducted outside of the United States, we evaluated all patients receiving lidocaine IV for the management of renal colic in the ED over a 7-month period following guideline implementation. Our primary outcome was to determine rates of opioid rescue therapy. Secondary outcomes were to evaluate pre- and post-lidocaine pain scores, repeat lidocaine IV doses, ED adverse events, and opioid prescribing at discharge.

A total of 86 patients received lidocaine IV for renal colic between November 2017 and May 2018. Thirty-two patients were excluded; one was a pediatric patient and 31 patients received opioids in the ED prior to lidocaine. The total cohort ($n = 54$) were 43 ± 11 years old (mean), predominantly male (57%), and weighed 85.7 ± 17.9 kg. More than half (52%) had a history of nephrolithiasis. Twenty-two percent of patients presented to the ED within the past 30 days for flank pain (22%) and 33% within the past month for pain not related to mechanical injury. Several patients had documented substance or opioid use disorder (19% and 17%, respectively) and 20% receive chronic opioids for various indications.

Mean lidocaine IV dose was 1.5 mg/kg ± 0.7 mg/kg (mean dose 127 mg ± 27 mg). Twenty-three patients (43%) received third-line opioid rescue in the ED with a median time from lidocaine IV to opioid rescue of 201 min (IQR 102–398). Administration of IV fluids, NSAIDs, or acetaminophen prior to lidocaine was documented. Only 5 (9%) patients received all three interventions prior to lidocaine IV; however receiving none, one, two, or three of these guideline recommended interventions did not influence opioid rescue administration. We had pre- and post-lidocaine pain scores available in 42 patients. Median pain score decreased from 8 to 4.5 ($p < 0.0001$, Wilcoxon Signed-Rank test) and 27 patients (64%) reported pain score reduction following lidocaine. No patients received a second dose of lidocaine. There were two adverse events thought to be lidocaine-related. One patient experienced dizziness and another bradycardia (heart rate < 60 bpm); neither requiring treatment. Overall, 22 patients (40%) were discharged with an opioid prescription. All but one of these patients were also discharged with a prescription/instructions to take acetaminophen, ibuprofen, anti-emetics, or expulsive therapy. Nine patients (17%) re-presented to the ED, urgent care or primary care clinic within 7 days for chief complaint of "flank pain" or "nephrolithiasis".

Lidocaine IV is an option for renal colic and may influence opioid use in the ED and at discharge. Given the long median time from lidocaine to opioid rescue (201 min), repeat administration of lidocaine may be a worthwhile consideration. One patient that was excluded for receiving an opioid 45 min prior to lidocaine did receive two doses of lidocaine IV separated by 3 h, had adequate pain relief, no adverse events, and did not receive an opioid prescription at discharge. Overall, lidocaine IV administration for patients with renal colic in the ED has potential to decrease opioid use in the ED and at discharge with minimal adverse events.

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Prior presentations

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References

[1] Claros OR, Silva CH, Consolmagno H, Sakai AT, Freddy R, Fugita OE. Current practices in the management of patients with ureteral calculi in the emergency room of a university hospital. Clinics (Sao Paulo) 2012;67:415–8.
[2] Brown J. Diagnostic and treatment patterns for renal colic in US emergency departments. Int Urol Nephrol 2006;38:87–92.
[3] Ghani KR, Roghmann F, Sammon JD, et al. Emergency Department visits in the United States for upper urinary tract stones: trends in hospitalization and charges. J Urol 2014;191:90–96.a.
[4] Bultitude M, Rees J. Management of renal colic. BMJ 2012;345:e5499.
[5] Golzari SE, Soleimanpour H, Mahmoodpoor A, et al. Lidocaine and pain management in the emergency department: a review article. Reg Anesth Pain Med 2014;4:e15444.
[6] Dunn LK, Durieux ME. Perioperative use of intravenous lidocaine. Anesthesiology 2017;126:729–37.
[7] Soleimanpour H, Hassanzadeh K, Mohammadi DA, et al. J Med Case Rep 2011;5:256.
[8] Soleimanpour H, Hassanzadeh K, Vaezi H, et al. Effectiveness of intravenous lidocaine versus intravenous morphine for patients with renal colic in the emergency department. BMC Urol 2012;12:13.
[9] Firouzian A, Alipour A, Dezfouli HR, et al. Does lidocaine as an adjuvant to morphine improve pain relief in patients presenting to the ED with acute renal colic? A double-blind, randomized controlled trial. Am J Emerg Med 2016;34:443–8.