

## ORIGINAL ARTICLE

## Treatment of Renal colic: Use of intravenous Lidocaine

Chirag J Patel<sup>1</sup>, Jigarkumar B Gosai<sup>2</sup>, Binit N Jhaveri<sup>3</sup>, Divyesh Kalariaya<sup>4</sup>, Utsav N Parikh<sup>5</sup><sup>1</sup>Associate Professor, <sup>2</sup>Assistant Professor, <sup>3</sup>Third year Resident, <sup>4</sup>First year Resident, <sup>5</sup>M.B.B.S, Emergency Medicine department, B.J. Medical College, Civil Hospital, Asarwa, Ahmedabad, Gujarat, India

## ABSTRACT

**BACKGROUND AND OBJECTIVES:** Patients suffering from renal colic presents to the ED with intractable pain. Common treatment of renal colic includes NSAIDS and Opiates. Intravenous lidocaine has been shown to have a safe medication profile when used at low doses and is effective in the treatment of renal colic. **METHODS:** This was a cross-sectional study. Patients with diagnosed renal colic pain were included. Patients were given intravenous lidocaine in a dose of 1.5mg/kg. **RESULTS:** 116 patients were enrolled in the study. In our study, 68 (58.62%) patients had right sided lumbar region pain and rest 48 (41.38%) had left lumbar region pain. 68 (58.62%) patients had right sided lumbar region pain and rest 48 (41.38%) had left lumbar region pain. Pain was radiating to groin in 88 (75.86%) patients and to genetelia in 37 (31.89%) patients. Costovertebral angle tenderness was found in 103 (88.79%) patients. 98 (84.48%) patients had pain relief within 60 minutes of injection lidocaine. 18 (15.52%) patients had no pain relief at 60 minutes of injectable lidocaine and were given rescue analgesics. **CONCLUSION:** Local anaesthetics halt impulse initiation and transmission process in the axons, by blocking voltage-dependent sodium channels. 90 % patients enrolled in the study by soleimanpour etal., responded to lidocaine. In our study, 84.48% patients had pain relief from lidocaine.

**Keywords:** Renal colic, Lidocaine, Local anaesthetics

## INTRODUCTION

Lidocaine is a safe medication that is administered via different routes in different fields of the emergency medicine including visceral/central pain, renal colic, terminally ill patients, headache, post herpetic neuralgia, post-stroke pain syndrome, complex regional pain syndrome, neuropathic pain, intra-articular injection, topical anaesthesia, Bier block, local and regional anaesthesia, local anaesthetic infiltration, digital blocks and hematoma blocks.<sup>1</sup> Renal colic presents as acute colic pain in the flanks due to the passage of a stone from the ureter. The classic presentation of acute renal colic is a pain radiating from the flanks to the groin and accompanied by; microscopic hematuria (85% of patients), nausea, and vomiting.

Another important finding is costovertebral angle tenderness and in some cases, urinary infection, hydronephrosis, and continuous colic attacks have been observed in urolithiasis patients.<sup>2</sup> Patients suffering from renal colic often present to the ED with intractable pain. Nowadays many drugs are used for the control of renal colic pain. Most commonly used are NSAIDS and Opiates. Knowing that these drugs have side effects, the administration of alternative therapies would appear to be inevitable.<sup>2</sup> It is well known that intravenous narcotics have many side effects including drowsiness, hypotension, respiratory depression and slow gastrointestinal motility. Intravenous lidocaine has been shown to have a safe medication profile when used at low doses (1.5 mg/kg) and is effective in the treatment of renal colic. It has been shown to be more effective than intravenous morphine in pain control. Furthermore, if combined with intravenous morphine, patients will likely have less nausea.<sup>3</sup> Local anaesthetics halt impulse initiation

*\*Corresponding Author:*

Dr Binit N Jhaveri  
B-104, New P.G. Hostel, Phase-2,  
Civil hostel campus,  
Asarwa, Ahmedabad.  
Contact No: 9033668214; 9426119075  
Email: nambinit261991@gmail.com

and transmission process in the axons, by blocking voltage-dependent sodium channels. Common local anaesthetics are categorized into two major chemical classes: amino esters and amino amides. Amino esters are metabolized by plasma esterases, while amino amides are metabolized in the liver by hepatic enzymes. While lidocaine an amino amide group is efficient for both visceral and central pain, its IV form can be considered as a proper choice in scenarios where opioids are either ineffective or associated with undesirable complications. In addition to its extensive applications, lidocaine can be administrated via various routes (i.e. IV, subcutaneously (SC) and nerve blocks).<sup>1</sup>

#### **MATERIALS AND METHODS**

This was a cross-sectional study carried out at tertiary care hospital at Ahmedabad, Gujarat, India. Patients coming to emergency room with renal colic pain were identified by symptoms like colic pain radiating from the flanks to the groin, pain at lumbar region and/or accompanied by, hematuria (microscopic), nausea, vomiting, costovertebral angle tenderness and in some cases, urinary infection, hydronephrosis. Patients information were collected over a period of three months. X-ray and ultrasound were the investigations done to diagnose renal stones and back pressure changes. Informed written consent was taken from the patient and those who gave the consent were enrolled in the study. Patient was given intravenous lidocaine in a dose of 1.5mg/kg. Vitals before and after giving lidocaine were recorded. Cardiac monitor was attached to the patient. Visual analog pain score were recorded at time t=0, t=10mins, t=20mins, t=30mins, t=60mins. The patient was kept under observation.

Ethical committee approval was taken.

Demographic details of patient was collected and past history was noted. Data were recorded and entered in excel sheet and appropriate statistical analysis was performed.

#### **Inclusion criteria:**

Patients giving consent.

Age 12 to 80 years.

Patients with acute flank pain with x-ray or ultrasound diagnosed renal colic.

#### **Exclusion criteria:**

Patients not giving consent.

#### **OBSERVATIONS**

116 patients were enrolled in the study, of which 81 (69.83%) were males and 35 (30.17%) were females. Mean ages of the patients were 34.41 years (CI 32.14-36.30). Minimum age was 13 years and maximum age was 65 years. In our study, 68 (58.62%) patients had right sided lumbar region pain and rest 48 (41.38%) had left lumbar region pain. Pain was radiating to groin in 88 (75.86%) patients and to genetelia in 37 (31.89%) patients. Costovertebral angle tenderness was found in 103 (88.79%) patients. 69 (59.47%) patients complained of both nausea and vomiting, while nausea was associated with renal colic in 82 (70.68%) patients and vomiting was associated in 35 (30.17%) patients. 68 (58.62%) patients had dysuria, 74 (63.78%) patients had burning micturition and 10 (8.62%) patients had hematuria (microscopic). In our study, 64 (55.18%) patients had mild to moderate hydronephrosis. 22 (18.96%) patients had a history of recurrent stones. 8 (6.89 %) patients had a history of past lithotripsy. Of 116 patients, average pulse rate was 87.05/min (CI 84.80-89.29). 90 (77.58%) patients had normal pulse rate with average of 84/min and tachycardia was found in 26 (22.42%) patients with an average pulse rate of 109.28/min. Of 116 patients, mean systolic blood pressure was 126.10mmhg and mean diastolic blood pressure was 78.34mmhg. Pain relief after lidocaine (Visual Analog Scale) is as shown in table1.

**Table 1: Pain relief after lidocaine is as shown in below table:**

Time after inj. lidocaine	Visual Analog Scale (mean)	Visual Analog Scale (CI)
0 mins	9.86	9.79-9.92
10 mins	7	6.68-7.31
20 mins	4.84	4.37-5.32
30 mins	2.84	2.30-3.38
60 mins	1.53	0.96-2.16

98 (84.48%) patients had pain relief within 60 minutes of injection lidocaine. 18 (15.52%) patients had no pain relief at 60 minutes of injectable lidocaine and were given rescue analgesics. 5 patients experienced dizziness after lidocaine, which was relieved on its own.

**Table 2: Comparison of VAS in different study.**

Time after inj. lidocaine	Visual Analog Scale (mean)	Soleimanpour etal., <sup>5</sup>	Sin etal., <sup>6</sup>
0 mins	9.86	9.65	10
10 mins	7	1.83	4
20 mins	4.84	-	3
30 mins	2.84	1.13	2
60 mins	1.53	-	-

**DISCUSSION**

Therapeutic approaches for the treatment of renal colic in the emergency department:

**Narcotics:**

Narcotics have long been used for pain control in renal colic. Although narcotics such as morphine, codeine and meperidine for pain relief in patients with renal colic are effective, they have little effect on the underlying cause of renal colic (prostaglandins). The benefits of using opioids include; low cost, good effect and titration possibility. However, the majority of physicians are not comfortable with using these drugs due to their side effects. On the other hand, there is not enough data on the effect of opiates on ureter muscle tone and there are certain conflicts; some data suggest that ureter smooth muscle tone increases with opiates, yet others suggest no effect of opiates on ureter smooth muscle tone. Tramadol is another narcotic with has fewer potential side effects such as; respiratory depression, constipation, or dependence, compared to other opiates. Tramadol is as effective as morphine in reducing moderate pain after

surgery, but it is less effective in more severe pain.

**NSAIDs:**

NSAIDs prevent afferent arterial vasodilation and increase vascular permeability, which cause diuresis and increased pressure within the renal pelvis. NSAIDs also reduce edema, inflammation and ureter muscular hyperactivity.

The effect of NSAIDs on relieving pain in acute renal colic is similar to opiates. In spite of the beneficial effects of nonsteroidal anti-inflammatory drugs on pain, NSAIDs can reduce renal blood flow and ureter pressure in acute ureteral obstruction.<sup>5</sup>

A Comparison in Effect of Diclofenac and Ketorolac in the Treatment of Renal Colic, came to the conclusion that there is no significant difference in efficacy between the two drugs in pain relief of patients with renal colic.

**Paracetamol:**

Paracetamol (acetaminophen) is a safe and effective analgesic with fewer side effects than NSAIDs and opiates. Acetaminophen acts by inhibiting prostaglandin synthesis (which are free of inflammatory response), furthermore, metabolites of acetaminophen with N-arachidonoylaminophenol inhibit endogenous cannabinoids, such as an andamide reuptake in the synaptic cleft, and consequently they cause analgesic effects.<sup>2</sup>

**Lidocaine:**

Lidocaine, the most-frequently applied local anesthetic of the amide group, is used broadly in different fields of medicine; e.g. antiarrhythmic therapy, in addition to its administration as a local anesthetic. The analgesic properties of intravenous (IV) lidocaine were first reported in cancer and postoperative patients. Later, lidocaine was shown to provide analgesia, by blocking both peripheral and central voltage-dependent sodium channels. In the IV administration route, it can also relieve both deafferentation and central pain. The antinociceptive properties of lidocaine seem to be derived from a more multifaceted process, rather than simple

inhibition of neuronal ectopic discharges. While lidocaine is efficient for both visceral and central pain, its IV form can be considered as a proper choice in scenarios where opioids are either ineffective or associated with undesirable complications.<sup>1</sup> Lidocaine is effective, inexpensive and has few side effects including; lightheadedness, nausea and constipation. Overall, the incidence of side effects compared to those of other drugs and narcotic analgesics is low.<sup>2</sup>

### **Hyoscine Butyl Bromide:**

Anti-muscarinic agents are effective in the treatment of smooth muscle spasms (especially gastrointestinal). Ureteral peristaltic activity of the genitourinary system is controlled by the autonomic nervous system so the use of anti-muscarinic agents can be effective and theoretically it is effective when administered in relieving pain associated with analgesic drugs for moderate renal colic pain.<sup>2</sup> Soleimanpour et al., in their case series of eight patients with intractable renal colic underwent therapy with morphine and NSAIDs before receiving lidocaine. After receiving intravenous lidocaine, six (80%) patients got pain relief and two patients did not get pain relief and needed additional analgesics.<sup>4</sup> In our study, 98 (84.48%) patients had pain relief within 60 minutes of injection lidocaine. 18 (15.52%) patients had no pain relief at 60 minutes of injectable lidocaine and were given rescue analgesics. Soleimanpour et al., in their study had mean age of the patients  $35.23 \pm 12.37$  years.<sup>5</sup> In our study the mean age of patients were 34.41 years (CI 32.14-36.30). 90 % patients enrolled in the study by soleimanpour et al., responded to lidocaine.<sup>5</sup> In our study, 84.85% patients had pain relief from lidocaine. Perioral numbness, transient dizziness, and dysrhythmia were the associated side effects in less than 5% cases.<sup>5</sup> In our study, transient dizziness was seen in 5 (4.31%) patients. Comparison of VAS in different study is as shown above Table 2 Keller et al, in their study concluded that patients

suffering from renal colic often present to the ED with intractable pain. Commonly, narcotic medications are used to control the patient's pain. It is well known that intravenous narcotics have many side effects including drowsiness, hypotension, respiratory depression and slow gastrointestinal motility. Intravenous lidocaine has been shown to have a safe medication profile when used at low doses (1.5 mg/kg) and is effective in the treatment of renal colic.<sup>3</sup> Firozian et al., in their study concluded that using lidocaine may be recommended as an effective, safe, and inexpensive adjuvant to morphine in improving nausea and reducing the time to achieve pain and nausea relief in patients presenting to the ED with acute RC.<sup>7</sup>

### **CONCLUSION**

Renal colic is a common presentation to Emergency Department. The drug with good efficacy and less side effects is always desired for reducing pain of the patients. NSAIDs and Opiates are the two commonly used drugs for treatment of renal colic, but they are associated with significant side effects. Lidocaine has shown efficacy in treatment of multiple pain syndromes including renal colic. Renal colic patients when treated with lidocaine showed satisfactory results and less and predictable side effects. Lidocaine can be used as a first line agent or as a rescue agent when other drugs failed for treatment of renal colic, depending on the local guidelines.

### **REFERENCES**

1. Golzari S, Soleimanpour H, Mahmoodpour A, Safari S, Ala A. Lidocaine and Pain Management in the Emergency Department: A Review Article. *Anesth Pain Med.* 2014 February; 4(1): e15444.
2. Golzari S, Soleimanpour H, Rahmani F, Mehr NZ, Safari S, Heshmat Y, Bakhtavar HE. Therapeutic Approaches for Renal Colic in the Emergency Department: A Review Article. *Anesth Pain Med.* 2014 February; 4(1): e16222.

3. Keller D, Seamon J, Jones JS. BET 2: Usefulness of IV lidocaine in the treatment of renal colic. *Emerg Med J* 2016;33:825–826.
4. Soleimanpour H, Hassanzadeh K, Mohammadi DA, Vaezi H, Esfanjani RM. Parenteral lidocaine for treatment of intractable renal colic: a case series. *Journal of Medical Case Reports* 2011 5:256.
5. Soleimanpour H, Hassanzadeh K, Vaezi H, Golzari S, Esfanjani RM and Soleimanpour M. Effectiveness of intravenous lidocaine versus intravenous morphine for patients with renal colic in the emergency department. *BMC Urology* 2012, 12:13.
6. Sin B. The Use of Intravenous Lidocaine for Renal Colic in the Emergency Department. *Annals of Pharmacotherapy*.
7. Firouzian A, Alipour A, Dezfouli HR, Kiasari AZ, Baradari AG, Zeydi AE, Ahidashti HA, Montazami M, Hosseininejad SM, Kochuei FY. Does lidocaine as an adjuvant to morphine improve pain relief in patients presenting to the ED with acute renal colic? A double-blind, randomized control trial. *Am J Emerg Med* (2015);1-6.