Intraoperative Lignocaine Infusion for Prevention of Post Operative Pain after Cholecystectomy

Shah S*, Shrestha RR**, Bajracharya GR***

* Anesthesiologist, Tansen Mission Hospital., ** Assistant Professor, National Academy of Medical Sciences *** Professor, Nepal Medical College.

ABSTRACT

INTRODUCTION: Post operative pain is the major concern in surgery because it affects multiple systems. It induces physiological, immunological, and psychological changes. Intravenous lignocaine can be used as multimodal therapy to pain control.

METHODS: This was a randomized double blind study in 50 patients (8 male, 42 female) for cholecystectomy. Both groups consist of 25 patients. Group one received 1.5mg/kg bolus lignocaine followed by 2mg/kg/h infusion. Group two received saline. In both groups induction, maintenance, type of surgery and duration of anesthesia were similar. Pain in PACU was assessed with VRS score. Intramuscular pethidine was given for pain control as required.

RESULTS: VRS score at 24hrs in PACU was significantly less in lignocaine group than in control group at rest, on coughing and in walking. Similarly the total pethidine requirement in PACU was significantly less in lignocaine group (108±27.68 mg) than control group (160±35.35), p value < .0001.

CONCLUSION: Intraoperative intravenous lignocaine in low dose as 2mg/kg/hr can be used as multimodal therapy in pain control and to decrease opioid consumption in PACU as it is cheap and easily available.

KEY WORDS: Lignocaine, Pethidine, Post operative Pain, VRS

INTRODUCTION

Post operative pain is a major concern in surgery because it affects multiple systems and induces physiological, immunological and psychological changes.[1] Surgery produces tissue injury with subsequent release of histamine and inflammatory mediators, such as peptides (bradykinin), lipids (Prostaglandin), neurotransmitters (serotonin), and neurotrophins (nerve growth factors). These activate the peripheral nociceptors which initiate the transduction by peripheral nociceptor, then the impulse are transmitted by Aδ and C nerve fibers from peripheral visceral and somatic site to the dorsal horn of spinal cord. From there it reaches the thalamus which in turn send projections through the internal capsule and corona radiata to the postcentral gyrus of cerebral cortex to ultimately produce the perception of pain.[2]

Intraoperative and post operative analgesia is provided traditionally by opioids analgesics. The use of opioids can be associated with increased incidence of post operative complications like respiratory depression, sedation, post operative nausea and vomiting, ileus and urinary retention.[3]

The classical action of lignocaine is by blocking peripheral and central sodium channels in the intracellular side of the cell membrane. Lignocaine also has an anti inflammatory property and stimulates the secretion of the anti inflammatory cytokines IL-1 receptor antagonist.[4] Conventional pharmacological treatment includes the use of acetaminophen, opioids and non steroidal anti inflammatory drugs. Under

Correspondence :
Shristi Shah, Anesthesiologist
Tansen Mission Hospital, Tansen 10, Palpa, Nepal.
Ph No – 00977-9851002214
E mail – shristi97@gmail.com

specific conditions antidepressant, antiepileptic, membrane stabilizer and n-methyl-d-aspartate antagonist are also added.[5] So this study is to use lignocaine as the part of multimodal therapy for pain control and to decrease the opioid consumption.

METHODS

It is the prospective, randomized, double blind study, approved by the Institutional Review Board of National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal.

The study size is thus set to 50 patients with 25 patients in each group.

Selection criteria for the patient include all ASA I or II, both male and female of 20- 60 years and those undergoing cholecystectomy. All patients with known allergy to drugs, history of seizure disorder, patient refusal and uncooperative patients, history of renal, hepatic and cardiac disease, and those with chronic use of opioids are excluded.

All patients were informed and explained about the 4 point verbal rating scale (VRS) ranges from 0-3 where 0 is no pain and 3 is severe pain. The patients were randomly allocated into two groups using envelop method. For each patient an envelope containing a group assignment was prepared and sealed. When Patients arrives theater, IV access was opened and monitors attached. Monitoring included continuous ECG, noninvasive blood pressure (NIBP), and pulse oxymetry during operation.

Group one received pethidine 0.5mg/kg at induction and then bolus lignocaine 1.5mg/kg followed by infusion of iv lignocaine $2mgkg^{-1}hr^{-1}$ until the end of surgery and other group received pethidine and then saline infusion as the control group.

All patients were induced with 2mg/kg propofol and with vecuronium 0.1mg/kg as muscle relaxant and intubated with cuffed orotracheal tube of proper size. Anesthesia was maintained with O_2, plus halothane, and vecuronium for muscle relaxation. At the end of surgery patients were reversed with neostigmine 0.05mg/kg and atropine 0.025mg/kg then extubated and were shifted to post operative ward.

For postoperative pain relief inj. pethidine 50mg im with phenergan 25mg was given SOS for VRS 2 or more by PACU nursing staff who was blind about the groups.

The time of post operative analgesic was recorded and also the total amount of opioids received in 24 hrs was recorded. VRS Score was recorded at the time of first dose of opioid, and after 24 hrs in PACU.

Statistical Analysis:

For age, weight, time of 1st dose of pethidine and total dose of pethidine mean were compared with Independent t – test and p value was calculated. For gender, ASA and VRS score median were compared with chi square test and p value was calculated. P value less than 0.05 was taken statistically significant.

RESULTS

A total of 50 patients of ASA I and II were included in this study.

Table 1: Patient's Characteristics

Characteristics	Lignocaine group (n=25)	Control group (n=25)	P – value
Gender(M/F)	5/20	3/22	0.44
Age(yrs)	44±12	39±11	0.145
Weight(kg)	54±8	55±8.5	0.512
ASA(I/II)	19/6	23/2	0.12

There was no significant difference between gender, age weight and ASA status in both study groups. The type of surgery included in the study was open cholecystectomy (80%) and laparoscopic cholecystectomy (20%) in both groups.

Mean time in minutes when the patient requested for the pethidine after surgery in PACU was 121.8±107.14min in lignocaine group and 83.49±76min in control group. P value calculated was 0.15 which was not statistically significant. In lignocaine group when patient was requesting for pethidine for the first time observed VRS at rest was 1-3 (2 as median) and in control group was 2-3 (2 as median). p value calculated was 0.35 which was not statistically significant. Similar result was obtained while coughing also.

After 24hrs at rest as shown in figure 1, in lignocaine group 40% had VRS 0, 56% had VRS 1 and 4% had VRS 2. In control group 4% had VRS 0, 76% had VRS 1 and 20% had VRS 2. Similarly VRS score on coughing in lignocaine group was 8% VRS 0, 48% VRS 1 and 44% VRS 2. In control group 24% VRS 1, 60% VRS 2 and 16% VRS 3. Also VRS score on walking in lignocaine group was as 24% VRS 1, 68% VRS 2 and 52% VRS 3. In control group 48% had VRS 2, 52% had VRS 3. The statistical

test shows that calculated p value for rest, coughing and walking (0.005, 0.035, 0.001 respectively**)** was statistically significant.

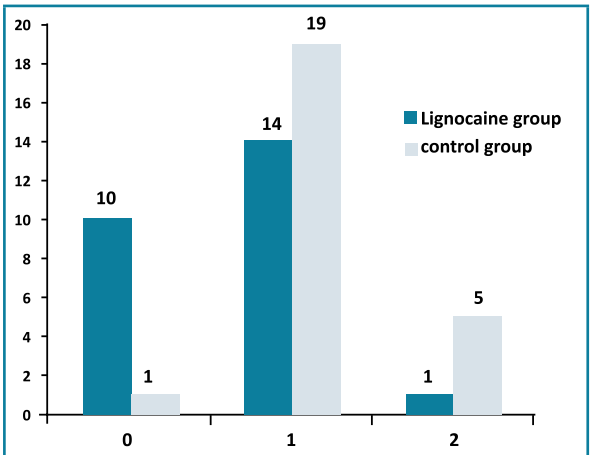

Figure 1: VRS score at the end of 24hrs (at rest)

At the end of 24hrs in PACU total pethidine used in lignocaine group was 108±27.68mg and in control group was 160.0±35.5mg. p value calculated was 0.0001 which was statistically significant.

DISCUSSION

Post operative pain is a major concern after abdominal surgeries. Conventional analgesic with opioids requires repetitive administration for sustained pain relief to be achieved. Along with analgesia, risk of side effect also exists and this may have the detrimental effect on patient's quality of life. In contrast short term administration of intravenous lignocaine may produce pain relief that far exceed both duration of infusion and half life of drug, thus reducing the concomitant analgesic medication and their side effect.

In this study we compared the post operative pethidine consumption and pain score after cholecystectomy in patients receiving lignocaine infusion ($2mgkg^{-1}hr^{-1}$) with the control group. In this study we compared the time of first dose of pethidine after surgery in PACU in both groups. The time ranges from 5mins to 480mins, still comparing the mean it was not statistically significant ($p = 0.15$). This finding was similar to study done by W. Koppert and others[6] in forty patients undergoing major abdominal surgery. We also compared the VRS score at the time of first dose of pethidine in PACU. It also was not statistically significant. Lauwick and others[7] studied intraoperative lignocaine infusion in 50 adult patients undergoing laparoscopic cholecystectomy. They also did not find any statistical difference in VRS score in lignocaine and in control group for first 90mins (p=0.4). This could be because the effect of lignocaine is mainly the central hyperalgesia, so the acute sharp pain needs the strong analgesic.

VRS score at the end of 24 hours at rest, coughing and on walking was statistically significant ($p<0.05$). It shows that intraoperative intravenous lignocaine decrease the VRS score in postoperative period. W. Koppert and others[6], Lauwick S. and others[7], Wu CT and others[8], Cassuto J and others[9], Israel ZY and others[10], Rimback G and others[11] and Kaba A and others[12] all have the similar results of less VRS Score in lignocaine group than control group. While Martin and others[13], Birch K and others[14] and Striebel HW and others[15] did not noticed any significant difference in pain score in total hip arthoplasty, abdominal hysterectomy and tonsillectomy respectively in lignocaine and control group. They concluded that perioperative administration of lignocaine intravenously is effective only in surgery associated with development of pronounced central hyperalgesia as in intestinal or bowel surgery. The mechanisms and the site of action of systemic lidocaine are still unclear. Systemic lidocaine can inhibit peripheral neuropeptide release; however, it is assumed that the main therapeutic effect can be attributed to a central antihyperalgesic effect. In abdominal surgery with extended tissue damage, there is major input from chemonociceptors to the central nervous system. In humans, especially, the mechanoinsensitive nociceptors are known to be tonically activated by chemicals. This class of nociceptors has also been linked to the induction of central sensitization in experimental and clinical settings. In line with these results, mechanoinsensitive nociceptors were particularly sensitive to small-dose lidocaine, thus preventing the induction of central hyperalgesia and improving the postoperative pain therapy[6].

Total pethidine consumed in 24 hours in PACU was statistically significant. There was significant decrease in opioid consumption in postoperative ward after intraoperative intravenous lignocaine infusion as in study done by Cassuto J. and others[9], Koppert W and others[6], Lauwick S and others[7], and Kaba A and others[12]. Similarly Wallen G and others[16] noticed the adequate blood level of lignocaine even after stopping lignocaine infusion. They noticed less opioids consumption significantly after 48-72hrs. However, the results were partly in contrast to the findings of Martin and others[13] and Striebel HW and others[15] who reported no beneficial effect in the postoperative

pain. This might be explained by the type of surgery they studied (total hip replacement and tonsillectomy respectively). The reason why Birch K and others[14] did not noticed any opioid sparing effect of lignocaine may be because of the different designs of the studies and the different dosages of lignocaine used in these patients. Similarly lignocaine was administered in post operative ward only after pain complain and if infusion for 30mins did not relieved pain then morphine was given so this intermittent infusion may be the cause for this type of result.

The safety of the intravenous lignocaine for postoperative analgesia although is not clearly determined as the serum lignocaine level was not measured. But the side effect of lignocaine like perioral numbness, cardiac dysarrhythmias, and seizures were not noted in the study group in PACU.

Since pethidine was supposed to have less addiction and safer than morphine it was considered for post operative pain in this study. In our institute we consider on demand intermittent bolus dose of pethidine on regular basis so same is considered in this study for post operative analgesia.

For future study Perioperative lignocaine infusion in other type of surgery, longer study period up to 72hrs, continuation of lignocaine in PACU also for 24hrs, and use of patient controlled analgesia are suggested.

Consistent with previous studies we found that systemic lignocaine reduces postoperative pain and pethidine consumption when applied perioperatively. Intravenous lignocaine has been shown to be analgesic, antihyperalgesic and anti-inflammatory. Clinical studies have revealed the nociceptive effect of IV sodium channel blocker[10]. This effect is thought to reflect the inhibition of primary evoked polysynaptic reflexes in spinal dorsal horn mediated by variety of mechanism including sodium channel blockadge[17].

CONCLUSION:

This study showed that intravenous bolus of lignocaine 1.5mg/kg body weight followed by infusion of 2mg/kg effectively decreases the pain score at 24hrs after surgery and also the total pethidine consumption postoperatively for 24hrs. From the result of this study we recommend that intravenous lignocaine, which is cheap, easily available, can be used intraoperatively to reduce the postoperative pain and opioid consumption as the multimodal therapy in pain control in abdominal surgeries.

REFERENCES

1 Kehlet H, Holte K. Effect of post operative analgesia on surgical outcome. Br J.Anaesth. 2001; 87: 62-72.

2 Edward Morgan, Maged Mikhail, Michael Murray. Pain Management. In: Clinical Anesthesiology, 4th edition. Singapore, McGraw Hill Education, 2008, pp 362-4.

3 White PF. The role of non opioids analgesic techniques in the management of pain after ambulatory surgery. Anesth Analg 2002;94:577-85.

4 Hollmann MW, Durieux ME. Local anesthetic and the inflammatory response: a new therapeutic indication? Anesthesiology. 2000;93:858-75.

5 Gary McCleane. IV lidocaine : An outdated or Underutilized treatment for pain? Journal of Palliative Medicine. 2007;10(3):798.

6 Koppert W, Weigand M, Neumann F, Sitt R, Schuettlet J, Schmelz M, et al. Perioperative intravenous lignocaine has preventive effect on postoperative pain and morphine consumption after major abdominal surgery. Anesth Analg. 2004; 98:1050-1055.

7 Lauwick S, Michelagnoli G, Kim DJ, Mistraletti G, Feldman L, Fried G, et al. Intraoperative lidocaine infusion spares postoperative fentanyl in patient undergoing ambulatory laparoscopic cholecystectomy. CJA. 2008;55:754-760.

8 Wu CT, Borel CO, Lee MS, Yu JC, Liou HS, Yi HD, Yang CP. The interaction effect of perioperative cotreatment with dextrometharphen and intravenous lidocaine on pain relief and recovery of bowel function after laparoscopic cholecystectomy. Anesth Analg. 2005;100:448-453

9 Cassuto J, Wallin G, Högström S, Faxén A, Rimbäck G. Inhibition of Postoperative Pain by Continuous Low-Dose Intravenous Infusion of Lidocaine. Anesth Analg. 1985;64:971-974.

10 Israel ZY, Benzion B, Eduard M, Yuri L, Hanna B. The effect of perioperative intravenous lidocaine on post operative pain and immune function. Anesth Analg. 2009;109:1464-9.

11 Rimbäck G, Cassuto J, Tollesson PO. Treatment of postoperative paralytic ilieus by intravenous lidocaine infusion. Anesth Analg. 1990;70:414-419.

12 Kaba A, Laurent SR, Detroz BJ. Intravenous lignocaine infusion facilitates acute rehabilitation after laparoscopic colectomy. Anesthesiology. 2007; 106:11-18.

13 Martin F, Cherif K, Gentili ME, Enel D, Abe E, Alvarez JC, et al. Lack of impact of intravenous lidocaine on analgesia, functional recovery and nociceptive pain threshold after total hip arthroplasty. Anesthesiology. 2008; 109:118-123.

14 Birch K, Jorgensen J, Jorgensen BC, Kehlet H. Effect of iv lignocaine on pain and endocrine metabolic response after surgery. Br J Anaesth. 1987;59(6):721-724.

15 Striebel HW, Klettke U. Is intravenous lidocaine infusion suitable for postoperative pain management. Schmerz. 1992 dec;6(4):245-50.

16 Wallin G, Cassuto J, Hogstrom S, Linden I, Anders F, Rimback G, et al. Effect of lidocaine infusion on the sympathetic response to abdominal surgery. Anesth Analg. 1987;66:1008-13.

17 Gabriela R Lauretti. Mechanism of analgesia of intravenous lignocaine. Rev Bras Anestesiol 2008;58.