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A COMPARISION OF INTRAVENOUS LIGNOCAINE ANALGESIA AND EPIDURAL ANALGESIA FOR CONTROL OF POST-OPERATIVE PAIN IN PATIENTS UNDERGOING ABDOMINAL SURGERIES.

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Abstract

Background and aim: Epidural analgesia using local anaesthetic is particularly appropriate after abdominal surgery; however, its benefit-risk ratio might be questionable. Intravenous lignocaine has recently gained popularity to manage postoperative pain. The present study aims to compare the effectiveness of intravenous lignocaine analgesia vs. epidural analgesia for postoperative pain control in patients undergoing abdominal surgeries. ***Methods:*** The quasi-experimental study involved patients aged 18-65 years with ASA physical status I and II who were undergoing abdominal surgeries under general anaesthesia for various reasons. Patients (N=26) were randomly allocated either to receive intravenous lignocaine infusion (n=13) or epidural bupivacaine infusion (n=13). Post-operative pain, Intra and postoperative heart rate, respiratory rate and blood pressure were monitored at 2, 4, 8, 12, 16, 24 h. Need for rescue analgesia and total dose of other analgesics administered were also monitored. ***Results:*** Pain scores in intravenous lignocaine group patients were lesser when compared with epidural bupivacaine infusion, however statistically insignificant (P>0.05) The SBP, DBP, MBP, HR and respiratory rate were comparable between both groups. Mean time from surgery to 1st dose of rescue analgesia with injection paracetamol was 13.848 h in lignocaine group and 8.923 h in epidural bupivacaine group. (P=0.025) In Lignocaine group, the average dose given was 50 mg whereas in epidural bupivacaine it was 66.67 mg from the end of surgery to 24 h post-operatively (P>0.01). ***Conclusion:*** Intravenous lignocaine (preservative free) infusion group patients had good analgesia post-operatively as equal to that provided by the epidural Injection bupivacaine infusion with a superiority of a technical easiness.

Keywords: Analgesia, Epidural, lidocaine, post-operative pain, bupivacaine.

INTRODUCTION

Major abdominal surgery is one of the most performed surgical procedures in the world.[1] However, postoperative pain control following the abdominal surgeries plays a critical role in the recovery, and outcome of the patients.[2] The chronic postoperative pain is estimated to be more than 20% if the surgery involves the gastrointestinal system.[1] Furthermore, it increases the healthcare costs as a results of longer hospital stays, longer recovery times, and related complications. Hence, analgesia in postoperative settings indeed provides comfort to patients, and minimizes the adverse effects, and the complications associated with procedure.Despite the fact that afferent neural blockade is the most effective method, it cannot be performed for major abdominal surgeries due to various reasons.[3]

Epidural analgesia, the first choice of mode of analgesia used more often by many anaesthetists, with local anesthetic is very beneficial after abdominal surgery as it reduces postoperative stress, offers great pain relief allows for enforced mobilization and improves the gastrointestinal function.[4] However, as it is an invasive technique, with risk of complications such as epidural abscesses and hematomas, it may be difficult to perform.[1] Intravenous lidocaine has been shown to accelerate the recovery of bowel function following surgery by acting as an analgesic, anti-hyperalgesic, and anti-inflammatory.[5,6] Furthermore, as it is a noninvasive method, it may be easier to use and even safer than an epidural analgesia.[1] Intravenous infusions of lidocaine have been utilized in several types of surgeries, including breast, abdominal, and gynaecological surgeries.[7–10]

Furthermore, previous studies reported that intravenous infusion of a local anesthetic, such as lidocaine can lower the pain intensity, opioid consumption, hospital stay and ileus with fewer adverse effects.[1] Hence, the purpose of the study is to assess the effectiveness of intravenous lignocaine analgesia vs. epidural analgesia for the control of postoperative pain in patients undergoing abdominal surgeries.

MATERIALS AND METHODS

Study design and patients

This study was a quasi-experimental study involving patients aged between 18-65 years old with an ASA physical status 1 and 2 who were hospitalized to our tertiary care centre between October 2017 to October 2019 and underwent abdominal surgeries under general anaesthesia for various reasons. After ethical committee approval and informed consent, the patients belonging to American Society of Anesthesiologists (ASA) grade I, II aged between 18 to 65 years, scheduled for elective abdominal surgeries were selected were included in the study. Patients who were unwilling or contraindicated to epidural analgesia, as well as those who had an allergy to local anaesthetics, were excluded from the study. Patients with valvular heart disease, arrhythmias, ectopics, myocardial infarction and cardiac failure, liver disease and/or renal impairment, international normalized ratio (INR) >1.5, parturient and pregnant women, and active breast-feeding mothers, seriously ill laparotomy patients, and patients using systemic corticosteroid, opiates were also excluded.

Randomization and study groups

The patients were in the study were chosen using closed envelope technique. Patients were randomly allocated into two groups with 13 in each group: Group A (intravenous lignocaine infusion) and Group B (epidural bupivacaine infusion). In group A patients Injection lignocaine (preservative free) 1.5mg/kg i.v. bolus was given at the time of incision followed by Injection lignocaine (preservative free) 1mg/kg i.v. infusion until 24h post-operatively, while in group B Injection bupivacaine 0.125% was given epidurally at the rate of 5ml/hour from the time of incision to 24hours post-operatively

Anesthesia technique

Thorough pre-anaesthetic evaluation and routine investigations was carried out before taking up the patient for surgery. All the patients were kept nil per oral for solids for 8 h and liquids for 4 h and clear liquids for 2 h, pre-medicated with oral ranitidine 150mg on the previous night and 2 h prior to surgery. On the day of the surgery, the patient was shifted to the anaesthesia procedure room and was positioned in supine position. Standard ASA monitors were connected (3 lead ECG, NIBP, pulse-oximetry), baseline readings were taken, and intravenous access was secured, and routine monitoring was done of the following parameters: Non-invasive blood pressure, Electrocardiogram, Heart Rate, Oxy-haemoglobin saturation. These parameters were recorded in the data collecting sheet. Additional analgesic agents used were documented along with the dosage and their route of administration. Anaesthetic management was standardized based on the standard of care in our institution and all the patients were induced with Injection fentanyl 2mcg/kg iv, Injection propofol 2mg/kg, Injection vecuronium 0.1mg/kg and intubated, and connected to ventilator. For patients randomized to intravenous lignocaine group, a single bolus of lignocaine 1.5 mg/kg was given at the time of starting of incision, followed by maintenance IV lignocaine infusion at 1mg/kg/hr perioperatively and continued for 24 h post operatively. The infusion was suspended in one patient where the patient developed tachycardia and the patient was monitored further for any other adverse effect and was excluded from the study. Patients randomized to the epidural local anaesthetic group had an epidural catheter placed through 10-11 or 11-12th thoracic vertebrae. Bupivacaine 0.125% was started at 5 ml/hr within.

Data collection

Patient's characteristics, and surgical data including age, gender, weight were recorded. The pain during the period of 24 h post operatively was evaluated using NRS (Numerical Rating Scale). After transfer to the post anaesthesia/post-operative recovery room, pain scores, hear rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MBP), respiratory rate (RR), and peripheral oxygen saturation (SPO2) were monitored and recorded at 0,2,4,8,12,16,24 h intervals post operatively. If the numerical pain score was 3 but <4 out of 10 then patients were managed with Injection paracetamol 1gram iv as rescue analgesia, and if it was ≥4 but <6 then patients were managed with Inj tramadol 50mg iv and it was recorded. In both the groups, adequate depth of anaesthesia was maintained throughout the surgery. Diet advancement was guided by return of bowel function. Patients were mobilized as per surgeons' discretion. All patients were instructed to report pain, the time of first flatus, and bowel movements, and the time was recorded. If therapy outside the standard protocol was required, the patient was withdrawn from the study, the patient was observed till he/she recovered. Patients were discharged to home after they tolerated a solid diet and starting of bowel function, optimized pain control on oral pain medication and be able to perform or have help with their activities of daily living by the surgeons.

Statistical analysis:

Based on Terkawi et al study, the NRS mean pain scores for lignocaine and epidural on day 1 was 4.93 ± 1.22 and 3.34 ± 1.39, respectively.[11] In our study, expecting similar result with 80% power, 95% confidence level and effect size of

0.025, the study requires a minimum of 26 subjects. SPSS .21was used for data analysis. The data were compared statistically using chi-square test for categorical variables and unpaired t test for continuous variables between two groups and significance was defined as $p<0.05$.

RESULTS

Table 1 shows that both groups were comparable in terms of age, gender, and weight. Mean time from surgery to 1st dose of rescue analgesia with Injection paracetamol was significantly more in patients who received intravenous lignocaine infusion than those in epidural bupivacaine group (P=0.025). The mean total dose between the two groups was found to be statistically significant (P=0.004).The patients who received intravenous lignocaine infusion had slightly lesser pain scores when compared with the epidural bupivacaine infusion over the different time points, however the mean difference was statistically insignificant (Table 2). Even the other variables, heart rate, blood pressure, respiratory rate mean differences were comparable and within the normal limits in both groups.

Table 1: Demographic, clinical, and operative data

	Lignocaine, n = 13	**Epidural bupivacaine, n = 13**	**P-value**
Age (years)	43.85±8.19	45.15±9.379	0.234
Gender			
Male	6 (46.2%)	9 (69.2%)	0.234
Female	7 (53.8%)	4 (30.8%)	
Weight (Kg)	59.692±10.547	55.308±10.664	0.302
Time from surgery to 1st dose of rescue analgesia			
Paracetamol (time, hr)	13.848 ± 5.8	8.923 ± 5.923	0.025*
Tramadol (time, hr)	24 ± 0.00	24 ± 0.00	1
Total dose of tramadol (OPIOID) post-operatively (mg)	50 ± 0.00	66.67 ± 25.82	0.004

**Significant*

Table 2: Post-operative pain score

Time	**Lignocaine, n = 13**	**Epidural bupivacaine, n = 13**	**P-value**
Preoperative	0.231 ± 0.439	0.308 ± 480	0.674
Postoperative 2h	1.308 ± 0.480	1.462 ± 0.519	0.44
Postoperative 4h	2.077 ± 0.494	2.154 ± 0.555	0.712
Postoperative 8h	2.538 ± 0.519	2.538 ± 0.519	1
Postoperative 12h	2.462 ± 0.660	2.692 ± 0.630	0.371
Postoperative 16h	2.615 ± 0.506	2.692 ± 0.751	0.762
Postoperative 24h	3.462 ± 0.519	3.615 ± 0.768	0.555

DISCUSSION

Pain management, which is one of the most crucial aspects to consider perioperatively, is critical to a patient's better outcome and quick recovery. The mode of analgesia, the route of administration, drug used, all play an important role in reducing the postoperative pain with least possible side effects and, in having better compliance. Another aspect to consider is the convenience of the technique, as well as the likelihood of failure for each approach, as well as the cost of expenditure, which gives the caregiver comfort and choice in adopting the technique to the selected patients.

Among various drugs, intravenous lignocaine is gaining importance to manage post-operative pain.[12] Antinociceptive effects through blocking sodium and potassium channels, pain regulation in the CNS by inhibiting NMDA and NK receptors, and anti-inflammatory characteristics are all proposed mechanisms for systemic analgesia.[13] Intravenous lignocaine infusion is an easier method for the health care provider and is also accepted easily by the patients due to its convenience. Intravenous lignocaine infusions also reduced the requirement for additional analgesic.[14] Hence, we performed a quasi-experimental study and found that although insignificant, intravenous lignocaine infusion is comparatively better to epidural bupivacaine in reducing postoperative pain in patients until 24 h in patients who underwent abdominal surgeries for various reasons.

The mean age in our study is comparable to other studies in which the adult population was >18 years of age.[11,15] In our study, the pain scores in intravenous lignocaine group patients were lesser when compared with epidural bupivacaine infusion at all timepoints, however insignificant. Furthermore, although the pain score increases with time, lignocaine was comparatively better having less increase compared to epidural bupivacaine. HR, SBP, DBP, MBP and RR, which are the

indirect indicators pain were also comparable between the groups indicating no difference in analgesia provided by both intravenous lignocaine infusion and epidural bupivacaine infusion. Similar study conducted by Terkawi et al., reported IV lignocaine infusion was not inferior to epidural analgesia with respect to pain scores.[11] Similar study by Swenson et also stated that infusion of lidocaine is as effective as epidural analgesia and can recommended as an alternative to epidural analgesia.[16]

The mean duration from surgery to 1st dose of rescue analgesia with Injection paracetamol was 13.848 h in Lignocaine while it was 8.923 h in Bupivacaine group, which indicates need of early additional rescue analgesia in epidural bupivacaine group. While a study by Tauzin-Fin et al, reported that none of the patients required tramadol for analgesic rescue either in reference or lidocaine group.[14] Mean total dose or requirement of Injection tramadol was higher in lignocaine group (50 mg) when compared to epidural bupivacaine group (66.67 mg), which shows the superiority of analgesia in intravenous lignocaine infusion group in comparison with epidural bupivacaine group. While similar other retrospective study by Terkawi et al., reported that patients in the lidocaine cohort had more opioid (morphine) than patients in epidural analgesia group.[11]

Like previous studies, we found no lignocaine-related adverse effects in our study.[11,14] Lidocaine should be given during surgery and continued for 24 hours afterward, rather than just during the intra-operative and immediate post-operative periods to induce its actions.[7,17,18] When lidocaine infusion was established only in the post-operative period, it failed to provide analgesic effects.[19] Therefore, lignocaine group, a single bolus of lignocaine 1.5 mg/kg was given at the time of starting of incision, followed by maintenance IV lignocaine infusion at 1mg/kg/hr perioperatively and continued for 24 h post-operatively in our study.

The study has few limitations that need to be acknowledged. The superiority of time for the mobilization and bowel sounds couldn't be analysed as our study was done only for a period of 24 h post-operatively. Limited small size and single-centric study. Hence, large-sample size and multicentric studies are required to be carried out to validate the current findings and generalizability of the study results.

CONCLUSION

Intravenous lignocaine (preservative free) infusion group patients had good analgesia post-operatively as equal to that provided by the epidural Injection bupivacaine infusion with a superiority of a technical easiness. Hence, Intravenous lignocaine (preservative free) can be a better alternative for post-operative analgesia in patients undergoing abdominal surgeries.

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