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A Comparative study between intravenous Lignocaine infusion and ultrasound guided Transversus abdominis plane block plus rectus sheath block for intraoperative hemodynamic stability in laparoscopic cholecystectomy surgery

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ABSTRACT

Introduction: Laparoscopic cholecystectomy surgery is currently the mainstay surgical procedure for the treatment of cholelithiasis and intraoperative and postoperative analgesia is still dominated by opioids. However, postoperative complications can easily occur. This study focused on the hemodynamic variations and analgesic effects between the two methods in patients undergoing laparoscopic cholecystectomy by intravenous infusion of lignocaine and ultrasound-guided transverse abdominis plane block plus rectus sheath block, providing new ideas for multimodal analgesic strategies and improvements of the quality of postoperative recovery in patients.

Methods: This is an observational study conducted after ethical committee approval. In this study, 60 patients were allocated into 2 groups to receive intravenous Lignocaine infusion (group L) and transversus abdominis plane block plus rectus sheath block (group B). Hemodynamic variations during intraoperative period were monitored and post operative analgesia and bowel recovery were assessed.

Results: Intravenous Lignocaine infusion shows significant intraoperative hemodynamic stability (p value -0.025) and postoperative bowel recovery (p valve-0.0001) and block shows significant VAS scores (p value -<0.0001)

Conclusion: intravenous lignocaine infusion provided better hemodynamic stability intraoperatively and faster bowel recovery whereas transversus abdominis plane plus rectus sheath block provided better postoperative analgesia.

Keywords: *laparoscopic cholecystectomy, lignocaine, transversus abdominis plane block, rectus sheath block.*

1. INTRODUCTION

Laparoscopic cholecystectomy is currently the gold standard for the management of most elective and emergency gallstone disease but the perioperative analgesia remains an important clinical issue [1]. Nonetheless, it is linked to carbon dioxide insufflation-pneumoperitoneum and surgical positioning of the patient. All of these result in detrimental alterations in hemodynamics which is harmful to the patients with compromised cardiac function in whom this may predispose the myocardium to ischemia.[2]. Among the reported postoperative symptoms are superficial incision pain, abdominal pain, and post-laparoscopy shoulder pain [3]. Suboptimal postoperative pain control after laparoscopic cholecystectomy results to prolonged hospitalization and worsening quality of recovery, thus inhibiting the effective implementation of a day-surgery policy [4].

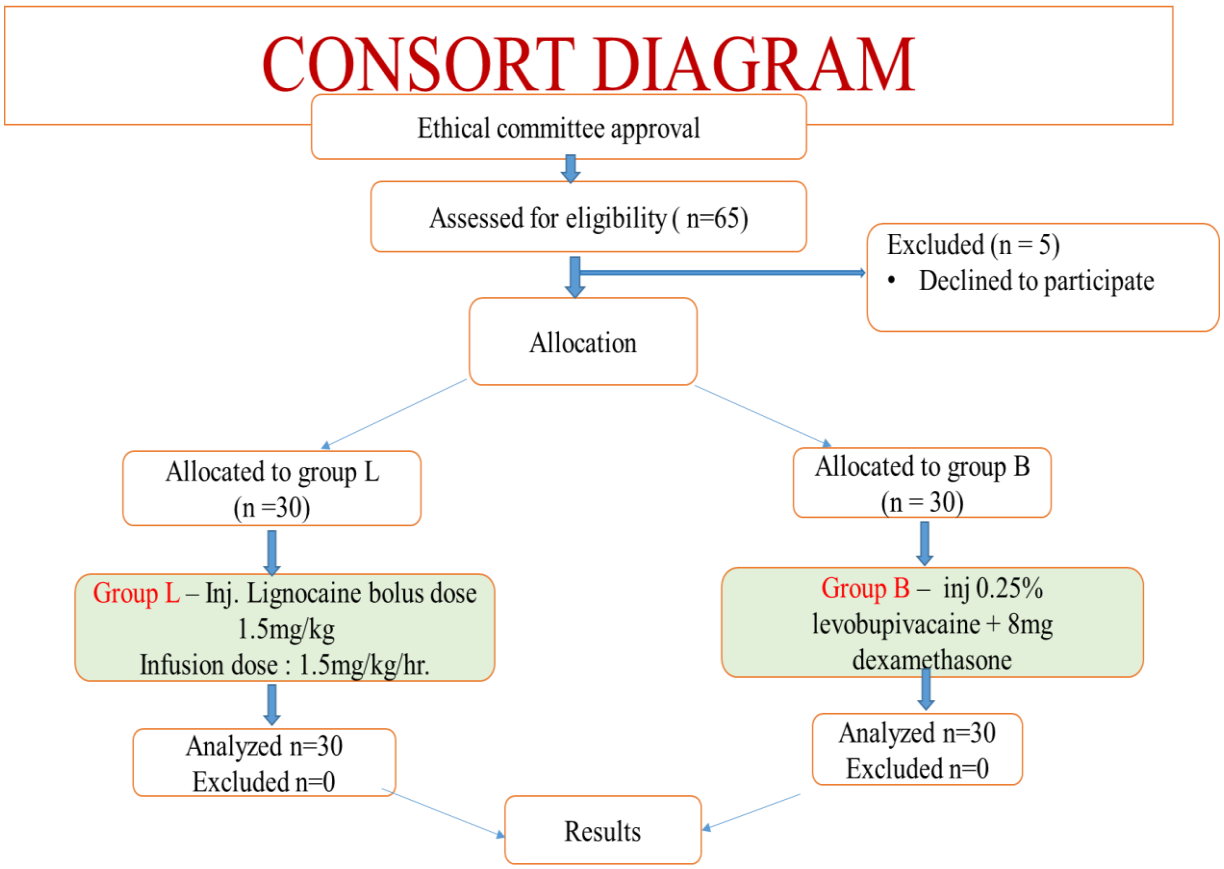
The regional blocks have now become the integral part of multimodal analgesia regimes. One such technique that has been reintroduced for surgeries involving the abdominal wall is the transversus abdominis plane (TAP) block plus rectus sheath block. Effective analgesia with effects that spare opioids is provided by the TAP plus rectus sheath block. The lack of efficacy

for visceral pain and the fact that the block's efficiency depends on the patient's anatomy and technique are drawbacks. Intravenous lidocaine has been utilized in a variety of surgeries, including laparoscopic procedures, as a component of a multimodal approach for postoperative analgesia and hemodynamic stability. Lidocaine is a short-acting amide local anaesthetic. Besides the potent analgesic and anti-inflammatory effect of intravenous lidocaine, there are also several other properties of this drug that accelerate postoperative recovery [5]. It also promotes the recovery of gastrointestinal function [6]. This action is by the inhibition of Na+ channels, NMDA, and G-protein coupled receptors. The concerns for LA toxicity have been raised with continuous intravenous lidocaine infusion [7]

Current evidence regarding the role of intravenous lidocaine infusion in laparoscopic cholecystectomy is conflicting. Initial reports proposed a significant analgesic and opioid-sparing effect that resulted to reduced morbidity and shortened length of hospital stay. These findings were further validated by two successive meta-analyses [4]. However, these pooled results were based on small size studies and heterogeneous lidocaine dosages.

Materials and methods: This double blinded observational study was conducted in Department of Anaesthesiology, Narayana Medical College and Hospital, Nellore, India. This study was conducted from December 2023 to February 2024 with the approval of Institution's Ethics Committee. Details of the Consolidated Standards of reporting trials (CONSORT) are shown in [Fig-1].

Figure 1. Consort diagram



After obtaining informed and written consent a total of 60 patients undergoing Laparoscopic cholecystectomy were enrolled in the study. A thorough preoperative check-up was conducted for all the patients. All the patients were divided into 2 groups of group B and group L. All the patients and the observer who records the data were blinded. Intravenous infusion of lignocaine was prepared by an anaesthesiologist who was not part of the study and TAP & RS block performed by the same anaesthesiologists who will not take part in the study further.

Study population: Patients aged between 20-60yrs, belonging to ASA categories I, II, regardless of gender, BMI of 18-24Kg/ m2 who were listed for elective Laparoscopic cholecystectomy surgery who met the inclusion criteria were included in the study. Those who refused to participate, individuals allergic to local anaesthetic agents, those with local skin infections, patients with hepatic, renal, or cardiac ailments and individuals with bleeding diathesis were excluded from the study. The pre anaesthetic checkup included assessment of history, general condition of the patient according to ASA classification,

general physical examination, detailed examination of the cardiovascular system, respiratory system, abdomen and neurological

Study Procedure: 60 patients scheduled for elective laparoscopic cholecystectomy were allotted to two groups: Group B & Group L. After thorough pre-anaesthetic evaluation, patient was shifted to operation theatre, all ASA standard monitors were connected and a standardised anaesthetic technique was followed. At induction all patients received Inj.midazolam 0.05mg/kg, Inj.propofol 2mg /kg, Inj.fentanyl 2mic/kg, Inj.cisatracurium 0.2mg/kg i.v. Airway secured with appropriate size I -gel and mechanical ventilation was commenced. Maintenance was done with inj.cisatracurium 0.02mg/kg, oxygen, air and sevoflurane 1- 2 MAC with intermittent positive pressure ventilation. In group L, bolus dose of 1.5 mg/kg iv lidocaine without preservative was given at induction followed by infusion at a rate of 1.5 mg/kg/hr till the end of surgery. Balanced crystalloid was used for fluid administration and intra-abdominal pressures were maintained below 12 mmHg. In Group B, received a bilateral TAP block and rectus sheath block with 0.25% Levobupivacaine and 8 mg Dexamethasone (30 mL for TAP block on each side and 10 mL for RS block on each side respectively).

Technique: A high-frequency Sono site M turbo linear USG probe (13-6 MHz) was placed in the midaxillary line between the bony prominences of the subcostal margin and the iliac crest. The three muscular layers of the abdominal wall-the External oblique (EO), Internal Oblique (IO) and Transverse Abdominis (TA) muscles were identified. Under strict aseptic precautions, a 20 G intravenous cannula stylet was introduced using an in-plane approach in an anterior-posterior direction and the needle was placed in the plane between the IO and TA muscles, where the drug (0.25% Levobupivacaine and 8 mg Dexamethasone, 30 ml on each side) was deposited.

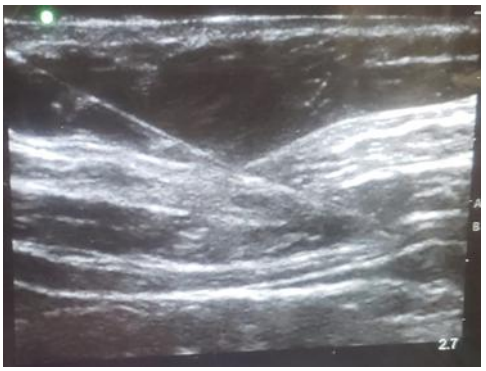


FIG 2. TAP block

For rectus sheath block, ultrasound probe was placed on the anterior wall of abdomen medial to the mid clavicular line. Needle was advanced using in- plane technique to posterior sheath of rectus muscle where the drug (0.25% Levobupivacaine and 8 mg Dexamethasone,10 mL on each side) was deposited. Intraoperative vitals were monitored. After extubation, patients were kept in the Post anaesthesia Care Unit (PACU) and assessed for various parameters.

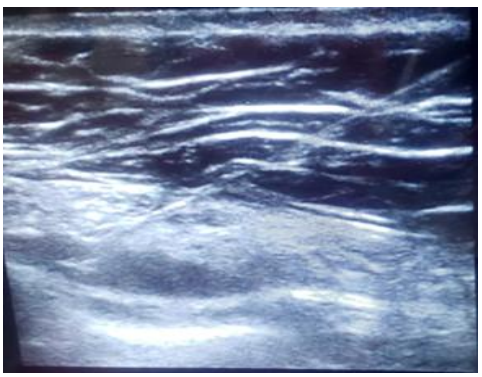


Fig 3. Rectus sheath block

All the patients received inj.paracetmol 1g at the end of surgery before extubation. After extubation patients were shifted to post anaesthesia care unit. Inj.Tramadol 1mg/kg was taken as rescue analgesia in the postoperative period. Rescue analgesic was given when VAS score was more than 3. Side effects like nausea, vomiting, drowsiness were not observed in any of the patients in Group L. No complications were seen in group B also.

Statistical analysis:

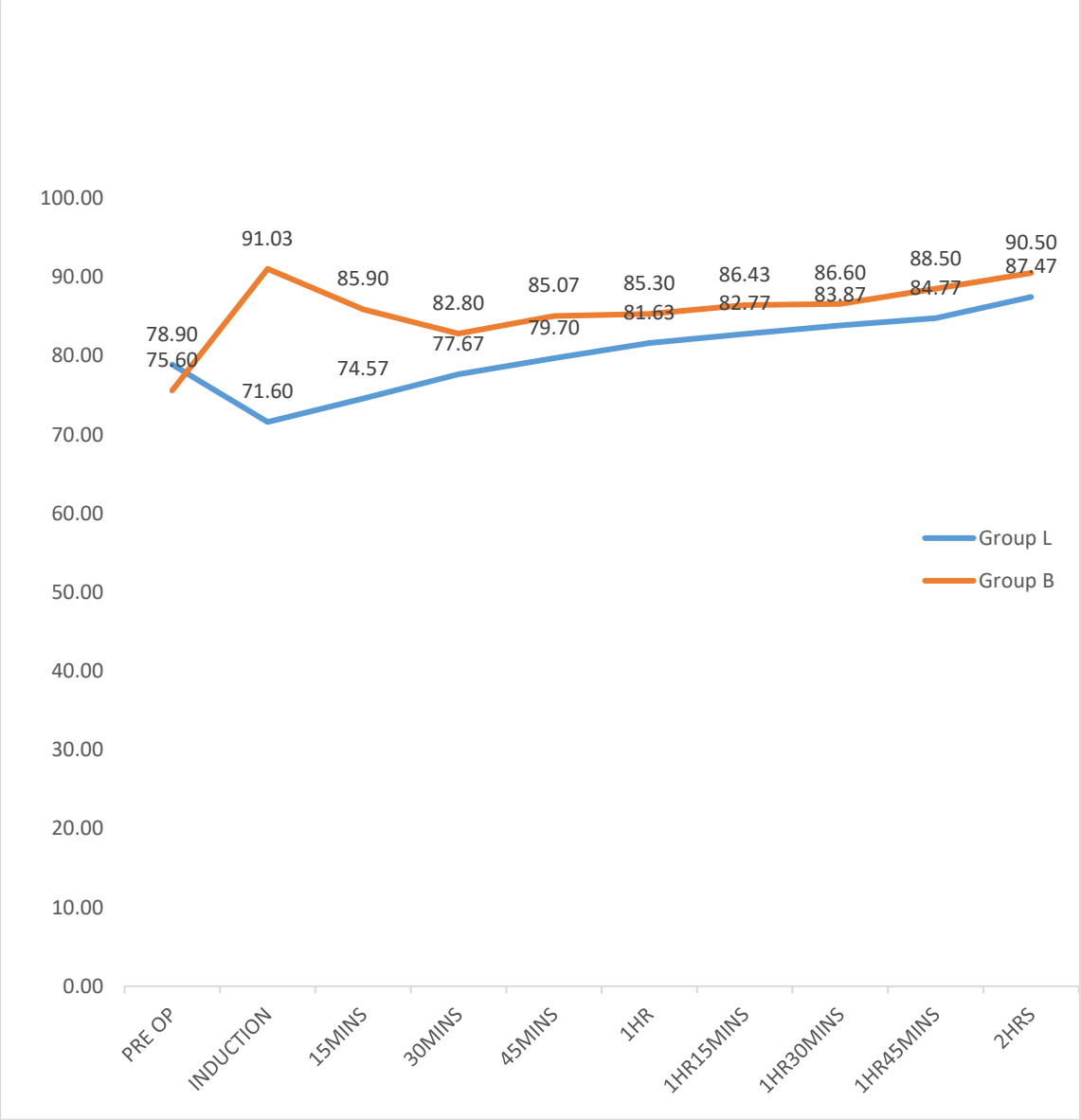
All recorded data was entered using MS excel software and analysis using SPSS Statistics software v.21(IBM, Armonk, NY) software. Qualitative data were recorded as number of patients and analyzed using Chi-square test. Quantitative data were recorded, mean ± standard deviation calculated and P value was calculated using Analysis of variance test. $P < 0.05$ was considered statistically significant.

2. RESULTS

Table 1 showing variations in heart rate between the two groups in which during preoperative period both the groups shows no significance.

VARIATIONS IN HEART RATE	Group				P value
	Group L		Group B		
	Mean	Standard Deviation	Mean	Standard deviation	
preop	78.90	7.54	75.60	8.34	0.113(NS)
induction	71.60	8.32	91.03	6.48	<0.0001(S)
15mins	74.57	7.64	85.90	10.08	<0.0001(S)
30mins	77.67	7.04	82.80	9.51	0.021(S)
45mins	79.70	6.35	85.07	8.28	0.007(S)
1hr	81.63	5.40	85.30	7.50	0.034(S)
1hr15mins	82.77	4.32	86.43	4.70	0.003(S)
1hr30mins	83.87	3.90	86.60	5.23	0.025(S)
1hr45mins	84.77	3.93	88.50	3.08	<0.0001(S)
2hrs	87.47	4.32	90.50	3.62	0.005(S)

Table 1: showing variations in heart rate



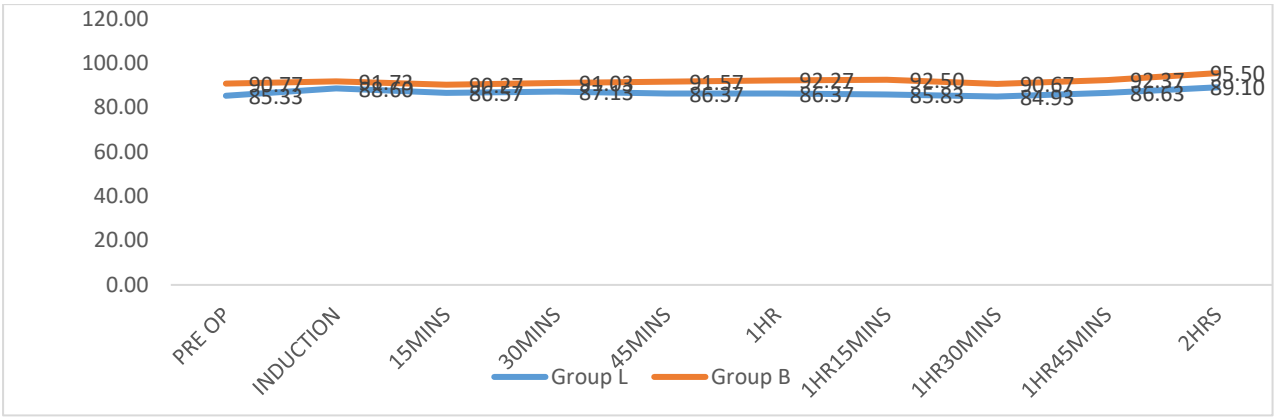
Graph 1: showing variations in heart rate

Table 2 showing variations in mean arterial pressure between the two groups in which lignocaine group showing better hemodynamics compared to block group

VARIATIONS IN MAP	Group				P value
	Group L		Group B		
	Mean	Standard Deviation	Mean	Standard Deviation	
Pre op	85.33	7.40	90.77	5.78	0.002(S)
Induction	88.60	4.52	91.73	6.48	0.034(S)
15mins	86.57	5.69	90.27	7.01	0.029(S)
30mins	87.13	6.25	91.03	6.45	0.021(S)
45mins	86.37	5.39	91.57	6.73	0.002(S)

1hr	86.37	3.70	92.27	5.71	<0.0001(S)
1hr15mins	85.83	4.58	92.50	6.00	<0.0001(S)
1hr30mins	84.93	4.23	90.67	6.88	<0.0001(S)
1hr45mins	86.63	4.43	92.37	5.57	<0.0001(S)
2hrs	89.10	5.07	95.50	5.41	<0.0001(S)

Table 2: showing variations in MAP

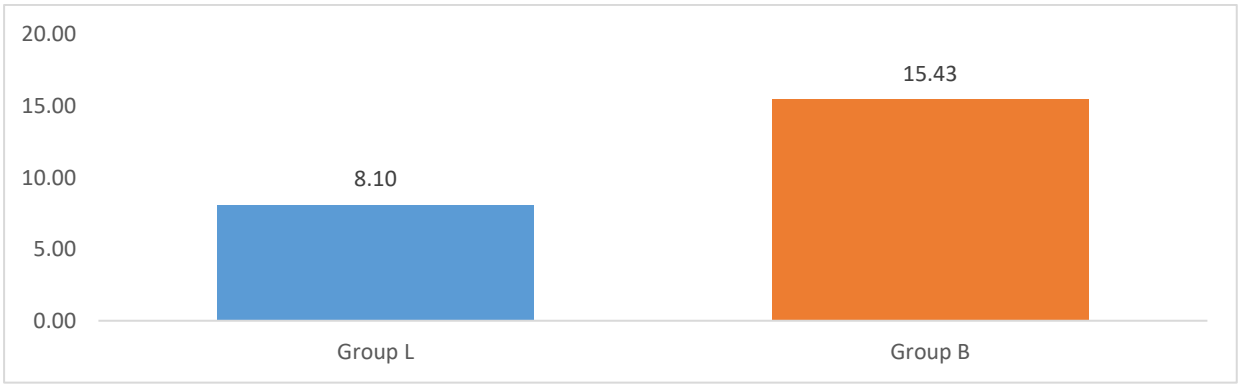


Graph 2: showing variations in MAP

Table 3 shows the bowel recovery status between the 2 groups in which lignocaine groups shows faster bowel recovery than block group.

	Group				P value
	Group L		Group B		
	Mean	Standard Deviation	Mean	Standard Deviation	
BOWEL RECOVERY WITHIN	8.10	1.40	15.43	2.10	<0.0001(S)

Table 3: showing bowel recovery

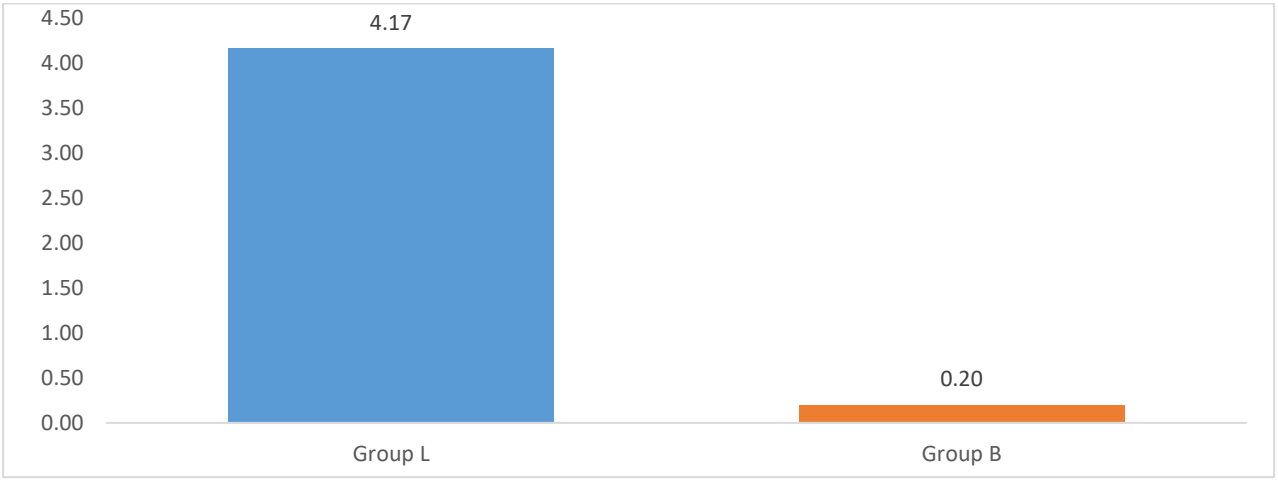


Graph 3: showing bowel recovery

Table 4 shows the require of rescue analgesia in both the groups after the first 24hrs postoperatively in which block group requires less number of doses of rescue analgesia when compared to lignocaine group.

	Group				P value
	Group L		Group B		
	Mean	Standard Deviation	Mean	Standard Deviation	
NUMBER OF RA DOSES FOR 1ST 24HRS	4.17	1.49	0.20	0.41	<0.0001(S)

Table 4: number of rescue analgesia doses in first 24hrs

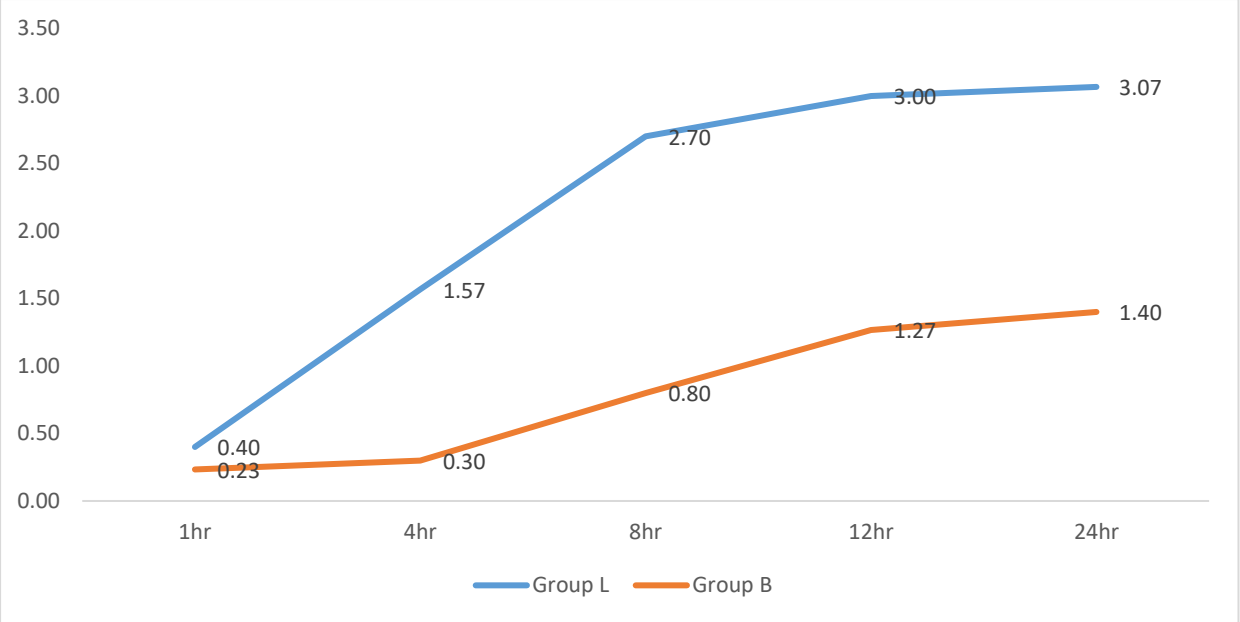


Graph 4: number of rescue analgesia doses in first 24hrs

Table 5 shows the VAS score variations between both the groups in which analgesia is better maintained with block group compared to lignocaine group.

VAS SCORE	Group				P value
	Group L		Group B		
	Mean	Standard Deviation	Mean	Standard Deviation	
1hr	0.40	0.50	0.23	0.43	0.169(NS)
4hr	1.57	0.68	0.30	0.47	<0.0001(S)
8hr	2.70	0.47	0.80	0.66	<0.0001(S)
12hr	3.00	0.59	1.27	0.45	<0.0001(S)
24hr	3.07	0.45	1.40	0.50	<0.0001(S)

Table 5: showing VAS scores



Graph 5: showing VAS scores

3. DISCUSSION

The literature is very sparse comparing intravenous drugs like lignocaine with abdominal wall interfascial plane block like combination of transversus abdominis plane block (TAP) plus rectus sheath block for intraoperative hemodynamic stability, postoperative analgesia and bowel recovery in laparoscopic cholecystectomy surgeries. To bridge this gap in the literature we have compared intravenous infusion of lignocaine and combined rectus sheath and TAP block in laparoscopic cholecystectomy surgeries.

Laparoscopic to cholecystectomy despite being minimally invasive it is maximally stressful perioperatively owing to the moderate to severe pain due the pneumoperitoneum and visceral manipulation. Hemodynamic instability may arise during surgery as a result of CO2 insufflation and the intraabdominal pressure associated with it. To prevent this, a well-balanced anaesthetic approach extending into the postoperative period with an effective pain management is required to provide enhanced recovery after surgery (ERAS) with reduced opioid consumption and reduced hospital stay. Intravenous lignocaine infusion has been used perioperatively for its analgesic, anti-inflammatory and opioid sparing properties.

Gupta and et al [7] in their study concluded that Intravenous Lidocaine as part of multimodal analgesic technique in obese patients undergoing laparoscopic bariatric surgery improves pain score and reduces opioid requirement as compared to USG-TAP Block.

Sun j and et al [8] stated that intravenous infusion of lidocaine provided better analgesia at 12 h and 24 h postoperatively compared with TAP block and improving the quality of postoperative recovery & postoperative analgesia in patients undergoing laparoscopic bariatric surgery.

In our study we have compared the two different methods of intravenous infusion of lignocaine and combined TAP block plus rectus sheath block individually for intraoperative hemodynamic stability and postoperative analgesia. Patients who received lignocaine infusion has better control of heart rate and mean arterial pressure compared to TAP plus rectus sheath block. Though this was statistically significant clinically all two methods provided stable hemodynamics intraoperatively. Patients in TAP + RS group had lower VAS scores in the postoperative period compared to lignocaine group. Time for first rescue analgesia and number of doses were also significantly less in TAP+ RS group. From our study we observed that intravenous lignocaine infusion is superior in providing hemodynamic stability intra operatively and faster bowel recovery postoperatively whereas combined TAP and rectus sheath block provided better pain relief and reduced analgesic consumption in the postoperative period. Infusion of lignocaine and TAP plus rectus sheath block can be an attractive combination for laparoscopic cholecystectomy surgeries with an efficient perioperative care aiding in fast-track anaesthesia and reduced hospital stay.

4. CONCLUSION

Intravenous lignocaine infusion provided better hemodynamic stability intraoperatively and faster bowel recovery whereas transversus abdominis plane plus rectus sheath block provided better postoperative analgesia.

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