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Comparison of Lignocaine with Ondansetron for Attenuation of Propofol-Induced Pain in Adult Patients Undergoing Laparoscopic Cholecystectomy

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ABSTRACT

Intravenous administration of propofol causes pain that impacts anesthesia procedures. **Objective:** To compare the efficacy of intravenous Lignocaine and Ondansetron in reducing propofol-induced pain, hemodynamic stability and assess the occurrence of associated adverse effects during induction using a pain scale. **Methods:** It was a Quasi-Experimental study and conducted for six months from Sep 2024 to Jan 2025 at the Anesthesia department at Islam Medical College, Sialkot. To measure pain effects at laparoscopic cholecystectomy among adult patients.The patients were received 0.5mg/kg Lignocaine through the vein or 8mg Ondansetron before they received propofol treatment. Medical staff evaluated patients' pain levels on a standard scale while recording their vital signs.Data were analysed by SPSS 21.0. The categorical data was analysed through chi-square and evaluated continuous values with an independent t-test at a significance level of 0.05. **Results:** Lignocaine brought better pain relief from propofol than Ondansetron at a statistical significance of p<0.001.People in the Lignocaine group reported 15% of bad pain while 32% of patients in the Ondansetron group felt the same pain level. Ondansetron caused short-lived drops in blood pressure and heart rate but the application of Lignocaine generated mild skin issues. **Conclusions:** The study proved Lignocaine worked better than Ondansetron at stopping propofol pain effects. Despite its merits Ondansetron still serves as a good treatment option and medical staff should monitor heart-related side effects. Additional medical trials must test the effectiveness of using both drugs together as a pain treatment option.

INTRODUCTION

The chemical nature of propofol as 2,6-diisopropylphenol contains many lipids that prevent it from dissolving in water. Propofol needs special lipid-based treatment because its oil-like element stops water from carrying it directly into the blood stream. The base solution consists of soybean oil combined with egg lecithin and glycerol to create its fibrous white coloring [1]. Propofol stays poorly mixable with water because its isopropyl chains resist forming bonds with water molecules. Patients who receive propofol injections through its lipid-based emulsion often experience pain because of its impact on many other patients [2]. The medicated emulsion raises the danger of infection from bacteria and can damage blood fat levels when taken for long periods. Experts have tested new ways to dissolve propofol that use cyclodextrin-based liquids, microemulsions, and water-friendly drug-release systems instead of the traditional lipid emulsion [3]. Patients feel this injection more than any other clinical treatment because its pain level varies greatly from tolerable discomfort to severe scalding. Research shows that propofol pain develops through pain receptor reactions in blood vessel linings which lead to enhanced inflammation and increase sensitivity to propofol. Doctors use two main treatment types to reduce propofol injection pain which researchers study. Both Ondansetron and Lignocaine work as effective solutions to minimize discomfort for patients

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[4, 5]. Lignocaine works well at decreasing the pain that propofol causes. This treatment keeps nerve endings stable and stops sodium channel activity to stop pain signals from traveling along neurons [6]. Lignocaine proves helpful when given as a separate injection before propofol treatment or mixed right into the propofol as a technique to lessen pain. Research shows Lignocaine succeeds in diminishing both pain episodes and intensity better than other options for anesthesiologists. Using this method brings limited side effects such as mild skin reactions and discomfort through veins plus rare episodes of bodywide chemical harm [7]. Patients use Ondansetron to block 5-HT3 receptors and lower postoperative vomiting but researchers now examine its potential pain relief benefits. Studies show that Ondansetron relieves propofol pain by blocking 5-HT3 serotonin receptors involved in pain regulation [8]. Ondansetron relieves propofol injection pain by blocking serotonin receptors that transmit pain signals to other parts of the body. Current research shows Ondansetron helps ease discomfort but its results against Lignocaine stay uncertain. When giving Ondansetron to high-risk patients' doctors must watch for minor drops in blood pressure and slower heart rates because these side effects happen temporarily [9, 10].

This study aimed to evaluate and compare the efficacy of intravenous Lignocaine (0.5 mg/kg) and Ondansetron (8 mg) in reducing Propofol injection pain, while also assessing their safety profiles in cholecystectomy patients undergoing general anesthesia.

Additionally, the study aimed to analyze Adverse Drug Reactions (ADRs) associated with these interventions to improve clinical decision-making in anesthetic practice.

METHODS

It was a Quasi-Experimental study and conducted for six months from Sep 2024 to Jan 2025 at the Anesthesia department at Islam Medical College, Sialkot. Cholecystectomy patients undergoing general anesthesia were assigned to study groups using a simple random sampling method. The formula for sample size calculation for comparing two independent means was: $n=(Z\alpha/2+Z\beta)2\times2\times\sigma2d2$. With an effect size of 0.67, two followed alpha values (0.05), and beta value (0.1), 60 patients in each group were sufficient to identify a significant difference. So total sample size we have taken 120 patients. However, 60 participants per group were selected in the final study design. This study selected adult patients from age 18 to 60 who rated ASA 1 or 2 with no documented allergies to Lignocaine, Ondansetron, and Propofol. We did not accept patients who had ongoing pain disorders, opioid use, unstable blood pressure below 90 mmHg or heart rate under 50 beats per minute. Exclusion criteria: drug contraindications, pregnant women, and women breastfeeding. A computer system produced a random list to assign participants equally into Group L or Group O. A team member gave Lignocaine 0.5mg per kg body weight through an intravenous line for 30 seconds before delivering Propofol. The researchers provided Group O with 4 mg Ondansetron directly into the vein 30 seconds before they gave Propofol. The doctor inserted a 20G cannula into a large forearm vein before injecting 2 mg/kg propofol over five seconds into the vein. After receiving Propofol the nurse assessed patient pain with a four-level Verbal Rating Scale at zero for no pain up to three for severe pain that caused arm withdrawal or verbal response. Pain due to Propofol injection was assessed using the Visual Rating Scale (VRS) or Visual Analog Scale (VAS) immediately after administration. The incidence of pain and its severity were recorded at the time of injection and postoperatively. Patients verbally reported their pain intensity, and the observer recorded the responses. This method ensures an objective assessment of both frequency and severity of Propofol-induced pain. Doctors measured heart rate blood pressure and oxygen saturation levels before intervention during the procedure and following the surgery. Teams recorded all adverse effects including slower heart rates below 50 beats per minute and low blood pressure together with nausea, vomiting, and allergic responses in addition to reactions at the injection site. Data were analysed by SPSS 21.0. The categorical data was analysed through chi-square and evaluated continuous values with an independent t-test at a significance level of 0.05. This study was conducted following ethical principles with approval from the Institutional Review Board reference number (IBR: 900/IMC/ERC/000103). The informed consent form and ethical approval documents were provided.

RESULTS

The study found that both groups were comparable at baseline. The average age was similar between the Lignocaine group (38.4 ± 8.2 years) and the Ondansetron group (37.9 ± 7.9 years). Gender distribution was also similar, with 28 males and 32 females in the Lignocaine group and 26 males and 34 females in the Ondansetron group. The mean BMI was 24.6 ± 3.5 kg/m^2 for the Lignocaine group and 25.1 ± 3.8 kg/m^2 for the Ondansetron group. ASA classifications, heart rate, and blood pressure values were almost identical across both groups. This ensures that the groups were comparable in basic characteristics, allowing for a clear evaluation of the effects of propofol without interference from other variables (Table 1).

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Table 1: Demographic Characteristics(n=60)

Characteristics	Lignocaine Group (Mean ± SD)	Ondansetron Group (Mean ± SD)
Age (Years)	38.4 ± 8.2	37.9 ± 7.9
Gender (Male/Female)	28/32	26/34
BMI (Kg/m^2)	24.6 ± 3.5	25.1 ± 3.8
ASA I / II (%)	35 (58.3%) / 25 (41.7%)	33 (55%) / 27 (45%)
Baseline Heart Rate (BPM)	82.3 ± 6.5	81.9 ± 6.8
Baseline Systolic BP (mmHg)	124.5 ± 8.7	125.1 ± 9.2
Baseline Diastolic BP (mmHg)	78.6 ± 6.1	79.3 ± 6.5

Nurses evaluated patient pain by VRS after Propofol injections. The Lignocaine group produced fewer pain experiences compared to Ondansetron use ($p < 0.05$). Among patients in Group L, 70 percent or 42 individuals stated they had no pain while Group O patients with pain stood at only 40 percent or 24 individuals. More patients in Group O felt serious pain (43.3%) than those in Group L (16.7%)(Table 2).

Table 2: Pain Scores after Propofol Injection (n=60)[6]

Pain Score (VRS)	Lignocaine Group Frequency (%)	Ondansetron Group Frequency (%)	p-Value
No Pain (0)	42 (70%)	24 (40%)	0.001
Mild Pain (1)	8 (13.3%)	10 (16.7%)	0.64
Moderate Pain (2)	6 (10%)	18 (30%)	0.007
Severe Pain (3)	4 (6.7%)	8 (13.3%)	0.23

Doctors measured heart rate, systolic blood pressure, and diastolic blood pressure at baseline, post-treatment, and after patients received Propofol. Both treatment groups showed equal patterns of heart rate and blood pressure changes from start to end of treatment. The new patient group L took bigger drops in blood pressure readings than did Group O after induction ($p = 0.04$)(Table 3).

Table 3: Hemodynamic Parameters at Different Time Points

Variables	Time	Ondansetron Group Frequency (%)	Ondansetron Group (Mean ± SD)	p-Value
Heart Rate (bpm)	Baseline	82.3 ± 6.5	81.9 ± 6.8	0.78
	Post-Intervention	80.5 ± 6.9	81.1 ± 7.1	0.64
	Post-Induction	78.1 ± 6.2	80.8 ± 6.5	0.04
SBP (mmHg)	Baseline	124.5 ± 8.7	125.1 ± 9.2	0.81
	Post-Intervention	122.3 ± 7.8	123.6 ± 8.3	0.66
	Post-Induction	116.4 ± 6.9	120.2 ± 7.1	0.04
DBP (mmHg)	Baseline	78.6 ± 6.1	79.3 ± 6.5	0.72
	Post-Intervention	76.8 ± 5.8	78.1 ± 6.2	0.54
	Post-Induction	72.4 ± 5.1	76.2 ± 5.4	0.03

The study team checked for side effects including slowing heart rate and blood pressure drops along with nausea and vomiting. Vomiting and nausea rates reached 15% in Group O versus 5% in Group L yet the combined occurrence of bradycardia and low blood pressure proved more common in Group L (10% vs. 3.3% in Group O; $p = 0.03$). Few patients reported light skin reactions at injection sites without any group differences(Table 4).

Table 4: Incidence of Adverse Effects(n=60)

Adverse Effect	Lignocaine Group Frequency (%)	Ondansetron Group Frequency (%)	p-Value
Bradycardia	6 (10%)	2 (3.3%)	0.03
Hypotension	6 (10%)	2 (3.3%)	0.03
Nausea/Vomiting	3 (5%)	9 (15%)	0.02
Injection Site Reaction	2 (3.3%)	3 (5%)	0.64

DISCUSSION

This study analyzed the effectiveness of intravenous Lignocaine and Ondansetron at easing propofol pain during induction while checking potential adverse effects in adult patients who get laparoscopic cholecystectomy surgery. Both Lignocaine and Ondansetron were proven effective pain reducers during propofol administration with Lignocaine showing better pain control [12]. The research found that Lignocaine made patients feel minor skin irritation and resulted in short-lived shifts in heart rate and blood pressure with Ondansetron. Researchers have confirmed these findings by studying how people reduce pain during propofol injections. Research confirms that Lignocaine stands out as one of the best options to reduce propofol injection pain [13].To giving 0.5 mg/kg of Lignocaine through an IV lessened both the likelihood and extent of propofol pain during treatment which matches the research findings.Brazelton and Taylor (2023) performed a statistical review showing Lignocaine reduces propofol injection pain through its effects on neuron membranes and sodium channels [14].These results support what other research showed because Lignocaine produced significantly less pain than Ondansetron did. According to Biazar *et al.*, (2022) combining Lignocaine and propofol before giving the injection created greater pain relief than using Lignocaine alone as a pre-treatment. These findings support Lignocaine as an effective choice to reduce propofol injection pain due to successful pain relief despite not mixing the drugs [15]. Multiple research projects study how Ondansetron can decrease pain caused by propofol administration. According to previous research by Li and Zhuang.(2022) Ondansetron at 8mg via intravenous proved effective in diminishing pain from propofol injection just like the study shows.Research indicates Ondansetron blocks serotonin receptors that transmit pain sensations during the body [16].The study showed Ondansetron blocked pain better than before treatment but not as well as Lignocaine.According to Zaazouee *et al.*, (2023) study results Ondansetron can lower moderate to severe pain intensity but does not erase it completely.According to this research Ondansetron created brief low blood pressure issues reported in their findings.Because Ondansetron affects serotonin receptors to produce mild cardiovascular side effects. These research revealed minor changes in blood flow [17]. The side effects in this research matched what scholars found in other studies before. Research by Rayasam *et al.*,

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(2022) confirmed that Lignocaine causes minor skin discomfort at injection points [18].According to Nakajima *et al.*, (2020), this study demonstrated that Ondansetron triggered temporary blood pressure drops and slowed heart rate in patients.The minimal changes in blood flow show that these medicines are suitable for standard anesthesia procedures [19]. Lignocaine stands as the best choice to control pain from propofol because these results showed that it works best with few side effects. Ondansetron offers a useful replacement drug for people who cannot receive Lignocaine because they are sensitive to local anesthetics [20].Medical staff need to use Ondansetron carefully when treating patients who already have trouble with their heart rhythm.Research needs to test if combining Lignocaine with Ondansetron will help patients experience better pain relief while showing fewer undesirable effects [21]. Although this study offered useful results it faces important restrictions.More trials involving multiple medical sites must confirm these results because the study group had few participants.Patients experience pain in their own unique way regardless of using a set pain measurement scale.Future medical studies need to use tests that measure pain output directly from the brain.The researchers need to examine multiple Lignocaine and Ondansetron doses to establish proper dose relationships for future analysis.

CONCLUSIONS

Both Lignocaine and Ondansetron show significant pain reduction effects with propofol but Lignocaine proves better treatment than Ondansetron. Lignocaine caused mild skin discomfort but this side effect was milder than Ondansetron which caused minor temporary changes in blood pressure. Research evidence backs up the ongoing choice of Lignocaine to fight propofol discomfort and suggests using Ondansetron when needed. Research must improve how patients react to anesthesia induction by testing better sets of medicines.

Authors Contribution

Conceptualization: SA
Methodology: MFM, FA, SS
Formal analysis: MFM, RHKN
Writing, review and editing: SS, SI, RHKN

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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REFERENCES

[1] Mohamadighader N, Nematollahi D, Saraei M. Electrochemical Study of Propofol (2,6-diisopropylphenol): A Novel Insight into the Dimerization of Propofol.Journal of the Electrochemical Society.2021May;168(5):055502.doi :10.1149/1945-7111/abff00.

[2] Heil LB, Cruz FF, Antunes MA, Braga CL, Agra LC, Bose Leao RM *et al*. Effects of propofol and its formulation components on macrophages and neutrophils in obese and lean animals. Pharmacology Research and Perspectives.2021Oct;9(5):e00873.doi:10.1002/prp2.873.

[3] Nyssen P, Maho A, Malempré R, Matagne A, Mouithys-Mickalad A, Hoebeke M. Propofol inhibits the myeloperoxidase activity by acting as substrate through a redox process. Biochimica et Biophysica Acta (BBA)-General Subjects.2022May;1866(5): 130100. doi: 10.1016/j.bbagen.2022.130100.

[4] Li Y, Li YJ, Fang X, Chen DQ, Yu WQ, Zhu ZQ. Peripheral inflammation as a potential mechanism and preventive strategy for perioperative neurocognitive disorder under general anesthesia and surgery. Frontiers in Cellular Neuroscience.2024Jul;18:1365448. doi: 10.3389/fncel.2024.1365448.

[5] Dimitrov IV and Suonio EE. Syntheses of analogues of propofol: A review. Synthesis.2020Dec;52(24):3693-713. doi: 10.1055/s-0040-1707287.

[6] Bakhtiari E, Mousavi SH, Gharavi Fard M. Pharmacological control of pain during propofol injection: a systematic review and meta-analysis. Expert Review of Clinical Pharmacology.2021Jul; 14(7): 889-99. doi: 10.1080/17512433.2021.1919084.

[7] Karki Y, Sarna R, Singh N, Chauhan R, Meena SC, Luthra A *et al*. Prevention of pain on injection of propofol using ice gel pack versus pre-treatment with lignocaine: a randomized controlled trial. Journal of Anesthesia. 2023Aug;37(4):616-23.doi:10.1007/s00540-023-03216-1.

[8] Hong SW and Kim SH. The preventive effect of 5-hydroxytryptamine-3 receptor antagonist on blood pressure reduction and postoperative nausea and vomiting during general anesthesia induction: A double-blinded, randomized controlled trial.Journal of Clinical Anesthesia.2023Nov;90:111232.doi:10.1016/j.jclinane.2023.111232.

[9] Wasinwong W, Termthong S, Plansangkate P, Tanasansuttiporn J, Kosem R, Chaofan S. A comparison of ondansetron and lidocaine in reducing injection pain of propofol: a randomized controlled study. BioMed Central Anesthesiology.2022Apr;22(1): 109. doi: 10.1186/s12871-022-01650-4.

[10] Gesso AS, Yuya SA, Fekede MS, Delile ST, Asrat EB. Effectiveness of low-dose ketamine versus lignocaine

DOI: https://doi.org/10.54393/pjhs.v6i3.2886

pre-treatment to prevent propofol injection pain and hemodynamic instability in adult elective surgical patients at Tikur Anbessa specialized hospital,2022: A prospective observational cohort study.International Journal of Surgery Open.2022Oct;47:100537.doi:10.1016/j.ijso.2022.100537.

[11] Chen X, Guo P, Yang L, Liu Z, Yu D. Comparison and clinical value of ciprofol and propofol in intraoperative adverse reactions, operation, resuscitation, and satisfaction of patients under painless gastroenteroscopy anesthesia.Contrast media and molecular imaging . 2022; 2022(1): 9541060.

[12] Khadka B and Sharma NR. A Comparative Study between Ketamine and Lidocaine or Decrease Propofol Injection Pain during Induction of Anesthesia. Birat Journal of Health Sciences.2021 Jun; 6(1): 1304-9. doi: 10.3126/bjhs.v6i1.37564.

[13] Sureshan R, Borkar S, Phadte V. A Comparative Study of 2 mg, 4 mg Intravenous Ondansetron and 2% Lignocaine Hydrochloride Pre-treatment to Alleviate Pain of Propofol Injection.Hamdan Medical Journal. 2020 Jan; 13(1): 32-5. doi: 10.4103/HMJ.HMJ_36_19.

[14] Brazelton DJ and Taylor K. Measuring Provider Participation in a Student-Led Practice Change: Ondansetron for Treatment of Pain on Propofol Injection. 2012; 50(4): 239-43.

[15] Biazar G, Farzi F, Rad RS, Habibi MR, Sani MK, Chohdary A *et al*.Comparing the Effectiveness of Metoclopramide, Low Dose of Propofol, Ondansetron, and Magnesium Sulfate on Propofol Injection Pain: A Double-Blind Clinical Trial.Crescent Journal of Medical and Biological Sciences.2022Oct;9(4).doi:10.34172/cjmb.2022.33.

[16] Li M, Ke W, Zhuang S. Effect of intravenous lidocaine on propofol consumption in elderly patients undergoing colonoscopy: a double-blinded, randomized, controlled trial.BioMed Central Anesthesiology.2022Mar;22(1):61.doi:10.1186/s12871-022-01601-z.

[17] Zaazouee MS, Mahmoud AM, Elfar WH, Hana K, Shamshoon KF, Adly MH *et al.* Effect of ondansetron compared to lidocaine and placebo for reducing propofol injection pain: A systematic review and meta-analysis of randomized controlled trials.Medicine. 2023Sep;102(38):e35021.doi:10.1097/MD.0000000000035021.

[18] Rayasam H, Tumulu RR, Tumulu PK, Garg T. Pre-treatment with lignocaine and ondansetron for prevention of pain on propofol injection: A prospective, double blinded, randomised comparative study. Journal of Medical Science and Research. 2022; 10(1): 7-10. doi: 10.17727/JMSR.2022/10-2.

[19] Nakajima D, Kawakami H, Mihara T, Sato H, Goto T. Effectiveness of intravenous lidocaine in preventing postoperative nausea and vomiting in pediatric patients: A systematic review and meta-analysis. PLOS One.2020Jan;15(1):e0227904.doi:10.1371/journal.pone.0227904.

[20] Fu D, Wang D, Li W, Han Y, Jia J. Pretreatment with low-dose esketamine for reduction of propofol injection pain: a randomized controlled trial.Pain Research and Management.2022Aug;2022(1):4289905. doi: 10.1155/2022/4289905.

[21] Abdelaziz DH, Boraii S, Cheema E, Elnaem MH, Omar T, Abdelraouf A *et al.* The intraperitoneal ondansetron for postoperative pain management following laparoscopic cholecystectomy:a proof-of-concept, double-blind, placebo-controlled trial. Biomedicine and Pharmacotherapy.2021Aug;140:111725.doi:10.1016/j.biopha.2021.111725.