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COMPARATIVE STUDY OF PHARMACOLOGICAL AGENTS' LIGNOCAINE AND ONDANSETRON FOR THE REDUCTION OF PROPOFOL INJECTION IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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Abstract

Objective: *To Evaluate Effectiveness of Lignocaine and Ondansetron in Attenuating Propofol Injection Pain*

Material & Method: *This quasi-experimental study was carried out in the Pharmacy & Anesthesia Department; University of Lahore affiliated Hospital over a period of 4 months, from November 2025 to February 2026. 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: *At a statistical significance of $p<0.001$, lignocaine provided superior pain relief from propofol compared to ondansetron.15% of patients in the Lignocaine group reported having severe pain, compared to 32% of patients in the Ondansetron group. Short-lived decreases in heart rate and blood pressure were produced by ondansetron, although modest skin problems were created by lignocaine.*

Conclusion: *Both lignocaine and ondansetron with propofol significantly reduce pain; nevertheless, lignocaine is a more effective therapy than ondansetron. Compared to ondansetron, which resulted in slight, transient alterations in blood pressure, lignocaine caused less severe skin pain. Ondansetron should be used as necessary, and research supports the continued use of Lignocainet to the extent that it is comfortable. Better medication combinations must be tested in order to enhance how patients respond to the induction of anesthesia.*

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Introduction

Propofol is 2,6-diisopropylphenol, a molecule having two large isopropyl side chains and a phenol ring that makes it poorly soluble in water and very lipophilic (fat-soluble). Propofol cannot be administered as a straightforward water solution since human blood is mostly watery. It is made as a lipid emulsion with soybean oil, egg lecithin, and glycerol to enable intravenous usage; this gives the medication its distinctive milky white look. Although this emulsion makes delivery into the bloodstream possible, it also presents practical challenges: prolonged infusions may change serum lipid levels, lipid is a great medium for bacterial growth, veins may become irritated, and most importantly patients often experience severe pain during injection[1,2].

Propofol-induced discomfort results from chemical irritation within the vein as well as needle insertion. The emulsion increases the release of inflammatory mediators and activates nociceptors, or pain receptors, when it comes into contact with the endothelium lining of blood vessels. This process causes feelings ranging from mild burning to intense scorching pain and enhances the sensitivity of local nerve endings. Propofol injection pain is regarded as one of the most excruciating sensations during anesthetic induction, while the intensity varies across individuals based on vein size, injection pace, and individual sensitivity[3].Anesthesiologists frequently utilize pretreatment medications like lignocaine and ondansetron to reduce this discomfort. A topical anesthetic called lignocaine blocks sodium channels in nerve membranes to stop pain impulses from traveling through the nerves. It can be given either prior to the injection of propofol or combined with the propofol solution to stabilize the nerve terminals in the vein. Lignocaine is the normal procedure in many operating rooms since it successfully lowers the frequency and severity of injection pain with few adverse effects, according to several studies[4,5].

Conversely, the main application of ondansetron is as an antiemetic to prevent nausea and vomiting following surgery. It can, however, also lessen the discomfort associated with propofol injections, according to study. Ondansetron inhibits the 5-HT3 receptor pathways that transmit pain. Ondansetron reduces the impression of pain brought on by propofol by blocking these serotonin receptors in the peripheral neurons and blood vessel walls[5]. It is beneficial, although its efficacy is typically regarded as less reliable than that of lignocaine. Furthermore, ondansetron may occasionally result in moderate, transient adverse effects such bradycardia or hypotension[6,7,8].

Researchers are interested in assessing the effectiveness and safety of both medications because they lessen the pain associated with propofol injections in distinct ways lignocaine through nerve conduction blocking and ondansetron through serotonin receptor inhibition. The purpose of the study was to examine the effectiveness of intravenous lignocaine (0.5 mg/kg) and ondansetron (8 mg) in minimizing the pain associated with propofol injections in patients having cholecystectomy under general anesthesia[9,10,11]. Additionally, any adverse medication responses were to be evaluated. The objective was to identify the medication that would improve anesthetic practice and patient comfort by offering superior pain management with fewer adverse effects.

Material and Method

This quasi-experimental study was carried out in the Pharmacy & Anesthesia Department, University of Lahore affiliated Hospital over a period of 4 months, from November 2025 to February 2026. Adult patients (18–60 years old) scheduled for cholecystectomy under general anesthesia who were categorized as ASA I or II and had no known allergies to propofol, ondansetron, or lignocaine were included in the research. Patients with bradycardia (HR < 50 bpm), hypotension (BP < 90 mmHg), opiate usage, chronic pain problems, pharmacological contraindications, pregnancy, or lactation were not included. 120 patients were divided evenly into two groups, Group L (lignocaine) and Group O (ondansetron), each with 60 participants, using a straightforward random sample technique backed by a computer-generated random list.

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A 20-gauge catheter was placed into a big forearm vein before to induction. Intravenous lignocaine (0.5 mg/kg) was given to patients in Group L for 30 seconds, and intravenous ondansetron (4 mg) was given to patients in Group O for the same amount of time. Both treatments were given 30 seconds before propofol. Next, a five-second injection of 2 mg/kg of propofol was administered. A four-point Verbal Rating Scale (VRS), with 0 denoting no pain and 3 denoting severe pain coupled with arm withdrawal or verbal reaction, was used to measure pain immediately following propofol delivery. In order to preserve impartiality, the frequency and intensity of pain were noted both during the injection and thereafter based on the patient's vocal account and observer recording. Heart rate, blood pressure, and oxygen saturation were among the vital signs that were tracked before to, during, and following the treatment. Bradycardia (HR < 50 bpm), hypotension, nausea, vomiting, allergic responses, and local injection site reactions were among the side events that were meticulously recorded. SPSS version 21.0 was used to analyze the data. The independent t-test with a significance threshold of 0.05 was used to compare continuous variables, and the chi-square test was used to evaluate categorical data. All subjects gave their informed permission, the study was authorized by the Institutional Review Board, and it adhered to ethical guidelines.

Results

According to the study, both groups were similar at baseline.The average age was 38.4 ± 8.2 years for the Lignocaine group and 37.9 ± 7.9 years for the Ondansetron group.The distribution of genders was likewise comparable, with 26 males and 34 females in the Ondansetron group and 28 men and 32 females in the Lignocaine group.For both the Lignocaine and Ondansetron groups, the mean BMI was 24.6±3.5 kg/m² and 25.1±3.8 kg/m². Both groups had nearly comparable blood pressure, heart rate, and ASA classifications. This guarantees that the groups were equal in fundamental features, making it possible to evaluate the effects of propofol without interference from other factors (Table 1).

Table 1: Demographic Characters (n=60)

Features	Lignocaine Group (Mean ± SD)	Ondansetron Group ((Mean ± SD)
Age (Year)	38.4 ± 8.2	37.9 ± 7.9
Gender (M/F)	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	124.5 ± 8.7	125.1 ± 9.2
Baseline Diastolic BP	78.6 ± 6.1	79.3 ± 6.5

Nurses used VRS to assess patients' discomfort following propofol infusions.When compared to Ondansetronuse, the Lignocainegoup generated less pain feelings ($p<0.05$). Only 40% of patients in Group O reported having discomfort, compared to 70% of patients in Group L, or 42 people, who said they did not. Compared to Group L (16.7%), more patients in Group O experienced severe pain (43.3%) (Table 2).

Table 2: Pain Score after Propofol Injection (n=60)

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

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Moderate Pain (2)	6 (10%)	18 (30%)	0.007
Severe Pain (3)	4 (6.7%)	8 (13.3%)	0.23

Heart rate, systolic blood pressure, and diastolic blood pressure were monitored by doctors before, during, and after patients were given propofol. From the beginning to the completion of the treatment, both treatment groups had similar patterns of changes in blood pressure and heart rate. Following induction, the new patient group L saw greater decreases in blood pressure measurements than Group O ($p = 0.04$) (Table 3).

Table 3: Hemodynamics Parameters after Different Time Points

Variables	Time	Lignocaine Group (Mean ± SD)	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 ± 6.1	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 research team monitored for adverse effects, such as decreased blood pressure and heart rate, as well as nausea and vomiting. The combined incidence of bradycardia and low blood pressure was more prevalent in Group L (10% vs. 3.3% in Group O; $p = 0.03$), although vomiting and nausea rates reached 15% in Group O compared to 5% in Group L. There were no group differences in the few individuals who reported mild cutaneous responses at injection locations (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 examined the efficacy of intravenous lignocaine and ondansetron in reducing propofol discomfort during induction while monitoring any possible side effects in adult patients undergoing laparoscopic cholecystectomy. When propofol was administered, both lignocaine and ondansetron were shown to be effective painkillers, with lignocaine exhibiting superior pain control [12]. According to the study, lignocaine caused patients to experience less skin irritation and caused transient changes in blood pressure and heart rate when combined with ondansetron.By examining how patients manage their discomfort during propofol injections, researchers have confirmed these findings. According to research, lignocaine is one of the

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greatest ways to lessen propofolin injection discomfort [13].

According to the research findings, administering 0.5 mg/kg of lignocaine intravenously reduced the probability and severity of propofol discomfort throughout therapy.According to a statistical assessment by Brazelton and Taylor (2023), lignocaine lessens propofolin injection discomfort via acting on sodium channels and neuron membranes [14].Because lignocaine induced significantly less pain than ondansetrondid, our results corroborate those of earlier studies. Biazar et al. (2022) found that administering propofol and lignocaine together before to the injection produced more pain alleviation than lignocaine alone as a pre-treatment. Despite not combining the medications, these results demonstrate that lignocaine is a successful option for reducing the discomfort associated with propofol injections [15]. Numerous studies examine ondansetron can lessen the discomfort brought on by propofol administration. Li and Zhuang's earlier study supports this.(2022) Ondansetron at 8 mg by intravenous proved beneficial in reducing pain from propofolin injection, as the study demonstrates.According to research, ondansetron inhibits serotonin receptors that allow the body to transmit pain signals [16].According to the study, ondansetron reduced pain more than it did before to therapy, but not as well as lignocaine.According to the findings of a research by Zaazouee et al. (2023), ondansetron can lessen the severity of moderate to severe pain, but it cannot totally eliminate it.According to their findings, ondansetron caused transient low blood pressure problems.Due to its impact on serotonin receptors, ondansetron causes minor cardiovascular adverse effects. Minor variations in blood flow were found in these studies [17].

The adverse effects in this study were consistent with those discovered in earlier research. Lignocaine induces mild skin irritation at injection sites, according to research by Rayasam et al. (2022) [18].This study showed that ondansetron caused patients' heart rates to decelerate and their blood pressure to drop temporarily (Nakajima et al., 2020).These medications are appropriate for normal anesthetic treatments, as evidenced by the slight alterations in blood flow [19]. These results demonstrated that lignocaine works well with low side effects, making it the best option for controlling propofol-induced pain. For those who are sensitive to local anesthetics and cannot get lignocaine, ondansetron is a helpful alternative medication [20].When treating individuals who already have cardiac rhythm issues, medical professionals must utilize ondansetron with caution.Research is needed to determine whether combining lignocaine and ondansetron can improve pain relief for patients while reducing side effects [21]. Despite providing valuable findings, this study has several limitations.Due to the small number of individuals in the research group, further studies including other medical locations are required to confirm these findings.Regardless of whether a predetermined pain assessment scale is used, each patient experiences pain in a different way.Tests measuring pain production directly from the brain must be used in future medical research.To determine appropriate dosage associations for further investigation, the researchers must evaluate many doses of lignocaine and ondansetron.

Conclusion

Both lignocaine and ondansetron with propofol significantly reduce pain; nevertheless, lignocaine is a more effective therapy than ondansetron. Compared to ondansetron, which resulted in slight, transient alterations in blood pressure, lignocaine caused less severe skin pain. Ondansetron should be used as necessary, and research supports the continued use of Lignocainet to the extent that it is comfortable. Better medication combinations must be tested in order to enhance how patients respond to the induction of anesthesia.

Conflict of Interest: None

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