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Research Article

Comparison of Efficacy of Lignocaine versus Tramadol in Keeping the Patients Pain Free of Propofol Induced Pain

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ABSTRACT

Background: All anesthetists deal with the persistent challenge of pain from propofol injection despite many attempts to solve it through various formulations and trials. While tramadol is commonly used to manage propofol induced pain, its side effects limit its effectiveness. Some studies suggest that using lignocaine before propofol is more efficient than tramadol, although this remains controversial. This study aimed to compare lignocaine and tramadol in preventing propofol-induced pain.

Methodology: Research was conducted at Lahore General Hospital from April 2019 to March 2020. 288 ASA class I and II patients were included, aged 18-60 undergoing general anesthesia with propofol induction. They were split into two groups: Group-A received lignocaine and Group-B received tramadol before propofol injection. Pain levels were evaluated using a verbal rating scale. The study focused on drug effectiveness in maintaining a pain-free state (VRS ≤4) during propofol injection and compared outcomes between the groups. Consent was obtained from each patient.

Results: The mean patient age was 40.42±12.50 years, with mean BMI of 27.85±3.82 Kg/m2. Male patients were 41.3% and females 58.7%, ratio 1:1.4. ASA Class-I had 47.6% and ASA Class-II 52.4% patients. Efficacy in propofol induction was higher in lignocaine vs. tramadol (92.4% vs. 75.7%; p<0.001), consistent across subgroups by age, gender, ASA, and BMI.

Conclusion: In this study, prophylactic intravenous lignocaine was more effective than traditional tramadol in maintaining pain control during propofol induction. Lignocaine's safety record and hemodynamic benefits support its future use in anesthesia.

Keywords: Propofol Induction, Pain, Lignocaine, Tramadol.

INTRODUCTION

Propofol, commonly dubbed as "milk of anesthesia", is one of the most popular intravenous anesthetic agents in modern medicine. The mechanisms of action on the central nervous system are rather complex with interactions at various neurotransmitter receptors. Propofol has many pharmacological advantages over other anesthetic agents such as rapid effect, short action and fewer side effects like postoperative nausea.[1] Propofol was originally developed in the United Kingdom by Imperial Chemical Industries following research into the sedative effect of phenol derivatives in animal models. Its anesthetic properties were first reported in January 1973. Initial clinical trials of Propofol used an emulsion containing polyethoxylated castor oil.[2-3]

Propofol is a sedative-hypnotic medication commonly used as an induction agent for preoperative sedation. Propofol possesses sedative, anxiolytic, and anticonvulsant properties. Furthermore, propofol may have beneficial anti-inflammatory and anti-oxidative effects as well as neuroprotective properties including reduction of intracranial pressure. Common side effects to anticipate after administration of propofol include a decrease in heart rate and in blood pressure.[4-5] The incidence of pain following propofol injection varies between 28 and 90% in adults if a vein

on the dorsum of hand is used. The quality of pain was described as extremely sharp, aching, or burning. It has been ranked as the seventh most important problem in current practice of clinical anesthesia by American anaesthesiologists.[6] Sara et al. conducted a study and found that the efficacy of lignocaine vs. tramadol in keeping the patients pain free during the injection of propofol was 86% in tramadol group vs. 78% in lignocaine group (p=0.298).[7] Zahoor et al. conducted a similar study and found it to be 91.7% in lignocaine group vs. 75% in tramadol group (p=0.028).[8] Conflicting data on the efficacy of two drugs reveals differences locally (86% tramadol vs. 78% lignocaine; p<0.298) and internationally (91.7% lignocaine vs. 75% tramadol; p=0.028). The study aims to assess drug efficacy in the local population to guide selection based on superior effectiveness and improve patient comfort during injections.

METHODOLOGY

This study was designed as a randomized controlled trial to compare the efficacy of lignocaine and tramadol in preventing propofol-induced pain. The research was conducted at the Department of Anesthesiology, Lahore General Hospital, Lahore, over a period of six months, from September 4, 2019, to March 3, 2020, following the approval of the study synopsis. A total of 288 patients were included in the study, with 144 cases assigned to each group. The sample size was determined with an 80% power of the test and a 5% level of significance, considering the expected efficacy of tramadol at 75% and lignocaine at 91.7%.[8]

Patients were selected using a non-probability consecutive sampling technique. Inclusion criteria consisted of patients aged 18-60 years undergoing surgery under general anesthesia with an ASA Grade I or II classification. Only those who provided written informed consent were enrolled. Patients with known hypersensitivity to propofol, lignocaine, or tramadol were excluded from the study.

After obtaining ethical approval, eligible patients presenting in the operation room were counseled about the study, and written informed consent was obtained. A detailed medical history was recorded for each participant. Patients were then randomly allocated into two groups using the lottery method: Group L received lignocaine, while Group T received tramadol.

For each patient, an intravenous access was secured using a 18G cannula, and a preload of 500 ml crystalloid lactate was administered under aseptic conditions. The propofol dose was calculated at 2 mg/kg, and one-fourth of this dose was injected at a rate of 1 ml/second. In Group L, patients received 2 ml (2%) lignocaine (40 mg) diluted in 2 ml normal saline, while Group T patients received 50 mg tramadol diluted in 2 ml normal saline. After a one-minute interval, the calculated propofol dose was administered. The efficacy of the two drugs was assessed based on the operational definition: patients who reported a pain score of ≤4/10 on the Verbal Rating Scale (VRS) were considered pain-free.

All anesthesia procedures and efficacy evaluations were performed by the same consultant to eliminate bias. Confounding variables were controlled through exclusion criteria. Data was collected on a structured proforma, including demographic details and pain assessment results.

Statistical analysis was conducted using SPSS version 20.0. Numerical variables, such as age and BMI, were expressed as mean ± standard deviation (SD). Categorical variables, including gender, ASA classification, and drug efficacy, were presented as frequencies and percentages. The chi-square test was applied to compare the efficacy of the two drugs, with a p-value ≤0.05 considered statistically significant. Data was further stratified by age, gender, BMI, and ASA classification to account for potential effect modifiers, and post-stratification chi-square tests were performed, maintaining a p-value threshold of ≤0.05 for significance.

RESULTS

The age of the patients included in the study ranged from 18 to 60 years, with a mean age of 40.42 ± 12.50 years. Among the total study population, 119 patients (41.3%) were male, while 169 patients (58.7%) were female, resulting in a male-to-female ratio of 1:1.4. The body mass index (BMI) of the patients ranged from 21.4 kg/m² to 34.6 kg/m², with a mean BMI of 27.85 ± 3.82 kg/m². A total of 92 patients (31.9%) were classified as obese. Regarding the American Society of Anesthesiologists (ASA) classification, 137 patients (47.6%) were categorized as ASA Class I, while 151 patients (52.4%) were classified as ASA Class II.

A comparative analysis of both study groups demonstrated that they were statistically comparable in terms of mean age (p = 0.962),

mean BMI (p = 0.918), and distribution across various demographic and clinical subgroups. There were no significant differences observed between the groups concerning age distribution (p = 0.906), gender (p = 0.905), BMI classification (p = 0.961), and ASA classification (p = 0.906).

Overall, 242 patients (84.0%) remained pain-free upon propofol injection. A statistically significant difference in the efficacy of lignocaine and tramadol in preventing propofol- induced pain was observed. The frequency of patients who remained pain-free following propofol administration was significantly higher in the lignocaine group compared to the tramadol group (92.4% vs. 75.7%; p < 0.001). This significant difference in efficacy was consistently observed across various subgroups stratified by age, gender, ASA classification, and BMI.

Table-1: Baseline Characteristics of Study Groups

Characteristics	Lignocaine N=144	Tramadol N=144
Age (Years)	40.38±11.90	40.45±13.11
18-39 Years	67 (46.5%)	66 (45.8%)
40-60 Years	77 (53.5%)	78 (54.2%)
Gender		
Male	60 (41.7%)	59 (41.0%)
Female	84 (58.3%)	85 (59.0%)
ASA Status		
Class-I	69 (47.9%)	68 (47.2%)
Class-II	75 (52.1%)	76 (52.8%)
BMI (Kg/M^2)	27.82±3.86	27.87±3.80
20-25 Kg/M^2	43 (29.9%)	43 (29.9%)
25-30 Kg/M^2	56 (38.9%)	54 (37.5%)
30-35 Kg/M^2	45 (31.2%)	47 (32.6%)

Table-2: Comparison of Efficacy in Keeping the Patients Pain Free On Propofol Induction between the Study Groups

Efficacy	Lignocaine N=144	Tramadol N=144	P-Value
Yes	133 (92.4%)	109 (75.7%)	<0.001*
No	11 (7.6%)	35 (24.3%)	
Total	144 (100.0%)	144 (100.0%)	

Table-3: Comparison of Efficacy in Keeping the Patients Pain Free On Propofol Induction between the Study Groups across Various Subgroups

Subgroups	Efficacy N (%)		P-Value
	Lignocaine N=144	Tramadol N=144	
Age (Years)			
18-39 Years	62/67 (92.5%)	50/66 (75.8%)	0.008*
40-60 Years	71/77 (92.2%)	59/78 (75.6%)	0.005*
Gender			
Male	56/60 (93.3%)	45/59 (76.3%)	0.009*
Female	77/84 (91.7%)	64/85 (75.3%)	0.004*
ASA Status			
Class-I	64/69 (92.8%)	52/68 (76.5%)	0.008*
Class-II	69/75 (92.0%)	57/76 (75.0%)	0.005*
BMI (Kg/M^2)			
20-25 Kg/M^2	39/43 (90.7%)	32/43 (74.4%)	0.047*
25-30 Kg/M^2	53/56 (94.6%)	42/54 (77.8%)	0.010*
30-35 Kg/M^2	41/45 (91.1%)	35/47 (74.5%)	0.035*

DISCUSSION

Propofol is a common IV anesthetic that is widely used for anesthesia induction, maintenance, and sedation in and out of operating rooms. While nearly ideal, pain during injection remains an issue.[1,6] Although

not serious, many patients recall the pain as an unpleasant part of their experience with anesthetists.[6] In a survey, propofol injection (POPI) was ranked seventh in the list of important issues in clinical anesthesia.[1] Phenols, including propofol, can irritate skin and mucous membranes causing angialgia due to vascular involvement. Pain post propofol injection is immediate (vein endothelium irritation) and delayed (mediator release like kininogen).[9]

Proposed techniques to reduce propofol-induced pain include modifying drug composition and administration methods, along with using other drugs concomitantly for clinical efficacy.[3] Tramadol is commonly used to relieve pain, but its side effects like nausea, vomiting, and respiratory depression can restrict its use.[10] Lignocaine, also known as "Lidocaine", serves as an amide local anesthetic and Class 1b antiarrhythmic. Its widespread use includes anesthesia and management of severe ventricular arrhythmias.[11-12] Data indicates lignocaine's sodium channel properties and its diverse immunomodulating, anti- inflammatory, and anti-cancer effects, showing promise for various clinical applications beyond its initial use.[11,13]

Recent studies found lignocaine more effective than tramadol in preventing POPI and recommended its future use, despite controversy in existing evidence prompting this study.[7-8] In this study, lignocaine was more effective than tramadol in keeping patients pain-free during propofol induction (92.4% vs. 75.7%; p<0.001), regardless of patient characteristics. This finding aligns with Zahoor et al.'s study in KSA, showing higher pain-free rates with lignocaine compared to tramadol (91.7% vs. 75.0%; p=0.028).[8]

In an Indian study on patients under general anesthesia, Patel et al. found lignocaine to be significantly more effective than tramadol (93.0% vs. 77.0%; p≤0.05), aligning with our current findings.[14] A comparable notable variation (93.3% vs. 76.7%; p=0.004) was also found in a study conducted by Biswal et al. in India.[15] In Turkish patients undergoing general anesthesia with propofol induction, lignocaine showed significantly higher efficacy than tramadol (90.0% vs. 75.0%; p<0.001) according to Borazan et al.[16] In Taiwan, Pang et al. found a significant difference between lignocaine and tramadol in keeping patients pain-free with propofol injection (91.0% vs. 77.0%; p < 0.001).[17]

However, our results conflict with another local study where Sara et al. didn't observe any significant difference in the frequency of efficacy between lignocaine and tramadol (78.0% vs. 86.0%; p-value=0.298).[7]

The conflict may be due to Sara et al.'s small sample size of 100 cases, with no stratification for patient factors like ASA status and BMI, which could introduce bias. This study contributes to existing research by showing that prophylactic intravenous lignocaine is better than tramadol for pain control during propofol induction. Lignocaine's safety and hemodynamic benefits support its use in future anesthesia practice.[11-13]

The study's strengths include a large sample size of 288 cases, random patient allocation to study groups, and data stratification to address effect modifiers. However, limitations include the lack of comparison of complications like nausea, vomiting, and respiratory depression associated with tramadol. Additionally, the study did not consider the hemodynamic response to induction between groups, which could have highlighted lignocaine's superiority in maintaining hemodynamic stability. Future research is recommended to explore these aspects further.

CONCLUSION

The study showed that pre-emptive lignocaine IV was more effective than using tramadol during propofol induction for maintaining pain relief, suggesting lignocaine's safety and hemodynamic benefits support its recommended use in future anesthesia practices.

REFERENCES

1. Xiao Y, Jin X, Zhang Y, Huang T, Zhou L, Gao J. Efficacy of propofol for the prevention of emergence agitation after sevoflurane anaesthesia in children: a meta- analysis. Frontiers in Surgery. 2022;9:1031010.
2. Gao X, Mi Y, Guo N, Luan J, Xu H, Hu Z, Wang N, Zhang D, Gou X, Xu L. The mechanism of propofol in cancer development: an updated review. Asia-Pacific J Clin Oncol. 2020;16(2):3-11.
3. Vellinga R, Valk BI, Absalom AR, Struys MM, Barends CR. What's new in intravenous anaesthesia? New hypnotics, new models and new applications. J Clin Med. 2022;11(12):3493.
4. Singh A, Anjankar AP, Anjankar A.

Propofol-related infusion syndrome: a clinical review. Cureus. 2022;14(10):150-5.

5. Lu M, Liu J, Wu X, Zhang Z. Propofol: a novel alternative to propofol in clinical intravenous anesthesia?. BioMed Res Int. 2023;2023(1):7443226.
6. 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. Med. 2023;102(38):e35021.
7. Sara S, Bukhari RH, Naqvi SSN. Efficacy of intravenous tramadol in reduction of propofol induced pain. Anaesth Pain Intensive Care. 2016;20(2):150-3.
8. Zahoor I, Mir AH, Qazi MS, Jan ZH, Yousuf A, Rasool A. A prospective, randomized, double blind study to evaluate and compare the efficacy of lidocaine, ramosetron and tramadol pre-medication, in attenuating the pain caused due to propofol injection. Int J Res Med Sci. 2017;5(6):2644-51.
9. Sassi K, Bechet E, Martin L, Pichon M, Yrondi A, Minville V. Investigating Anxiety's Impact on Seizure Quality in Electroconvulsive Therapy: A Prospective Observational Study. J ECT. 2023:10-97.
10. Chae JW, Kang DH, Li Y, Kim SH, Lee HG, Choi JI, Yoon MH, Kim WM. Antinociceptive effects of nefopam modulating serotonergic, adrenergic, and glutamatergic neurotransmission in the spinal cord. Neuroscience Letters. 2020;731:135057.
11. Ji F, Zhang Y, Cui P, Li Y, Li C, Du D, Xu H. Preventive Effect of Local Lidocaine Administration on the Formation of Traumatic Neuroma. J Clin Med. 2023;12(7):2476.
12. Herrero-Cervera A, Soehnlein O, Kenne E. Neutrophils in chronic inflammatory diseases. Cellular Molecular Immunol. 2022;19(2):177-91.
13. Pavel MA, Petersen EN, Wang H, Lerner RA, Hansen SB. Studies on the mechanism of general anesthesia. Proceedings of the National Academ Sci. 2020;117(24):13757- 66.
14. Patel M, Patel N, Vachchrajani P. A comparative study of attenuation of propofol induced pain by lignocaine, ondansetron, dexamethasone and cold propofol per se. Int J Sci Res. 2018;7(2):1-4.
15. Biswal S, Moningi S, Ramachandran G. Effect of intravenous tramadol, acetaminophen in attenuating pain on propofol injection: comparison with lignocaine: a randomized, double-blind, controlled study. Karnataka Anaesth J. 2015;1(3):118-22.
16. Borazan H, Sahin O, Kececioglu A, Uluer MS, Et T, Otelcioglu S. Prevention of propofol injection pain in children: a comparison of pretreatment with tramadol and propofol-lidocaine mixture. Int J Med Sci. 2012;9(6):492-7.
17. Pang WW, Huang PY, Chang DP, Huang MH. The peripheral analgesic effect of tramadol in reducing propofol injection pain: a comparison with lidocaine. Reg Anesth Pain Med. 2019;24(3):246-9.