

ORIGINAL RESEARCH

Efficacy of Intravenous Dexmedetomidine on Propofol Injection PainRakesh Nigam¹, Milton Debbarma², Shikha Nigam³**ABSTRACT**

Introduction: Propofol is known to causes a high incidence of pain during intravenous (IV) injection and dexmedetomidine is known to reduce the requirement of propofol during general anaesthesia. The aim of this randomized, placebo-controlled study was to determine whether pre-treatment with dexmedetomidine, used for premedication, would reduce propofol-induced pain.

Methods and Material: One Hundred American Society of Anesthesiologists grade (ASA) I and II patients were randomly assigned into two groups (50 in each). Five minutes prior to propofol injection Group NS received 10 ml of 0.9% saline and Group DM received 10 ml of 1mcg/kg dexmedetomidine over 10 minutes then propofol was injected at 1ml/sec. Patients were observed for intensity of pain by using composite pain scale. Appropriate test were used to analyze the result.

Results: The incidence of pain on injection of propofol in the control (NS) group was 64% (32/50), as compared to 40% (20/50) in dexmedetomidine group. The incidence of pain score >2 was 46% (23/50) in the NS (control group) and 6 % (3/50) in group DM which was significantly lower than the control group (p< 0.001).

Conclusion: Pretreatment with dexmedetomidine 1mcg/ kg is effective in preventing pain from propofol Injection.

Keywords: Injection, dexmedetomidine, pain, propofol.

How to cite this article: Rakesh Nigam, Milton Debbarma, Shikha Nigam. Efficacy of intravenous dexmedetomidine on propofol injection pain. International Journal of Contemporary Medical Research 2015;2(4):966-969

¹Associate Professor, ²Assistant Professor, Department of Anaesthesiology, ³Demonstrator, Department of Anatomy, Chhattisgerh Institute of Medical Science, Bilaspur, Chhattisgerh

Corresponding author: Dr. Rakesh Kumar Nigam, 23, Om Garden, Parijat Colony, Nehru Nagar, Bilaspur, Chhattisgerh

Source of Support: Nil

Conflict of Interest: None

INTRODUCTION

Propofol is the drug of choice for induction of anaesthesia in millions of patients every year because of its rapid onset and short duration of action, easy titration, and favourable profile for side effects.¹ But pain on injection site is its negative aspect. The incidence of propofol injection pain varies from 28% to 90%.² Different technique has been used to overcome the pain of propofol injection like adding lidocaine to propofol, cooling or warming propofol, diluting the propofol solution, injection of propofol into a large vein, and prior injection of lidocaine, acetaminophen, ondansetron, metoclopramide, magnesium or ketamin intravenously. All have been tried with variable results.³⁻⁶ Dexmedetomidine is a highly selective, specific and Potent α_2 -adrenoceptor agonist, with potent sedative, analgesic and sympatholytic effects, it also reduces the requirement of propofol during anaesthesia.⁷ So in this randomized, placebo-controlled study, we evaluated the role of intravenous dexmedetomidine in the prevention of propofol-induced pain during induction of anaesthesia.

MATERIAL AND METHODS

After approval by Institutional Ethical Committee, this study was carried out on 100 American Society of Anesthesiologists (ASA) I/II patients of either sex, in the age group of 20-60 years, posted for elective surgery under general anesthesia. Exclusion criteria were: patients having history of allergy to study drugs, receiving analgesic or sedative medication in the last 24 hours, had infection on the dorsum of the left hand, presence of cardiac conduction defects, patients on beta blockers, antiarrhythmic medications, epilepsy renal and liver diseases, pregnant women and uncooperative patients were excluded from study.

All patients were kept nil orally for at least 6 hour before the procedure. Premedication was given in the form of tablet alprazolam 0.5 mg and tablet ranitidine 150 mg at 10 pm night before surgery and injection glycopyrrolate 0.2 mg intramuscular 30 minutes before surgery. On arrival in the operating room, intravenous line was set using 20 Gauge cannula into superficial radial vein of the left hand and an infusion of Ringer's

lactate was started. Standard monitor attached and patients were monitored for heart rate (HR), noninvasive measurements blood pressure (Systolic and diastolic), mean arterial blood pressure (MAP) at an interval of 5 min, continuous ECG and hemoglobin oxygen saturation (SPO2) monitoring, throughout the perioperative period.

Patients were randomly allocated, using a computer-generated table with random numbers, into two groups. Patients in group NS (n=50) were received 10 mL of isotonic saline and patients in groups DM (n=50) received Dexmedetomidine 1 mcg/kg (mixed with 10 mL isotonic saline) intravenously over 10 min via syringe pump. Five minutes later, 1% long-chain triglyceride (LCT) propofol was injected in a dose of 2.5 mg/kg at a rate of 1 mL/s to both the groups. Anesthesiologist, who was blind to the study group, assessed the intensity of pain after propofol injections by using composite pain scale described by Rochette and colleagues.⁸⁻⁹ The pain score is based on assessments of patients' motor and verbal reactions, from the time of propofol injection to loss of consciousness (Table 1). Pain is graded on a 0–6 scale with a score more than two considered unacceptable. Mean arterial pressure (MAP) and heart rate (HR) were recorded immediately before injection of the study drug, and then every 5 min until propofol injection. Data were collected and statistically analysed.

Statistical analyses were performed using Statistical Product for Social Sciences (SPSS) software v. 18.0. The continuous normally distributed data (age and weight) are described as mean ± standard deviation and compared using one-way ANOVA. Categorical data such as gender, ASA status, and the number of patients having pain scores were expressed as number, percent, or both, and were compared using the chi-square test or Fischer's exact test as appropriate. A p value of <0.05 was considered significant.

RESULTS

All patients in both the groups completed the study. There were no statistically significant differences among the two groups with regard to age, sex, weight and ASA status (p > 0.05) (Table-2). No patients in any group experienced pain and discomfort during the injection of pretreatment solution. The incidence of pain on injection of propofol in the control (NS) group was 64% (32/50), as compared to 40% (20/50) in dexmedetomidine group. The incidence of pain score >2 was 46% (23/50) in the NS (control group) and 6% (3/50)

in group DM which was significantly lower than the control group (p < 0.001) (Table-3). No significant side effect noted in both the group.

DISCUSSION

Propofol is now common drugs in induction and maintenance of anesthesia but it induces pain and can cause extreme distress among patients.¹⁰ Mechanism of pain induction by propofol in patients is not unclear. Pain on injection of propofol can be immediate or delayed. The immediate pain could be the result of a direct irritant effect, but the kinin cascade is probably the cause of delayed pain. The lipid solvent for propofol activates the plasma kallikrein–kinin system which results in bradykinin production that increases local vein per-

Sr. No.	parameter	response	score
1	Motor events	No movements	0
		Slight withdrawal	1
		Marked withdrawal rubbing, trying to tear off line	2
		General restlessness	3
2	Verbalization	No vocalization	0
		Purposeless moaning	1
		Explicit protest	2
		Screams, cries	3
Total score			6

Table-1: Scoring system for propofol injection pain

Parameter	Group NS	Group DM	P Value
Age (Yrs.)	37.5 ± 10.6	36.7 ± 8.5	>0.05
Sex (M/F)	27:23	25:25	>0.05
Wt. mean	52.6 ± 5.1	54.7 ± 5.3	>0.05
A.S.A. grade I/II	31/19	29/21	>0.05

Table-2: Demographic Profile

Pain score (0-6)	Group NS No.(%)	Group DM No.(%)	P Value
0 (no pain)	18(36)	30(60)	<0.05
1-2 (acceptable)	9(18)	17(34)	<0.05
>2 (unacceptable)	23(46)	3(6)	<.001
Total patient	50(100)	50(100)	-

Table-3: Incidence and severity of pain

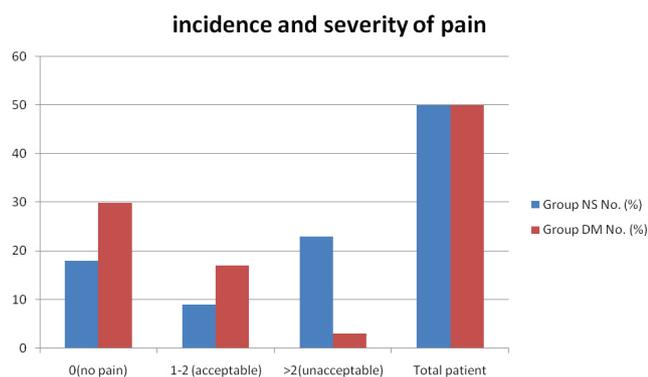


Figure-1: Pain after propofol injection

meability and dilation. The aqueous-phase propofol diffuses into more free nerve endings outside the endothelial layer of the vessel which is more permeable and dilated because of bradykinin effect, thereby intensifying pain on injection. Inhibition of bradykinin generation by nafamostat mesylate is shown to reduce propofol-induced pain. Moreover, cold appears to lessen propofol injection pain through suppressing the activation of plasma kallikrein-kinin system that in turn initiates enzymatic cascade.^{3,4,11} Propofol is a member of phenol group, can irritate the skin; mucus membrane and venous intima immediately stimulate nociceptors and free nerve endings.¹²

The present study showed that using dexmedetomidine had significant impact on declining the pain after propofol injection in comparison to NS as placebo. Liang He in their study found that the Pretreatment with intravenous dexmedetomidine 1mcg/kg 5 min prior to injection of long-chain triglyceride propofol is effective and safe in reducing the incidence and severity of pain due to propofol injection.⁹ Jeong Han Lee et al in their study also found that 0.5 µg/kg of dexmedetomidine mixed with propofol is a proper dosage for reducing injection pain.¹³

Sedat Kaya et al reported that pretreatment with lidocaine 20 mg with or without venous occlusion significantly reduced the incidence and the severity of pain during the injection of propofol when compared with the group with no venous occlusion administered saline. In addition, pretreatment with lidocaine 20 mg plus venous occlusion for 60 seconds significantly reduced the incidence of propofol-induced pain compared with lidocaine without venous occlusion.¹⁴ Singh D et al demonstrated that IV ramosetron when given as pretreatment is as effective as lidocaine on propofol associated pain with an added advantage of preventing PONV.¹⁵

Dong Hun Chung evaluated the use different doses of sufentanil for reducing the severity of pain of propofol

injection pain and found that pretreatment with sufentanil 0.3 µg/kg reduced the severity of microemulsion propofol injection pain without increasing arterial blood pressure and heart rate after endotracheal intubation.¹⁶

Rahimzadeh P compared the analgesic effect of ondansetron, magnesium sulphate (MS) and placebo on patients after propofol 2% injection and observed that the MS and ondansetron had significant impacts on pain reduction after propofol 2% injection in comparison with NS as placebo. Comparing two trial groups did not have any significant priority for analgesic impact.¹²

Yoshikawa T et al used oral clonidine powder two hour before surgery for reducing the propofol injection pain and reported that orally administered clonidine significantly reduces pain during injection of propofol.¹⁷

CONCLUSION

In our study we found that pretreatment with dexmedetomidine 1mcg/ kg is effective in preventing pain from 1% long-chain triglyceride(LCT) propofol Injection and can be a better alternative to other pretreatment drugs.

REFERENCES

1. Marik PE. Propofol: therapeutic indications and side-effects. *Curr Pharm Des* 2004;10:3639-49.
2. Koo SW, Cho SJ, Kim YK, Ham KD, Hwang JH. Small-dose ketamine reduces the pain of propofol injection. *Anesth Analg*.2006;103:1444-7.
3. Canbay O, Celebi N, Arun O, Karagoz AH, Sari-caoglu F, Ozgen S.Efficacy of intravenous acetaminophen and lidocaine on propofol injection pain. *Br J Anaesth* 2008;100:95-8.
4. Picard P, Tramèr MR. Prevention of pain on injection with propofol:A quantitative systematic review. *Anesth Analg* 2000;90:963-9.
5. Jalota L, Kalira V, George E, Shi YY, Hornuss C, Radke O, et al. Perioperative Clinical Research Core. Prevention of pain on injection of propofol: Systematic review and meta-analysis. *BMJ* 2011;342:d1110.
6. Fujii Y, Uemura A. Effect of metoclopramide on pain on injection of propofol. *Anaesth Intensive Care* 2004;32:653-6.
7. Kamibayashi T, Maze M. Clinical uses of alpha 2-adrenergic agonists. *Anesthesiology* 2000; 93: 1345-9.
8. Rochette A, Hocquet AF, Dadure C, Boufroukh D, Raux O,Lubrano JF, et al. Avoiding propofol

- injection pain in children: a prospective, randomized, double-blinded, placebo controlled study. *Br J Anaesth.* 2008;101:390–4.
9. Liang He, Jun-Mei Xu, Tao He, Lei Liu, Rong Zhu. Dexmedetomidine pretreatment alleviates propofol injection pain *Ups J Med Sci.* 2014 November; 119: 338–342.
 10. Klement W, Arndt JO. Pain on injection of propofol: Effects of concentration and diluent. *Br J Anaesth* 1991;67:281-4.
 11. Barker P, Langton JA, Murphy P, Rowbotham DJ. Effect of prior administration of cold saline on pain during propofol injection: a comparison with cold propofol and propofol with lignocaine. *Anaesthesia* 1991; 46: 1069–70.
 12. Rahimzadeh P, Faiz SH, Nikoobakht N, Ghodrati MR. Which one is more efficient on propofol 2% injection pain? Magnesium sulfate or ondansetron: A randomized clinical trial. *Adv Biomed Res* 2015;4:1-5.
 13. Jeong Han Lee, Soon Yong Jung, Myoung-Hun Kim, Kwangrae Cho. The effect of dexmedetomidine on propofol injection pain. *Korean J Anesthesiol.* 2014 December; 67(Suppl): S30–S31.
 14. Sedat Kaya, Selim Turhanoglu, Haktan Karaman, Sule Özgün, Nihal Basak. Lidocaine for prevention of propofol injection-induced pain: A prospective, randomized, double-blind, controlled study of the effect of duration of venous occlusion with a tourniquet in adults *Curr Ther Res Clin Exp.* 2008; 69: 29–35.
 15. Singh D, Jagannath S, Priye S, S, Kadli C, Reddy D. Prevention of propofol injection pain: Comparison between lidocaine and ramosetron. *J Anaesthesiol Clin Pharmacol* 2014;30:213-6.
 16. Dong Hun Chung, Nan Sook Kim, Mi Kyung Lee, Hee-kyung Jo. The effect and optimal dose of sufentanil in reducing injection pain of microemulsion propofol. *Korean J Anesthesiol.* 2011; 60:83–89.
 17. Yoshikawa T, Wajima Z, Ogura A, Inoue T, Ogawa R. orally administered clonidine significantly reduces propofol pain during injection of propofol. *Br J Anaesth.* 2001;86: 977–984.