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ORIGINAL ARTICLE

To Study the Effect of I.V. Dexmedetomidine by Two Different Means for Prevention of Pain Due to Propofol Injection

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Abstract .

Background: The incidence of propofol injection pain during induction of general anaesthesia varies from 28% to 85%. **Purpose:** To Study the Effect of I.V. Dexmedetomidine by Two Different Means for Prevention of Pain Due to Propofol Injection. **Material and Methods:** This prospective, randomized study we evaluated the effect of dexmedetomidine for reducing the incidence and severity of propofol injection pain by two different approaches while evaluating the hemodynamic stability. 120 Patients undergoing elective surgical procedures were randomly divided into four groups; in group I and II with the aim of keeping the drug within the vein the forearm was squeezed with a tourniquet up to 70 mmHg for 20 sec; the patients were administered 0.5µg/kg dexmedetomidine in Group 1 (n 30), 0.75µg/kg dexmedetomidine in Group 2 (n 30) for 5 min, followed by 15 ml of 1% propofol in all patients over 25 seconds to induce anaesthesia. In Group 3 and 4; 0.5µg/kg and 0.75µg/kg dexmedetomidine was premixed with 15ml propofol respectively and administered for induction. Pain is graded on a 0– 6 scale. **Results:** Overall median propofol injection pain score reduction was 65.75% with the maximum reduction of 80% seen in group 4 and minimum reduction of 50% in group 1. There were statistically significant differences (p Â0.05) in both SBP and DBP and heart rate with the maximum decrease in all hemodynamic parameters in group 2 and 4. **Conclusion:** Pre-treatment with intravenous dexmedetomidine 0.75µg/kg, 5min prior to injection of long-chain triglyceride propofol is effective and safe in reducing the incidence and severity of pain due to propofol injection.

Key Words
Propofol, Injection Pain, Dexmedetomidine

Introduction

Propofol is widely administered during anaesthetic induction. However, Propofol causes undesirable pain during vascular injection and may cause hand withdrawal and dislodging of the venous cannula (1). The incidence of pain varies from 28% to 85% on propofol injection (2). Many methods have been used to relieve the pain of propofol injection. A recent systematic review and meta-analysis showed that propofol infusion via the antecubital vein and pre-treatment with lidocaine in conjunction with venous occlusion were the two most efficient interventions to reduce pain on injection of propofol (3) but with increased rate of complications. Pre-treatments with various drugs have been evaluated to reduce pain on propofol injection, such as parecoxib with venous occlusion (4), tourniquet-controlled lidocaine (5),

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ondansetron (6), and a small dose of ketamine (7).

Dexmedetomidine, an á2-adrenoceptor agonist, has an analgesic effect as well as a sedative effect. So far very few studies have evaluated the pain inhibiting effect of dexmedetomidine on propofol injection with a few negating its effect (8). Several studies have examined whether the analgesic effect of dexmedetomidine can reduce pain associated with propofol injection (9), but these studies were not helpful in clarifying the appropriate dosage of dexmedetomidine for minimizing hemodynamic changes from the drug while maximizing the reduction of propofol injection pain. In this study, we evaluated the efficacy of dexmedetomidine in reducing pain and hemodynamic changes during propofol injection.

Material and Methods

The study was approved by the Institutional Ethical Committee of our hospital, and informed consent was obtained from the subject patients after sufficient explanation regarding general anaesthesia and our study. One hundred ASA grade 1 or 2 patients (20 to 60 years old) who were scheduled for elective surgery, were enrolled. They were randomly divided into four groups; in group I and II with the aim of keeping the drug within the vein, a 20-gauge catheter was mounted on the dorsal hand or wrist area. After attaching the monitor and recording the baseline parameters of HR, SBP, DBP, SPO2 and ETCO2; the forearm was squeezed with a tourniquet up to 70 mmHg for 20 seconds; the patients were administered dexmedetomidine in Group 1 (n 30), 0.75µg/kg dexmedetomidine in Group 2 (n 30) both diluted to 5 ml with normal saline, followed by 15 ml of 1% propofol (long-chain triglyceride) after 5 min in all patients over 25 seconds to induce anaesthesia. In Group 3 and 4; 0.5µg/kg dexmedetomidine (Group III (n 30)) was premixed with 15ml propofol, and 0.75µg/kg dexmedetomidine (Group IV (n 30)) was premixed with 15ml propofol, respectively; to a total volume of 20 ml with normal saline, at ambient operating room's temperature (20–22°C) over 20 seconds. Injection pain was graded and patients pain score > 2 were considered as scale for the primary outcome. Hemodynamic measurements were taken at baseline, immediately after administration of dexmedetomidine and propofol in group 1 and 2 and deflation of cuff and administration of propofol in group 3 and 4.

The degree of pain was statistically analyzed with Student's t test for parametric data and chi square test for non-parametric data using SPSS 17.0, and the results were considered statistically significant when the P value

Table 1: Scoring System for Propofol Injection Pain (10)

Motor events	No movement	0
	Slight hand withdrawal	1
	Marked withdrawal, rubbing, trying to tear off the line	2
	General restlessness	3
Verbalization scale	No vocalization	0
	Purposeless moaning	1
	Explicit protest	2
	Screams and cries	3
		0-6

Table 2: Basic Characteristics for Patients

Group(number)	Gender m/f	Age (years)	Weight (kg)
Group 1(n=30)	15/15	70.5	164.3 ±14.5
Group 2(n=30)	16/14	69.8	168.2±13.4
Group 3(n=30)	16/14	72.5	163.9±9.9
Group 4(n=30)	17/13	67.6	167.7±9.8

Table 3: Incidence of Pain After Administration of Dexmedetomidine and Propofol

	Pain score			
	0	1	2	3
Group 1(n=30)	5(16.6)	10(33.3)	11(36.6)	4(13.3)
Group 2(n=30)	10(33.3)*	11(36.6)	7(23.3)	2(6.7)*
Group 3(n=30)	7(23.3)	11(36.6)	9(30)	2(6.7)*
Group 4(n=30)	18(60)*!	6(20)*!	6(20)*!	0(0)*
Values are number of patients (%). Scores*p < 0.05 compared with group 1. are evaluated as per table 1 *p < 0.05 compared with group 1. !p < 0.05 compared with group 3.				

Table 4: Hemodynamic Values for the Four Groups

	Group 1	Group 2	Group 3	Group 4
HR (bpm)				
T1	88.1±9.3	87.9±10.4	89.2±8.3	87.1±10.2
T2	85.7±8.9	79.2±9.8*	84.6±9.91	75.5±8.3*
SBP (mmHg)				
T1	138.6±8.3	132.9±10.2	137.4±9.2	136.8±11.3
T2	132.9±9.1	120.5±9.8*	128.4±8.3	118.9±7.9*!
DBP (mmHg)				
T1	92.3±7.2	93.1±6.4	92.9±8.2	94.3±7.6
T2	89.8±8.3	84.9±7.2*	98.3±9	76.9±9.2*!

Values are mean ± SD, HR heart rate bpm beats per minute, SBP Systolic blood pressure, DBP Diastolic blood pressure, T1 baseline, T2 immediately after the administration of dexmedetomidine.
*p < 0.05 compared with group 1.
!p < 0.05 compared with group 3.

was less than 0.05.

Results

All patients completed the study. There were no statistically signiûcant differences among the four groups with regard to age, weight, gender, or ASA class (p > 0.05) *(Table 2)* the incidence of injection pain diminished significantly in group 2 (70%) and group 4 (80%) compared to group 1 (50%) and group 3 (60%) *(Table 3)*. The hemodynamic changes measured before and after the drug injection show that there was a significant decrease HR, SBP and DBP in group 2 and 4 as compared to group 1 and 3. *(Table 4)*.

Discussion

This prospective, randomized study was carried out in order to evaluate the effect of dexmedetomidine for reducing the incidence and severity of propofol injection pain by administering it as a pre-treatment or in tandem while demonstrating that the reduction of pain with dexmedetomidine depended on the dose and the technique used to administer it. Although the decrease in pain score was significant when dexmedetomidine was used in conjunction with propofol in the dose of 0.75 µg/kg but, with the pre-treatment dose of 0.75 µg/kg, the incidence rate of pain scores >2 decreased from 11/30 to 6/30. A dose of 0.5µg/kg could not reduce the intensity and incidence of propofol injection pain significantly.

Our results are in tandem with the study done by Erdil *et al.* (11) who while comparing dexmedetomidine and saline reported that the pain score was lower in the group that received dexmedetomidine. Jeong Han Lee *et al.* (12) used the tourniquet technique to administer the propofol dexmedetomidine admixture concluded that a dose of more than 0.5µg/kg dexmedetomidine was adequate for reducing pain. A study by Liang He *et al.* (13) compared different doses of dexmedetomidine given either immediately or 5 min before propofol and concluded that 1µg/kg given 5 min before was the most effective. In the research conducted by Xiang Li *et al.* (14), the results showed that administration of 0.2–0.5 µg/ kg dexmedetomidine reduced the incidence and severity of propofol injection pain in ECT. The results of our study do not collaborate with the above given study for we found the dose of 0.75µg/kg to be more effective while giving an adequate hemodynamic stability.

Tourniquets are the most common compressive devices for venous occlusion, but can cause tourniquet-induced hypertension or even ischemia-reperfusion injury (15). Therefore, venous occlusion before propofol injection may be contraindicated in patients with moderate to severe hypertension. But dexmedetomidine has a proven preventive effect on the tourniquet induced hypertension (16).

The increase in blood pressure is seen during administration of high doses of dexmedetomidine administration is due to vasoconstriction of the á2B-adrenoceptor, which is located on the smooth muscle cells of certain peripheral blood vessels (17). The decline in heart rate is attributable to the baroreceptor reflex response to the increase in blood pressure. In this study, there were significant decreases in blood pressure in all groups that were administered dexmedetomidine (0.5–

0.75 ìg/kg) compared to smaller doses and saline administration.

Conclusion

Dexmedetomidine in a dose 0.75µg/kg and above if given as pre-treatment is effective and safe way to reduce the intensity and incidence of pain during propofol injection.

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Conflicts of Interest

There are no conflicts of interest.

References

1. Ayoglu H, Altunkaya H, Ozer Y, Yapakçi O, Cukdar G, Ozkoçak I. Does dexmedetomidine reduce the injection pain due to propofol and rocuronium? *Eur J Anaesthesiol* 2007;24:541-45.
2. Koo SW, Cho SJ, Kim YK, Ham KD, Hwang JH. Small-dose ketamine reduces the pain of propofol injection. *Anesth Analg* 2006;103:1444-47.
3. Jalota L, Kalira V, GeorgeE, Shi YY,Hornuss C, Radke O, *et al.* Prevention of pain on injection of propofol: systematic review and meta-analysis. *BMJ* 2011;342:1-18.
4. Walker BJ, Neal JM, Mulroy MF, Humsi JA, Bittner RC, McDonaldSB. Lidocaine pretreatment with tourniquet versus lidocaine-propofol admixture for attenuating propofol injection pain: a randomized controlled trial. *Reg Anesth Pain Med* 2011;36:41-45.
5. Kwak HJ, Min SK, Kim JS, Kim JY. Prevention of propofol induced pain in children: combination of alfentanil and lidocaine vs alfentanil or lidocaine alone. *Br J Anaesth* 2009;103:410-12.
6. AmbeshSP, DubeyPK, SinhaPK. Ondansetron pretreatment to alleviate pain on propofol injection: a randomized, controlled, double-blinded study. *Anesth Analg* 1999;89:197-99.
7. Zhao GY, Guo Y, Bao SM, Meng LX, ZhangLH. Prevention of propofol-induced pain in children: pretreatment with small doses of ketamine. *J Clin Anesth* 2012;24:284-88.
8. Ayoglu H, Altunkaya H, Ozer Y, Yapakçi O, Cukdar G, Ozkoçak I. Does dexmedetomidine reduce the injection pain due to propofol and rocuronium? *Eur J Anaesthesiol* 2007;24:541-45.
9. Turan A, Memis D, Kaya G, Karamanlioglu B. The prevention of pain from injection of propofol by dexmedetomidine and comparison with lidocaine. *Can J Anaesth* 2005;52:548-49.
10. Nyman Y, von Hofsten K, Georgiadi A *et al.* Propofol injection pain in children: a prospective randomized double-blind trial of a new propofol formulation versus propofol with added lidocaine. *Br J Anaesth* 2005;95:222-25
11. Erdil FA, Gulhas N, But AK, Begec Z, Ersoy MO. Does single dose premedication of dexmedetomidine reduce pain during injection of propofol? *The Pain Clinic* 2007;19:21-25.
12. Jeong Han Lee, Soon Yong Jung, Myoung-Hun Kim, and Kwangrae Cho. The effect of dexmedetomidine on propofol injection pain. *Korean J Anesthesiol* 2014;67(Suppl): S30-31.
13. Liang he, Jun-mei xu, Tao he, Lei liu & Rong zhu. Dexmedetomidine pretreatment alleviates propofol injection pain. *Upsala J Med Sci* 2014;19:338-44
14. Xiang Li, Chao jin Chen, Fang Tan, Jing ru Pan, Ji bin Xing, *et al.* Effect of dexmedetomidine for attenuation of propofol injection pain in electroconvulsive therapy: a randomized controlled study. *J Anesth* 2018;32(1):70-76.
15. Hughes SF, Hendricks BD, Edwards DR, Middleton JF. Tourniquet-applied upper limb orthopaedic surgery results in increased inûammation and changes to leukocyte, coagulation and endothelial markers. *PLoS One* 2010;5:1184-86.
16. Lu Y, Zhang Y, Dong CS, Yu JM, Wong GT. Preoperative dexmedetomidine prevents tourniquet-induced hypertension in orthopedic operation during general anesthesia. *Kaohsiung J Med Sci* 2013;29:271-74.
17. Bloor BC, Ward DS, Belleville JP, Maze M. Effects of intravenous dexmedetomidine in humans. II. Hemodynamic changes. *Anesthesiology* 1992;77:1134-42.