Original Article

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Assessment of Effect of 6% Hydroxyethyl Starch Pre-Administration for Reduction of Pain on Propofol Injection

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Abstract

Background: The aim is to assess effect of 6% hydroxyethyl starch pre- administration for reduction of pain on propofol injection. **Subjects and Methods:** Eighty- eight adult patients were classified patients into 2 groups. Group A received 100 mL bolus of HES and group B received 0.9% normal saline (NS) over three to five minutes through an 18 G cannula placed in the hand or forearm vein, followed by induction with 1% propofol premixed with 2% lidocaine. Pain during propofol injection was assessed every 10 seconds before the loss of verbal contact. **Results:** Group A comprised of 24 males and 20 females and group B had 21 males and 23 females. The mean weight was 60.5 kgs in group A and 59.8kgs in group B. Propofol induction dose in group A was 126 mg and in group B was 130. Loss of verbal response was 57 seconds in group A and 58 seconds in group B. The difference was non- significant (P> 0.05). Grade 0 was seen in 62% in group A and 40% in group B, grade 1 in 20% in group A and 35% in group B, grade 2 in 13% in group A and 15% in group B and grade 3 in 5% in group A and 10% in group B. The difference was non- significant (P> 0.05).**Conclusion:** Pre-administration of 100 mL of 6% HES, 3 to 5 min before propofol injection, significantly decreases the pain on injection with propofol in comparison to normal saline.

Keywords: Anaesthesia, Normal saline, Propofol injection.

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Introduction

Propofol is the most widely used intravenous agent for induction of anaesthesia. Pain on the intravenous injection of propofol however is a problem.[1] The incidence of pain on the intravenous injection of propofol is 30-90%. Most patients remember it as one of the unpleasant encounters during operation. Propofol injection pain ranks seventh amongst common important postoperative problems after anaesthesia.[2]

Propofol (2,6-diisopropylphenol) is one of the most common intravenous drugs in the clinical field used to induce a loss of consciousness.[3] It is known as a modulator and an activator of type A γ-amino butyric acid (GABAA) receptors in the central nervous system, but it is also reported to affect the function of glycine receptors in the spinal cord.[4] Colloids are used for intraoperative fluid therapy in anaesthesia, and are considered to be safe.[5] They are macromolecules that have the capacity to modify endothelial cell junctions and permeability of the vascular endothelium and inhibit endothelial activation by various substances and molecules.[6] Thus, pre-administration of colloids may prevent contact activation by propofol, which may in turn lead to reduced pain during injection.[7,8] We conducted present study to assess effect of 6% hydroxyethyl starch pre- administration for reduction of pain on propofol injection.

Subjects and Methods

After considering the utility of the study and obtaining approval from ethical review committee of the institute, we selected eighty- eight adult patients of the American Society of Anesthesiologists physical status I and II patients of either gender and undergoing elective surgery.

We classified patients into 2 groups. Group I received 100 mL bolus of HES and group II received 0.9% normal saline (NS) over three to five minutes through an 18 G cannula placed in the hand or forearm vein, followed by induction with 1% propofol premixed with 2% lidocaine. Pain during propofol injection was assessed every 10 seconds before the loss of verbal contact as 0 no pain; 1 mild pain evident only on questioning after 10 seconds without any obvious discomfort; 2 moderate pain self-reported by patients within 10 seconds with some discomfort; and 3 severe pain accompanied by withdrawing of hand, and behavioral signs. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

Results

Table 1: Patients distribution

Groups	Group A	Group B
Method	100 mL bolus of HES	0.9% normal saline
M:F	24:20	21:23

Group A comprised of 24 males and 20 females and group B had 21 males and 23 females [Table 1].

Table 2: Demographic characteristics

Parameters	Group A	Group B	P value
Weight (kg)	60.5	59.8	0.94
Propofol induction dose (mg)	126	130	0.81
Loss of verbal response (seconds)	57	58	0.92

The mean weight was 60.5 kgs in group A and 59.8kgs in group B. Propofol induction dose in group A was 126 mg and in group B was 130. Loss of verbal response was 57 seconds in group A and 58 seconds in group B. The difference was non- significant (P> 0.05) [Table 2].

Table 3: Comparison of grades of pain

Grade	Group A	Group B	P value
0	62%	40%	0.05
1	20%	35%	0.02
2	13%	15%	0.95
3	5%	10%	0.01

Grade 0 was seen in 62% in group A and 40% in group B, grade 1 in 20% in group A and 35% in group B, grade 2 in 13% in group A and 15% in group B and grade 3 in 5% in group A and 10% in group B. The difference was non-significant (P> 0.05) [Table 3].

Discussion

Propofol is frequently used for general anesthesia due to its rapid onset and short-acting efficacy.[9,10] Previous studies have found that changes in blood volume, regional organ blood flow, blood chemistry, body fluid distribution and hemodynamics can alter the pharmacokinetic and pharmacodynamic profile of propofol.[11,12,13] We conducted present study to assess effect of 6% hydroxyethyl starch pre- administration for reduction of pain on propofol injection.

Our results showed that group A comprised of 24 males and 20 females and group B had 21 males and 23 females. Misra et al,[14] evaluated the effect of 6% hydroxyethyl starch (HES) pre administration on propofol injection pain. 126 patients completed the study. Overall incidence of pain was significantly higher in the NS group vs HES group (53% vs 28%; P = 0.004; relative risk 1.54, 95% confidence interval 1.13 2.09). Incidence of severe (8% vs 0%) and moderate pain (16% vs 5%) was higher in the NS group, while the incidence of mild pain was comparable (29% vs 23%; NS vs HES). A significant difference was seen in the severity of pain between the groups (P = 0.002).

Our results showed that the mean weight was 60.5 kgs in group A and 59.8kgs in group B. Propofol induction dose in group A was 126 mg and in group B was 130. Loss of verbal response was 57 seconds in group A and 58 seconds in group B. Li et al,[15] in their study a total of 20 patients undergoing AHHD following epidural anesthesia were studied, and 20 patients was control group. The results showed that the potency of propofol was decreased during AHHD. Compared with the controls, the predicted blood and effect- site concentrations of propofol at LOC were higher in patients of the hemodilution group, resulting in higher EC50 values (P=0.001 and 0.025, respectively). At ROC, the effect- site EC50 was 2.9 µg/ml in hemodilution patients and 2.5 µg/ml in control patients (P=0.001). With AHHD, the LOC time was significantly longer and the propofol dose was higher, while ROC times were comparable. AHHD increases the requirement for propofol at LOC and prolongs LOC time.

Grade 0 was seen in 62% in group A and 40% in group B, grade 1 in 20% in group A and 35% in group B, grade 2 in 13% in group A and 15% in group B and grade 3 in 5% in group A and 10% in group B. Dahaba et al,[16] showed that the hypnotic potency of propofol was increased and the LOC time was short in hemodilution patients.

Sumalatha et al,[17] compared the efficacy of ondansetron, ramosetron and lignocaine in terms of attenuation of propofol-induced pain during induction of anaesthesia. Hundred and fifty adult patients, aged 18-60 years, posted for various elective surgical procedures under general anaesthesia were randomly assigned to three groups of 50 each. Group R received 0.3 mg of ramosetron, Group L received 0.5 mg/kg of 2% lignocaine and Group O received 4 mg of ondansetron. After intravenous (IV) pre-treatment of study drug, manual occlusion of venous drainage was done at mid-arm with the help of an assistant for 1 min. This was followed by administration of propofol (1%) after release of venous occlusion. The overall incidence and intensity of pain were significantly less in Groups L and R compared to Group O ($P \leq 0.001$). The incidence of mild to moderate pain in Groups O, R and L was 56%, 26% and 20%, respectively. The incidence of score '0' (no pain) was significantly higher in Group L (76%) and Group R (72%) than Group O (34%) ($P < 0.001$).

It is possible that the pre-administration of HES may have led to modulation of the venous endothelium, thereby preventing contact activation of the various nociceptive receptors by propofol. This modulation of the endothelium by starches has been demonstrated in many in-vivo and in-vitro experimental models.[18]

Conclusion

Pre-administration of 100 mL of 6% HES, 3 to 5 min before propofol injection, significantly decreases the pain on injection with propofol in comparison to normal saline.

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