Original Article

Efficacy of Intravenous Ondansetron in Reducing Postoperative Shivering after General Anesthesia

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Abstract

Background and aim of study: *Postoperative shivering is one of the common problems following general anesthesia and may lead to multiple complications. The aim of this study was to observe the preventive effect of intravenous ondansetron on postoperative shivering.*

Materials and methods: *This randomized placebo-controlled double blind clinical trial included 80 patients scheduled for elective ENT operations, randomly divided to two groups. ondansetron (4 mg) and 2ml normal saline (as placebo group) were administered immediately before the induction of anesthesia. Anesthesia induced equivalently for all. Patients were observed incidence and severity of shivering in postoperative period.*

Results: *Postoperative shivering was observed in 15% of patients in ondansetron group which is significantly lower than the saline group 50% ($p<0.05$). The change in temperature during the anesthesia and recovery, changes in systolic and diastolic blood pressure and heart rate were similar in both groups.*

Conclusion: *Intravenous ondansetron can effectively reduce postoperative shivering (POS).*

Key words: *Ondansetron, general anesthesia, postoperative shivering.*

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Introduction

Postoperative shivering (POS) is a common and distressing experience occurring in up to 60% of patients recovering from general anesthesia[1,2] and in up to 30% of patients receiving epidural anesthesia.[2] It depends upon various factors including age, gender, type of anesthesia, amount and temperature of intravenous (IV) fluids, duration of surgery, and temperature of operating room.[2,3] POS is either of normal thermoregulatory type of shivering which occurs in response to core hypothermia and release of cytokines by the surgical trauma or non thermoregulatory type that occurs in normothermic patients in response of anesthetics.[1]

Intraoperative hypothermia is common problem and POS is one of the undesirable response to hypothermia.[4-7] POS is not only distressing to patients, but it may also lead to potentially serious complication by increasing tissue oxygen consumption, carbon-dioxide production, minute ventilation, cardiac output, circulating catecholamines, intracranial pressure, and intraocular pressure; and causing a significant decrease in mixed venous oxygen saturation.[1,2,4-6] All these factors, if severeenough, may lead to hypoxia and lactic acidosis and can significantly complicate recovery which may be potentially lethal in patients with cardiopulmonary dysfunction. POS also interferes with monitoring and aggravates postoperative pain by stretching

of surgical incision site.[5,8,9]Various pharmacological agents have been used for prevention of POS, including pethidine, tramadol, clonidine, ketamine, nefopam, ondansetron and physostigmine; but noneof them have shown promise.[10-12]

Ondansetron, a 5-HT_3 receptor antagonist, is widely used to prevent postoperative and pregnancy induced nausea andvomiting. 5-TH can affect the body temperature and shivering in rats since the balance of nor-epinephrineand 5-hydroxytryptamine (5-HT) in the preoptic anterior hypothalamus controls the temperature set point.[13,14]Consistently, several studies[15-18] have demonstrated ondansetron can prevent POS, which made ondansetron a promising drug for postoperative complications including POS, nausea and vomiting.

The aim of this work was to assess the prophylactic effect of a single intravenous dose of 4 mg ondansetron, compared with placebo, on the prevention of postoperative shivering (POS) after general anesthesia.

Materials and methods

This study was carried out in National Institute of ENT, Dhaka during May to October2017 after obtaining written informed consent from the patients.All patients were in ASA physical status I or II. Obese patients (weight >100 kg),endocrine problems or Parkinson disease were excluded as well as patients who received blood, vasodilator or vasoconstrictor medications during the operation. Long duration of the operation (>90 minutes) also resulted in exclusion.

Patients then were randomly selected to Group I (ondansetron group) who received4 mg intravenous ondansetronand Group II (placebo group) who received 2 mlnormal saline 2 minutes before induction of anesthesia. The responsible anesthesiologist was blinded to the drug available in same 2 ml syringes. Anesthesia was induced by 1 mcg/kg fentanyl, 2 mg/kg propofol and 1.5 mg/kg succinylcholine and maintained by halothane in an inspired mixture of 40% oxygen and 60% N_2O after intubation. Vecuroniumwas administered for muscle relaxation. The patients were mechanically ventilated.After completion of operation patients were reversed by neostigmine and atropine as usual and shifted to recovery room.Room temperature was set at 22°-24 °C. Heart rate, blood pressure and body temperatures were measured every 5 minutes interval throughout the intraoperative and postoperative period. Patients were observed for shivering in recovery roomas per shivering scale described byCrossley & Mahajan[19] and Tsai &Chu[20]

Grading scale of postoperative shivering validated by Crossley & Mahajan[19] and Tsai & Chu[20]

0= No shivering.

1= Piloerection or peripheral vasoconstriction but no visible shivering.

2= Muscular activity in only one muscle group.

3= Muscular activity in more than one muscle group but not generalized shivering.

4= Shivering involving the whole body.

Statistical analysis

Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage. The following tests were done: Independent-samples t-test of significance was used when comparing between two means. Chi-square test of significance was used in order to compare proportions between two qualitative parameters. P-value <0.05 was considered significant. P-value >0.05 was considered insignificant.

Results

There was no significant difference in terms of age, body weight, sex, ASA status, hemodynamics and body temperature between the groups (Table I). In group I six (15%) out of the 40 patients had postoperative shivering (POS), whereas 20 (50%) out of the 40 patients had POS in group II (P<0.05). Grade 1 POS was lower number of patients in group I when compared with group II (4 versus 11; P<0.05). Grade 2 POS was also lower number of patients in group I when compared with group II (2 versus 6; P<0.05) and grade 3 POS was only present in group II (0 versus 3; p<0.05.There was no grade 4 POS in either of the two groups (Table II). The baseline values of systolic and diastolic blood pressure, heart rate and temperature in both groups were similar and there was no any adverse effect.

Table-I *Demographic and operative details of patients between Ondansetron and Saline group.*

Demographicand operative details	Group I (Ondansetron group) n=40	Group II (Saline group) n=40
Age (Years)	38.24±8.37	37.78±9.12
Weight (Kg)	66.54±7.22	65.72±9.31
Sex M/F	23/17	24/16
ASA physical status I/II	36/4	35/5
Mean basal heart rate (bpm)	76.8±7.3	77.4±8.6
Mean basal systolic BP (mm Hg)	118.23±6.12	116.45±7.63
Mean basal diastolic BP (mm Hg)	79.87±8.86	81.12±7.52
Mean duration of surgery (min)	70.84±7.43	72.24±6.57
Mean body temperaturesduring surgery (^{0}C)	36.19±0.48	36.33±0.32
Mean body temperaturein recovery room (^{0}C)	36.43±0.23	36.48±0.31

Table II

Incidence and severity of postoperative shivering

Postoperative shivering (POS)	Group I(Ondansetron group) n=40	Group II(Saline group) n=40	p value
Incidence of POS number (%)	6 (15%)	20 (50%)	p<0.05
Grading of POSnumber (%)			
0	34 (85%)	20 (50%)	p<0.05
1	4 (10%)	11 (27.5%)	p<0.05
2	2 (5%)	6 (15%)	p<0.05
3	0	3 (7.5%)	p<0.05
4	0	0	-

Discussion

Postoperative shivering may be dangerous because it increases oxygen consumption and hemostatic dysfunction especially in patients with a low cardiac reserve. It may also result in hypoxemia. Several medications have been suggested for the prevention and treatment of postoperative shivering.

The present study shows valuable preventive effect of ondansetron on postoperative shivering compared to placebo group, here ondansetron group six (15%) out of the 40 patients had postoperative shivering (POS), whereas 20 (50%) out of the 40 patients had POS in placebo group (P<0.05). Grade 1 POS was lower number of patients in ondansetron groupwhen compared with placebo group (4 versus 11; P<0.05). Grade 2 POS was also lower number of patients in ondansetron group when compared with placebo group (2 versus 6; P<0.05) and grade 3 POS was only present in placebo group (0 versus 3; p<0.05.There was no grade 4 POS in either of the two groups.

Asl et al[16] had a study preventing POS after general anesthesia using ondansetron 4 mg, pethidine 0.4 mg/kg and normal saline. The result was 13.3% patients had POS in ondansetron group, 20% patients in pethidine group and 50% patients had normal saline group.

Kelsaka et al[17] reported in his study a reduction in the occurrence of shivering after spinal anesthesia from 36% in controls to 8% by either ondansetron or pethidine.

Powel et al[18] also had a study on POS using 4 and 8 mg ondansetron and placebo, they recorded 33%, 15% & 57% patients respectively experienced postoperative shivering.

The result of present study regarding prevention of POS by intravenous ondansetron is nearly similar to those of Kelsaka et al,[17] Powel et al.[18] and Asl et al[16].

Conclusion

In conclusion, using intravenous 4 mg ondansetron before induction of general anesthesia has ability to reduce effectively the postoperative shivering.

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