

Effect of Different Doses of Granisetron on Preventing Postoperative Shivering in Patients undergoing Septorhinoplasty under General Anesthesia

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Abstract

Background: Postoperative shivering is a frequent complication in recovery room after general anesthesia and has been reported in 40-70% of patients undergoing surgery. Postoperative shivering might cause hypoxemia, increase in oxygen consumption, a linear increase in carbon dioxide production, lactic acidosis, and increased intraocular pressure and intracranial pressure. The aim of this study was to compare the effects of different doses of granisetron on preventing postoperative shivering in patients undergoing septorhinoplasty under general anesthesia. **Methods:** 90 patients aged 18-60 years old with grades I or II of American Society of Anesthesiologists (ASA) physicals classification were allocated to the study. The first group (G1) received Granisetron 1mg Intra Venous (IV) before anesthesia induction; the second group (G2) received 3mg Granisetron IV before anesthesia induction and the last group, the control group, received Normal Saline (NS). Three groups were matched regarding age, gender, weight and duration of surgery. Shivering grade and time of operation were recorded in the recovery room. **Results:** 90 patients scheduled for septorhinoplasty, including 54 men and 36 women, were enrolled to the study. The mean age of the patients was 28.53 ± 8.62 (18-60) years. The number of the patients suffering from shivering in the recovery room was significantly less in group G2 rather than control group ($P=0.006$) and also need to therapy was significantly less in this group (G2) compared with the control group ($P=0.002$).

Conclusion: Prophylactic use of granisetron (3mg, IV) can be effective in preventing postoperative shivering following septorhinoplasty.

Keywords: Granisetron; Shivering; General Anesthesia;

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Introduction

Postoperative shivering is one of the most common side effects following anesthesia. The prevalence of shivering has been reported to be about 40-70% in different patients (1) and it can be related to the age, gender, anesthetics, temperature of the operative room and the operation period (2). Postoperative shivering which is accompanied by vasoconstriction of skin circulation occurs due to hypothermia throughout the operation. This is a physiologic mechanism to preserve body temperature (3-4). Central neuroaxial blockage and general anesthesia can cause hypothermia and shivering. Perioperative hypothermia is the most common cause of shivering (4). Postoperative shivering is associated with an unpleasant experience in patients. Increase in oxygen consumption, arterial hypoxia and carbon dioxide production can contribute to acid and base abnormalities (5). It can also cause some other abnormalities like: increase in intraocular pressure (IOP) and intracranial pressure (ICP), and abnormalities in Pulse Rate (PR), Blood Pressure (BP), peripheral capillary oxygen saturation (SpO₂) and Electrocardiography (ECG) (1). Shivering can impose further pressure on cardiac function through increasing oxygen consumption in patients with reduced cardiopulmonary reserve or coronary artery diseases (6). Furthermore, this event exacerbates incisional pain, delays incision healing, increases hospital costs and hospital stay and delays Post Anesthesia Care Unit (PACU) discharge. Thus, preventing these hazardous side effects seems logical. Some pharmacological and non-pharmacological interventions have been proposed to prevent shivering. Some pharmacological treatment such as clonidine, tramadol, neostigmine, dexmethadone, magnesium sulfate, ketamine, narcotics have been reported to be effective (1, 8). Granisetron is a 5HT₃ receptor antagonist

that can prevent vomiting and nausea after operation (11-12). In a study by Iqbal et al., it was shown that granisetron can be effective in treating postoperative shivering (8). The aim of this study was to compare the effects of different doses of granisetron on preventing postoperative shivering in patients undergoing septorhinoplasty under general anesthesia.

Methods

Our study was a clinical trial that was approved by the ethics committee of Tabriz University of Medical Sciences, Tabriz, Iran and registered in Iranian Registry of Clinical Trial (IRCT) with the code number: IRCT201411173915N12. The trial was conducted in Imam Reza Hospital, Tabriz University of Medical Sciences, Tabriz, Iran in a 12-month period (January 2014 to December 2014). Written informed consents were obtained from patients prior to enrollment. 90 patients aged 18-60 years old with ASA grade I or II scheduled for septorhinoplasty under general anesthesia were allocated to the study. Subjects were randomly divided into three groups (Each group consisted of 30 patients) using computer randomization software. Exclusion criteria from the study were: Patients with the history of cardiopulmonary diseases, concurrent infection, body temperature of more than 38.0 C or less than 36.5 C and hypersensitivity to serotonin antagonists. Body temperature was measured through the tympanic membrane in the operation room. The first group (G1) received granisetron 1mg Intra Venous (IV) with 5cc NS before anesthesia induction; the second group (G2) received 3mg granisetron IV in 5cc NS before induction and the last group, control group, received only 5cc of Normal Saline (NS). All groups underwent the same standard general anesthesia and were matched regarding age, gender, weight, operation room condition, volume and



Score/ grade	Clinical signs
0	No shivering
1	Piloerection but no visible shivering
2	Muscular activity only one muscle group
3	Muscular activity more than one muscle group
4	Shivering involve the whole body

Table 1: Classification of shivering

temperature of administered fluids, body coverage during and after surgery and duration of surgery. All patients were under ASA standard monitoring (SpO₂, NIBP, HR, EtCO₂ and body temperature). All patients received fentanyl 2µg/kg and midazolam 0.03mg/kg as premedication and propofol 2mg/kg and cisatracurium 0.15mg/kg for anesthesia induction. Anesthesia maintenance was performed with Total Intravenous Anesthesia (TIVA) using infusion of propofol and remifentanyl. Shivering grade, nausea, vomiting and the period of operation were recorded every 5 minutes by a single anesthesiologist in the recovery room. Shivering grade of the patients has been shown in Table 1. In case of shivering, patients were kept warm for 10 minutes at first and if shivering did not resolve, they received pethidine 25mg IV up to three times every 20 minutes. Response to treatment was controlled every 5 minutes. Patients with grade 3 intensity of shivering or higher were treated. Statistical Analysis: Data were given as mean ± standard deviation (SD). Chi-square test (qualitative data), Independent samples Kruskal-Wallis test and t test (quantitative data) were used for comparisons. Statistical analysis was performed using SPSS software (SPSS, USA). P value ≤ 0.05 was regarded statistically significant.

Results

90 patients scheduled for septorhinoplasty, including 54 men and 36 women were enrolled to the study. The mean age of the patients was 28.53 ± 8.62 (18-60) years. Comparison of the three groups was made based on the mean age, weight and duration of surgery, blood pressure (BP) and Heart Rate (HR) (Table 2). Comparison between three groups in terms of HR, BP, need for treatment, shivering, time of shivering occurrence after surgery are presented in Table 3. In terms of post-operative shivering, there was significant difference between G2 that received 3mg granisetron and control group (P=0.006); however, there was no significant relation between G1 and control groups. There was significant correlation between G2 and control groups (P=0.018) and G1 and control groups (P=0.002) in terms of need for treatment after shivering. There was no significant difference between three groups in terms of HR and BP. There were 18 patients in G1 and 21 patients in G2 groups that did not experience shivering after surgery (Table 4). There were only 3 patients in G2 group that experienced shivering and did not response to active warming; they were treated with a single of pethidine (Table 5). There was no significant correlation between three groups in terms of the onset time of shivering after surgery (Table 6).

Discussion

In this study, it was demonstrated that granisetron can be effective in preventing postoperative shivering. Shivering is an important concern in patients after surgery and increases oxygen uptake and could cause arterial hypoxia and lactic acidosis in patients. Furthermore, it can interfere with ECG

	Mean age	Weight (kg)	period of operation	Diastolic blood pressure	Systolic blood pressure	Heart rate
G1	26.23 ± 8.28	68.23 ± 11.89	1.92 ± 0.79	77.8 ± 5.02	123.77 ± 7.05	77.17 ± 10.61
G2	28.1 ± 7.78	71.43 ± 12.36	2.41 ± 0.60	77.57 ± 8.93	122.8 ± 11.46	78.6 ± 12.54
Control group	31.27 ± 9.81	69.57 ± 9.3	2.26 ± 0.58	82.13 ± 5.55	122.83 ± 6.62	80.73 ± 9.44

Table 2: Comparison of three groups based on the mean age, weight and the period of operation. Data are presented as mean ± standard deviation

monitoring. Therefore, preventing shivering in the elderly patients with low cardiopulmonary reserve is of great importance (8). In this study, the incidence of shivering in the control group

was 60% and grade 3 or higher shivering was seen in 43% of the patients which was different from the previous similar studies (2, 8,15).

	Diastolic blood pressure (P-value)	Systolic blood pressure (P-value)	Heart rate (P-value)	Need for treatment after shivering (P-value)	Shivering (P-value)	Time of shivering after surgery (p-value)
G1 and G2	0.058	0.549	0.517	0.430	0.389	0.583
G1 and control group	0.478	0.737	0.745	0.018	0.053	0.293
G2 and control group	0.081	0.543	0.328	0.002	0.006	0.066

Table 3: Comparison of P-value of three groups based on DBP, SBP and HR. The numbers indicate p-value

Age and duration of surgery have been reported to be important risk factors of postoperative shivering (8). In this study, patients over 60 years old were excluded. In statistical analysis, there were no significant differences in terms of age, the time of operation, gender and weight in three groups. Post-operative shivering and need for treatment were significantly lower in patients who received 3mg granisetron vs. control group. Iqbal et al. demonstrated that shivering after laparoscopy under general anesthesia was lower in patients having received granisetron 40 µ/kg (8). In a similar study, Sagir et al.

showed that shivering was lower in patients undergoing urological surgery and received granisetron (11). In 40 children who received 10 µ/kg granisetron, there was no postoperative shivering (12). Sajedi et al. confirmed these results in a study performed on 132 patients undergoing orthopedic surgery. Shivering was lower in patients who received 40 µg/kg granisetron in comparison to the control group (13). Generali et al. demonstrated that receiving 3mg granisetron had an important effect in reducing postoperative shivering (14). These results were confirmed by Mahmoud et al. study. They realized that shivering was

	G1 (patients)	G2 (patients)	Control group (patients)
No shivering	18	21	12
Piloerection	4	3	3
One muscle	3	3	2
More than one Muscle	4	3	11
Whole body	1	0	2

Table 4: Comparison of three groups in term of post-operative shivering. The numbers show the patients

significantly lower in patients receiving granisetron (15). In this study, 1mg granisetron had no significant effect on the postoperative shivering. It seems that low doses of granisetron are able to reduce postoperative shivering in patients but not considerably affect the rate of occurrence. The onset time of shivering in previous studies was not studied. Based on the results obtained from our study, either 1mg or 3mg granisetron compared to the placebo had no significant effect on the onset time of shivering.

	G1	G2	Control group
No therapy	25	27	16
1 dose therapy	4	3	6
2 dose therapy	1	0	5
3 dose therapy	0	0	1

Table 5: Numbers of patients need for treatment after surgery

	5 min (patients)	10 min (patients)	15 min (patients)	20 min (patients)
G1	4	4	4	0
G2	5	2	0	2
Control group	7	8	3	0

Table 6: The time of shivering after surgery. The Numbers indicate the number of patients

Conclusion

Prophylactic use of granisetron (3mg, IV) can be effective in preventing postoperative shivering following septorhinoplasty surgery.

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