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Original Research

Role of Pethidine in post halothane anesthesia shivering

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Abstract

Background: Postoperative shivering, along with nausea and vomiting, is a common source of discomfort for patients recovering from general anesthesia. A key differentiator between shivering in postanesthetic patients and shivering in fully awake individuals, as observed in electromyogram recordings, is the presence of clonus. This clonus resembles the pattern seen in patients with spinal cord transection. Clonus occurs alongside the typical waxing and waning electrical activity seen with thermoregulatory shivering, which is linked to cutaneous vasoconstriction. The primary cause of postanesthetic shivering is intraoperative hypothermia, which results from anesthetic-induced suppression of the body's temperature regulation mechanisms. Additionally, shivering can occur with cutaneous vasodilatation (non-thermoregulatory shivering), which is often attributed to postoperative pain.

Aims and Objectives: The aim was to determine the know the incidence of post halothane anaesthesia shivering and to study the efficacy of Pethidine in treating the post halothane anaesthesia shivering.

Materials and Methods: The present study was carried out in 500 adult patients of ASA grade 1 of either sex between 18 to 50 years of age undergoing major surgery under general anesthesia with the aim of studying the incidence of post halothane anaesthesia shivering and to know efficacy of pethidine in treating the post-halothane anesthesia shivering.

Results: It was found that Overall incidence of shivering upon emergence from halothane anesthesia was 22 % (110/500). Sufficient precautionary measures both intra operatively and post operatively reduced the incidence of shivering. Males showed an increased incidence of shivering 57.27% (63/110) as compared to females 42.73% (47/110). Shivering was predominantly seen in patient who had greater fall in core temperature during anaesthesia.

Conclusion: Shivering following halothane anesthesia is a known complication. When shivering occurs, oxygen demand of the body increases to 200 to 400 % above the normal. The incidence of post halothane shivering can be minimized by taking proper precautions for fall in core temperature and minimizing the duration of anaesthesia. Pethidine is very effective in treating post halothane anaesthesia shivering and is without any side effects.

Introduction

Shivering involves rhythmic muscle contractions accompanied by irregular and brief relaxation intervals.[1] Postoperative shivering refers to involuntary muscle activity, which can be generalized or focused on specific areas such as the neck, throat, or jaw, occurring after a patient regains consciousness. It is a frequent source of discomfort in individuals recovering from anesthesia. The reported incidence of postoperative shivering ranges from 5% to 65%.[2] For patients undergoing laparoscopic surgeries, the occurrence rate is approximately 40%.

Postoperative shivering can prolong hospital discharge, particularly since most laparoscopic gynecological surgeries are performed on an outpatient basis. While pethidine remains the primary treatment for postoperative shivering, its dose-dependent side effects—such as sedation, postoperative nausea and vomiting (PONV), respiratory depression, and hemodynamic instability—can hinder timely discharge. It was hypothesized that administering a low dose of pethidine before induction in patients undergoing outpatient gynecological laparoscopy could help prevent postoperative shivering.[3]

Keeping in view the above advantages of pethidine for the management of post halothane anaesthesia shivering this study is planned to evaluate the efficacy of pethidine in treating post halothane anaesthesia shivering.

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Aim of the study

To know the incidence of post halothane anaesthesia shivering.

To study the efficacy of Pethidine in treating the post halothane anaesthesia shivering.

Materials and Methods

With the aim of studying the efficacy of pethidine for the treatment of halothane anaesthesia induced shivering, 500 adult patients of ASA grade I of either sex between 18-50 years of age group were studied undergoing major surgery under general anaesthesia with halothane at Rajindra Hospital, Patiala. Patients who received blood and blood products intraoperatively were excluded from the study. Those patients who developed post halothane anaesthesia shivering in the recovery room were studied to know the incidence and treatment of shivering. All patients were premedicated with injection Pentazocine 30 mg and injection Promethazine 25 mg. intramuscularly half an hour before the commencement of anaesthesia. Balanced technique of anaesthesia was used. Patients were induced with oxygen, nitrous oxide, halothane (2%) plus injection thiopentone 4to 6 mg./kg body weight and were intubated after receiving Succinyl Choline 1.5to2mg/kg body weight.

All patients were monitored continuously on multifunctional anesthesia monitor in the operation theatre and in the recovery room. The various parameters monitored were blood pressure, heart rate, ECG, Sp02, and core temperature. The latter was recorded by inserting the temperature sensor probe of the monitor into the nasopharynx of the patient. Temperature of the operating room and recovery room was noted by room thermometer. The parameters monitored on multifunctional anaesthesia monitor were recorded in the proforma.

On arrival to the recovery room after surgery, all patients were given 50 percent oxygen with venturi mask. They were covered with cotton sheet in summer and woolen blanket in winter. In case shivering occurred within 10 minutes of arrival to the recovery room, the time of onset and duration of shivering was noted. Shivering was classified into four grades.

Grade 0 – No shivering

Grade 1 – Minimal fasciculations on the face and neck

Grade 2 – Visible tremors involving head, neck, shoulders, and extremities

Grade 3 – Generalized shivering

Those patients who shivered were randomly divided into two groups for the purpose of treatment.

Group 1 – Control group

Group 2 – Trial group

The patients in the control group were given normal saline 0.9%, 4ml IV in two minutes and those in trial group received pethidine hydrochloride 25 mg diluted upto 4 ml in distilled water in two minutes.

After receiving the treatment patients were observed for 30 minutes and the results of treatment of shivering were graded into0 4 grades as follows:

Group A – No change

Group B – Tremor or fasciculation diminished

Group C – Tremor or fasciculation disappeared

Group D – Absolute relief from shivering and patients comfortable

All the patients were observed for any side effects of treatment and observations were recorded in proforma. Then the data was statistically analyzed.

Results

Table no 1: Showing mean age of shivering and non-shivering patients

Group	No. of Patients (MALE)	No. of Patients (FEMALE)	Age Range in Years	Mean ± SD	Mean Difference	SE	T	P	Significance
Shivering	63	47	18-50	34.23±10.86	1.27	1.15	1.10	>0.05	N.S.
Non-Shivering	229	161	18-50	32.96±10.22					

The table shows that the mean age amongst group of patients was 34.23±10.86 years while the mean age in the non-shivering group of patients was 32.96±10.22 years with the age range of 18-50 years in the entire study. The distribution of patients according to age was compared in both the groups which on statistical analysis was not significant.

Table no 2: Comparision Of Core Temperature ^{0}c (Intra-Operative Of Shivering & Non-Shivering Group

Temperature ^{0}C	Number of Patients	Shivering	Non-Shivering
36.4 – 36.6	(N = 182)	52 (28.57%)	130 (71.43%)
36.7 – 36.8	(N = 117)	37 (31.62%)	80 (68.38%)
36.9 – 37.2	(N = 201)	21 (10.44%)	180 (89.56%)

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The table shows comparison of core temperature (intra-operative) in shivering and non-shivering group. Patients who had temperature of 36.4 to 36.6^{0}C, there were total of 182 patients and in them 52 patients were shivering and 130 were non-shivering. Patients who had temperature of 36.7 to 36.8^{0}C, there were total of 117 patients and in them 37 patients were shivering and 80 were non-shivering. Patients who had temperature of 36.9 to 37.2^{0}C, there were total of 201 patients and in them 21 patients were shivering and 180 were non-shivering.

Table no 3: Comparision Of Post Operative Core Temperature (^{0}c) Of Shivering &Non-Shivering Groups

Temperature ^{0}C	Number of Patients	Shivering	Non-Shivering
36.4 – 36.5	(N = 287)	68 (23.69%)	219 (76.31%)
36.6 – 36.7	(N = 141)	30 (21.27%)	111 (78.73%)
36.8 – 37.0	(N = 90)	12 (13.33%)	78 (86.67%)

The table no 3 shows comparison of core temperature (post-operative) in shivering and non-shivering group. Patients who had temperature of 36.4 to 36.6^{0}C, there were total of 287 patients and in them 68 patients were shivering and 219 were non-shivering. Patients who had temperature of 36.7 to 36.8^{0}C, there were total of 141 patients and in them 30 patients were shivering and 111 were non-shivering. Patients who had temperature of 36.9 to 37.0^{0}C, there were total of 90 patients and in them 12 patients were shivering and 78 were non-shivering.

Table no 4: Mean Changes In Core Temperature (^{0}c)

	Shivering	Non-Shivering
Intra Operative	-0.1±0.06	-0.06±0.07
Recovery room	+0.1±0.05	+0.08±0.06

Table no 4 shows mean changes in core temperature.

Table no 5: Comparision Of Ambient Temperature Of Operation Theatre In Shivering & Non-Shivering Groups

Temperature ^{0}C	Number of Patients	Shivering	Non-Shivering
24.1 – 24.4	(N = 282)	82 (29.07%)	200 (70.93%)
24.5 – 25.0	(N = 215)	27 (12.55%)	188 (87.45%)
25.5 – 26.0	(N = 3)	1 (33.33%)	2 (66.67%)

Table no 5 shows comparison of ambient temperature of operation theatre in shivering and non-shivering group. In patients with temperature 24.1 to 24.4^{0}C, there were total of 282 patients, 82 patients were shivering and 200 were non-shivering. In patients with temperature 24.5 to 25.0^{0}C, there were total of 215 patients, 87 patients were shivering and 188 were non-shivering. In patients with temperature 25.5 to 26.0^{0}C, there were total of 3 patients, 1 patients were shivering and 2 were non-shivering.

Table no 6: Comparision Of Ambient Temperature Of Recovery Room In Shivering & Non-Shivering Groups

Temperature ^{0}C	Number of Patients	Shivering	Non-Shivering
24.0 – 24.5	(N = 153)	37 (24.19%)	116 (75.81%)
24.6 – 25.5	(N = 277)	78 (28.16%)	199 (71.84%)
25.6 – 26.5	(N = 70)	5 (7.15%)	65 (92.85%)

Table no 6 shows comparison of ambient temperature of recovery room in shivering and non-shivering group. In patients with temperature 24.0 to 24.5^{0}C, there were total of 153 patients, 37 patients were shivering and 116 were non-shivering. In patients with temperature 24.5 to 25.0^{0}C, there were total of 277 patients, 78 patients were shivering and 199 were non-shivering. In patients with temperature 25.5 to 26.5^{0}C, there were total of 70 patients, 5 patients were shivering and 65 were non-shivering.

Discussion

In the present study an attempt has been made to evaluate the efficacy of petthidine for the treatment of post-halothane anaesthesia shivering. The study was carried out in 500 adult patients of ASA grade of either sex between 18 to 50 years of age undergoing major surgery under general anaesthesia with oxygen, nitrous oxide, and halothane.

It was seen in the study that incidence of shivering following recovery from anaesthesia was 110/500. The incidence in our study was 22% and 19 % in study done by Pauca et al[4], 29 % in study done by Moir et al[5], 36.6% in study done by Jones et al, and 42 % in study done by Soliman and Gilles et al[1].

The coorelation of age and incidence of shivering was studied and it was found out that there was no statistical difference in the age of shivering and non shivering

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patients. Vaughen et al (1981)[6] and Pflug et al (1978)[7] could not find any correlation between age and incidence of shivering.

Males shivered more as compared to the females in our study. In the study done by Soliman and Gilles (1972)[1], amongst 68 total male patients, 31 had shivering i.e. 48 % whereas out of 147 total female patients, 52 had shivering i.e. 35 %. They concluded that the incidence of shivering is higher in males H.D. Johnes et al (1965)[8] reported in their study that amongst total 44 male patients, 8 (20%) had shivering whereas out of 16 female patients 2 (12.5%) had shivering.

The mean fall in intra operative core body temperature in patients who shivered was .1 ± .06 ^{0}C as compared to .06 ± 0.07 ^{0}C in patients who did not shiver. Similarly, the mean gain in post operative core temperature in patients who shivered was .1 ± 0.05 ^{0}C as compared to 0.08 ± 0.06 ^{0}C in those who did not shiver. Pflug et al (1978)[7] showed that once shivering started the core temperature increased while the skin temperature decreased. The fall in core temperature in the intra operative period is statistically significant ($p < 0.0001$) which is similar to the study by Pflug et al (1978)[7] who found that the incidence of shivering was higher in the patients who were not warmed than those who were warmed intra operatively. Shirley T et al (1974)[9] in their study reported that there was no correlation between the patients who shivered and the fall of body temperature below normal range. They measured rectal temperature and that too before and after anaesthesia.

Pauca et al (1984)[4] made a casual approach to the measurement of temperature. They measured body temperature with a mercury thermometer either in the rectum or in the axilla. They also did not attempt to correlate core temperature and shivering.

Holdcraft et al (1978)[10] stated that rectal temperature may be affected by faces and pelvic irrigations and changes in rectal temperature tend to lag behind oesophageal temperature. While in this study core temperature was measured with a probe of multifunctional anaesthesia monitor which was inserted into the nasopharynx of the patient. The central mechanism for the onset of shivering are approximately three times as powerful as the peripheral thermal stimuli. Thus central (core) body temperature measurement is of greater significance than the peripheral skin temperature measurement (John et al 1957).The results of present study show lower incidence of shivering as the mean fall in intra-operative core temperature is less than the previous studies.

The operating and recovery room ambient temperature was maintained between 24 to 26.5 degrees C There was no statistically significant difference between the two groups shivering and non-shivering with respect to ambient temperature. However, the number of shivering patients were higher in the lower range of ambient temperature of operating and recovery room. The operation theatre temperature range 24.1 to 24.4 degrees C there was relatively higher percentage of shivering patients (29.07%) and in the recovery room temperature range of 24.0 to 24.5 degrees C there was higher percentage (24.19%) of shivering patients. Roger et al (1971)[11] had shown that the greatest fall in body temperature takes place during the first hour of anaesthesia and surgery. The patients in the room of less than 21 degrees C temperature almost invariably became hypothermic unless the procedure was very brief. Only in the rooms warmer than 24 degrees C the patients remained normothermic. However, in the present study ambient temperature was maintained between 24 degrees C to 26.5 degrees C, so no significant effect of ambient temperature on incidence of shivering has been found. It is important to maintain operation theatre and recovery room temperature as any cause that could lead to hypothermia or a decrease in core temperature would increase the chance of post operative shivering.

Conclusion

Shivering is defined as rhythmic contractions of muscle groups with intermittent periods of relaxation. It occurs after the patients starts responding to simple verbal commands.

Shivering following halothane anesthesia is a known complication. Infact halothane is not unique in this regard as it has been found to occur even after ether and cyclopropane anaesthesia. When shivering occurs, oxygen demand of the body increases to 200 to 400 % above the normal. In such a situation the respiratory quotient increases from 0.86 to 1.06 and it becomes highly significant in patients who have compromised cardiopulmonary reserve, especially in cardiac patients and in old age patients. It has also been associated with myocardial infarction in the predisposed person.

Prevention and control of shivering becomes essential keeping in view the deleterious complications secondary to shivering. Pharmacological control appears to be the most appropriate method as it would be used only if it is clinically tested.

The present study was carried out in 500 adult patients of ASA grade 1 of either sex between 18 to 50 years of age undergoing major surgery under general anesthesia with the aim of studying the incidence of post halothane anaesthesia shivering and to know efficacy of pethidine in treating the post-halothane anesthesia shivering.

The following conclusions were drawn from the present study:

1. Overall incidence of shivering upon emergence from halothane anesthesia was 22 % (110/500). Sufficient precautionary measures both intra

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operatively and post operatively reduced the incidence of shivering.

2. Males showed an increased incidence of shivering 57.27% (63/110) as compared to females 42.73% (47/110).
3. Shivering was predominantly seen in patienst who had greater fall in core temperature during anaesthesia.
4. The incidence of post halothane shivering can be minimized by taking proper precautions for fall in core temperature and minimizing the duration of anaesthesia.
5. Pethidine is very effective in treating post halothane anaesthesia shivering and is without any side effects.

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