Post Operative Shivering: Prophylactic Effects of Ketamine and Pethidine, A Comparative Study in Tertiary Care Hospital.

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Abstract

Introduction: Postanesthetic shivering is one of the common problems following general anesthesia and an accompanying part of general anesthesia with different unpleasant and stressful consequences for patients undergoing surgery. Postoperative shivering may lead to multiple complications. Hence, its proper management is necessary for both treatment and prevention. This study aim was to compare the prophylactic effects of ketamine and pethidine in preventing postoperative shivering in general anesthesia.

Methods: In this prospective study, patients aged from 21 years to 72 years were taken for study who has been scheduled for elective surgery under general anesthesia and they were randomized into two groups. Each group received intravenous (IV) pethidine, and IV ketamine. The frequency of shivering was determined immediately after surgery, and at 10, 20, and 30 minutes, postoperatively.

Results: Each group included 27 patients. Mean values of central temperature in the recovery room were significantly different between the 2 groups (p<0.05). However, the differences were not significant during surgery but postoperative shivering was reported in 14.9% and 3.7% of patients in ketamine and pethidine groups.

Conclusions: The result of this study showed that Ketamine and Pethidine might reduce postoperative shivering. Pethidine seems to be the most appropriate choice for preventing postoperative shivering.

Keywords: Ketamine; Pethidine, Postoperative shivering, general anesthesia.

I. Introduction

Post operative Shivering is an unpleasant postoperative feeling that might be associated with adverse effects especially in patients with poor myocardial reserve. Postoperative shivering is one of the most common problems in the early recovery phase following general anesthesia.[1] It is considered as the sixth most important problem of current clinical anesthesiology with an estimated rate of 5–65%.[2,3]

It is the rhythmic contraction of muscles with frequency of 4-8 Hertz [4]. It is the natural response of the body to central hypothermia with release of cytokines from surgical site. It can also occur because of pain. Almost all anesthetics impair autonomic control of body temperature. Its incidence ranges from 5% to 65% following general anesthesia and 30% with epidural anesthesia [5, 6]. However, the incidence appears to be less as more patients are kept normothermic and opioids are administered more frequently and in larger doses than in the past. Shivering decreases mixed venous oxygen saturation as a result of impaired cardiopulmonary function. In addition, postoperative shivering can increase oxygen consumption up to 5 times, might increase carbon dioxide production, minute ventilation, and hence, cardiac output even in healthy adults [7].

It is a potentially serious complication that increases oxygen consumption roughly 100% in proportion to intraoperative heat loss. It might also be associated with increased blood pressure, intracranial pressure, metabolic rate, lactic acidosis, and postoperative surgical wound pain [8,9].

Ketanserin, sufentanil, alfentanil, tramadol, physostigmine, clonidine, magnesium sulfate, Pethidine, dexamethasone, and doxapram have been used for the treatment of postoperative shivering [10]. Among these, Pethidine is widely used as the first line therapy [11, 12]. However, it might result in nausea and vomiting, delayed gastric emptying, and increased length of recovery stay. N-methyl D aspartate agonists including Ketamine can affect temperature regulation and might be effective for the management of shivering. Nevertheless, they are associated with some neuropsychological adverse effects including somnolence and hallucination.
Since postanesthetic shivering is an accompanying part of general anesthesia with different unpleasant and stressful consequences for patients undergoing surgery, it seems that its proper management is necessary for both treatment and prevention. The purpose of this study was to compare Pethidine and Ketamine in the prevention of postoperative shivering in patients undergoing general anesthesia. The main outcome is to compare the incidence of postoperative shivering.

II. Methods

In this prospective study patients aged between 21 years to 72 years who were scheduled for elective surgery under general anesthesia at tertiary care hospital were enrolled. The patients and the investigators were blind to the study. They were randomly allocated (using randomization table) to receive either Pethidine 20mg (n=27), Ketamine 0.5 mg/kg (n=27). Patients with a history of convulsions, hypersensitivity reaction to ketamine, and pethidine, history of using tricyclic antidepressants (TCAs), monoamine oxidase (MAO) inhibitors, and β-blockers, multiple allergies, hypertension, coronary artery disease, dysautonomia, and other cardiorespiratory or neuromuscular pathology were excluded from the study. In addition, patients who received intraoperative blood component transfusion, and surgeries lasting more than 3 hours were excluded.

After receiving midazolam 0.05mg/kg and fentanyl 2 g/kg, anesthesia was induced with propofol 2 mg/kg and atracurium 0.5mg/kg for endotracheal intubation. Anesthesia was maintained with propofol 70-00μg/kg/min and N2O 50% in oxygen. Fentanyl was given 0.02μg/kg/min. The room temperature and the intravenous fluids were kept between 22 to 24 centigrade degrees. Postoperative shivering was assessed immediately after surgery, and at 10, 20, and 30 minutes using the following scales: Grade 0: no shivering. Grade 1: slight fasciculation in the neck and face. Grade 2: visible shivering in more than one muscle group. Grade 3: shivering and movement throughout the body.

We used independent Student t-test and ANOVA to compare continuous variables exhibiting normal distribution, and Chi-square and Mann-Whitney U test for non-continuous variables. P value less than 0.05 was considered significant. In cases with a grade 3 shivering for more than 4 minutes, the prophylaxis was considered ineffective and 25 mg IV pethidine was administered. Moreover, mean heart rate, mean arterial pressure (MAP), drug side effects, level of consciousness in the recovery room, and duration of extubation were evaluated and recorded.

Side effects of the studied drugs including hallucinations, agitation, blurred vision, drowsiness, nausea, vomiting, hypotension, tachycardia, meiosis, seizure, urinary retention, numbness, dry mouth and dizziness were recorded.

III. Results

Out of 54 patients who were taken for the study it was aged from 21 years to 72 years with mean age of 46.5 years and weight of 63kg. There was also no significant difference among the groups with respect to ASA class and duration of surgery (p values 0.07 and 0.1 respectively). Shivering was seen immediately after surgery in two groups.

Immediately after surgery shivering with grade 0, 1, 2, and 3 in the ketamine group shivering was seen in 25, 1, 0, and 1 cases, and in the pethidine group 26,0, 0, 1 case shown in (table 1). Using Post-hoc ANOVA (Tukey test) revealed that the difference was between the first and the second groups (p value<0.01). However, comparison of the Pethidine and Ketamine groups did not show significant difference (p value 0.15). Shivering was seen more commonly in the ketamine group than the pethidine group at 10 minutes (table 2), and at 20 as well in (table 3). No shivering cases were seen after 30 minutes of surgery in both the groups which is shown in (table 4).

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In this study, prophylactic effects of ketamine and pethidine in preventing postoperative shivering in general anesthesia were compared. Most anesthetics can decrease thermoregulation thresholds resulting in hypothermia in patients exposing to the operating room. Hypothermia may lead to shivering, prolonged drug action, coagulopathy, and decreased resistance to infection. Therefore, maintaining normal body temperature is pivotal for prevention of hypothermia and its complications.

Many studies have confirmed the effectiveness of pethidine in preventing postoperative shivering. The anti-shivering mechanism of pethidine is due to its action via k receptor rather than μ opioid receptors.[13] However, pethidine has some adverse effects which limit its use in some cases. It may cause respiratory depression especially in patients with previous history of opioids and anesthetics administration. Other side effects are hypotension, postoperative nausea and vomiting.[14] Therefore, it seems that proper alternatives should be determined for cases with contraindications for pethidine administration.

Similar to the present study Pazuki et al revealed that Pethidine could better reduce postoperative shivering after cesarean section.[15] In another survey, it was reported that Pethidine and dexamethasone were similar in reducing shivering after abdominal surgery.[16]

A few other studies have shown ketamine to have proper effects in preventing postoperative shivering. Some studies have also investigated different doses of the drug.[17,18] Dal et al. indicated low dose of ketamine (0.5mg/kg) approximately 20 minutes before completion of surgery under general anesthesia, which was also administered in the current study, to be effective in preventing postoperative shivering. They concluded that ketamine can be used as an alternative prophylaxis for preventing postoperative shivering in patients with bradycardia, hypotension, respiratory depression, nausea, vomiting, and allergic reactions to pethidine.[18]

In contrast to our study, Ketamine has been effective in preventing shivering after prostate[19] and general surgeries[20]. Application of Ketamine and Pethidine in children after tonsillectomy showed the same result with no significant difference between the two drugs[21].In a recent study in Nigeria, the effectiveness of prophylactic low-dose of ketamine in preventing postoperative shivering has been reported.[22] Likewise, Norouzi et al. determined the optimum dose of ketamine for preventing postanaesthetic shivering as 0.5 mg/kg.[23]

Postoperative shivering increases recovery length of stay and cost and is an additional burden to both the patients and hospitals. A number of studies showed the same result of efficacy of Pethidine and Ketamine in preventing postoperative shivering[24-28].

In addition to common drugs, many researchers have used tramadol, clonidine, dexamethasone, dexmedetomidine, acupuncture, ondansetron, for Prevention Of Postoperative Shivering.[29-36]

To conclude, considering the rates and severity of shivering, it seems that, as reported by previous studies and present study it shows that pethidine is the most appropriate choice for treatment and preventing postoperative shivering.

**References**


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