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ORIGINAL ARTICLE

Examine the Effects of Adding Low-Dose Ketomine to Tramadol in Order to Prevent Shivering during Spinal Anesthesia

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ABSTRACT

Objective: The purpose was to evaluate the effects of adding a barely amount of ketamine to tramadol to avoid shivering when under spinal anesthesia.
Study Design: Retrospective Study.
Place and Duration: Department of Anesthesia & ICU, Madina Teaching Hospital/Punjab Medical College Faisalabad during April 2022 to February 2023.
Methods: Total 140 patients of both genders undergoing inguinal hernia were included in this study. Patients were divided equally into two groups. Group I received low dose ketamine 0.25 mg/kg (K) into tramadol in 70 case and 70 cases of group II received tramadol 0.5 mg/kg (T) alone. The efficiency of both groups' post-treatment shivering control was compared. The SPSS 26.0 version was utilized to evaluate all of the data.
Results: In comparison to tramadol alone, which caused shivering in 33 (47.1%) of the patients, we determined that a low dose of ketamine added to tramadol effectively reduced shivering in 32 (31.4%) of the instances (p value <0.003).
Conclusion: In this study, we came to the conclusion that treating patients having surgery with a low dose of ketamine added to tramadol under spinal anesthetic reduces shivering more effectively and usefully than tramadol alone.
Keywords: Ketamine, Shivering, Tramadol, Spinal Anesthesia

INTRODUCTION

General and regional anesthesia frequently result in post-anesthetic shivering (PAS). The incidence of PAS in patients recuperating from general anesthesia ranges from 5% to 65%, according to several studies, while in patients recovering from regional anesthetic, it ranges from 40% to 60%.[1,2] In addition to making the patient uncomfortable, shivering raises intracranial and intraocular pressures, puts the patient at greater risk for cardiovascular problems, increases oxygen consumption, and interferes with patient monitoring[3]

Numerous pharmaceutical agents have been used to prevent and treat PAS, such as odanserton, a serotonin receptor antagonist; α blockers, such as clonidine and dexmedetomidine; opioids, such as fentanyl, tramadol, and meperidine; anticholinergics, such as physostigmine; and NMDA receptor antagonists, such as ketamine. In recent years, a number of studies have assessed the effectiveness of ketamine in preventing PAS[6].

But shivering is a common and unwanted adverse effect of the operation for women who are parturient and have CS under SA. It may come from the production of cytokines during surgery or from a natural thermoregulatory reaction to central hypothermia[7]. Shivering can result in lactic acidosis, increased carbon dioxide generation, oxygen use, and disruption of routine monitoring[8].

To date, perioperative shivering has been suppressed using a range of pharmacologic agents, such as magnesium sulfate, opiates, α2-agonists, N-methyl d-as receptors inhibitors, as well as serotonin 5-HT3 receptor antagonists, as well as non-pharmacological techniques, such as blankets, radiant heat, and forced air warmers[9].

Particularly in patients with insufficient cardiac reserves and arterial hypoxia, untreated PSS can have major consequences, such as hemostatic failure, elevated metabolic demand, postponed wound healing, and worsened wound pain[10]. PSS can be prevented and treated in a variety of ways. Non-medical methods to reduce the condition's prevalence include radiant heat, warm hydrated anesthetic gases, cutaneous forced-air warming devices, and reflective blankets. Despite being helpful in maintaining a healthy body temperature, this technology was costly and occasionally impracticable. Additionally, it is better to prevent the issue and maintain normothermia during neuraxial anesthesia rather than addressing it after it has already happened[11]. Medical procedures are the most widely used and economical strategy in clinical practice.

Many studies have found that anti-shivering drugs are beneficial; the most successful pharmacological therapies are ketamine, hydrocortisone, nefopam, meperidine, clonidine, and tramadol[12]. A study specifically emphasizes two medications, ketamine and tramadol, since, although most of these medications are useful in avoiding PSS, they have some disadvantages[11]. Ketamine, a noncompetitive agonist of the N-methyl-D-aspartate (NMDA) receptor, can promote thermoregulation by reducing heat redistribution from the core to the periphery by blocking norepinephrine uptake.

In addition to its pharmacological properties as a noncompetitive NMDA antagonist, it also interacts with muscarinic receptors, has a local anesthetic action, inhibits amine absorption in the descending inhibitory monoaminergic pain route, and serves as an opioid agonist[10–12].

Meperidine and alfentanil, tramadol, magnesium sulfate, ondansetron, and dexmedetomidine are among the pharmaceutical treatments and methods used to lessen post-operative shivering.[10] Reda S. Abdelrahman tested the two medications and found that tramadol plus ketamine significantly reduced shivering (15 percent vs. 30 percent). A review of the literature reveals that the combination of a medication called tram and ketamine has not been investigated for the exact same purpose as these two medications' individual actions at different dosages.

The purpose of this study was to determine whether ketamine and tramadol, rather than tramadol alone, could be used together to reduce shivering during spinal anesthesia.

MATERIAL AND METHODS

This Retrospective study was conducted at Department of Anesthesia & ICU Madina Teaching Hospital/Punjab Medical College, Faisalabad during April 2022 to February 2023 and

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comprised 140 patients undergoing inguinal hernia. Before determining demographic data including age, sex, and BMI, informed consent was acquired. Participants in this study were excluded if they had preoperative hypothermia or hyperthermia, unstable cardiac disease, or other systemic disorders.

The patients who were included ranged in age from 22 to 60. To rate shivering, a scale akin to Lema's was employed: 0 indicates that there is no shivering; 1 indicates that there is piloerection or peripheral vasoconstriction but no shivering is observable; 2 indicates that there is muscular activity in a single muscle group; 3 indicates that there is muscular activity in many muscle groups but it is not widespread; and 4 indicates that there is shivering throughout the body.

Zero was assigned to no nausea or vomiting, one to just being sick, two to having both nausea and vomiting at the same time, and three to having both at many times. As the name implies, this measurement examines the time interval (time s) between the injection of a local anesthetic into your subarachnoid area at time zero and the onset of shivering.

Bradycardia is defined as a heart rate of less than 60 beats per minute, and hypotension is defined as a heart rate of less than 90 millimeters of mercury.

Measurements of NIBP, O2 saturation, and ECG were made upon arrival in the operating room (OR), and baseline values were documented. The IV infusion rates in this trial varied between 10 and 15 milliliters per kilogram per hour. Until the patient was released from recovery, hemodynamic data were tracked and documented every five minutes. In accordance with institution regulations, the OR temperature was set at 24 degrees Celsius. Before the intrathecal injection, a mercury axillary thermometer was used to measure T0. A second body temperature reading (T1) was taken when shivering started. Anaesthesia was given subarachnoidly through the L3/4 or L4/5 interspaces. 15 mg of hyperbaric bupivacaine at a concentration of 5 mg/ml was administered using a 25G Quincke spinal needle. An opaque envelope method that was sealed was used for randomization. The intrathecal injection was followed immediately by the intravenous bolus of all drugs. Each of the five syringes holding the research medications had a different code. The frequency and severity of shivering in each patient were monitored by an anesthesiologist who was blind to their identities. Both ketamine and tramadol were administered at a dose of 0.25 mg/kg to the first group, while 0.5 mg/kg of tramadol was administered to the second group.

There are two methods to quantify the period between spinal anesthesia and the onset of shivering (TS-TO): TS and TO. For shivering worse than Grade 2, rescue medication was administered in the form of 25 mg of intravenous pethidine. Additionally, there was a 0–3 nausea and vomiting scale, where 0 meant no vomiting. Grades 1–3 pupils were deemed to be at risk of vomiting. Up to two hours after the intrathecal injection, individuals experienced bradycardia, hypotension, nausea, and vomiting. The SPSS 23.0 version was utilized to evaluate all of the data.

RESULTS

Among all, 45 (32.1%) cases had age 22-30 years, 60 (42.8%) cases had age 31-40 years and 35 (25%) cases had age >40 years. (Figure 1)

There was no any significant difference among both groups regarding time of surgery. In group I 80 (57.1%) cases had ASA class I and in group II 90 (64.3%) cases had class II of ASA. Most common comorbidity was hypertension, diabetes mellitus and obesity.(table 1)

In comparison to tramadol alone, which caused shivering in 33 (47.1%) of the patients, we determined that a low dose of ketamine added to tramadol effectively reduced shivering in 32 (31.4%) of the instances (p value <0.003). Mean time to shivering in group I was 30.7±6.24 min and in group II was 22.9±8.17 min with p<0.002. (Table 2)

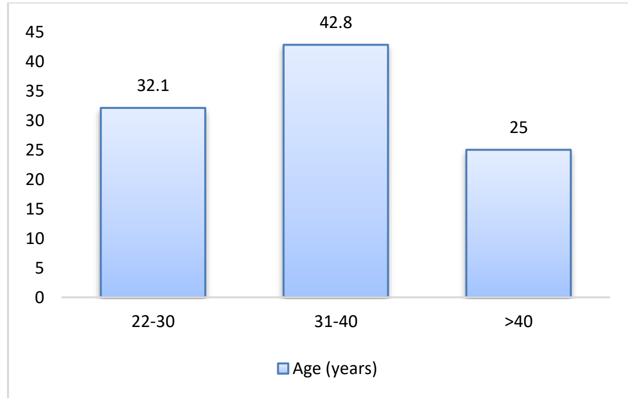

Figure-1: Age of the presented cases

Table-1: Comparison of surgery time and comorbidities among both groups

Variables	Group I (70)	Group II (70)
Mean Time of surgery	46.6±5.19	47.3±2.38
ASA Class		
I	42 (60%)	45 (64.3%)
II	28 (40%)	25 (35.7%)
Comorbidities		
Hypertension	40 (57.1%)	30 (36.8%)
Diabetes mellitus	10 (58.2%)	25 (63.2%)
Obesity	20 (58.2%)	15 (63.2%)

Table 2: Post-operative comparison of shivering among both groups

Variables	Group I	Group II	P value
Shivering Reduction			
Yes	33 (38.9%)	41 (48.2%)	<0.003
No	27 (61.1%)	29 (51.8%)	
Mean onset time (min)	29.13±17.31	24.4±9.52	<0.002

DISCUSSION

Many explanations have been proposed to explain the shaking that occurs during and after subarachnoid anesthesia. Shivering is caused by intraoperative and postoperative hypothermia, which reduces subarachnoid anesthesia. This is because hypothermia causes perioperative shivering. However, shivering can also occur when hypothermia is not present, indicating that processes other than heat loss may be involved. These include afterwards anguish, adrenal suppression, sympathetic too much activity, unrepressed spinal reflexes, and the resulting respiratory alkalosis. Additionally, shivering during healing may make it more difficult for the patient to fully recover, and stretching the surgical incision may exacerbate after surgery pain due to shivering[13].

Low-dose ketamine patients in the current study saw a considerably reduced incidence of post-spinal shivering than the tramadol group. Abubakar Tafawa Balewa Teaching Hospital in Bauchi, Nigeria, did a study on the efficacy of ketamine, which supported this conclusion[14]. The Indian study, on the other hand, found no discernible difference between the two pharmaceuticals. This might be because, in the current investigation, PSS is captured for only 30 minutes following surgery, whereas extensive follow-up is employed[15].

The intraoperative hemodynamic parameters in the two groups in the current study were significantly different, and the ketamine group's mean arterial blood pressure was greater. This finding aligns with a comparative investigation carried out in India that revealed ketamine-treated patients had greater mean arterial blood pressure than the placebo group[15].

An Indian study found no significant changes in hemodynamic parameters in the ketamine and tramadol groups' intraoperative hemodynamic values[16]. The use of an IV preload of fluid that has endured preheated to 37 oC and the sympathomimetic nature of ketamine, which increases mean arterial blood pressure, could be the cause of this.

Compared to the tramadol group, the ketamine group experienced a higher prevalence of moderate sedation. The prevalence of sedative ratings was also examined in one comparison study, which discovered that the ketamine group had much higher ratings than the tramadol group[17]. However, the sedation scores of tramadol and ketamine were statistically considerably higher than those of dexamethasone, according to a study done at Siddhardha Medical College in India. Fentanyl and midazolam premedication may be the cause of this[18].

Our findings are consistent with a 2015 University of Gondar study that found a high correlation between an older population and a decreased likelihood of post-spinal shivering. This could be due to skeletal muscle atrophy or a decreased thermoregulatory response to body temperature fluctuations in old age[18].

The results of our investigation demonstrated a statistically significant correlation between the avoidance of PSS and patients' use of low-dose ketamine. Similar investigations also out in Iran, Turkey, and Pakistan[19,20] corroborate this conclusion.

CONCLUSION

In this study, we came to the conclusion that treating patients having surgery with a low dose of ketamine added to tramadol under spinal anesthetic reduces shivering more effectively and usefully than tramadol alone.

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