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PROPHYLACTIC LOW DOSE KETAMINE IN PREVENTING PERI-OPERATIVE SHIVERING DURING SPINAL ANESTHESIA IN ORTHOPEDIC PATIENTS

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ABSTRACT

Background: Shivering is observed in almost 35 -85 % of the cases after spinal anesthesia. Usually use of pharmaceuticals and physical techniques like external heating is carried to prevent peri-operative hypothermia and shivering.

Objective: To evaluate the efficacy of low dose ketamine in avoiding peri-operative shivering in orthopedic patients taking spinal anesthesia.

Methodology: This was prospective study conducted at the Anaesthesia Department Khyber Teaching Hospital Peshawar. The study was conducted for a period of six months from January 2023 to June 2023. Totally, 100 patients were incorporated. Group 1 patients (n=50) were given low dose of ketamine (0.2 mg/kg iv) after spinal anesthesia while group 2 patients (n=50) were given 5ml of saline after spinal anesthesia. Axillary/frontal temperature was measured at 0, 15 and 30 minutes after spinal anesthesia.

Results: In group 1, shivering was observed in 2 (4%), 2 (4%) and 4 (8%) patients after 0, 15 and 30 minutes respectively while in group 2, shivering was observed in 0, 10 (20%) and 16 (32%) patients after 0, 15 and 30 minutes respectively (p=0.006). In group 1, rescue maneuver was used in 7 (14%) patients while group 2 rescue maneuver was used in 14 (28%) patients. This difference was statistically significant (p=0.005)

Conclusion: The study concludes that prophylactic Low dosage of ketamine is effective in preventing shivering during spinal anesthesia in orthopedic patients**.**

Keywords: Orthopedic patients Prophylactic; ketamine; Pre-operative shivering; Spinal anesthesia

INTRODUCTION

The typical core temperature of the human body is 36.5°C–37.5°C, with 0.2–0.4°C inter-threshold range. If the temperature drops below this threshold, responses to warm the body are triggered [1].

Vaso-dilation caused by regional anesthesia enables heat transfer from the core to the periphery, resulting in vasoconstriction and shivering above the block level [2]. Shivering is described as a perceptible fasciculation or tremor lasting more than 15 seconds in the Jaw, face, trunk, head or extremities [3]. After spinal anesthesia, shivering is reported to occur in 36 - 85 % of cases [4, 5]. The thermoregulation system is affected by spinal anesthesia because it inhibits tonic vasoconstriction, which is important for regulation of temperature [6]. Although the specific cause of shivering during spinal anesthesia is unknown, hypotheses have been proposed to explain it[7-9]. The heat is transferred internally from the core to the peripheral region. Increased heat loss from body surfaces exceeds metabolic heat generation due to the lack of temperature regulation vasoconstriction below the blockage. There is a 0.5° C reduction in vasoconstriction and a small rise in the sweating threshold, indicating altered temperature regulation [10].

Shivering during regional anesthesia is impacted by a variety of different parameters, including the number of spinal segments blocked, old age, a high degree of spinal blockade, and the usage of ingredients in spinal anesthesia, all of which may have an impact on the regulatory systems. One of the most common unpleasant adverse effects of surgery is perioperative hypothermia and shivering. Because of its ability to impede norepinephrine absorption into post ganglionic sympathetic nerve terminals, ketamine plays a function in thermoregulation [11, 12]. By inhibiting norepinephrine absorption into postganglionic sympathetic nerve terminals and directly stimulating central sympathetic nerves, redistribution of heat might be reduced by ketamine to the periphery from the core to [13]. After regional anesthesia, ketamine was beneficial in prevention and treatment of shivering, although patients had hallucinations [11, 14]. This study was piloted to determine the role of prophylactic ketamine in preventing peri-operative shivering during spinal an aesthesia in orthopedic patients.

MATERIAL AND METHODS

This was prospective randomized double-blinded study done at the Anaesthesia Department Khyber Teaching Hospital Peshawar. The study was conducted for a period of six months from January 2023 to June 2023. Study approval was taken from the hospital ethical and research committee. The inclusion criteria for our study was ASA 1 patients of both the gender having age ranged from 18 to 60 years enrolled for orthopedic surgery under spinal anesthesia while the exclusion criteria was patients having >30 kg/m2 BMI with uncontrolled hypertension, patients having coronary problems, patients having high intracranial and intraocular pressure, patients not willing for spinal anesthesia and patients having known psychiatric problems. Totally, 100 patients were incorporated. They were categorized in group 1 and 2. A consent form in written was taken from all the patients. 50 patients were included in each group. Group 1 patients were given low dose of ketamine (0.2 mg/kg iv) after spinal anesthesia while group 2 patients were given 5ml of saline after spinal anesthesia. Axillary/frontal temperature was measured at 0, 15 and 30 minutes after spinal anesthesia. Rescue drug was given if shivering was present after 20 minutes of spinal anesthesia. Data was analyzed statistically by using SPSS version 23. For qualitative data mean (SD) were calculated while for quantitative data, frequency (percentages) were calculated. For comparison of shivering between the two groups, Chi-square test was used.

RESULTS

In this study, totally 100 patients were included. In group 1 there were 30 (60%) male and 20 (40%) female while in group 2, there were 35 (70%) males and 15 (30%) females. (Figure 1) The mean (SD) age in group 1 was 39.14 (11.59) years while in group 2, the mean age was 38.94 (12.14) years. (Figure 2) In group 1, shivering was observed in 2 (4%), 2 (4%) and 4 (8%) patients after 0, 15 and 30 minutes respectively while in group 2, shivering was observed in 0 (00), 10 (20%) and 16 (32 %) patients after 0, 15 and 30 minutes respectively (p=0.006). (Figure 3) In group 1, rescue maneuver was used in 6 (12%) patients while group 2 rescue maneuver was used in 21 (42%) patients. This difference was statistically significant (p=0.005) (Figure 4)

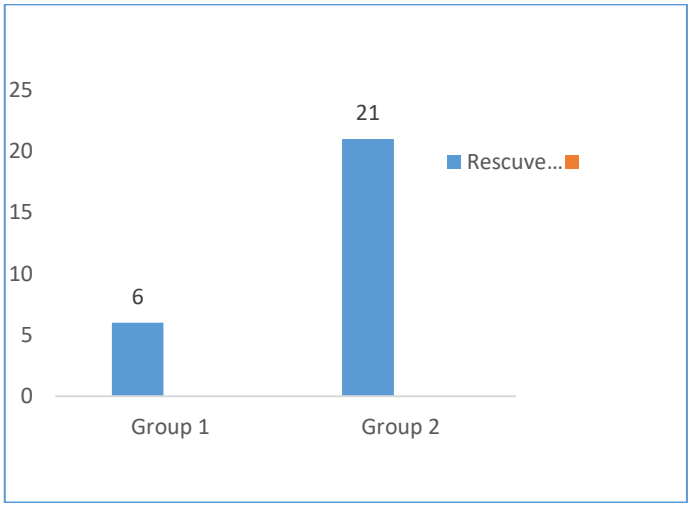

Figure 1: Gender wise distribution of patients in both the groups

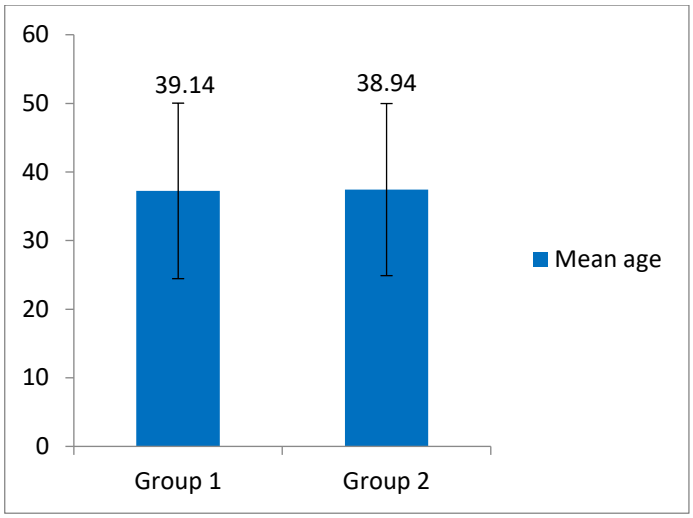

Figure 2: Age wise distribution of patients in both the groups

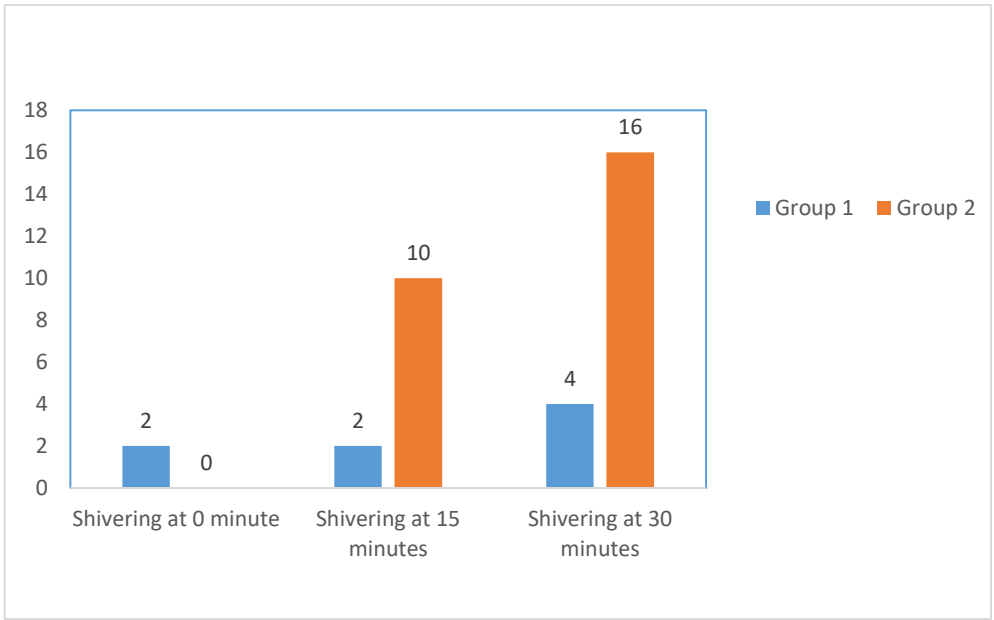

Figure 3: Comparison of shivering in both the groups

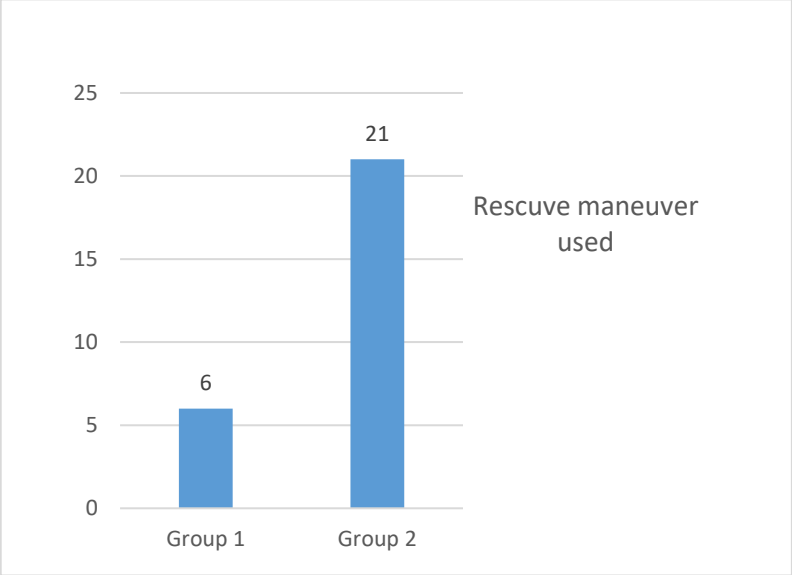

Figure 4: Rescue maneuver used in both the groups

DISCUSSION

A rise in metabolic activity, increased oxygen use (by 300–400%), and increased carbon dioxide generation are all associated with shivering. It induces arterial hypoxemia and lactic acidosis, as well as increased intraocular and intracranial pressures, as well as elevated cardiac activity and peripheral vascular resistance [15, 16]. Physical techniques like external heating [15] or pharmaceutical interventions are often used to avoid peri-operative hypothermia and shivering [17-19]. According to the literature, ketamine has been used in various studies for treatment of shivering in various doses [20, 21]. In our study, group 1, shivering was observed in 2 (4%), 2 (4%) and 4 (8%) patients after 0, 15 and 30 minutes respectively while in group 2, shivering was observed in 0, 10 (20%) and 16 (32%) patients after 0, 15 and 30 minutes respectively (p=0.006).

In accordance with our study, a previous study by Kose et al. reported that there were few cases of shivering in patients treated with ketamine as compared to placebo group [22]. While its function in thermoregulation has been linked to its anti-shivering effects, the precise mechanism by which ketamine works to counteract this effect is yet unknown. Another study done by Shakya et al. also reported that shivering can be reduced effectively with ketamine after spinal anesthesia than saline [20]. Ketamine's vasoconstrictive characteristics reduce heat redistribution from the core to the periphery, limiting the drop in temperature that comes with spinal anesthesia. In addition to its effects on the periipheri, Ketamine has also been observed to have a central effect on thermoregulation at several levels, such as the hypothalamus and the locus coeruleus [1, 23]. In group 1, rescue maneuver was used in 7 (14%) patients while group 2 rescue maneuver was used in 14 (28%) patients. This difference was statistically significant (p=0.005). In our study, a significant reduction in shivering was observed, in group 1patients as compared to group 2, by following them for two hours. This shows that ketamine has also anti-shivering ability post-operatively. Due to the huge volume of distribution and accumulation of ketamine after prolonged infusions, side effects such as abnormal liver function tests or psychomimetic problems might be developed [24].

One of the recognized adverse effects of ketamine is hallucination, which has only been recorded in high dosages [25]. A previous study reported that low dosage of ketamine effective in treating post-anesthetic shivering [25]. With the dosage utilized in our research, none of the patients had any side effects. The major limitation of our study was that shivering was not graded. The second limitation of our study is small sample size.

CONCLUSION

The study concludes that prophylactic low dose ketamine is effective in averting peri-operative shivering in orthopedic patients taking spinal anesthesia as compared to placebo group. There were no noticeable side effects were seen among the patients.

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