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Pethidine Versus Tramadol for Post-Anaesthetic Shivering Control in Patients Going Through Elective Surgery under Spinal Anaesthesia

Mazhar ul Haq, Saeed Bin Ayaz*, Sajjad Qureshi, Habib ur Rehman, Abdullah**, Hina Iftikhar****

Quetta Institute of Medical Sciences, Quetta/National University of Medical Sciences (NUMS) Pakistan *Combined Military Hospital, Muzaffarabad/National University of Medical Sciences (NUMS) Pakistan, **CMH Multan Institute of Medical Sciences, Multan/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: To assess the efficacy of Pethidine versus Tramadol in controlling shivering after spinal anaesthesia in patients selected for lower limb surgery.

Study Design: Quasi-experimental study

Place and Duration of the Study: Department of Anaesthesiology, Combined Military Hospital, Multan Pakistan, from Jun 2019 to Dec 2020.

Methodology: Seventy-four individuals (aged: 18 to 65 years) selected through non-probability consecutive sampling for elective lower limb orthopaedic procedures under spinal anaesthesia were included in the study. The patients were distributed among two groups through computer-generated random numbers to receive Tramadol at a dose of 0.5 mg/kg (Group-T) or Pethidine at 0.5 mg/kg (Group-P). The frequency of post-anaesthetic shivering was recorded in all patients.

Results: The average age of patients in Groups T and P were 30.2 ± 9 years and 34.5 ± 10 years, respectively. Fifty (67.6%) patients were males, while 24(32.4%) were females. Post-anaesthetic shivering was reported in 37(78.7%) patients in the Tramadol- Group compared to 26(96.3 percent) patients in the Pethidine- Group (p = 0.041).

Conclusion: Tramadol caused less post-anaesthetic shivering than Pethidine after spinal anaesthesia in our sample of patients undergoing lower limb surgery.

Keywords: Adverse effects, Pethidine, Shivering, Spinal anaesthesia, Tramadol.

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INTRODUCTION

Post-anaesthetic shivering is a common and unpleasant side effect of spinal anaesthesia caused by sympathetic blocking, which causes vasodilation. Post-anaesthetic shivering can raise metabolic rate and oxygen usage by up to 600%.[1,2] It may increase intraocular and intracranial pressures, induce lactic acidosis and arterial hypoxia, and disrupt monitoring of pulse rate, blood pressure, and ECG.[3] Post-anesthetic shivering is particularly devastating to patients with compromised preoperative cardiorespiratory functions.[4] The aetiology of post-anaesthetic shivering needs to be better understood. The commonly promoted reason for post-anaesthetic shivering is hypothermia, however, and it can also develop in normothermic individuals during surgery. Pain and rapid opioid withdrawal are other possible explanations, particularly when short-acting narcotics are used.[5,6] Unfortunately, the gold standard for preventing and treating perioperative shivering has yet to be established. Despite that, preventing perioperative hypothermia is the first step in avoiding post-anaesthetic shivering.[7]

Post-anaesthetic shivering can be treated in various ways, most of which are empirical. Pethidine is commonly advocated as the recommended medication for post-anaesthetic shivering. It is an opioid product. However, the mechanism of its anti-shivering effect has yet to be fully understood.[8] Tramadol is a less controlled and cheap drug as compared to Pethidine. Therefore, it causes less sedation and has less addiction potential than Pethidine.[9] An earlier Pakistani study found no significant difference in successful control of post-anaesthetic shivering between the two drugs, contrary to the results of many earlier trials conducted worldwide.[10] With this study, we aimed to find out the possible difference in efficacy of the two drugs in our setting so that the supporting or contradicting results may be added to the local data.

METHODOLOGY

The quasi-experimental study was conducted at the Department of Anaesthesiology of Combined Military Hospital Multan from June 2019 to December 2020 after getting permission from the hospital Ethical Committee (ERC number: 16/2022). The sample size

Correspondence: Dr Hina Iftikhar, Classified Anaethesia, CIMS Multan, Pakistan

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was calculated by the WHO sample size calculator keeping, P1 as 0.207, and P2 as 0.00.7 Through non-probability consecutive sampling, 74 patients were included.

Inclusion Criteria: The patients of either gender, aged between 18 and 65 years from the Orthopedic Surgery Indoor Department or the Pre-anesthesia Assessment Clinics planned for surgeries under spinal anaesthesia having the ASA Physical Class I and II, were included in the study.

Exclusion Criteria: Patients with a recent history of a febrile illness or current body temperature of >38oC or <36oC, history of seizures, psychological disorders, hypo or hyperthyroidism, neuromuscular diseases, peripheral neurological diseases, cardiopulmonary disease, and renal or liver impairment, history of alcohol or substance abuse, recent intake of vasodilators and medications that alter thermoregulation, and individuals with contraindications to regional anaesthesia or allergy to the study medications were excluded from the study. Individuals who required blood transfusion during surgery were also chosen for the exclusion.

Written informed consent explaining the purpose of the study was taken from every patient participating in the study. The patients were selected from the Orthopedic Surgery Indoor Department or Preanesthesia Assessment Clinic. A detailed preanaesthesia assessment included detailed history, examination, and airway assessment. All baseline investigations were carried out preoperatively. All patients were given a 0.25 mg Alprazolam Tablet the night before surgery. Intravenous access was established in the operating room using an 18G cannula inserted into the dorsal aspect of one of the hands of the upper arm. Ringer's Lactate solution was warmed to 37°C and administered at 10 mL/kg/h for 30 minutes before spinal anaesthesia. After that, the infusion rate was lowered to 6 mL/kg/h. Standard noninvasive monitors recorded pulse, mean arterial pressure, and peripheral oxygen saturation before anaesthesia at 0, 5, 10, 15, 20, 25, and 30 minutes. Using a 25G Quincke spinal needle, 2 mL (15mg) of hyper-baric Bupivacaine 0.75 percent was administered in the L3-4 or L4-5 interspaces, blocking the T9-10 derma-tome. All patients were draped in one layer of surgical drapes over their chests, thighs, and calves throughout the procedure, and one cotton blanket was put over the complete body afterwards. A thermo-meter assessed body temperature before spinal anaesthesia and throughout post-anaesthetic shivering treatment.

A list of computer-generated random numbers was used to assign patients to one of two groups (Group-T or Group-P). Tramadol was given at 0.5 mg/kg to Group-T, and Pethidine was given at 0.5 mg/kg to Group-P. The anaesthesiologists who performed the procedure and recorded the data must know the patient's group. If post-anaesthetic shivering occurred, a prepared solution of Tramadol or Pethidine in a 10 mL syringe labelled as an "anti-shivering agent" with a concentration of 10 mg/mL was given in a dose of 0.5 mg/kg. Post-anaesthetic shivering was documented, and an 'anti-shivering agent' was provided if it happened. Post-anaesthetic shivering that lasted 15 minutes or longer was classified as severe post-anaesthetic shivering, and rescue treatment with a second dosage of the same medicine was provided. Nausea, vomiting, and dizziness were considered among the reportable side effects.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Quantitative variables were expressed as mean±SD and qualitative variables were expressed as frequency and percentages. The Chi-Square test was used to examine the post-anaesthetic shivering of the two study groups for any differences. The *p*-value lower than or up to 0.05 was considered as significant.

RESULTS

A total of 74 patients were included in the study. The participants in this study ranged from 18 to 65 years old, with a mean age of 31.8 ± 9.4 years. The average age of patients in the Tramadol and Pethidine groups were 30.2±9 years and 34.5±10 years, respectively. Fifty 67(6%) of the 74 patients were males, while 24(32.4%) were females. Post-anaesthetic shivering was reported in 37(78.7%) patients in the Tramadol-Group compared to 26 96(3%) patients in the Pethidine-Group (p = 0.041) (Table).

Table: Comparison of Pethidine and Tramadol for the Frequency of Shivering in Patients Undergoing Lower Limb Surgery under Spinal Anesthesia (n=74)

Shivering	Group-T (n=47)	Group-P (n=27)	*p*-value
	n(%)	n(%)	
Yes	37(78.7)	26(96.3)	0.041
No	10(21.3)	1(3.7)	

DISCUSSION

Regional approaches are more significant in orthopaedic surgery than in any other surgical subspecialty.[10] They can be utilized as stand-alone procedures with or without sedation or as a supplement to general anaesthesia. Compared to typical general

anaes-thesia, localized blocks provide proper post-operative pain management and a faster recovery period in major orthopaedic surgeries.[11] however, they are associated with many complications, the most prevalent of them being post-anaesthetic shivering with a 40-70% incidence rate.[12] Post-anesthetic shivering may have thermoregulatory benefits, but it also puts the patient under higher physiological stress, causing a 400% rise in metabolic rate, arterial hypoxemia, lactic acidosis, an increase in intraocular pressure, and monitoring artefacts.[13] Patients with limited cardiorespiratory reserves, for whom localized anaesthesia is favoured, primarily suffer.

Pethidine, Clonidine, Doxapram, Kentaserine, Tramadol, and Nefopam have all been studied for post-anaesthetic shivering prevention and therapy.[14] They are easy to use, inexpensive, and readily available. For example, Pethidine is effective at a minimum dose of 0.35 mg/kg among the numerous medications for reducing shivering.[15] It has thus become the gold standard medicine for treating post-anaesthetic shivering; however, it has many negative side effects, including nausea, vomiting, and respiratory depression. Tramadol, though controlled post-anaesthetic shivering at a higher dose of 1mg/kg,[16] but the risks of nausea and vomiting were minimal. We used a lower dose of Tramadol to identify if a decreased dose might have the same anti-shivering properties with fewer side effects and found that post-anaesthetic shivering was reported in a lower percentage of patients (78.7%) of the Tramadol-Group compared to a higher percentage (96.3%) of patients of the Pethidine-Group (p=0.041).

Tramadol was found to be more effective than Pethidine in reducing post-spinal shivering, according to Zahedi et al.[17] and Singh et al.18 They did, however, employ a greater amount of Tramadol, i.e. 1 mg/kg, as opposed to the 0.5 mg/kg we used, and delivered general anaesthesia in the majority of the instances. T and Kaparti conducted a randomized experiment on 40 patients with characteristics sufficing categories I and II of ASA to examine the efficacy of Pethidine and Tramadol in reducing post-anaesthetic shivering following neuraxial block.[13] In the trial, they observed better results of Tramadol in reducing shivering after anaesthesia than Pethidine.

During spinal anaesthesia, Bozgeyik et al.[19] examined the capacity of preemptive Tramadol in a dose of 100 mg and Dexmedetomidine in a dose of 0.5 mg/kg to avoid post-anaesthetic shivering. The Tramadol dose was not titrated according to weight. Tramadol and Dexmedetomidine caused much less post-anaesthetic shivering at 20 minutes compared to a placebo. However, at 30 minutes and post-operatively, there was no significant difference between the placebo, Tramadol, and Dexmedetomidine groups.

Heid et al. found that Tramadol in the dose of 2 mg/kg reduced the occurrence and extent of perioperative shivering when used during general anaesthesia induced by Remifentanil for patients undertaking disc surgeries in the lumbar spine region.[20]

LIMITATIONS OF STUDY

We studied only low-risk patients (ASA status I and II) and thus could not give a verdict for high-risk cases or patients with difficult airways.

CONCLUSION

Tramadol produced less post-anaesthetic shivering than Pethidine while using spinal anaesthesia in our sample of patients scheduled for surgeries involving lower limbs. However, the recommendation regarding consistently using Tramadol in our general practice to minimize post-anaesthetic shivering needs further investigation.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MH & SBA: Conception, study design, drafting the manuscript, approval of the final version to be published.

SQ & HR: Data acquisition, data analysis, data interpretation, approval of the final version to be published.

A & HI: Critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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