USE OF ORAL TRAMADOL TO PREVENT POST-ANAESTHETIC SHIVERING IN PATIENTS UNDERGOING SURGERY UNDER SPINAL ANAESTHESIA

Sulav Acharya, Sanam Dangol

Department of Anaesthesia, Nepal Medical College Teaching Hospital, Attarkhel, Gokarneshwor-8, Kathmandu, Nepal

ABSTRACT

Shivering is a common and distressing problem after spinal anaesthesia which occurs due to heat loss and core to peripheral redistribution of body heat, resulting in reduction of core body temperature. Post anaesthetic shivering has deleterious metabolic and cardiovascular effect which should ideally be prevented by pharmacological methods that are economically and practically feasible in all settings compared to many physical methods. Therefore, this study was conducted using a centrally acting analgesic, oral Tramadol hydrochloride prophylactically for the prevention of perianaesthetic shivering after spinal anaesthesia. This prospective observational study was carried out in 106 patients of ASA I or II, aged 15 to 70 yrs of age undergoing lower limb or lower abdominal surgery under spinal anaesthesia. Postanaesthetic shivering was evaluated during the surgery. Shivering was observed in 11 (10.4%) patients and among them 2 (1.9%) patients had grade 1, 6 (5.7%) patients had grade 2, 2 (1.9%) patients had grade 3 and 1 (0.9%) patients had grade 4 type of shivering. Sedation was observed in 19 (17.9%) patients. The result of this study concluded that oral tramadol is very safe and superior to various drugs studied till date and can be used prophylactically as a part of premedication for the prevention of postanaesthetic shivering in patients undergoing surgery under spinal anaesthesia.

KEYWORDS

Postanaesthetic shivering, spinal anaesthesia, tramadol

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CORRESPONDING AUTHOR

Dr. Sulav Acharya
Assistant Professor,
Department of Anaesthesia,
Nepal Medical College Teaching Hospital
Attarkhel, Gokarneshwor-8, Kathmandu, Nepal
Email: sulav37@hotmail.com
Orcid No: https://orcid.org/0000-0002-8388-1450
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INTRODUCTION

Spinal anaesthesia was the first major regional technique introduced into the clinical practice. On August 1898, August Bier performed a first surgery under spinal anaesthesia at the Royal Surgical Hospital of the University of Kiel, Germany.[1] Spinal anesthesia refers to a technique that provide fast and deep surgical block through the injection of small doses of local anesthesia directly into the sub-arachnoid space.[2] By interrupting the afferent transmission of painful stimuli and abolishing the efferent impulses responsible for skeletal muscle tone, neuraxial blocks can provide excellent operating conditions.[3]

Spinal anaesthesia gives a whole new dimension and option to the anaesthesiologist providing alternative to general anesthesia.[3] It is useful for procedure of known duration that involves the lower extremities, perineum, pelvic girdle and or lower abdomen. It may also be indicated when patient wish to remain conscious or when some comorbid condition such as severe respiratory disease or any airway that may be difficult to manage increase the risk of using general anaesthesia.

Neuraxial blockade can reduce pulmonary and possible cardiac morbidity although the mortality benefit appears minimal.[4] Inspite of all the benefits and advantages of the spinal anesthesia it is not devoid of any demerits. It is frequently associated with side effects including hypotension, bradycardia, decresead expiration, nausea, vomiting and urinary retention.[5] One of the frequent side effect is shivering, which is unpleasant and thoroughly discomfortable after surgery and with many grades, from mild form of having skin eruption to a severe form with generalized continuous skeletal muscele contracton with prevalance up to 50-80%.[6]

Postanaesthetic shivering is spontaneous involuntary rhythmic, oscillating tremor like muscle hyperactivity that increases metabolic heat production up to 600% after regional or general anesthesia.[7] The aetiology of shivering is not clearly understood yet, but it is supposed to be usually triggered by hypothermia or decrease in core body temperature.[8] Core temperature is maintained with in a normal range during exposure to cool environment because of sympathetically mediated vasoconstriction. Spinal anaesthesia produce vasodilation which facilitates core to peripheral redistribution of heat and cool periphery is warmed at the expenses of the core compartment.[7] Shivering is a physiological compensatory response to core hypothermia due to redistribution of heat as a result of vasodilation from chemical sympathectomy of spinal anaesthesia.[9] While cold induced thermoregulatory shivering remains the most common aetiology, pain, disinhibited spinal reflexes, decresed sympathetic activity and respiratory alkalosis are the other possible cause.[8]

Shivering is associated with important adverse effect especially to those recovering from anesthesia. Patients report shivering is remarkably uncomfortable and some even find associated cold sensation worse than surgical pain and also aggravates wound pain by stretching the incision. Increased muscular activity during shivering may increase oxygen demand by as much as 500% and also leads to increased carbon dioxide production that leads to hypoxemia, hypercarbia and lactic acidosis which may be deleterious to the patient with limited cardio respiratory reserve.[6,8,9] Shivering also may interfere with the monitoring of the patient causing artifacts of electrocardiogram, blood pressure and pulse oxymetry.[7,10]

Many therapeutic strategies for treating and prevention of shivering exist. The efficacy of various pharmacological and physical method has already been established.[10] Warming the operating room, administration of the warm IV fluids and active cutaneous warming of patient are the best physical methods of preventing post spinal shivering.[11,12] In addition, variety of pharmacological agent including clonidine, meperidine, nefopam, ketamine and finally tramadol has been used for treating as well as prevention of postanaesthetic shivering.[10-12]

Tramadol hydrochloride, a centerally acting analgesic is effective in treatment of shivering after spinal anaesthesia.[12] Tramadol, a cyclohexanol derivative, has μ agonist activity as well as acts as an inhibitor of serotonin and norepinephrine uptake.[10] In addition it also encourages hydroxyltriptamine secretion which act on body temperature regulation centers.[12] Incomparison to intravenous formulation oral tramadol is cost effective and associated with the minimal adverse effect.[10] In this study we evaluated the prophylactic efficacy of the tramadol's oral formulation in preventing postanaesthetic shivering in patients undergoing surgery under spinal anaesthesia.

MATERIALS AND METHODS

This prospective observational study was carried out at Department of Anesthesiology, Nepal Medical College Teaching Hospital from

June to November 2022 after approval from Institutional Ethical Committee. An informed consent was obtained from the patients. 106 patients undergoing lower limb or lower abdominal surgery belonging to American Society of Anesthesiologist (ASA) Class I and Class II under SAB were enrolled for the study. Patients who were obese (body mass index >30) or febrile, patient who have any history suggestive of allergy to tramadol , ischemic heart disease, cerebrovascular disease, thyroid dysfunction, severe diabetic / autonomic neuropathy, infection of urinary tract or external auditory meatus were excluded from the study. All patients received oral tramadol 50 mg, 2 hours prior to the surgery. Spinal anesthesia was given at lumbar vertebrae L3-L4 or L4-L5 interspace using hyperbaric 0.5% bupivacaine 2-3 ml.

All surgery were performed in the operation theater which was maintained under a constant humidity and an ambient temperature of around 22±2°C. No means of active rewarming was used in the tudy unless it was required for the rescue measures. Pre-warmed intravenous fluids was used. Heart rate, noninvasive blood pressure, SpO_2, skin temperature was recorded every 5 min from the baseline for 1 hr and then after every 15 min for the rest of the observation period. Shivering and its severity was recorded by the same attending anesthesiologist as per grading given by Wrench *et al.*[13] If perioperative shivering occured it was treated with reassurance, warming blanket or meperidine.

Grading status of shivering as per Wrench et al

Grade 0 : No shivering
Grade 1 : One or more of Piloerection: Peripheral cyanosis without other cause, but without visible muscular activity
Grade 2 : Visible muscle activity confined to one muscle group
Grade 3 : Visible muscle activity in more than one muscle group
Grade 4 : Gross muscular activity involving the whole body.

Associated symptoms such as nausea vomiting, bradycardia (heart rate <50/min) and hypotension (systolic blood pressure < 20% of baseline) was recorded. Bradycardia and hypotension was treated with atropine and mephentermine respectively in titrated doses. The sedative side-effect of tramadol was assessed with a four-point sedation score as per Filos *et al.*[14]

1. Awake and alert
2. Drowsy, responsive to verbal stimuli
3. Drowsy, arousable to physical stimuli
4. Unarousable

Statistical analysis was done using SPSS 17.

RESULTS

Total 106 patients were involved in this study. The mean age of patients involved in the study was 39.6 ± 14.01 yrs. Out of 106 patients 64 were male and 42 were female with M:F ratio of 60.4/39.6% and 68 patients belonged to American Society of Anaesthesiologist (ASA) grade of physical status, ASA I and 38 to ASA II (Table 1).

In this study, shivering was observed in 11 (10.4%) patients and was absent in 95 (89.6%) patients (Table 2). Among them, 2 (1.9%) patients had grade 1, 6(5.7%) patients had grade 2, 2 (1.9%) patients had grade 3 and 1 (0.9%) patient had grade 4 type of shivering (Table 3).

The mean axillary temperature was similar during shivering and throughout the study period in all patients (Table 4).

Table 1: Demographic variables

Characteristics	Mean	SD
Age(years)	39.6	14.01
M/F	64/42 (60.4/39.6%)	
ASA(I/II)	68/38 (64.2/35.8%)	

Table 2: Incidence of shivering

Incidence	n = 106
Yes	11 (10.4%)
No	95 (89.6%)

Table 3: Severity of shivering

Grading of shivering	n = 106
0	95 (89.6%)
1	2 (1.9%)
2	6 (5.7%)
3	2 (1.9%)
4	1 (0.9%)

Table 4: Temperature pattern of patients

Temperature	Mean	SD
Base line temperature	97.31° F	0.65
Temperature during shivering	97.45° F	0.35

Table 5: Severity of sedation	
Grading of sedation	**n = 106**
1	87 (82.1%)
2	18 (17%)
3	1 (0.9%)
4	0 (0%)

In this study, 18 (17.0%) patients had grade 2 and 1 (0.9%) patient hade grade 3 type of sedation. Eighty seven (82.1%) patients were fully awake and alert and no patients experienced grade 4 type of sedation during the study period (Table 5). No patient in this study had nausea, vomiting, or pruritis as a side effect of the drug used.

DISCUSSION

Perioperative shivering is very unpleasant and annoying for the patients. Prevention or treatment of perioperative shivering is very necessary, so various methods and medications are used but no method or an ideal drug has yet been identified. Prevention is preferable than treatment as patients do not experience this unpleasant state. Oral tramadol is easily available and cheaper. It is readily absorbed following oral administration. Oral bioavailability is around 68% after a single dose and increases to 90% at a steady state. Many studies have investigated the effectiveness of tramadol in postanaesthetic shivering and reported it to be equal or more superior to pethidine with low risk of respiratory depression, tolerance and dependence in treatment and prevention of postanaesthetic shivering.[15-19] Hence, in this study, we have used oral tramadol in search for more safer and effective drug for the prevention of postanaesthetic shivering.

In our study, oral Tramadol 50 mg was very effective in providing prophylaxis against shivering with minimal side effects in patients undergoing surgery under spinal anaesthesia. The incidence of shivering was 10.4% and among them 5.7% of patients had grade 2, 1.9% had grade 1, 1.9% had grade 3 and only 0.9% 0f patient had grade 4 type of shivering. Axillary temperature pattern was similar in all paients during shivering and throughout during study period. There was no incidence of nausea, vomiting or pruritis and 17% of patients had grade 1 and 0.9% of patient had grade 2 type of sedative effect. This is similar to studies conducted by Tewari *et al,*[10] which showed that tramadol reduces the incidence and severity of perianaesthetic shivering with minimal side effects in patients undergoing transurethral resection of prostate under spinal anaesthesia.

In a study conducted by Adinehmehr *et al*[20] oral tizandine and tramadol were comparable in respect to their effect in decreasing the incidence and intensity of shivering when used prophylactically in patients under spinal anaesthesia which was similar to our study. Mittal *et al*[21] in 2014 evaluated the effects of dexmedetomidine and tramadol on haemodynamics and shivering after spinal anaesthesia and concluded that tramadol is as effective as dexmedetomidine in reducing shivering rate, nausea and vomiting.

Tsai and Chu[22] compared the antishivering potency and side effcts between tramadol, amitriptyline and pethidine for the treatment of post epidural shivering in parturients and found that both tramadol and pethidine have similar shivering reducing effects whearas tramadol decreases the incidence of central depressive effects, hence could be considered superior to pethidine for the treatment of shivering.

Atashkhoyi *et al*[23] studied the effect of single dose of tramadol on prevention of post anaesthetic shivering prior to induction of general anaesthesia and found that the incidence of shivering was significantly lower in tramadol group. Similar reports were published by Javaherforoush *et al*[24] which support the safety and effectiveness of tramadol in prevention and treatment of post anaesthetic shivering. *Heidari et al*[25] studied the prophylactic use of oral tramadol for prevention of post anaesthetic shivering in general anaesthesia and found that it reduces the severity of shivering requiring treatment significantly.

Most of the studies support the use of tramadol as safer and as effective or superior to various drugs studied for the prevention of shivering supported also by our study. Hence we concluded that oral tramadol can be used prophylactically as a part of premedication for the prevention of postanaesthetic shivering in patients undergoing surgery under spinal anaesthesia.

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