RESEARCH ARTICLE

Efficacy of Oral Tramadol *vs* Tizanidine for Controlling Intraoperative Shivering among Patients undergoing Spinal Anesthesia: A Prospective Comparative Study

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ABSTRACT

Background: Shivering is one of the most frequent postoperative side effects for patients receiving spinal anesthesia. The frequency of shivering varies but is generally between 40 and 50%. The presence of vasodilatation prior to shivering indicates that shivering among patients sustaining neuraxial anesthesia has been a typical thermoregulation mechanism. This study assessed and compared the efficiency of oral tizanidine and tramadol in lessening shivering intraoperatively among patients sustaining spinal anesthesia for urological procedures.

Materials and Methods: The Department of Urology conducted this prospective, randomized comparative study of a tertiary care institute for a six-month period. About 100 patients who underwent spinal anesthesia in the Department of Urology for various procedures were selected into the study and assigned into the groups randomly (50 in each group). Group A included the patients who were given oral tramadol 50 mg for 90 minutes before surgery. Group B included the patients who were given oral tizanidine 4 mg for 90 minutes before surgery.

Results: The mean age in the oral tramadol group (Group A) and oral tizanidine group (Group B) are 39.7 and 42.4 years, respectively. The oral tramadol (Group A) comprised 39 males and 11 females. The tizanidine group (Group B) comprised 37 males and 13 females. The oral tramadol group showed greater shivering than the oral tizanidine group.

Conclusion: Oral tramadol and oral tizanidine have comparable efficacy to control intraoperative shivering, while oral tizanidine has more sedative effects than oral tramadol.

Keywords: Shivering, Spinal anesthesia, Tizanidine, Tramadol.

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INTRODUCTION

One of the most frequent postoperative side effects for patients receiving spinal anesthesia is shivering. One typical physiological process of thermogenesis is shivering. But it can also cause lactic acidosis, catecholamine release, and hypoxemia.[1,2] Patients who are already at high risk will unintentionally experience difficulties because of this. Hypothermia is the primary cause of shivering, yet patients with normal body temperatures can also experience shivering after surgery.[3] Shivering is a typical and upsetting side effect many experience during or after surgery. It is described as a repeated, involuntary, skeletal, muscular action. The frequency of shivering varies but is generally between 40 and 50%.[4,5] The presence of vasodilatation prior to shivering is indicative that shivering among patients sustaining neuraxial anesthesia has been a typical thermoregulatory mechanism.[6] Because spinal anesthesia inhibits vasoconstriction, a key mechanism in temperature regulation, it compromises the thermoregulatory system. Spinal anesthesia redistributes core heat from below the trunk to the periphery.[7-9] Patients receiving spinal anesthesia are more vulnerable to hypothermia and shivering because of these two consequences. Shivering raises intracranial and intraocular pressures and obstructs intraoperative monitoring such as ECG, SPO2, and blood pressure monitoring.[10,11] It may be harmful to people with limited cardio-respiratory reserve because it causes lactic acidosis, arterial hypoxemia, and increased oxygen demand and consumption. Shivering under anesthesia can be controlled in several ways.[12,13] Non-

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pharmacological techniques such as electrical heaters and infrared warmers are employed to preserve normothermia. However, not all environments may be suitable for the equipment needed to maintain normothermia. Medications such as tramadol, clonidine, ketamine, nefopam, and pethidine [meperidine] were explored to prevent and treat shivering during spinal anesthesia.[14,15] Although several medications have been found to be useful in reducing shivering, most of them also cause respiratory depression, nausea, and vomiting are among the worst adverse effects.[16,17] An anesthetist must, therefore, be knowledgeable about the various causes of intraoperative shivering and therapeutic techniques. This study's objective is to ascertain how well oral tramadol and tizanidine work to lessen intraoperative shivering in patients receiving sedation for urological operations.[18-20] Additionally, it compares the sedative effects of oral tramadol with oral tizanidine. It looked at the nausea and vomiting incidence among the two, examined the hemodynamic effects, and assessed any potential adverse effects.[21] This study assessed and compared the effectiveness of oral tramadol and tizanidine in reducing shivering intraoperatively among patients undergoing spinal anesthesia for urological procedures.

MATERIAL AND METHODS

A prospective, randomized comparative research took place in a tertiary care facility's Urology Department over a period of six months. About 100 patients in the Urology Department undergoing spinal anesthesia for various operations were randomly selected to one of the two groups for the investigation. (50 patients per group) after the Institutional Ethics Committee has given its approval. About 90 minutes before surgery, tramadol 50 mg was administered orally to participants in group A. Group B patients received oral tizanidine at a dosage of 4 mg 90 minutes before surgery. Individuals in their 20 to 60 who had elective urological operations under spinal anesthesia that were included in the study had physical status I or II as defined by the American Society of Anesthesiologists (ASA).

Patients who declined to provide consent for the study, excluded from the study were pregnant women, individuals with severe systemic disorders, those who were not suitable for spinal anesthesia, individuals with a known history of allergy or hypersensitivity to tramadol or tizanidine, patients categorized as physical state IV by the ASA, and patients who needed to transition to general anesthesia. Two groups of 50 patients each were randomly assigned to the patients using computerized random number assignment. Group A received a dosage of tramadol at 50 mg, whereas group B received a dosage of tizanidine at 4 mg. Patients were included in the study following a comprehensive pre-anesthetic examination and standard diagnostic tests, such as electrocardiogram (ECG), random blood sugar testing, coagulation profile, and full blood count. The patients were instructed to abstain from oral intake, in accordance with the recommendations published by the ASA. The patients were administered the oral medication (Tramadol 50 mg or Tizanidine 4 mg) based on their assigned group and small amounts of water 90 minutes before the scheduled elective operation. After the patient was moved to the operating room, an intravenous line was successfully established. The formula utilised to determine the sample size is n = 2 (Za + ZB) 2 pqavg/(p1-p2)2. In this equation, n represents the sample size, Za corresponds to the statistically significant constant at a 95% confidence interval, and ZB represents the value for 80% power; p1 = 52.5% (Incidence of Shivering under spinal anesthesia with tramadol); q1 = 47.5% (100-p1); p2 = 22.5% (Incidence of shivering under spinal anesthesia with tizanidine); q2 = 77.5% (100-p2); pqavg = 2119; (p1-p2) 2 = 900 (30 x 30); n = 15.6 x 2119/900; n = 37;

Adding 10% non-response rate (i.e., 10% of 37 = 4), the minimal sample size was calculated to be, n = 41. Therefore, sample size is taken as n = 50 for each group. Hence, the total sample including the two groups is 100.

Monitors were connected, which included electrocardiography, non-invasive blood pressure monitoring, temperature probe and oxygen saturation through pulse oximetry. Operation theatre room temperature was maintained around 27 to 28ºC. Under spinal anesthesia in a seated position, using a 25G Quincke bevel needle, each participant in the current study got an injection of 12.5 mg 0.5% hyperbaric bupivacaine in the L3–L4 interspaces. T8–T10 was the degree of spinal anesthesia attained. Irrigating fluid was given to each patient at a constant temperature of 36°C. Intravenous ephedrine was administered as a vasopressor if the systolic pressure had dropped by more than 20% of the baseline. The occurrence of vomiting, nausea, and the severity of shivering were observed during the surgical procedure and the subsequent healing process. During the procedure, measurements and records were taken for the following variables: Body temperature, heart rate, saturation, oxygen, breathing rate, and mean arterial pressure. These were initially created and thereafter repeated every ten minutes.

Shivering was graded as 0 - none, 1 – when localized to the thorax and neck as mild shivering, 2 – gross movements of the upper limbs are involved in mild shivering, while gross movements of the torso, upper, and lower limbs are involved in slight shivering. Rescue therapy consisted of intravenous pethidine (25 mg) given to shivering patients. Using the Ramsay sedation score, the sedative effect of the medication (Tramadol 50 mg or Tizanidine 4 mg) was evaluated. When the patient exhibited signs of restlessness, agitation, or anxiety, or any combination of these, the score was 1. 2. Cooperative, calm, and attentive; 3. Sleepy but responsive to commands; 4. Asleep and fast to react in kind to a little touch on the forehead or a booming sound; 5. Asleep and slow to respond to an intense loudness or a quick touch on the forehead; 6. unconscious and unable to wake;

After gathering, Excel for Windows was used to input the data. Version of the statistics program SPSS 16 (SPSS Inc., 2007) was used for further analysis. SPSS for Windows, namely Version 16.0, created by SPSS Inc., is the program used. The firm is based in Chicago. The categorical parameters were represented as proportions with matching percentages, whereas

the continuous parameters were represented by their mean and standard deviation. When a test's *p-value*, which represents a 95% confidence level, is less than 0.05, it is regarded as statistically significant.

RESULTS

The mean age in the oral tramadol group (Group A) and oral tizanidine group (Group B) are 39.7 years and 42.4 years, respectively. The oral tramadol (Group A) included 11 females and 39 males, in contrast, the tizanidine group (Group B) consisted of 37 men and 13 girls. Table 1 shows shivering was higher among the oral tramadol group compared to oral tizanidine group. Grade 2 shivering was present in three subjects of tramadol and in only one subject of tizanidine group. Table 2 represents rescue ant shivering drug was used in nine subjects of tramadol while only six subjects in tizanidine group required it. In Table 3 proves Ramsay sedation score was better in oral tizanidine group than oral tramadol group, which had a strong statistical significance ($p < 0.001$). Table 4 shows none of the group had any side effects. Tizanidine is superior in inducing drowsiness, however, both medications are similarly efficacious and comparable in managing shivering.

DISCUSSION

Experiencing shivering following surgery and during the early postoperative phase is a prevalent yet often overlooked problem that significantly troubles a substantial proportion of individuals. There are multiple factors that can lead to shivering during spinal anesthesia. This research evaluated the effectiveness of oral tramadol and tizanidine in managing patients' postoperative shivering having spinal anesthesia for urological operations. The two medications used in the experiment worked just as well to stop shivering. Nine patients received tramadol, and six individuals received tizanidine, out of the 50 patients in each group. The findings of the present study align with the report by Adinehmehr L *et al*., which also observed comparable outcomes. Specifically, the study found that patients treated with tizanidine and tramadol experienced considerably reduced levels of shivering in terms of both frequency and intensity compared to those who received a placebo (*p-value* 0.04 *vs* 0.001).[22] The level of nausea and vomiting was similar between both medicines, as indicated by the *p-values* of 0.026 and 0.01. The hemodynamic parameters did not significantly change across the three groups (*p-value* 0.01 *vs* 0.08). In order to prevent intraoperative shivering, Seyam *et al*. compared the efficacy of preoperative low dosage injections of tramadol and ketamine. Both drugs were found to be equally effective.[23] In a research conducted by Bozgeyik *et al*., dexmedetomidine was administered in conjunction with tramadol. Both medications demonstrated equivalent efficacy in the prevention of shivering. The tramadol dosage administered was consistent with that in the referenced study, with all patients receiving 100 mg.[24] As per the research carried out by Sharma and colleagues, it was discovered that pethidine was more efficacious than tramadol in managing intraoperative shivering among the patients who were administered these medications. The disparity may have arisen due to the administration of the medicine to patients after the onset of shivering, rather than as a preventive measure.[25] Tewari *et al*.'s research looked at the preventative use of oral tramadol and clonidine in the treatment of perioperative shivering. What they found is that oral clonidine and tramadol work just as well to reduce perioperative shivering, which is consistent with our findings.[26] Sedation was used as the study's secondary measure of outcome. To differing degrees, all the medications employed in the study to reduce shivering have the potential to cause drowsiness. Therefore, during the trial, no further sedatives, hypnotics, or anxiolytics were administered. Tizanidine had better sedation score than tramadol. Sedation score was 2 in about 32 patients of tizanidine group whereas only 18 patients in tramadol group. Other research also found a similar observation. Adinehmehr *et al*. observed that sedation was more in tizanidine than tramadol, which is comparable to our study.[22,27] Tewari *et al*. clonidine group had better sedation scores than the tramadol group, which is, according to our study, as tizanidine is a congener of clonidine. None of the group had any side effects.[26]

Table 1: Age and gender distribution of the participants

	Group	*N*	*Mean*	*p-value*
Age	Oral tramadol	50	39.70	$p > 0.05$
	Oral tizanidine	50	42.40	
Gender	Oral tramadol	11 (Female)	39 (Male)	$p > 0.05$
	Oral tizanidine	13 (Female)	37 (Male)	

Table 2: Grade of shivering

		Group		*Total*	*p-value*
		Oral tramadol	*Oral tizanidine*		
Shivering grade	No	41	44	85	$p > 0.05$
	1	6	5	11	
	2	3	1	4	
Total		50	50	100	

Table 3: Rescue ant shivering drug

		Group		*Total*	*p- value*
		Oral tramadol	*Oral tizanidine*		
Rescue Anti-shivering drug	Nil	41	44	85	$p > 0.05$
	Inj. Pethidine 25mg IV	9	6	15	
Total		50	50	100	

Table 4: Ramsay sedation score

		Group		*Total*
		Oral tramadol	*Oral tizanidine*	
Ramsay sedation score	1	29	12	41
	2	21	38	59
Total		50	50	100

CONCLUSION

Oral tramadol and oral tizanidine have comparable efficacy to control intraoperative shivering, while oral tizanidine has more sedative effects than oral tramadol.

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