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COMPARISON OF EFFICACY OF CLONIDINE AND TRAMADOL FOR THE CONTROL OF SHIVERING UNDER SPINAL ANESTHESIA

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ABSTRACT:

BACKGROUND: Shivering is a common side effect of spinal anaesthesia. We evaluated the effectiveness of intravenous clonidine and tramadol for treating shivering during spinal anaesthesia.

MATERIALS AND METHODS: A prospective, randomized, clinical controlled trial was carried out on 60 ASA grade I and II patients of either gender, aged 18-40 years, who were scheduled for elective lower abdomen and lower limb procedures under spinal anaesthesia. Patients with post-spinal intraoperative shivering of grade 3 or 4 lasting for at least 2 minutes were included in the study and randomly assigned to one of two groups, group C (n=30) received Inj. clonidine 50µg/kg i.v., and group T (n=30) received Inj. tramadol 0.5mg/kg i.v. when shivering was observed. Shivering control time, response rate, recurrence rate, and side effects were all measured.

RESULTS: The average time taken for shivering to disappear in the clonidine group was 3.04 ± 0.72 minutes compared to 5.21 ± 0.95 minutes in the tramadol group. Tramadol patients had a higher rate of incomplete response and recurrence. Group C exhibited a larger rate of drop in heart rate and blood pressure, as well as higher sedation levels. The nausea and vomiting rates were greater in Group T.

CONCLUSION*:* In patients receving spinal anaesthetia for surgery, clonidine was found to be more safe and effective than tramadol in reducing shivering.

KEYWORDS-spinal anesthesia, shivering, clonidine, tramadol

Introduction:

Spinal anaesthesia is widely used as a safe anaesthetic technique for both elective and emergency operations. Shivering is known to be a frequent event, reported in 40 to 70% of patients undergoing surgery under regional anaesthesia.[1-2].The main causes of shivering intra and postoperatively are temperature loss, decreased sympathetic tone and systemic release of pyrogens [3]

Shivering is a potentially dangerous condition that increases metabolic rate, carbon dioxide (CO_2)

production and oxygen consumption by 200% to 500%, ventilation, and cardiac output, as well as adverse postoperative outcomes like wound infection, increased surgical bleeding, and morbid cardiac events. It can interfere with heart rate, blood pressure, and electrocardiographic (ECG) monitoring, and it can lead to arterial hypoxia, lactic acidosis, increased intraocular pressure (IOP), and increased intracranial pressure (ICP).[5] There are a number of ways to prevent shivering while under anesthesia, including nonpharmacological approaches (such as covering the patient with blankets, applying radiant heat to warm the operating room, using warm local anaesthetic solution or warm intravenous fluids), and pharmacological approaches using medications like opioids (such as pethidine, nalbuphine, or tramadol), ketanserin, propofol, granisetron,[6] The opioid activity of tramadol hydrochloride, a synthetic opioid, is most often mediated by the mu receptor. It has a modulatory effect on central monoaminergic pathways, which inhibits noradrenaline/serotonin neuronal absorption and promotes the release of hydroxytriptamine, which resets the body's temperature regulating centre and has been proven to be beneficial in reducing post-spinal shivering.[7]

An agonist of the α2 adrenoceptor is clonidine. Three areas of the body—the hypothalamus, locus coeruleus, and spinal cord—are affected by its anti-shivering properties. It lowers the thermoregulatory threshold for vasoconstriction and shivering in the hypothalamus[8–9], reduces spontaneous firing in the locus coeruleus, a pro-shivering centre in the pons, and activates the 2-adrenoreceptors in the spinal cord, releasing dopamine, norepinephrine, and acetylcholine.[10] High lipid solubility allows clonidine to pass through the blood-brain barrier with ease.[11] As a result of these advantages, the central nervous system interacts with the 2-adrenoreceptors at the spinal and supraspinal sites.[12] Despite the fact that both medications are used to control shivering, comparative studies regarding the relative efficacy of the two medications have produced conflicting results. While some workers[13] believe that Clonidine provides a better solution for shivering, others[14] report in favour of Tramadol. This study was done to examine the relative efficacy of tramadol and clonidine for controlling intraoperative shivering while under spinal anaesthetic in light of these conflicting results.

In our study, we examined the two widely accessible and safe medications Clonidine and Tramadol to treat shivering in patients who had spinal anaesthesia for different surgical operations.

Materials and methods:

This study was carried out in the department of anaesthesia at Panimalar medical college and hospital in Chennai. Following ethics committee approval and written informed consent from patients, 60 American Society of Anaesthesiologists grade-I & II (ASA I & II) patients of either sex, aged 18 to 40 years, scheduled for elective lower abdominal and lower limb surgeries under spinal anaesthesia, who developed intraoperative shivering post spinal anaesthesia of grade 3 or 4 lasting for at least 2 minutes, were included in this prospective randomizable trial. Patients with a history of fever, known sensitivity to the medications to be used, and shivering even before spinal anaesthetic administration were excluded from the study.

A detailed pre-anaesthetic check-up was performed on all patients scheduled for surgery the day

before surgery. Prior to surgery, all patients were maintained nil by mouth for 8 hours. Patients are taken to the operating room on the day of surgery. The I.V. line was secured, standard monitors were connected, and baseline parameters were recorded. A thermometer in the axilla was used to record the baseline temperature.

Before receiving neuraxial blockade, all patients were pre-loaded with Ringer lactate (10 ml/kg). All fluids and medicines were stored and supplied at room temperature, and the operating room temperature was kept between 22ºC and 23ºC. In accordance with the surgical protocol, spinal anaesthesia was administered using a 23 or 25 gauge Quincke spinal needle in a sitting position at the L3-4 / 4-5 inter space (midline approach) with Bupivacaine (0.5% heavy) at a dose of 3.5 ml to obtain a desirable level at the T8-T10 dermatome.

Patients were examined for shivering after spinal anaesthetic was administered. The study included all patients who experienced intraoperative shivering after spinal anaesthesia of grade 3 or 4 that lasted at least 2 minutes. They were divided into two groups at random. Patients in Group C (n=30) received clonidine 0.5 µg/kg IV injection, while patients in Group T (n=30) received tramadol 0.5 mg/kg IV injection. Shivering was graded according to wrench.[15].It goes like this: Grade-0, no shivering, Grade-I, one or more of the following symptoms: piloerection, peripheral vasoconstriction, peripheral cyanosis with but no apparent muscular activity, Grade 2; observable muscular activity is limited to a single muscle group, Grade 3 - Visible muscular activity in more than one muscle group; Grade 4 - Total body muscle activity.

According to the assigned group, the study medication was administered slowly IV. The time in minutes that shivering began following spinal anaesthesia (onset shivering), the degree of shivering, the time it took for shivering to cease after drug delivery, and the response rate were all noted. The treatment was deemed successful when the shivering stopped. The length of operation was recorded in both groups. Throughout, the pulse rate, blood pressure, axillary temperature, and SPO2 were all measured. Significant hypotension was defined as a drop in systolic pressure (SAP) of more than 20% below the pre-anaesthetic value, which was treated by injections of Mephenteramine 6 mg in increments. Significant bradycardia was treated with intravenous atropine sulphate 0.6 mg. According to filos [16], sedation was graded on a four-point scale. Drowsy, receptive to verbal cues, Drowsy, arousable to physical stimuli, Unarousable. The presence of side effects and problems such as nausea, vomiting, hypotension, bradycardia, allergic responses, and sedation was documented. Metaclopromide 10 mg/IV was given to patients who developed nausea and vomiting.

Statistical analysis: Using SPSS software, observations and findings were reviewed and compared between the two groups. Numerical data were displayed as mean and standard deviation (SD), whereas categorical variables were displayed as percentage. In terms of numerical variables, the unpaired student t test was used. For categorical variables, the chi-square test was used. p value <

0.05 was considered significant.

Result:

There were no statistically significant differences between the two groups in terms of demographic characteristics namely age, sex, weight, ASA status, duration of surgery, onset of shivering and grade of shivering as shown in table 1

TABLE 1: DEMOGRAPHIC CHARACTERISTICS

Event	Group C	Group T	P Value
Age in years	33.42±4.02	32.41±4.14	>0.05
Sex Male / female	16/14	15/15	>0.05
Weight (Kg)	65.82±11.43	68.42±11.74	>0.05
ASA grade I/II	17/13	18/12	>0.05
Duration of surgery (mins)	67.20±16.83	68.30±17.12	>0.05
Onset of shivering(minutes)	34.12±20.14	33.45±20.84	>0.05
Grade of shivering (III/IV)	16/14	17/13	>0.05

Mean time taken in group C from clonidine administration to cessation of shivering was 3.04±0.72 minutes. Mean time taken from tramadol administration and cessation of shivering was 5.21±0.95 minutes. Time taken by clonidine to control shivering was less compared to tramadol which was significant. .shivering did not subside in 2 patients of group C & 3 patients of Group T. Patients with incomplete response to drug There was no recurrence of shivering in Group C, in Group T, there were 2 patients with recurrence of shivering as shown in table 2

TABLE 2: COMPARISON OF TIME TAKEN TO CONTROL OF SHIVERING, INCOMPLETE RESPONSE AND RECURRENCE

Event	Group C (N=30)	Group T (N=30)	P value
Time taken for control of shivering (mean±SD)	3.04 ± 0.72	5.21 ± 0.95	0.012
Incomplete response (%)	7	10	>0.05
Recurrence (%)	0	7	>0.05

Side effects like hypotension, bradycardia and dry mouth were seen in Clonidine group, and nausea and vomiting were seen in Tramadol group, but all were controllable. The sedation score was higher in group C than group T as shown in table 3

TABLE 3: COMPARISON OF SIDE EFFECTS

Complications	Group C		Group T		P Value
	(n=30)	%	(n=30)	%	
Nausea	0		3	10	>0.05
Vomiting	0		5	17	>0.05
Dry mouth	2	7	0		>0.05
Hypotension	4	13	0		>0.05
Bradycardia	3	10	2	7	>0.05
Sedation score 1 2	 20 10	 67 33	 25 5	 83 17	>0.05

Discussion:

Shivering is an involuntary, rhythmic muscle action that occurs in response to hypothermia as a thermoregulatory response to increase metabolic heat generation. There are three main causes of hypothermia during spinal anaesthesia. For starters, spinal anaesthesia causes an internal heat redistribution from the core to the peripheral compartment. Second, at the level of the spinal block, there is a decrease of thermoregulatory vasoconstriction. Finally, the central neuraxial block alters thermoregulation, as seen by a decrease in shivering thresholds.[17].

The purpose of this study was to compare the relative efficacy of intravenously administered Tramadol 0.5mg/kg versus 0.5µg/kg Clonidine in controlling shivering in patients receiving spinal anaesthesia for various procedures, as well as to investigate the study drugs' side effects in terms of sedation, hypotension, nausea and vomiting, and others.

Tramadol is a new analgesic medicine. It is a synthetic substance with an opioid effect mediated by the mu-receptor and little effect on the kappa and delta receptors. Tramadol's anti-shivering actions are achieved via reduction of 5-HT3 and NA reuptake. Tramadol decreases 5-HT3 reuptake while increasing its release. It also inhibits synaptosomal noradrenaline reuptake, which helps to explain its antishivering effect. Tramadol is more likely to be clinically useful as an anti-shivering agent. It has potential application in the treatment of shivering and is more convenient and safer than meperidine due to its pharmacological benefit of generating less sedation and less respiratory

depression.Tramadol at a dose of 0.5mg/kg is chosen, as in the study by Usha Shukla et al [18].

Clonidine is a selective α2 - agonist that acts centrally. It inhibits shivering at three levels: the hypothalamus, the spinal cord, and the locus coeruleus. Because the hypothalamus has a high density of α2 receptors, it lowers the thermoregulatory threshold for shivering and vasoconstriction. Clonidine inhibits spontaneous firing in the locus coeruleus, a pro shivering area in the pons. It activates α2 adreno receptors in the spinal cord, releasing acetylcholine, nor-epinephirine, and dynorphine. Thermal inputs are modulated by the depressor actions of these transmitters at the dorsal horn. Clonidine is a lipid-soluble drug that passes the blood-brain barrier and has a rapid onset. Because of these benefits, the central nervous system interacts with two adreno receptors at the spinal and supraspinal levels. Clonidine was given at a dose of 0.5 µg /kg, which was identical to the trial conducted by Kulshrestha et al [19].

The time interval for the disappearance of shivering was observed and found to be 3.04± 0.72 mts for Group C and 5.21± 0.95 mts for Group T. Usha shukla et al [18] found similar results in 2011, concluding that clonidine was greater in managing shivering than tramadol with substantial side effects of nausea, vomiting, and dizziness.

The reappearance of shivering was observed after 15 mts of response time. In our current investigation, Group C experienced no recurrence of shivering. Group T, on the other hand, had two recurrences (7%), which was identical to the study conducted by Oranuch Kyokong et al [20] in 2007.

The sedation score as specified by "Filos" was employed for evaluation in our study. All patients were awake and alert during anaesthesia, with a sedation score of 1. After shivering treatment, the sedation score was 2. In our analysis, no patients with a score of 3 or 4 were identified. It was comparable to a study conducted in 1996 by vander stappen et al [21] to examine the efficacy of clonidine on post-operative shivering, which concluded that there is no increase in post-operative sedation

Conclusion:

Our study implies that both study drugs Clonidine and Tramadol are effective in suppressing shivering during spinal anesthesia, however Clonidine required less time to achieve shivering cessation than Tramadol. The incidence of nausea and vomiting is greater in the Tramadol group than in the Clonidine group. Clonidine is a safer and more effective alternative to Tramadol in individuals undergoing spinal anaesthesia for surgery.

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