

Randomised double-blind Comparative study of Tramadol and Dexmedetomidine for Post-Spinal Anaesthesia Shivering

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ABSTRACT

Background and Aims: Dexmedetomidine (α_2 adrenergic agonist) is used for prevention of post anaesthesia shivering. The aim of this study is to compare and evaluate the efficacy, adverse and haemodynamic effects of dexmedetomidine with that of tramadol, when used for control of post-spinal anaesthesia shivering.

Materials and Methods: A randomised, prospective, and double-blind study was conducted in 60 American Society of Anaesthesiologists Grade I and II patients of age between 18 and 65 years, either gender, scheduled for various surgeries under spinal anaesthesia. The patients were randomised in two groups of 30 patients each to receive either dexmedetomidine 0.5 $\mu\text{g}/\text{kg}$ or tramadol 0.5 mg/kg as a slow intravenous bolus. Onset of shivering, grade of shivering, time for cessation of shivering, response rate, recurrence and adverse effects were observed at scheduled intervals. Unpaired t-test was used for analysing the data.

Results: Nausea and vomiting was observed only in tramadol group (28% and 20% respectively). Time taken for cessation of shivering was significantly less with dexmedetomidine when compared to tramadol. There was not much difference in the sedation profile of both the drugs.

Conclusion: We conclude that although both drugs are effective, the time taken for cessation of shivering is less with dexmedetomidine group when compared to tramadol group. Moreover, dexmedetomidine has negligible adverse effects when compared to tramadol which is associated with significant nausea and vomiting.

Key words : Dexmedetomidine , Tramadol , Post-spinal anesthesia shivering.

INTRODUCTION

Shivering, a common post-anaesthesia occurrence is defined as an involuntary, repetitive activity of skeletal muscles. The incidence has been found to be quite high, approximately 40-50% in different studies.^[1] It can double or triple oxygen consumption and carbon-dioxide production.^[2]

It also increases intracranial and intraocular pressure, may contribute to delayed wound healing, increased wound pain, and delayed discharge from post-anaesthetic care.^[3] Its deleterious effects deserve primary prevention and rapid control on occurrence.

Shivering is a physiological response to core hypothermia to raise the metabolic heat production. The main causes of intra/post-operative shivering are increased

sympathetic tone, pain, temperature loss and systemic release of pyrogens. Spinal anaesthesia impairs the thermoregulatory system by inhibiting tonic vasoconstriction, which plays an important role in regulation of temperature.

It also causes a redistribution of core heat from the trunk [below the block level] to the peripheral tissues. These are the factors which predispose patients to hypothermia and shivering.^[4] The treatment for shivering includes both pharmacological and non-pharmacological methods.

The non-pharmacological management is by external heating like the use of warming blankets, warmed fluids, forced air warming, etc. According to the results of a meta-analysis, the most frequently reported pharmacological interventions include clonidine, tramadol, pethidine,

ketamine and nefopam.^[5] But no gold standard treatment is known for shivering as the administration of all the available drugs is associated with various adverse effects.

During the last decade, Tramadol has become a commonly used drug for post-spinal anaesthesia shivering. But, it has many adverse effects like dizziness, nausea, vomiting etc., which cause further discomfort to the patient.^[6]

Clonidine is other agent which gained popularity during the last few years. Various studies have been conducted to compare them, which have concluded that clonidine has less adverse effects and better efficacy as compared to tramadol.^[6] But there was 5-10% incidence of bradycardia and hypotension with clonidine.^[6]

Dexmedetomidine, which is a congener of clonidine, is a highly selective α_2 -adrenoceptor agonist. It has been used as a sedative agent and is known to reduce the shivering

threshold.^[7] The studies which have explored its anti-shivering potential, inferred that dexmedetomidine is an effective drug without any major adverse effect and provides good haemodynamic stability.^[6-9] Hence, we planned to do a comparative study of the efficacy, adverse hemodynamic effects of tramadol and dexmedetomidine when used for the control of post-spinal anaesthesia shivering.

MATERIALS AND METHODS

This was a randomised, prospective, double-blind study. Upon entering into the operation theatre, an 18G venous cannula was inserted and preloading was done with Ringer's Lactate solution 10 ml/kg before giving spinal anaesthesia and maintained at 4 ml/kg/h after spinal anaesthesia. Before starting the procedure, standard monitors were attached and all the baseline parameters such as heart rate (HR), oxygen saturation (SPO₂), electrocardiography (ECG), and body temperature

DEMOGRAPHIC PROFILE OF PATIENTS OF BOTH GROUPS

Table 1: Demographic profile of patients of both groups

Parameter (n=30)	Dexmedetomidine	Tramadol	P value
Age (years)	37.16±12.02	38.04±9.69	0.78
Gender (male/female)	16/14	14/16	0.31
Duration of surgery (min)	61.00±12.58	63.40±15.02	0.27
Duration of spinal anaesthesia (min)	138.20±14.20	126.50±21.26	0.29

Age, duration of surgery, duration of anaesthesia are presented as mean±SD.

Test done was unpaired t

PARAMETERS FOR POST SPINAL ANESTHESIA SHIVERING

Table 1: Demographic profile of patients of both groups

Parameter	Dexmedetomidine group (%)	Tramadol group (%)	P value
Onset of shivering (min)	21.40±12.98	20.00±13.22	0.74
Time for cessation of shivering after medication (min)	2.50±0.44	5.96±0.81	0.0023
Response rate (%)	100	100	
Recurrence	2/30	3/30	

Data was analysed using unpaired test statistically significant $p < 0.05$

(axillary) were recorded. Subarachnoid anaesthesia was given with 0.5% heavy bupivacaine (15 mg) at L3 recorded at intervals of every 5 min for first 30 min and every 15 min for the rest of the observation period.

Shivering was graded using a four point scale as^[10]

Grade 0: No shivering.

Grade I: One or more of the following: peripheral vasoconstriction, peripheral cyanosis, piloerection, but without visible muscle activity.

Grade II: Visible muscle activity confined to one muscle group.

Grade III: Visible muscle activity in more than one muscle group and

Grade IV: Gross muscle activity involving the whole body.

Patients who developed either Grade III or IV shivering were included in the study. Either of the two drugs were given as slow IV bolus injection. The drugs were diluted to a volume of 5 ml in a 5 ml syringe and presented as coded syringes as per randomisation list by an anaesthesiologist who was not aware of the group allocation. The attending anaesthesiologist recorded onset

of shivering (time after giving spinal anesthesia), severity of the shivering, time to the disappearance of shivering and response rate (shivering cessation within 15 min after treatment).

Duration of surgery was recorded and spinal anaesthesia duration was noted by assessing recovery of sensory block using the pin

Grade I : Awake and alert,

Grade II : Drowsy, response to verbal stimuli,

Grade III : Drowsy, arousable to physical stimuli,

Grade IV : Unarousable.

Nausea and vomiting were treated with injection metoclopramide (Perinorm) 10 mg IV as and when required. The coding was opened after completion of the study to compile results. Power analysis was based on the difference between the means of time taken for cessation of post-spinal shivering after treatment with tramadol or dexmedetomidine = 180 s.

Numerical data were presented as mean \pm SD and categorical data as proportions (%). The comparison of the mean levels of all variables between two groups was made by the unpaired t-test. P value calculated, and $P < 0.05$ was considered to be statistically significant.

RESULTS

In the present study, a total of 60 patients out of 80 consecutive patients met the inclusion criteria. These 60 patients were randomized into two groups of 30 each. Out of the total patients, 30 were female, and 30 were male. As it was an intragender, age, ASA grade, duration of surgery and spinal anaesthesia. Duration of surgery varied from 30 min to 90 min. Duration of spinal anaesthesia ranged from 90 min to 150 min [Table 1].

All the patients had Grade 3 shivering. There was no significant difference (statistically) in time for the onset of shivering between the two groups. But, the time interval between administration of drug after the onset of shivering and cessation of shivering was significantly shorter in the dexmedetomidine group when compared to that of tramadol group.

There was recurrence of shivering in 2 patients in dexmedetomidine group and 3 patients in tramadol group. The patients were given extra doses of dexmedetomidine or tramadol, respectively [Table 2].

Nausea and vomiting was observed only in tramadol group and there was no incidence in case of dexmedetomidine group. Almost equal number of patients were sedated in both groups and the sedation score was 2 in all the patients. There was no evidence of respiratory depression, bradycardia or hypotension in

any of the patients. HR, SPO₂, mean blood pressure and body temperature remained within normal limits throughout the procedure in either groups.

DISCUSSION

The possible mechanisms of shivering during spinal anaesthesia include impairment of central thermoregulation, heat loss to the environment and internal redistribution of body heat. Potential risk factors for hypothermia in spinal anaesthesia include level of sensory block, ageing, IV solutions and temperature of the operation theatre.

In this study, operation theatres (OTs) were maintained at an ambient temperature of 23-25°C, and all drugs and fluids were administered at room temperature during the surgery.

The neurotransmitter pathways which involve in shivering are multiple and it involve serotonergic, opioids and anticholinergic receptors. Hence, drugs acting on these systems which include opioids (tramadol, pethidine or nalbuphine), propofol, ketanserin, clonidine, doxapram, nefopam and ketamine are utilized in the treatment of shivering. However, adverse effects such as hypotension, sedation, hypertension, nausea and vomiting, respiratory depression limit their use. Tramadol is an opioid analgesic with opioid effect mainly mediated via.

The incidence of nausea and vomiting with tramadol in our study was 28% and 20%, respectively. The results correspond with that of other studies by Reddy and Chiruvella; Bansal and Jain.^[15,16] However, in the study by Shukla et al.,^[6] the incidence of nausea was quite high (77.5%), whereas Wason et al. have reported the incidence of nausea as only 4%.^[17]

These variations could be explained by the peculiar patient characteristics in different studies. Maheshwari et al. have reported a very high incidence of sedation to the extent of 84%, which as mentioned earlier could be due to the higher dose as opposed to 28% sedation in our study.^[18] In our study, the incidence of sedation was 21.4%, which is similar to other studies. The other The results of this study indicates that dexmedetomidine takes lesser time to control shivering compared to tramadol.

The incidence of adverse effects like nausea and vomiting were found to be higher in case of tramadol compared with dexmedetomidine. There was not much difference in the number of patients who were sedated in either of the groups.

The sedation seen with dexmedetomidine, in the absence of nausea and vomiting, is beneficial for the anaesthetist, surgeon as well as the patient. It provided more comfort

to the patient, maintained more cardio-respiratory stability (hemodynamics), improved surgical conditions and also provided amnesia during surgery.

CONCLUSION

Both dexmedetomidine (0.5 µg/kg) and tramadol (0.5 mg/kg) are effective in treating patients with post-spinal anaesthesia shivering, but time taken for complete cessation of shivering was shorter with dexmedetomidine when compared to tramadol, the difference being statistically significant. Dexmedetomidine causes fewer adverse effects like nausea and vomiting. Sedation caused by dexmedetomidine provides additional comfort to the patient. More studies of different dose ranges of dexmedetomidine need to be conducted in order to cement its position as an efficient anti-shivering agent.

CONFLICT OF INTEREST :

The authors declared no conflict of interest

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REFERENCES

- De Witte J, Sessler DI. Perioperative shivering : Physiology and Pharmacology. *Anesthesiology*. 2002; 96:467-84.
- Bhattacharya P, Bhattacharya L. Postanaesthetic shivering (PAS): A review. *Indian J Anaesth*. 2003; 47:88-93.
- Kranke P, Eberhart LH, Roewer N, Tramèr MR. Pharmacological treatment of postoperative shivering: A quantitative systematic review of randomized controlled trials. *Anesth Analg*. 2002; 94:453-60.
- Sessler DI. Temperature regulation and monitoring. In: Millar RD, editor. *Textbook of Anaesthesia*. 7th edition, New York: Churchill Livingstone Inc.; 2010:1533-56 .
- Park SM, Mangat HS, Berger K, Rosengart AJ. Efficacy spectrum of antishivering medications: Meta-analysis of randomized controlled trials. *Crit Care Med*. 2012; 40: 3070-82.
- Shukla U, Malhotra K, Prabhakar T. A comparative study of the effect of clonidine and tramadol on post-spinal anaesthesia shivering. *Indian J Anaesth*. 2011; 55:242-6.
- Bajwa SJ, Gupta S, Kaur J, Singh A, Parmar S. Reduction in the incidence of shivering with perioperative dexmedetomidine: A randomized prospective study. *J Anaesthesiol Clin Pharmacol*. 2012; 28: 86-91.
- Usta B, Gozdemir M, Demircioglu RI, Muslu B, Sert H, Yaldiz A. Dexmedetomidine for the prevention of shivering during spinal anesthesia. *Clinics (Sao Paulo)*. 2011; 66: 1187-91.
- Karaman S, Gunusen I, Ceylan MA, Karaman Y, Cetin EN, Derbent A, et al. Dexmedetomidine infusion prevents post-operative shivering in Patients undergoing gynaecologic laproscopic surgery. *Turk J Med Sci*. 2013; 43: 232-7.
- Wrench IJ, Singh P, Dennis AR, Mahajan RP, Crossley AW. The minimum effective doses of pethidine and doxapram in the treatment of post-anaesthetic shivering. *Anaesthesia*. 1997; 52: 32-6.
- Mathews S, Al Mulla A, Varghese PK, Radim K, Mumtaz S. Postanaesthetic shivering – A new look at tramadol. *Anaesthesia*. 2002; 57: 394-8.
- Grewal A. Dexmedetomidine: New avenues. *J Anaesthesiol Clin Pharmacol*. 2011; 27: 297-302.
- Talke P, Tayefeh F, Sessler DI, Jeffrey R, Noursalehi M, Richardson C. Dexmedetomidine does not alter the sweating threshold, but comparably and linearly decreases the vasoconstriction and shivering thresholds. *Anesthesiology*. 1997; 87: 835-41.
- Kamibayashi T, Maze M. Clinical uses of alpha2 -adrenergic agonists. *Anesthesiology*. 2000; 93:1345-9.
- Bansal P, Jain G. Control of shivering with clonidine, butorphanol, and tramadol under spinal anesthesia: A comparative study. *Local Reg Anesth*. 2011; 4: 29-34.
- Reddy VS, Chiruvella S, Clonidine vs Tramadol for post spinal shivering during cesarean section: a randomised double blind study. *J Obstet Anesthesia Crit Care*. 2011; 1: 26-9.
- Wason R, Jain N, Gupta P, Gogia AR. Randomized double-blind comparison of prophylactic ketamine, clonidine and tramadol for the control of shivering under neuraxial anaesthesia. *Indian J Anaesth*. 2012; 56: 370-5.
- Maheshwari BS, Shah SK, Chada IA. Tramadol and Butorphanol for control of shivering; Randomised double blind comparative study. *J Anesth Clin Pharmacol*. 2008; 24: 343-6.