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INTRAVENOUS DEXMEDETOMIDINE V/S TRAMADOL ON POST SPINAL ANAESTHESIA SHIVERING: A RANDOMIZED, DOUBLE BLIND AND INTERVENTIONAL STUDY

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ABSTRACT

Introduction: Regional anaesthesia is widely used and safe anaesthetic technique. It leads to Intra/ post-operative shivering. There are various methods available to control. Tramadol is one of the most widely used to control shivering, however it is also associated with nausea and vomiting. **Objective:** To compare the efficacy of dexmedetomidine and tramadol in the treatment of post-spinal anesthesia (SA) shivering as well as to compare their side-effect profile. **Methodology:** This hospital based, prospective, randomized, double blinded, Superiority type of interventional study included 60 patients undergoing elective spinal anesthesia aged 20-60 years, ASA grade I and II, weighing 40-80 kilograms. Subjects were randomly allocated into two groups, to receive either 0.5 mcg/kg Dexmedetomidine (Group D) or 05 mg/kg Tramadol (or grpup T). The grade of shivering was assessed as per wrench (Grade 0: no shivering, Grade 1: One or more of the following: piloerection, peripheral vasoconstriction, peripheral cyanosis, but without visible muscles activity, Grade 2: Visible muscle activity confined to one muscle group, Grade 3: Visible muscle activity in more than one muscle group and Grade 4: Gross muscle activity involving the whole body). **Result:** Shivering was eliminated in all the patients who received either dexmedetomidine or tramadol. Time for unset of shivering and grade of shivering is quite similar in both study groups. Time to cessation of shivering was significantly earlier with dexmedetomidine (174.3±12.5) as compare with tramadol (279.6±15.9). Nausea and vomiting is found significantly higher (P value = 0.024) with tramadol.

INTRODUCTION

The combination of anaesthesia induced thermoregulatory impairment and exposure to a cool environment makes warmed surgical patients hypothermic [1]. This hypothermic leads to Intra- operative and post-operative shivering and it is known to be a frequent complication of anaesthesia. The prevalence of perioperative shivering is ranged from 40 to 70% [2]. Though shivering is a protective mechanism to preserve body heat. Shivering is unpleasant for the patient, anaesthesiologist and the surgeon besides being physiologically stressful for the patient

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and may be dangerous in patients with impaired cardiovascular reserves or limited respiratory capacity, as shivering increases the circulating catecholamine, HR, cardiac output, minute ventilation, oxygen consumption, metabolic CO2 production and lactic acid level. It also increases intraocular pressure (IOP), intracranial pressures (ICP), and postoperative pain due to surgical incision stretching. Shivering may also interfere with the monitoring of patients by causing artifacts on the ECG or disrupting BP and pulse oximetry readings additionally, shivering in patients with ASA grades III and IV may cause challenges for the anaesthesiologist and increase the operative time [1]. There are various methods to control shivering during anaesthesia, which include non-pharmacological method (active cutaneous counter warming, body core warming, passive cutaneous warming, and electro-acupuncture but in practice active cutaneous counter-warming is the most commonly used method [3]) and Pharmacological methods (pethedine, tramadol, clonidine, doxapram, katenserin, nefopam, dexmedetomidine etc).

Tramadol hydrochloride is a μ-opioid receptor agonistic drug, has a modulatory effect on central mono-aminergic pathways, and thus inhibits the neuronal uptake of noradrenaline/serotonin and encourages hydroxytriptamine secretion which resets the body temperature regulation centre. Dexmedetomidine is a selective α2-agonist that decreases vasoconstriction and shivering thresholds and when administered with meperidine additively reduces the shivering threshold in healthy volunteers [4]. Intraoperative dexmedetomidine reduces postanesthetic shivering as does meperidine after surgery [5].

According to the available literature, both tramadol and dexamethasone are effective in the prevention of intra as well as post anaesthetic shivering (PAS) [6, 7]. In the quest for safer and more efficacious drug, in our study, we compare two easily available and safe drugs Dexmedetomidine and Tramadol, intravenously administered for treating shivering in patients who received spinal anesthesia. The objective of this study was to determine the difference between mean time taken for cessation of post spinal anaesthesia shivering after medication in both the groups.

MATERIAL AND METHODS

This Hospital based, Randomized, double-blind, Superiority type of interventional study was conducted at the tertiary care center which is one of the largest tertiary care center of Northern India in the year of 2021 to 22.

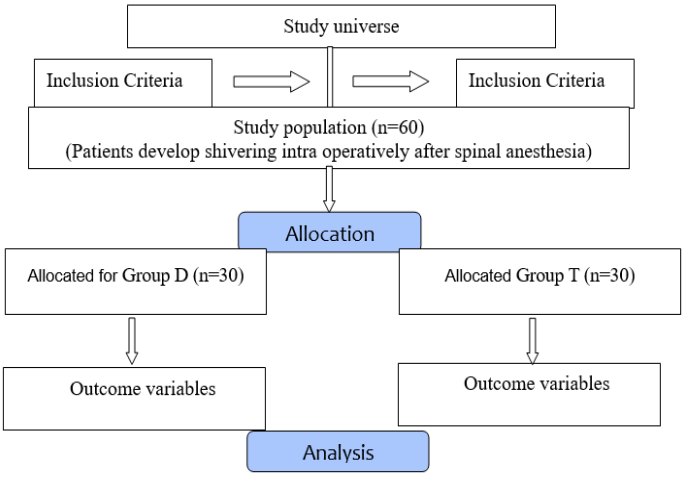
The study included all the Patients who developed intra-operatively shivering under spinal anesthesia, aged 20-60 year of either gender with weighing and height of 40-80kg and ≥ 145 cms respectively. Those with allergy reactions to the drugs used in this study, coagulation disorders or on anticoagulant therapy, local infection at the site of puncture for caudal anesthesia, developmental delay, neurological deficit, or vertebral deformity were excluded from this study. A Sample size of total 60 cases with 30 in each group at 95% confidence and 80% power was adequate to verify the expected difference of 102(±23.14) in mean time for cessation of post spinal shivering in cases of both study group as per finding of a published study [8]. A total of 60 eligible subjects were recruited consecutively till sample size was achieved. Subjects were randomly allocated into one of the following two groups using block randomization method to ensure the equal number of subjects in both group – Group D (n=30) during shivering patient received inj. dexmedetomidine 0.5 mcg/kg i.v. diluted in 50 ml saline. Group T (n=30) during shivering patient received inj. tramadol 0.5 mg/ kg diluted in 50 ml saline.

Allocation concealment was ensured using opaque sealed envelope method for group allocation. Allocation was done by a person not involved directly in the research to avoid selection bias. Neither the anesthetist nor the patient was aware of the groups and the drugs used (Double blind). All patients were subjected to standard Pre anesthetic check-up before the surgery including detailed history, examination, vitals, routine investigations and markers. Patients heart rate, systolic blood pressure (SBP) and diastolic blood pressure (DBP), mean arterial pressure (MAP), respiratory rate (RR), arterial oxygen saturation (SPO_2), shivering score, sedation score and temperature were measured at the beginning and 0,5,10,15,20,25,30,45,60 minutes after spinal anaesthesia and there after every 30 minutes. If any patient developed shivering of grade 3 or 4. He or she is randomized in any of 2 groups by sealed envelope method. IV tramadol 0.5mg/kg. in 50ml normal saline over 10 minutes (Group T) or IV dexmedetomidine 0.5 μg/kg.in 50 ml normal saline solution over 10 minutes (Group D) was given according to group allotted. If shivering continued after 15 minutes of study drug administration, dexamethasone IV injection (0.1 mg/kg) according to weight was given as a

rescue drug and the treatment was considered to be ineffective. Such cases were excluded from the study.

Ethical approval was obtained from Institutional Ethics Committee (1180/MC/EC/2021) with CTRI registration (CTRI/2022/03/041377). Written informed consent was obtained from parents or guardian (legally authorized representative) of all the patients before inclusion into the study.

Consort flow chart of the study



Statistical analysis

Quantitative data were summarized as mean and standard deviation and analyzed using Student "t-test" while the median and interquartile range of ordinal variables were calculated and analyzed using the "Mann-Whitney U test". Frequencies and percentage were analyzed using chi square test. A "p-value" <0.05 was taken as statistically significant. SPSS trial version 22 was used for statistical test.

RESULTS

Both the groups were comparable in relation to their baseline characteristics like age, gender, ASA grade and type of surgery (table no.1). Difference of haemodynamic parameter in between groups at different time interval were not statistically significant. (Depicts in Table no. 2). The Mean time for onset of shivering for Group D and Group T were 73.3±4.34 and 74.03±5.7, respectively and the difference of mean time for onset of shivering was not significantly ("p-value">0.05). Similarly, non-significant ("p-value"-0.755) difference of Severity of shivering was found in between groups (table no.3). Time to cessation of shivering was significantly earlier ("p-value"-<0.01) in Group D (174.3±12.5) as compare with Group T (279.6±15.9) (table no.4) however the difference in proportion of patients as per recurrence of shivering was not statistically significant (figure 1).

There are non-significantly difference between groups for Sedation score at the time of shivering. This is evident from the t test performed in which showed non-significant ("p-value" >0.05) difference in Sedation score at the time of shivering. Nausea and vomiting are found significantly higher in Group T as compare to Group D ("p-value" -0.017 and 0.030 respectively). Proportion of hypotension and bradycardia are found higher in group D as compare to Group. All reported side effects are depicted in figure 2.

Table no. 1 age, gender, ASA grade, type of surgery wise distribution of patients

Variables		Group D	Group T	"p-value"
Age (Mean ±S.D.)	In Years	33.3 ± 12.1	38.8 ± 9.5	0.377
Gender	Male	22 (73.3%)	24 (08%)	0.778
	Female	8 (26.6%)	6 (20.0%)	
BMI (Mean ±S.D.)		23.14 ± 2.1	22.98 ± 1.98	0.762
ASA	Grade I	27 (90%)	28 (93.3%)	0.778
	Grade II	3(10%)	6 6.6%)	
Type of surgery	Haemorrhoids	8 (26.670%)	9 (30%)	
	TAH with BSO	4 (13.3%)	7 (11.7%)	
	Inguinal hernia	8 (26.7%)	10(33.33%)	
	Striping of varicose	5 (16.67%)	4 (13.3%)	
	Foot surgery	3(10%)	2(6.6%)	
	EUA +fistulactomy	2(6.6%)	2(6.6%)	

Table 2: Hemodynamic parameter

Comparison of intra operative SBP (mm Hg)						
Time	**Group D**		**Group T**		**Test of significance**	
	Mean	**S.D.**	**Mean**	**S.D.**	"t-value"	"p-value"
Baseline	133.47	9.24	134.40	9.4	0.386	0.705
5 minutes	118.43	7.65	119.77	7.1	0.703	0.494
10 minutes	116.20	8.49	116.77	6.3	0.295	0.775
15 minutess	117.03	8.34	116.83	6.82	0.102	0.920
30 minutes	117.43	10.73	120.20	7.03	1.183	0.242
60 minutes	125.80	14.36	126.73	12.93	0.264	0.794
Comparison of intra operative DBP (mm Hg)						
Baseline	85.50	6.43	86.97	5.47	0.954	0.344
5 minutes	75.93	6.04	77.67	5.66	1.151	0.254
10 minutes	74.67	6.10	76.90	5.93	1.436	0.156
15 minutes	77.37	8.11	78.43	6.71	0.552	0.583
30 minutes	78.83	7.89	77.40	7.09	0.643	0.463
60 minutes	80.03	7.77	82.90	6.69	1.530	0.129

Table 3: Comparison of mean time to cessation of shivering

Groups	**No.**	**Mean Time (s)**	**S.D.**	**Test of significance**
Group D	30	174.3	12.5	"t-value" =28.5 Df=58
Group T	30	279.6	15.9	"p-value" =<0.01 (significant)

DISCUSSION

Regional anaesthesia is a safe and very popular technique whether it is a central neuraxial system block or a peripheral nerve block however most of (about 40% to 70%) the patients undergoing regional anaesthesia develop shivering perioperatively, though it is also found to occur after general anaesthesia. Though shivering is a protective mechanism to preserve body heat, it causes patient discomfort and pain and may be dangerous in patients with impaired cardiovascular reserves or limited respiratory capacity, as shivering increases the circulating catecholamine, HR, cardiac output, minute ventilation, oxygen consumption, metabolic CO_2 production and lactic acid level.

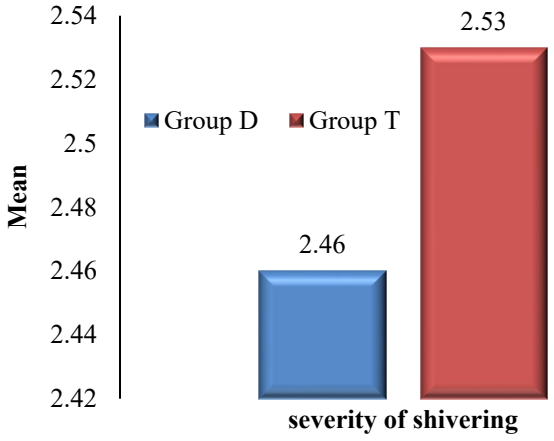


Figure 1: Mean score for severity of shivering.

It also increases intraocular and intracranial pressure and postoperative pain due to surgical incision stretching. Shivering may also interfere with the monitoring of patients by causing artifacts on the ECG or disrupting BP and pulse oximetry readings. Additionally, shivering in patients with ASA grades III and IV may cause challenges for the surgeon and increase the operative time.

In the present study, we compared the efficacy of Tramadol and Dexmedetomidine for the treatment of post spinal anaesthesia shivering in patients undergoing various surgeries under spinal anaesthesia. The demographic data were comparable in both the groups in terms of age, sex, body weight or BMI, type of surgery so as to ensure that there was no any confounding bias. In our study the difference of hemodynamic variable (mean heart rate,

mean systolic blood pressure, mean diastolic blood pressure) are remain non-statistically significance (>0.05) throughout the procedure in both dexmedetomidine and tramadol group. These observations were similar with the study of Geeta M. et al [9], Jainendra C et al [10] and Kundra T. S.et al [11] who reported that hemodynamic variability are remain stable throughout the procedure, and none of patients develop hypotension and bradycardia in both dexmedetomidine and tramadol group. We did not find a significant difference in the mean time of onset of shivering after drug administration between the groups. Similar findings were reported in the study by Kundra T.S. et al [11] where the mean time for onset of shivering was 72.30 ± 41.37 minute for dexmedetomidine and 72.66 ± 41.64 in minute for tramadol. The difference in onset of shivering between the two groups was not statistically significant according to the study. Similar non-significant difference of mean time for unset of shivering was found in the study of Usha S.et al [12].

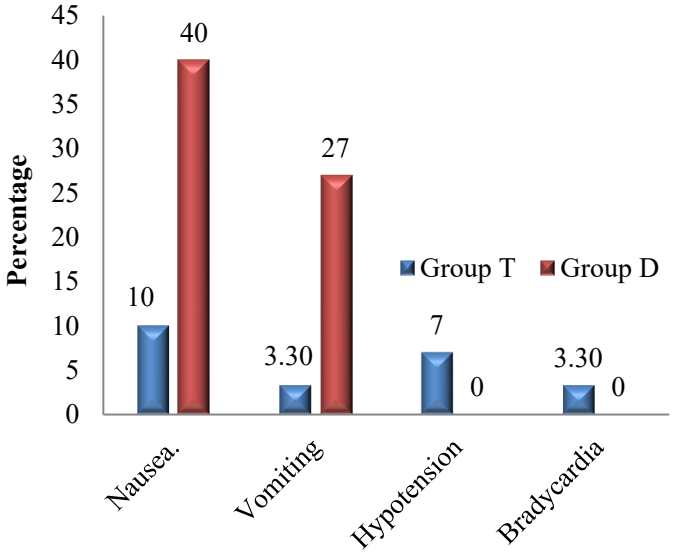


Figure 2: Comparisons of side effects

In our study we found the mean time for cessation of shivering for Group D and Group T were 174.3±12.5 and 279.6±15.9 seconds respectively and there are significant ("p-va;ue"<0.05) difference in between groups for mean time of cessation of shivering. These findings align with the study conducted by Geeta Mittal et al. [9] where they also observed that both drugs are effective to control the shivering and time taken for cessation of shivering was significantly less with dexmedetomidine (2.52 min) when compared to tramadol (5.92 min). Venkatraman et al. [13] also reported that dexmedetomidine require less time to cease post spinal anesthesia shivering than tramadol. Similar results were also obtained by Pausawaudi S. et al. [14], Javaherforoosh F. et al [15]. In our study, we did not find a significant difference between the groups in terms of sedation score at the time of shivering. In Lim F. and Karis M. et al [16]. reported the difference in the sedation score in the three groups was also statistically insignificant ("p-value"> 0.05) which is similar to our study. Maheshwari et al. [17] have reported a very high incidence of sedation with tramadol to the extent of 84%, which could be due to the higher dose as opposed to 20% sedation in comparison to our study.

Nausea and vomiting are found significantly higher ("p-value" = 0.024) in Group T as compare to Group D, while the proportion of Hypotension and bradycardia are found significantly higher in group D as compare to Group. Our observation are similar with the study of Geeta mittal et. al [9] who reported the higher incidence of nausea and vomiting with tramadol (28% and 20% respectively) as compare with Dexmedetomidine. (0%). Kundra T.S. et al [11] in their study reported the incidence of nausea and vomiting with tramadol was 28% and 8%, respectively and no nausea and vomiting with dexmedetomidine, which is also similar to our study However, in the study by Shukla et al. [12], the incidence of nausea was quite high (77.5%). Bajwa et al. [18] and Usta et al. [19] in their study reported no nausea and vomiting in patients with Dexmedetomidine, which is similar to our study result.

CONCLUSION

Both dexmedetomidine and tramadol are effective in treating the patients with post spinal anesthesia shivering, but the time taken for complete cessation of shivering was shorter with dexmedetomidine group as compare to tramadol, difference being statistically significant. The dexmedetomidine offer an excellent advantage of lesser adverse effects like nausea and vomiting.

FINANCIAL ASSISTANCE

Nil

CONFLICT OF INTEREST

The authors declare no conflict of interest

AUTHOR CONTRIBUTION

Pooja Bharti and Yogesh Chand Modi initiated the study. They also contributed in conducting literature review, creating the manuscript and gathering the data. Subhita Marodia and Pushpendra Bairwa then performed the statistical analysis and

prepared the draft of the manuscript. Pushpendra Bairwa also contributed in reviewing and proof reading of the final manuscript. The final draft was checked by all the authors

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