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Original Research Article

A PROSPECTIVE RANDOMISED DOUBLE-BLIND COMPARATIVE STUDY OF DEXMEDETOMIDINE AND TRAMADOL FOR POST-SPINAL ANAESTHESIA SHIVERING

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Abstract

Background: Post-spinal shivering is a common complication during spinal anesthesia, which can cause discomfort and affect surgical conditions. Dexmedetomidine, an α2-adrenergic agonist, and tramadol, an opioid analgesic, are both used to manage shivering. The primary aim of this study was to compare the efficacy of dexmedetomidine and tramadol in controlling perioperative shivering in patients under spinal anesthesia. Secondary objectives included evaluating their effects on hemodynamic parameters, sedation, and side effects. **Materials and Methods:** A prospective, randomized, comparative, and double-blind study was conducted involving 50 patients who were randomly assigned to receive either dexmedetomidine (0.5 mcg/kg) or tramadol (0.5 mg/kg) intravenously. Shivering parameters, axillary temperature, hemodynamic and respiratory parameters, sedation scores, and adverse effects were monitored. **Result:** Dexmedetomidine demonstrated a significantly faster cessation of shivering compared to tramadol ($p < 0.05$). While heart rate, diastolic blood pressure (DBP), and mean arterial pressure (MAP) were significantly lower in the dexmedetomidine group, respiratory parameters remained stable across both groups. Dexmedetomidine also provided superior sedation compared to tramadol ($p < 0.05$). 24% of patients in the tramadol group experienced nausea and vomiting, whereas no such side effects were reported in the dexmedetomidine group. **Conclusion:** Both dexmedetomidine and tramadol effectively managed post-spinal shivering, but dexmedetomidine was more effective in terms of faster onset of action, better sedation profile, and fewer adverse effects.

INTRODUCTION

Shivering, a common occurrence following anesthesia, is defined as an involuntary, repetitive activity of skeletal muscles.[1] The incidence of shivering in the intraoperative period is high, affecting approximately 5% to 65% under general anesthesia and as 33% during spinal and epidural anesthesia.[2] This condition poses several intraoperative challenges, significantly impacting patient outcomes and comfort. Shivering can double oxygen consumption and carbon dioxide production, and can lead to increased intraocular pressure and intracranial pressure.[3,4] Additionally, it can exacerbate wound pain, delay wound healing, and prolong discharge from the post-anesthesia care unit (PACU), making it an uncomfortable experience for patients.[5]

The importance of managing and preventing shivering cannot be overstated due to its potential adverse effects. Several factors can induce shivering, including core hypothermia, heat loss, increased sympathetic tone, pain, elevated pyrogen release, inhibition of vasoconstriction, and redistribution of heat below the spinal blockade.[6,7] Specifically, post-spinal anesthesia shivering is attributed to mechanisms such as impaired thermoregulation, redistribution of core body temperature to the periphery, heat loss to the environment, and patient-specific factors like age and gender.[8]

Treatment options for shivering include both non-pharmacological and pharmacological measures. Non-pharmacological approaches involve active warming through external heating, warm air, and warm intravenous fluids.[9,10] Pharmacological treatments encompass a variety of agents such as tramadol, clonidine, pethidine, and ketamine.[11,12]

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However, each of these agents presents certain drawbacks. Pethidine can cause respiratory depression and itching; ketamine may lead to sympathetic stimulation and dissociative anesthesia.[13-15] While alpha-2 adrenergic blockers like clonidine and dexmedetomidine are effective against shivering, clonidine is often associated with significant hypotension and bradycardia.[16] These side effects complicate the selection of an optimal agent for managing shivering.

Tramadol is currently one of the most widely used medications for treating post-spinal anesthesia shivering, but it is not without side effects, including nausea, vomiting, and dizziness.[17] Dexmedetomidine, an α2-adrenoceptor agonist, is used for sedation, analgesia, antihypertension, and shivering control.[18] Emerging studies suggest that dexmedetomidine effectively treats shivering while offering added benefits such as sedation, hemodynamic stability, and minimal adverse effects.[18]

Given that tramadol remains a frequently used agent and dexmedetomidine is a relatively newer alternative with promising advantages, this study aims to compare the efficacy and safety of these two drugs in the management of post-spinal anesthesia shivering. The scarcity of comparative studies suggests the need for this investigation to determine the more effective treatment option, potentially improving patient care and outcomes.

MATERIALS AND METHODS

Study Setting and Design

This prospective randomized double-blinded comparative study was conducted in the Department of Anesthesia at Dr. D. Y. Patil Hospital, School of Medicine, Nerul, Navi Mumbai. The study, carried out from 2019 to 2022, took place at the Operation Theatre Complex within the Department of Anesthesiology. Ethical clearance was obtained from the Institutional Ethics Committee prior to the commencement of the study. All patients included in the study provided written informed consent, which was available in three languages (English, Hindi, Marathi). For patients unable to read or write, the consent form was explained in their vernacular language in the presence of an unbiased, unrelated literate witness. Adequate time was given for patients to understand the nature of the study and to ask any questions, ensuring informed and voluntary participation.

Sample Size and Eligibility Criteria

A total of 50 patients were included in the study, with 25 patients in the dexmedetomidine group and 25 patients in the tramadol group. Sample size calculations were based on reports of previous study,[19] using Medicalc version 19.0.3. Eligible participants were those who provided informed consent, were of either sex, aged between 18 and 65 years, and classified as ASA 1 or 2. Exclusion criteria included known drug hypersensitivity to either of the study drugs, renal or hepatic impairment, thyroid dysfunction, psychiatric disorders, a history of substance or alcohol abuse, severe diabetes mellitus, autonomic neuropathy, and patients undergoing cesarean section.

Study Groups

The study comprised two groups. Group D received an intravenous injection of dexmedetomidine at a dose of 0.5 μg/kg, while Group T received an intravenous injection of tramadol at a dose of 0.5 mg/kg.

Study Procedure

Intravenous cannulation was performed for all patients in the operation theatre to facilitate co-loading with Ringer's lactate solution at a rate of 6 ml/kg/hour and drug administration. Standard monitoring (heart rate, non-invasive blood pressure, oxygen saturation, electrocardiography, and axillary body temperature) was conducted, and baseline values were recorded. Under aseptic precautions, a subarachnoid block was performed using a 25G Quincke's spinal needle at the L3-4 or L4-5 intervertebral space, with 0.5% heavy bupivacaine used for intrathecal injection. All patients received supplemental oxygen (5 L/min) and active warming. Intravenous fluids and all anesthetic drugs administered intravenously were at room temperature. Standard monitoring parameters such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and oxygen saturation (SpO2), continuous ECG monitoring, axillary temperature was recorded.

Shivering Grading

Shivering was graded using a four-point scale as per Wrench et al., 1997.[20] Grade 0 indicated no shivering. Grade 1 included one or more of the following: piloerection, peripheral vasoconstriction, or peripheral cyanosis, but without visible muscle activity. Grade 2 was defined by visible muscle activity confined to one muscle group. Grade 3 involved visible muscle activity in more than one muscle group, and Grade 4 was characterized by gross muscle activity involving the whole body.

Study Procedure and Data Collection

Patients with a shivering grade of 2, 3, or 4 were included in the study. They were randomly allocated to one of the two study groups using a randomization table. An anesthesiologist, unaware of the group allocation, administered the study drug and recorded the data using pre-coded syringes. Both drugs were administered as slow intravenous boluses after dilution to 5 ml, with Group T receiving tramadol 0.5 mg/kg and Group D receiving dexmedetomidine 0.5 μg/kg.

The recorded data included vital parameters (HR, SBP, DBP, MAP, SpO2, and axillary temperature), shivering variables (grade of shivering, onset of shivering, time taken for cessation of shivering after drug administration), sedation scores, and demographic data. The onset of shivering was defined as the time taken for shivering to start after

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administration of spinal anesthesia, while the time of cessation of shivering was defined as the time taken for the study drug to stop shivering. Any side effects, such as nausea, vomiting, dizziness, hypotension, and bradycardia, were noted and treated conservatively. Criteria for adverse effects included bradycardia (heart rate <50 bpm) and hypotension (a drop in NIBP >20% of the baseline value).

Sedation Scoring

The degree of sedation was assessed using a four-point scale based on the system described by (Filos et al., 1994).[21] In this scale, Grade 1 indicated that the patient was awake and alert. Grade 2 described a drowsy state but with responsiveness to verbal stimuli. Grade 3 was characterized by drowsiness where the patient could be aroused only with physical stimuli. Finally, Grade 4 represented an unarousable state where the patient was not responsive to any external stimuli.

Statistical Analysis

Data were expressed as counts with percentages for discrete data and as means with standard deviation (SD) and standard error of the mean (SEM) for measurement data such as shivering, sedation scores, and vital parameters. A 95% confidence interval (C.I.) was also presented. The data were analyzed using the Statistical Package for Social Sciences (SPSS 16.0). The mean values of vital parameters and ordinal data were compared between groups using the unpaired t-test, while sedation scores were analyzed using the Mann-Whitney U test. Repeated measures analysis of variance (ANOVA) was applied for measurement data and scores, and nominal data were analyzed using the chi-square test and Fisher's exact test. Statistical significance was determined at a p-value of 0.05.

RESULTS

Our results showed that Group D and Group T had similar demographic characteristics and ASA physical status [Table 1]. There were no significant differences in age, weight, height, or BMI between the groups, and the gender distribution was also comparable. Both groups had a similar proportion of ASA 1 and ASA 2 patients, indicating that the groups were well-matched in terms of baseline characteristics. The mean grade of shivering was similar between the two groups (p=0.33). There was no significant difference in the onset of shivering between the groups. However, the time to cessation of shivering was significantly shorter in Group D (3.7 ± 0.9 mins) compared to Group T (6.4 ± 0.8 mins), with a p-value of <0.001 [Table 2].

Body temperature remained similar between both groups at all time points compared to baseline. Further, there were no significant differences in body temperature between the two groups at any of the measured time points (p > 0.05 for all times) [Table 3]. HR decreased from baseline in both groups over time (Table 3). A significant difference was observed in HR between the groups at 45 and 60 minutes. Group D had a lower HR compared to Group T at these times. At 45 minutes, Group D had a mean HR of 69.6 ± 5.7 bpm, whereas Group T had a mean HR of 76.8 ± 7.6 bpm (p = 0.0004). At 60 minutes, Group D had a mean HR of 69.5 ± 6.6 bpm compared to 74.1 ± 6.3 bpm in Group T (p = 0.01).

Both SBP and DBP exhibited a decreasing trend from baseline in both groups [Table 4]. While there were no significant differences in SBP between the two groups at any time point (p-values ranged from 0.13 to 0.95), a significant difference was observed in DBP. Specifically, Group T had a significantly lower DBP than Group D at 45 minutes (p = 0.0004) and 60 minutes (p = 0.0006). This indicates that although both groups experienced a decrease in DBP over time, the reduction was more pronounced in Group T.

When comparing the MAP between the two groups, a evident decrease was observed from baseline across both groups [Table 5]. Although there was no significant difference in MAP between Group D and Group T at baseline (p = 0.58), Group T showed a significantly higher MAP compared to Group D at 45 minutes (p = 0.006) and 60 minutes (p = 0.0013). This indicates that MAP decreased more in Group D over time, especially at the later time points. Further, sedation scores, both groups exhibited an increase from baseline to 60 minutes [Table 5]. However, significant differences between the groups were evident at several time points. At 30 minutes, Group D had a significantly higher sedation score than Group T (p = 0.0002). This trend continued, with Group D showing significantly higher sedation scores compared to Group T at both 45 minutes (p = 0.0002) and 60 minutes (<0.0001).

When examining the mean sedation scores between the groups, Group D exhibited a significantly higher mean sedation score compared to Group T (p < 0.001). This trend is further supported by the distribution of sedation scores across both groups [Table 6]. Specifically, a larger proportion of patients in Group D experienced higher sedation levels compared to Group T. No patients in Group D had a sedation score of Grade 0, while 4% of patients in Group T had this minimal sedation level (p = 0.12). A significantly higher percentage of patients in Group D were classified as Grade 2 (64%) compared to Group T (24%) with a p-value of 0.009. Furthermore, Group D had a greater proportion of patients at Grade 3 (20%) compared to Group T (4%) with a p-value of <0.001. There were no patients in either group with a Grade 4 sedation score. These findings indicate that Group D was associated with a higher level of sedation overall compared to Group T.

A significant difference in side effects between the two groups was observed [Table 7]. All patients in Group D reported no side effects, whereas 24% of patients in Group T experienced nausea or vomiting (p < 0.001). Additionally, a higher percentage of patients in Group D experienced no side effects compared to Group T (100% vs. 76%, p < 0.001).

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There were no instances of bradycardia, hypotension, or respiratory depression in either group.

Table 1: Comparison of Demographic Variables and ASA Physical Status Between Group D and Group T.

Variable	Group D (n=25)	Group T (n=25)	P Value
Age (Mean ± SD)	38.3 ± 12.0	42.6 ± 11.2	0.21
Weight (Mean ± SD)	65.4 ± 9.2	64.7 ± 10.4	0.4
Height (m)	1.63 ± 0.07	1.63 ± 0.09	0.915
BMI (Mean ± SD)	24.4 ± 2.8	24.2 ± 2.7	0.74
Male : Female	15 : 10	13 : 12	0.08
ASA 1	14	15	0.77
ASA 2	11	10	

Group D (dexmedetomidine) and Group T (tramadol)

Table 2: Comparison of Grade of Shivering and Time of Onset and Cessation of Shivering Between Group D and Group T

Variable	Group D (n=25)	Group T (n=25)	P Value
Mean Grade of Shivering	2.5 ± 0.6	2.4 ± 0.5	0.33
Onset (Mean ± SD)	24 ± 5.8 mins	23.1 ± 6.5 mins	0.59
Time of Cessation (Mean ± SD)	3.7 ± 0.9 mins	6.4 ± 0.8 mins	<0.001

Table 3: Comparison of Body Temperature and Heart rate Between Groups D and T

	Body Temperature			Heart Rate		
Time (min)	Group D (Mean ± SD)	Group T (Mean ± SD)	p	Group D (Mean ± SD)	Group T (Mean ± SD)	p
Baseline	36.3 ± 0.3	36.3 ± 0.2	0.85	85.2 ± 6.9	81.7 ± 8.2	0.11
5	36.1 ± 0.2	36.2 ± 0.1	0.50	81.3 ± 8.1	77.3 ± 6.3	0.06
10	36.2 ± 0.1	36.2 ± 0.2	0.65	79.3 ± 8.7	76.1 ± 6.5	0.15
15	36.1 ± 0.2	36.0 ± 0.2	0.41	77.5 ± 9.3	74.0 ± 6.8	0.15
20	36.1 ± 0.2	36.0 ± 0.3	0.21	76.2 ± 7.0	73.7 ± 6.0	0.19
25	36.2 ± 0.2	36.2 ± 0.2	0.54	77.1 ± 7.3	76.1 ± 8.0	0.66
30	36.2 ± 0.2	36.2 ± 0.3	0.40	73.6 ± 8.4	75.3 ± 7.5	0.44
45	36.3 ± 0.2	36.3 ± 0.3	0.48	69.6 ± 5.7	76.8 ± 7.6	0.0004
60	36.3 ± 0.2	36.3 ± 0.3	0.67	69.5 ± 6.6	74.1 ± 6.3	0.01

Table 4: Comparison of Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) Between Groups D and T

	SBP			DBP		
Time (min)	Group D (Mean ± SD)	Group T (Mean ± SD)	p	Group D (Mean ± SD)	Group T (Mean ± SD)	p
Baseline	128.0 ± 9.6	132.6 ± 11.2	0.13	81.6 ± 9.4	77.4 ± 8.8	0.11
5	122.4 ± 10.2	118.5 ± 11.1	0.20	75.8 ± 9.7	73.2 ± 9.5	0.35
10	117.6 ± 9.4	116.4 ± 9.7	0.66	73.2 ± 9.2	76.7 ± 8.2	0.16
15	114.8 ± 9.2	116.6 ± 8.8	0.50	70.2 ± 9.2	71.0 ± 10.2	0.78
20	115.6 ± 7.5	116.8 ± 10.3	0.64	68.8 ± 7.7	74.0 ± 11.0	0.06
25	116.2 ± 11.3	118.5 ± 11.8	0.49	68.9 ± 8.9	72.5 ± 10.2	0.20
30	118.7 ± 12.7	118.5 ± 10.9	0.95	69.2 ± 9.6	72.1 ± 10.3	0.32
45	115.0 ± 10.4	114.6 ± 9.9	0.87	66.6 ± 7.7	75.8 ± 9.5	0.0004
60	114.2 ± 8.4	117.2 ± 9.1	0.23	66.6 ± 6.1	75.0 ± 9.6	0.0006

Table 5: Comparison of Mean Arterial Pressure (MAP) and Sedation Scores Between Groups D and T

	MAP			Sedation Score		
Time (min)	Group D (Mean ± SD)	Group T (Mean ± SD)	p	Group D (Mean ± SD)	Group T (Mean ± SD)	p
Baseline	97.1 ± 8.2	95.8 ± 8.2	0.58	0.0 ± 0.0	0.0 ± 0.0	-
5	91.3 ± 8.5	88.3 ± 8.8	0.22	0.0 ± 0.0	0.0 ± 0.0	-
10	88.0 ± 8.4	89.9 ± 6.7	0.37	0.0 ± 0.0	0.0 ± 0.0	-
15	85.1 ± 8.3	86.2 ± 8.6	0.09	0.8 ± 0.4	0.9 ± 0.3	0.12
20	84.4 ± 6.3	88.3 ± 9.2	0.65	1.1 ± 0.8	0.9 ± 0.3	0.16
25	84.7 ± 9.1	87.8 ± 8.0	0.20	1.4 ± 0.7	1.2 ± 0.6	0.38
30	85.7 ± 9.9	87.6 ± 9.1	0.50	1.7 ± 0.5	1.1 ± 0.5	0.0002
45	82.7 ± 5.9	88.7 ± 8.5	0.006	1.8 ± 0.5	1.2 ± 0.6	0.0002
60	82.4 ± 6.0	89.1 ± 7.4	0.0013	1.8 ± 0.5	1.2 ± 0.5	<0.0001

Table 6: Comparison of Maximum Sedation Score and Distribution Based on Sedation Scores

Parameter	Group D (Mean ± SD)	Group T (Mean ± SD)	p
Mean Sedation Score	2.0 ± 0.6	1.3 ± 0.6	<0.001
Sedation Score N, (%)			
Grade 0	0 (0%)	1 (4%)	0.12
Grade 1	4 (16%)	17 (68%)	<0.001

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Grade 2	16 (64%)	6 (24%)	0.009
Grade 3	5 (20%)	1 (4%)	<0.001
Grade 4	0 (0%)	0 (0%)	-

Table 7: Comparison of Side Effects Between Group D and Group T

Side Effect	Group D N (%)	Group T N (%)	P
Nausea/Vomiting	0 (0%)	6 (24%)	<0.001
Bradycardia	0 (0%)	0 (0%)	-
Hypotension	0 (0%)	0 (0%)	-
Respiratory Depression	0 (0%)	0 (0%)	-
No Side Effects	25 (100%)	19 (76%)	<0.001

DISCUSSION

Effective management of post-spinal shivering is essential for enhancing patient comfort and ensuring hemodynamic stability during surgeries. Shivering not only causes significant discomfort and anxiety for the patient but can also interfere with surgical procedures and complicate intraoperative monitoring.[22] Addressing this issue promptly with appropriate pharmacological interventions can improve overall patient outcomes, reduce surgical interruptions, and maintain stable vital signs throughout the perioperative period. This study aimed to compare dexmedetomidine and tramadol for the management of post-spinal shivering, focusing on their effectiveness, safety, and side effect profiles.

Our study demonstrated that dexmedetomidine led to a significantly shorter cessation time for shivering compared to tramadol. Several studies have shown that dexmedetomidine is more effective than tramadol for the prompt cessation of shivering. Mittal et al. reported that dexmedetomidine took 2.52 ± 0.44 minutes to stop shivering compared to tramadol's 5.92 ± 0.81 mins.[19] Similarly, Kalapala et al. found dexmedetomidine (172.19 ± 16.32 sec) to be more effective than tramadol (279.16 ± 24.32 seconds).[23] Verma et al. also noted a faster cessation time with dexmedetomidine (2.95 ± 1.18 mins) compared to tramadol (7.15 ± 1.77 mins).[24] Another research article also confirmed that dexmedetomidine is superior to tramadol for shivering cessation, with times of 174.12 ± 14.37 secs versus 277.06 ± 23.37 sec.[25]

In our study, the body temperature of patients remained stable between 36.0 °C and 36.3 °C across both treatment groups, indicating effective management of temperature during the procedure. The mean temperatures in the dexmedetomidine and tramadol groups were comparable, with no significant differences observed ($p > 0.05$). These findings are consistent with previous studies evaluating the effects of dexmedetomidine and tramadol on body temperature. For instance, Kundra et al. observed no significant changes in body temperature during the administration of dexmedetomidine and tramadol for shivering management.[25] Similarly, another work compared the mean tympanic temperatures of patients receiving intravenous dexmedetomidine, clonidine, and tramadol, finding no significant differences among the groups.[26] Verma and co-worker also reported that there were no significant differences in axillary temperatures among patients treated with dexmedetomidine, clonidine, and tramadol.[27] These studies support the stability of body temperature when using these agents for managing post-spinal anesthesia shivering.

In this study, a significant drop in HR was observed in the dexmedetomidine group between 45 and 60 minutes, though it remained above 60 beats per minute. These findings are aligned with previous research where researchers found a significant decrease in HR with dexmedetomidine compared to tramadol, especially after shivering cessation.[25] Similarly, another report showed a lower HR in the dexmedetomidine group (64.1 ± 7 beats/min) compared to tramadol (83.4 beats/min), with the difference being statistically significant but not requiring treatment.[26] Additionally, a parallel research observed that while dexmedetomidine led to a lower heart rate than tramadol, none of the patients developed bradycardia (heart rate < 50 bpm).[28]

Our study found a significant decrease in both DBP and MAP between 45 and 60 minutes in the dexmedetomidine group, though no hypotension was observed. Similarly, Arora et al., who reported a significant reduction in MAP with dexmedetomidine but without severe hypotension. [28] These changes are attributed to dexmedetomidine's α2-adrenoceptor agonism and the effects of spinal anaesthesia on cardiovascular stability.

Throughout the study, oxygen saturation and respiratory rate were stable in both groups, with no respiratory depression. These results are in line with previous reports who also observed no respiratory depression with either drug.[24,25,28,29]

In our study, the mean sedation score was significantly higher in the dexmedetomidine group (2.0 ± 0.6) compared to the tramadol group (1.3 ± 0.6) ($p<0.05$). Dexmedetomidine provided better sedation, with 16% of patients showing grade 1, 64% showing grade 2, and 20% showing grade 3 sedation scores. In contrast, 4% of tramadol recipients had no sedation (grade 0), 68% had grade 1, 24% had grade 2, and 4% had grade 3 sedation. This finding corroborated aligns with several studies demonstrating superior sedation with dexmedetomidine over tramadol. Venkatraman et al. reported that 70% of patients in the dexmedetomidine group had a sedation score of 2, and 23.3% had a score of 3, compared to the tramadol group where sedation scores were lower. [30] Akshita Singla et al.

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2017 also found that mean sedation scores were significantly higher with dexmedetomidine (1.06 ± 0.71) versus tramadol (0.34 ± 0.63).[31] Similarly, Kalapala et al noted that dexmedetomidine was associated with better sedation scores compared to tramadol, with a significant proportion of patients achieving grade 2 or 3 sedation.[23] Another study observed that dexmedetomidine provided better sedation compared to tramadol and clonidine, which is consistent with our results.[24] This study also found that dexmedetomidine offered superior sedation compared to tramadol, with a greater proportion of patients achieving higher sedation grades.

In our study, the incidence of nausea and vomiting was significantly higher in the tramadol group, with 24% of patients experiencing these side effects, while no patients in the dexmedetomidine group reported nausea or vomiting. Ondansetron 4 mg IV was administered to manage these side effects in the tramadol group, and all patients in the dexmedetomidine group remained side-effect-free, with 76% of tramadol patients also not experiencing any adverse effects. This finding is aligns with study that found that 28% of patients experienced nausea and 20% experienced vomiting with.[19] Kundra and colleagues also noted that the incidence of nausea and vomiting was significantly higher in the tramadol group compared to the dexmedetomidine group.[25] Another report suggested that 30% of tramadol patients had vomiting compared to only 3.33% in the dexmedetomidine group.[29] A parallel finding also reported that 13.3% of patients experienced vomiting with tramadol, compared to none with dexmedetomidine. [30]

Our study's findings suggest that dexmedetomidine is a more effective and safer alternative to tramadol for managing post-spinal shivering. However, further research is needed to validate these results across different patient populations and clinical scenarios. Future studies could explore larger sample sizes, multi-center designs, and long-term outcomes to provide a more comprehensive understanding of the benefits and limitations of these agents. Additionally, investigating the cost-effectiveness of dexmedetomidine compared to tramadol could offer valuable insights for clinical decision-making.

CONCLUSION

In summary, our study demonstrates that dexmedetomidine is a superior agent compared to tramadol for the management of post-spinal shivering. Dexmedetomidine not only provides a faster onset of action and better sedation but also avoids the gastrointestinal side effects commonly associated with tramadol. These findings support the use of dexmedetomidine as a more effective and safer alternative for managing post-spinal shivering, with implications for improving patient comfort and surgical outcomes in clinical practice.

REFERENCES

1. Nakamura K, Morrison SF. Central efferent pathways for cold-defensive and febrile shivering. The Journal of Physiology. 2011;589(14):3641-3658.
2. Cao C, Lv M, Wei C, Yan J, Wang Y, Gu C. Comparison of dexmedetomidine and meperidine for the prevention of shivering following coronary artery bypass graft: study protocol of a randomised controlled trial. BMJ Open. 2022;12(2):e053865.
3. Badjatia N, Strongilis E, Gordon E, et al. Metabolic Impact of Shivering During Therapeutic Temperature Modulation. Stroke. 2008;39(12):3242-3247.
4. Biswa DD, Sharma DA, Gogna DR. Comparative assessment of clonidine and tramadol on post-spinal anaesthesia shivering among patients with lower abdominal and lower limb surgeries. Int J Med Anesthesiology. 2021;4(2):130-132.
5. Choudhury S, Panda BK, Pradhan D, Padhi N, Soren DK, Seth D. Comparative Evaluation of Intravenous Tramadol and Dexmedetomidine for Treatment of Shivering after Spinal Anesthesia. Journal of Surgical Specialties and Rural Practice. 2023;4(2):102.
6. Hamzawy HAE, Stohy AM, El-Mahdi W, Gamal A. Comparative Study between the Use of Room Temperature and Cold Intra-Thecal Heavy Bupivacaine and Its Effect on Intraoperative Shivering in Lower Limb Orthopedic Surgery. The Egyptian Journal of Hospital Medicine. Published online 2019. Accessed June 29, 2024.
7. Horn EP, Sessler DI, Standl T, et al. Non-thermoregulatory Shivering in Patients Recovering from Isoflurane or Desflurane Anesthesia. Anesthesiology. 1998;89(4):878-886.
8. De Witte J, Sessler DI. Perioperative Shivering: Physiology and Pharmacology. Anesthesiology. 2002;96(2):467-484.
9. Amsalu H, Zemedkun A, Regasa T, Adamu Y. Evidence-Based Guideline on Prevention and Management of Shivering After Spinal Anesthesia in Resource-Limited Settings: Review Article. IJGM. 2022;15:6985-6998.
10. Campbell G, Alderson P, Smith AF, Warttig S. Warming of intravenous and irrigation fluids for preventing inadvertent perioperative hypothermia - Campbell, G - 2015 | Cochrane Library. Accessed June 29, 2024.
11. 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 Journal of Anaesthesia. 2012;56(4):370.
12. Eydi M, Golzari SE, Aghamohammadi D, Kolahdouzan K, Safari S, Ostadi Z. Postoperative Management of Shivering: A Comparison of Pethidine vs. Ketamine. Anesth Pain Med. 2014;4(2).
13. Acalovschi J, Ene V, Lörinczi E, Nicolaus F. Saddle Block with Pethidine for Perineal Operations. Obstetric Anesthesia Digest. 1987;7(2):66.
14. White JM, Ryan CF. Pharmacological properties of ketamine. Drug and Alcohol Review. 1996;15(2):145-155.
15. Sear JW. Recent advances and developments in the clinical use of i.v. opioids during the peroperative period. British Journal of Anaesthesia. 1998;81(1):38-50.
16. Kleiber N, van Rosmalen J, Dunk J, Tibboel D, de Wildt SN. Clonidine Induced Bradycardia And Hypotension Are Frequent In Critically Ill Children, But Do Not Appear To Compromise Hemodynamics. Paediatrics & Child Health. 2017;22(suppl_1):e30.
17. Bharti P, Modi YC, Marodia S, Bairwa P. Intravenous dexmedetomidine v/s tramadol on post spinal anaesthesia shivering: A randomized, double blind and interventional study. Journal of Applied Pharmaceutical Research. Published online 2023.
18. Abdel-Ghaffar H, Mohamed S, Fares K, Osman MA. Safety and Efficacy of Dexmedetomidine in Treating Post Spinal Anesthesia Shivering: A Randomized Clinically Controlled Dose-Finding Trial. Pain physician. Published online May 1, 2016.
19. Mittal G, Gupta K, Katyal S, Kaushal S. Randomised double-blind comparative study of dexmedetomidine and tramadol

ISSN (O): 2687-5365; ISSN (P): 2753-6556

for post-spinal anaesthesia shivering. Indian J Anaesth. 2014;58(3):257-262.
20. 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(1):32-36.
21. Filos KS, Goudas LC, Patroni O, Polyzou V. Hemodynamic and analgesic profile after intrathecal clonidine in humans. A dose-response study. Anesthesiology. 1994;81(3):591-601; discussion 27A-28A. doi:10.1097/00000542-199409000-00011
22. Alfonsi P. Postanaesthetic shivering: epidemiology, pathophysiology, and approaches to prevention and management. Drugs. Published online May 1, 2003. Accessed June 29, 2024.
23. K RR, V SB, Santha N. A Randomized Double Blinded Study Comparing the Postoperative Analgesic Effects of Butorphanol, Parecoxib and Tramadol in Patients Undergoing Major Surgical Procedures. Biomedical and Pharmacology Journal. 2019;12(2):809-814.
24. Verma A, Bhandari D, Dhande P, Jain S, Tidke S. Comparative Evaluation of Dexmedetomidine and Tramadol for Attenuation of Post-Spinal Anaesthesia Shivering. Journal of Clinical and Diagnostic Research. 2018;12:UC01-UC04.
25. Kundra TS, Kuthiala G, Shrivastava A, Kaur P. A comparative study on the efficacy of dexmedetomidine and tramadol on post-spinal anesthesia shivering. Saudi J Anaesth. 2017;11(1):2-8.
26. Sahi S, Singh MR, Katyal S. Comparative efficacy of intravenous dexmedetomidine, clonidine, and tramadol in postanesthesia shivering. J Anaesthesiol Clin Pharmacol. 2016;32(2):240-244. doi:10.4103/0970-9185.182109
27. Verma DrNK, Kumar DrM. Comparison of Clonidine, Dexmedetomidine and Tramadol for Control of Post Spinal Shivering: A Randomized Double Blind Clinical Study. IJLSSR. 2016;2(6).
28. Arora N, Ram S, Smarak M. Prophylactic Tramadol versus Dexmedetomidine for Prevention of Shivering during Spinal Anaesthesia. In: ; 2014. Accessed June 29, 2024.
29. Singh S, Kumar V, Prasad C, Prakash J. Randomised Double-Blind Comparative Study Of Dexmedetomidine And Tramadol For Prevention Of Perioperative Shivering In Transurethral Resection Of Prostate Under Spinal Anaesthesia. Journal of Evolution of Medical and Dental Sciences. 2016;5.
30. Venkatraman R, Karthik K, Pushparani A, Mahalakshmi A. A prospective, randomized, double-blinded control study on comparison of tramadol, clonidine and dexmedetomidine for post spinal anesthesia shivering. Braz J Anesthesiol. 2016;68(1):42-48.
31. Sardar Patel University, Singla A. Efficacy and Safety of Tramadol and Dexmedetomidine in Treatment of Shivering Following Spinal Anaesthesia: A Randomized Controlled Study. jmscr. 2017;05(04):20338-20344

ISSN (O): 2687-5365; ISSN (P): 2753-6556