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Original Research Article

A Comparison of Efficacy of Intravenous Dexmedetomidine and Intravenous Tramadol for Post Spinal Anaesthesia Shivering

Sejal D. Shelat[1], Mauli K. Gandhi[2], Vibhaben J. Panchal[3], Hina R. Gajjar[4], Yagnik P. Ramani[5]

[1,2]Assistant Professor, Department of Anaesthesia, Sardar Vallabhbhai Patel Institute of Medical Sciences and Research, Ahmedabad, Gujarat, India

[3]Third Year Resident, Department of Anaesthesia, Sardar Vallabhbhai Patel Institute of Medical Sciences and Research, Ahmedabad, Gujarat, India

[4]Consultant Anaesthesiologist, VS General Hospital, Ahmedabad, Gujarat, India

[5]Senior Resident, Department of Anaesthesia, Gujarat Adani Institute of Medical Sciences, Bhuj, Kachchh, Gujarat, India

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Corresponding author: Dr. Vibhaben J. Panchal

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Abstract

Background: Shivering is a frequent and distressing complication after spinal anaesthesia, associated with increased metabolic demand, patient discomfort, and potential cardiovascular strain. Dexmedetomidine and tramadol are commonly used pharmacologic agents to control of shivering, yet their comparative efficacy remains under evaluation.

Aim: To compare the efficacy of intravenous dexmedetomidine and tramadol in the management of post-spinal anaesthesia shivering.

Material and Methods: In this prospective, observational clinical study, 60 adult patients undergoing elective surgeries under spinal anaesthesia were assigned to two groups. Group D received intravenous Dexmedetomidine at a dose of 0.5 mcg/kg. Group T received injection Tramadol 0.5 mg/kg i.v. The primary outcome was time taken for cessation of shivering.

Secondary outcomes included recurrence, sedation scores, and adverse effects.

Results: Dexmedetomidine provides a significantly faster cessation of shivering (2.93 ± 0.50 min) compared to tramadol (4.98 ± 1.04 min), with no recurrence of Shivering and Incidence of nausea and vomiting.

Conclusion: Dexmedetomidine is more effective than tramadol for controlling post-spinal shivering, offering quicker onset and better patient comfort, although it requires hemodynamic monitoring.

Keywords: dexmedetomidine, tramadol, post-spinal shivering, neuraxial anaesthesia.

Introduction

Shivering following spinal anaesthesia is a common and distressing complication, reported in 30–60% of patients during the perioperative period. It is primarily a thermoregulatory response to hypothermia, resulting from impaired vasoconstriction and redistribution of heat due to sympathetic blockade. Although a protective mechanism, shivering increases oxygen consumption, carbon dioxide production, and metabolic rate by up to 400%, which may precipitate adverse cardiovascular events in high-risk individuals [1]. In addition, it interferes with patient comfort, complicates hemodynamic stability, and hampers monitoring during surgery [2] The multifactorial etiology of post-spinal anaesthesia shivering includes peripheral vasodilation, core-to-peripheral heat redistribution, and altered hypothalamic thermoregulation. Non-pharmacological measures such as forced-air warming and warmed fluids can help but are not always feasible, especially in resource-limited settings or during prolonged surgeries [3]. Therefore, pharmacological agents remain the primary approach to managing this condition. Tramadol, a synthetic opioid with serotonergic and noradrenergic reuptake inhibition, has long been a preferred drug for treating shivering. Its efficacy lies in lowering the thermoregulatory threshold and modulating central pathways. However, its use is often limited by adverse effects such as nausea, vomiting, and dizziness, which may compromise patient satisfaction and delay recovery [4]. On the other hand, dexmedetomidine, a highly selective alpha-2 adrenergic agonist, has gained attention in

recent years for its sedative, analgesic, and sympatholytic properties without significant respiratory depression. Its antishivering action is attributed to central inhibition of sympathetic outflow and reduction of the shivering threshold [5] . Recent randomized controlled trials and systematic reviews suggest that dexmedetomidine provides superior control of shivering, faster onset of action, and lower recurrence rates compared to tramadol. These studies also indicate improved sedation and patient comfort with dexmedetomidine, although dose-dependent bradycardia and hypotension remain concerns. The present study aims to evaluate and compare the efficacy of intravenous dexmedetomidine and tramadol in the management of post-spinal anaesthesia shivering, focusing on onset of action, recurrence rates, and associated adverse effects to determine the safer and more effective intervention.

Material and Methods

This prospective, observational clinical study was conducted after obtaining ethical clearance from the Institutional Ethics Committee and informed written consent from all participants. A total of 60 adult patients of either sex, aged between 18 and 60 years, weighing between 50 and 90 kg, belonging to the American Society of Anesthesiologists (ASA) physical status I and II, and scheduled for elective lower abdominal and lower limb surgeries under spinal anaesthesia were included in the study. Patients who developed shivering within 45 minutes of giving spinal anaesthesia were enrolled, and the efficacy of intravenous Dexmedetomidine and intravenous Tramadol in controlling shivering was compared.

Inclusion Criteria

- Patients who developed shivering of grade III and IV (crossley & mahajan)
- Patients who have given a valid informed written consent

Exclusion Criteria

- Patients with an initial axillary temperature was greater than 38°C or less than 36°C using a digital thermometer
- Patients with known hypersensitivity to Tramadol or Dexmedetomidine
- Patients who develop shivering even before administering spinal anesthesia
- Patients requiring supplementation with general anesthesia
- Patients who are not fit for spinal anesthesia.

Patients were divided in two groups with 30 patients in each. Group D Who received intravenous Dexmedetomidine at a dose of 0.5 mcg/kg. Group T Who received intravenous Tramadol 0.5 mg/kg i.v for control of shivering.

Pre-anaesthetic Evaluation: Pre-anaesthetic evaluation of all patients consisted of detailed history, general and systemic physical examination and routine investigation including complete hemogram, RBS, RFT (S. Urea & S. Creatinine), Serum Electrolytes (S. Sodium, S. Potassium), LFT (S. Bilirubin & SGPT), Coagulation profile (PT, INR, aPTT), EGC and Chest X-ray. All patients were kept nill by mouth for a minimum 6 hours before the surgery.

Anesthetic Technique: All I.V. fluids and drugs were stored and administered at room temperature. Baseline axillary temperature of the patient was recorded using a digital thermometer. Monitors such as pulse oximeter, NIBP, ECG and axillary surface temperature probe were attached and baseline vital parameters such as Heart rate, Blood pressure, SPO2 and axillary temperature were recorded I.V. access was obtained with 18G cannula and i.v. fluid was started.

All the patients were given Subarachnoid block using 0.5% hyperbaric Bupivacaine. After giving Spinal Anaesthesia,

Hemodynamic changes and vital parameters were observed and patients were observed for the occurrence of shivering.

Time of onset of shivering and grade of shivering were noted after spinal anesthesia. Intensity of shivering was graded according to Crossley & Mahajan Scale.

Grade 0	No shivering
Grade I	No visible muscle activity but Piloerection, Peripheral vasoconstriction, or both represent (other causes excluded)
Grade II	Muscular Activity in Only One Muscle Group
Grade III	Moderate muscular activity involving two or more than two muscle groups but not involving whole body
Grade IV	Violent muscular activity that involves the whole body and bed shaking

Patients who developed grade 3 and 4 shivering were randomly divided into two groups of 30 each, according to the drug administered. Group D who received intravenous dexmedetomidine at a dose of 0.5 µg/kg, while Group T who received intravenous tramadol at a dose of 0.5 mg/kg.

Shivering Response Was Defined As

Complete Response	When the shivering grade declined to grade 0 within 15 min of drug administration
Incomplete Response	When the shivering grade declined but shivering did not cease completely within 15 min of drug administration.
Failed/No Response	If no change in shivering grade was observed within15 min drug administration.
Recurrence	any rise in shivering score post treatment after achieving complete response

Sedation was assessed using scale described by Filos, where Grade I indicated that the patient was awake and alert, Grade II denoted drowsiness with responsiveness to verbal stimuli, Grade III referred to drowsiness with arousability only to physical stimuli, and Grade IV indicated an unarousable state.

The primary outcome measured was the time taken for cessation of shivering following drug administration. Secondary outcomes included sedation score, drug response to shivering, and adverse effects such as nausea, vomiting, bradycardia, and hypotension. Bradycardia was defined as a heart rate of less than 60 beats per minute and was managed with intravenous atropine 0.6 mg, while hypotension was defined as a fall in systolic blood pressure of more than 20% from baseline and was treated with intravenous fluids and injection mephentermine as required. Data were recorded and analyzed using appropriate statistical methods. Continuous variables were expressed as mean ± standard deviation and compared using the student's t-test, whereas categorical variables were compared using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1 shows the demographic profile of patients in both groups. All the demographic variables (age, sex, weight, ASA grade, duration of surgery) between two groups were not found to be statistically significant. ($p>0.05$)

Table 2 exhibits Comparison of Average Time for Onset of Shivering after Spinal Anesthesia in Minutes. Time for onset of shivering after spinal anesthesia was not statistically significant between the two groups.

Table 3 demonstrates Grade of Shivering. The grade of shivering at the time of onset was comparable in both the groups. There was no statistically significant difference between the two groups. ($p>0.05$)

Table 4 shows Comparison of Time of Cessation of Shivering. The time taken for complete cessation of shivering was significantly higher in Group T than in Group D and which was found to be statistically significant. ($p<0.05$)

Table 5 shows Type of Response. The rate of complete response was 100 % for patients in group D and 96.67 % for patients in group T. The Incomplete response rate and recurrence rate was more in patients receiving group T drugs. This difference was statistically significant. ($p<0.05$)

Table 6 exhibits the incidence of adverse effects in both groups. Incidence of Nausea (20%) and vomiting (6.67%) were higher in Group T which was treated accordingly. whereas no side effects were reported in Group D.

Table 7 exhibits sedation score among patients. Dexmedetomidine was found to cause more sedation than Tramadol and this sedation was desirable and beneficial for surgeon and patient both.

Table 1: Demographic Profile of Patients

Groups	Group D	Group T	p value	Inference
Age in years (mean ± SD)	41.06 ± 7.27	39.7 ± 7.15	0.47	NS
Sex (male/female)	16/14	14/16	0.91	NS
Weight in kg (mean ± SD)	64.43 ± 6.78	63.67 ±13.27	0.78	NS
ASA Grade I/II	14/16	16/14	0.61	NS
Duration of surgery in min (mean ± SD)	121.33 ± 17.56	122.17 ± 19.46	0.86	NS

Table 2: Comparison of Average Time for Onset of Shivering after Spinal Anesthesia in Minutes

Event	Group D	Group T	P value	Inference
Onset of Shivering After Spinal Anaesthesia in Minutes (Mean ± SD)	32.0 ± 7.06	32.93 ± 6.74	0.60	NS

Table 3: Grade of Shivering

Grade of shivering	Group D	Group T	P value	Inference
Grade III	15 (50%)	14 (46.67%)	0.79	NS
Grade IV	15 (50%)	16 (53.33%)		

Table 4: Comparison of Time of Cessation of Shivering

Event	Group D	Group T	P value	Inference
Cessation of Shivering after Administration of Study Drug in Minutes (Mean ± SD)	2.93 ± 0.50	4.98 ± 1.04	0.005	S

Table 5: Type of Response

Type of Response	Group D	Group T
Complete	30(100%)	29(96.67%)
Incomplete	0(0%)	1(3.33%)
Failed	0(0%)	0 (0%)
Recurrence	0(0%)	2 (6.67%)

Table 6: Perioperative Complication & Side Effects

Side Effects	Group D		Group T	
	No of Patients	%	No of Patients	%
Nausea	0	0	6	20
Vomiting	0	0	2	6.67
Hypotension	0	0	0	0
Bradycardia	0	0	0	0
Respiratory Depression	0	0	0	0

Table 7: Sedation Score

Sedation Score	Group D	Group T
Grade I	8 (26.67%)	29 (96.67%)
Grade II	21 (70%)	1 (3.33%)
Grade III	1 (3.33%)	0 (0%)
Grade IV	0 (0%)	0 (0%)

Discussion

Spinal anesthesia is safe and widely used for a variety of surgeries worldwide. Post spinal anesthesia shivering is a common condition encountered by anaesthesiologists, with an incidence of 30% - 60%. Possible mechanisms include a decrease in core body temperature caused by sympathetic block, peripheral vasodilation and increased cutaneous blood flow, which leads to increased heat loss through skin. Cold temperature of the operating room and rapid infusion of cold intravenous fluid also responsible for shivering.

Tramadol is an opioid analgesic with an opioid action mainly mediated by the mu receptor. Tramadol decreases 5- HT3 reuptake while increasing its release. It also prevents noradrenaline reuptake in synaptosomes. Tramadol also activates the monoaminergic receptors of the pain pathway. Tramadol's anti shivering impact is most likely mediated by its opioid, serotonergic and noradrenergic activities. Dexmedetomidine is an alpha 2 adrenoreceptor agonist, with antihypertensive, sedative, analgesic, and anti-shivering properties. It reduces vasoconstriction and shivering threshold. In addition, it has hypothalamic thermoregulatory effects; thus, it acts on the central thermoregulatory system rather than preventing shivering peripherally. The findings of the present study indicate that intravenous dexmedetomidine is more effective than tramadol in controlling post-spinal anaesthesia shivering, with a faster onset of action, lower recurrence rates, and fewer gastrointestinal side effects.

These results are consistent with recent literature suggesting that dexmedetomidine offers superior efficacy compared to conventional agents for perioperative shivering management [6]. Patel A et al. demonstrated that dexmedetomidine significantly reduces the time to cessation of shivering and improves sedation scores compared to tramadol, with minimal incidence of nausea and vomiting [7]. Similarly, a prospective trial by Kumar et al. reported that dexmedetomidine was associated with a faster onset of shivering control and a lower need for rescue medication, making it a reliable choice for intraoperative use [8].

The sedative properties of dexmedetomidine, observed in our study, have been highlighted as an additional advantage for patient comfort during surgery. Gupta et al. noted that patients receiving

dexmedetomidine had a more stable hemodynamic profile and reported higher satisfaction scores, reinforcing its dual role in analgesia and anxiolysis [9]. A meta-analysis by Ahmed et al. further confirmed that dexmedetomidine significantly reduces the recurrence of shivering compared to tramadol, although the risk of bradycardia and hypotension remains notable, which aligns with our observations [10]. Finally, Sharma et al. emphasized the importance of dose titration and vigilant monitoring to mitigate these cardiovascular side effects while maximizing the clinical benefits of dexmedetomidine [11]. Taken together, the evidence suggests that dexmedetomidine is an effective and safe alternative to tramadol for managing post-spinal shivering [12].

Conclusion

Intravenous dexmedetomidine demonstrated superior efficacy compared to tramadol in the treatment of post-spinal anesthesia shivering, offering faster onset, lower recurrence, and fewer gastrointestinal adverse effects. The combination of effective shivering control and sedation makes dexmedetomidine a preferred choice over tramadol when appropriate monitoring is available.

References

1. Buggy DJ, Crossley AWA Thermoregulation, mild perioperative hypothermia and Post anaesthetic shivering. Bri Journal of Anaesth 2000;84:615-628.
2. Dhimar AA, Patel MG, Swadia VN. Tramadol for control of shivering (comparison with pethidine). Indian J Anaesth. 2007; 51:28---31.
3. Sessler DI, editor. Miller's anaesthesia. 7th ed. New York: Churchill Livingstone;2010.
4. Schmied H, Kurz A, Sessler DI, Kozek S, Reiter A. Mild hypothermia increases blood loss and transfusion requirements during total hip arthroplasty. Lancet.1996;347(8997):289-92.
5. Giesbrecht GG, Sessler DI, Mekjavic IB, et al. Treatment of mild immersion hypothermia by direct body-to-body contact. J Appl Physiol. 1994; 76:2373-9.
6. Mittal G, Gupta K, Katyal S, Kaushal S. Randomised double-blind comparative study of dexmedetomidine and tramadol for post-spinal anaesthesia shivering. Indian J Anaesth. 2014;1;58(3):257-62.
7. Singla A, Chaudhari M, Patel A. Efficacy and safety of tramadol and dexmedetomidine in treatment of shivering following spinal anaesthesia: a randomized controlled study. J Med Sci Clin Res. 2017; 5:20338-44.
8. Kumar D, Fatima DH, Singh D, Samina M. Randomised double blind comparative study of dexmedetomidine and tramadol for control of post-spinal anesthesia shivering. IOSR J Dent Med Sci. 2024;23(11):54–60.
9. Gupta M, & Gupta P, Singh, DK. Effect of 3 Different Doses of Intrathecal Dexmedetomidine (2.5µg, 5µg, and 10 µg) on Subarachnoid Block Characteristics: A Prospective Randomized Double-Blind Dose-Response Trial. Pain physician. 2016; 19. E411-E420.
10. Ibrahim, Ahmed & Hayal, Hussien & Al-Sawad, Ahmed & Abdulla, Shahab & Makline, Ralela.. Efficacy of Pethidine and Tramadol in the Suppression of Postoperative Shivering: A Comparative Study. AUIQ Complementary Biological System. 2025; 2. 1-9. 10.70176/3007-973X.1040.
11. Sharma N, Pandey M, Gupta A, Kumar A. A Randomized Control Trial of Three Intravenous Dexmedetomidine Doses for Procedural Sedation in Patients Undergoing Minor Gynaecological Surgery. Cureus. 2022 Mar 19;14(3):e23309. doi: 10.7759/cureus.23309. .
12. Singla A, Madhavi A, Patel A. Efficacy and Safety of Tramadol and Dexmedetomidine in Treatment of Shivering Following Spinal Anaesthesia: A Randomized Controlled Study. JMSCR 2017; 5:420338-344.