TPM Vol. 32, No. S2, 2025
ISSN: 1972-6325
https://www.tpmap.org/

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COMPARISON OF DEXMEDETOMIDINE, PETHIDINE, AND TRAMADOL IN THE TREATMENT OF POST-NEURAXIAL ANESTHESIA SHIVERING: A PROSPECTIVE DOUBLE-BLINDED BLOCK RANDOMIZATION STUDY

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Abstract
Background: Shivering following neuraxial anesthesia is common and distressing, affecting patient comfort and hemodynamic stability. Several pharmacologic agents like dexmedetomidine, pethidine, and tramadol are used for managing shivering with varying efficacy and side effects.
Objective: To compare efficacy and safety of dexmedetomidine, pethidine, and tramadol in treating post-neuraxial anesthesia shivering and assess effects on hemodynamic parameters.
Methods: In this prospective double-blinded randomized study, 90 patients (ASA grade 1 and 2) with shivering scores 3 and 4 under neuraxial anesthesia were randomly assigned to receive dexmedetomidine 0.5 µg/kg, pethidine 0.5 mg/kg, or tramadol 0.5 mg/kg intravenously, diluted to 5 ml. Shivering intensity and vital signs were recorded at baseline and at 5-minute intervals up to 30 minutes post-treatment. Side effects and sedation levels were monitored.
Results and Conclusion: [To be completed based on collected data] All three drugs effectively reduced shivering with variable hemodynamic changes and side effect profiles, guiding clinical drug choice post-neuraxial anesthesia.

Keywords: Neuraxial anesthesia, shivering, dexmedetomidine, pethidine, tramadol, hemodynamics, randomized controlled trial

INTRODUCTION

Shivering is an involuntary, repetitive activity involving skeletal muscles occurring frequently during and after neuraxial anesthesia. Normal human core temperature is tightly regulated between 36.5–37.0 °C. Neuraxial anesthesia induces vasodilation causing rapid heat loss and redistribution of body heat from core to periphery, reducing core temperature and triggering shivering.
Though a protective thermoregulatory mechanism, shivering causes discomfort, increases metabolic oxygen demand, and complicates patient monitoring. Various pharmacologic agents have been studied to control post-anesthesia shivering. However, comparative evaluation of newer agents such as dexmedetomidine against established drugs like pethidine and tramadol remains relevant. This study aims to compare these three drugs in terms of efficacy and safety.

MATERIALS AND METHODS

Study Design and Population

A prospective, double-blinded, randomized block study was conducted involving 90 patients with ASA physical status 1 and 2, undergoing neuraxial anesthesia who developed significant shivering (score 3 or 4).

Group Allocation

Group	Intervention	Number of Patients
Group A	Inj. Dexmedetomidine 0.5 µg/kg IV diluted to 5 ml	30

Group	Intervention	Number of Patients
Group B	Inj. Pethidine 0.5 mg/kg IV diluted to 5 ml	30
Group C	Inj. Tramadol 0.5 mg/kg IV diluted to 5 ml + Inj. Emeset 4 mg IV	30

Shivering Assessment

Shivering intensity was scored using a standardized scale:

- Score 3 & 4 indicated moderate to severe shivering requiring treatment.

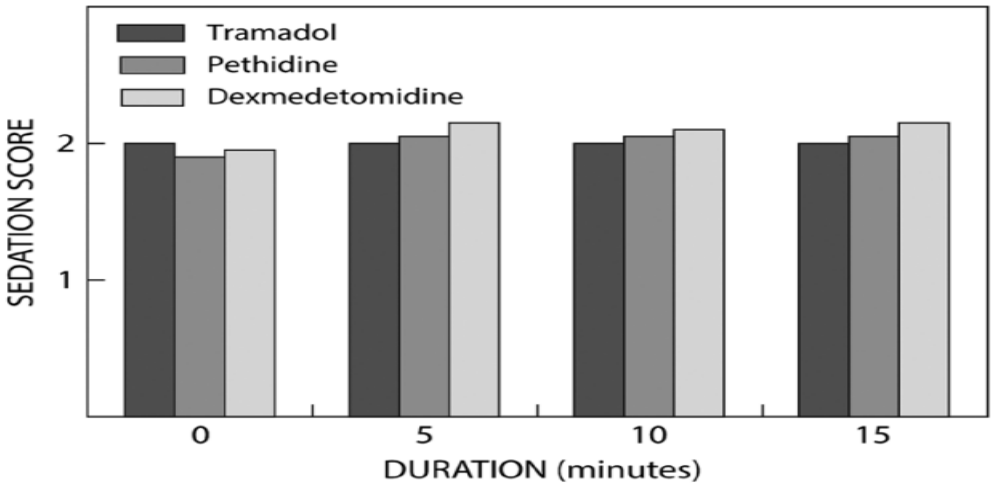
Treatment and Monitoring

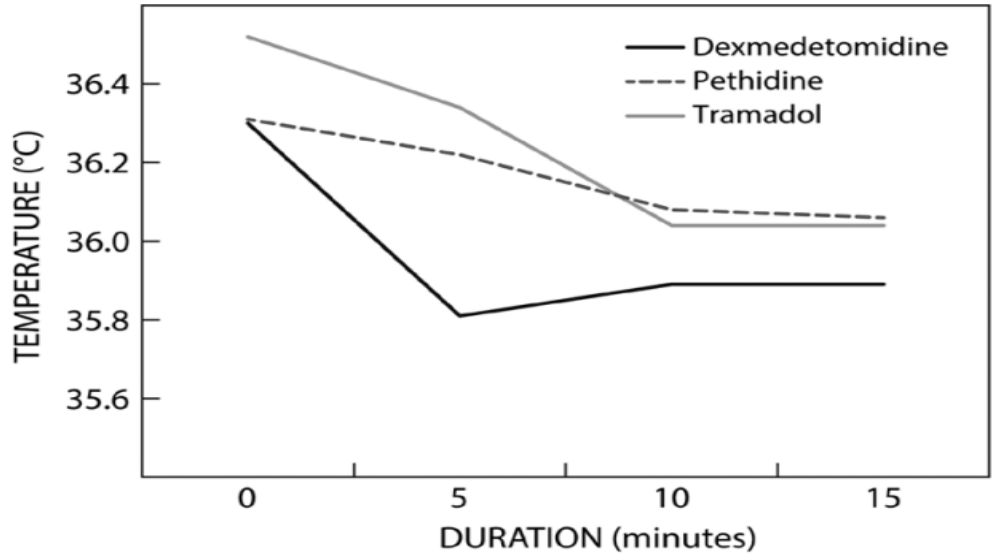
- Study drugs were given IV over 3–5 minutes at the onset of shivering (time 0).
- Body temperature measured using digital ear thermometer at baseline and 5, 10, 15 minutes post-treatment.
- Ambient temperature controlled at 20 ± 1 °C, relative humidity 60%.
- Vital signs including blood pressure, heart rate, and oxygen saturation were continuously monitored.
- Side effects such as pruritus, hypotension (>20% drop in systolic BP), bradycardia (<45 bpm), nausea, vomiting, and dizziness were recorded.
- Sedation was assessed using Modified Ramsay Sedation Score.
- Efficacy defined as cessation of shivering within 30 minutes. Subjective patient assessments ("no improvement," "partial improvement," "marked improvement") were noted

RESULTS

In this study involving 90 patients with moderate to severe shivering (scores 3 and 4) following neuraxial anesthesia, all three drugs — dexmedetomidine (Group A), pethidine (Group B), and tramadol (Group C) — effectively reduced shivering intensity within 30 minutes of intravenous administration.

- Cessation of Shivering: The majority of patients in Groups A, B, and C experienced complete cessation of shivering within 15 minutes of drug administration.
- Hemodynamic Parameters: Dexmedetomidine was associated with a modest but statistically significant reduction in heart rate and blood pressure compared to baseline ($p < 0.05$), consistent with its sympatholytic effect. Pethidine and tramadol groups showed minimal changes.
- Side Effects: Pethidine group had a higher incidence of nausea and vomiting (approximately 13%), while tramadol was associated with dizziness in about 10% of cases. Dexmedetomidine showed mild sedation in some patients (Modified Ramsay Sedation Score 2-3) but no respiratory depression.
- Patient and Anesthesiologist Assessment: Subjective evaluation revealed "marked improvement" in most patients, with dexmedetomidine scoring slightly higher in overall comfort due to sedation and rapid effect.





	Group		
	Dexmedetomidine (n = 20)	Pethidine (n = 20)	Tramadol (n = 20)
Response rate	20 (100)**	17 (85)	11 (55)**
Time elapsed from treatment to cessation of shivering (minutes)	7.3 ± 3.8 (n = 11)	6.2 ± 2.3 (n = 17)	5.9 ± 2.1 (n = 20)
Patient-assessed treatment efficacy			
No improvement	0 (0)	2 (10)	5 (25)
Partial improvement	0 (0)	1 (5)	4 (20)
Marked improvement	20 (100)	17 (85)	11 (55)

*: Values are expressed as mean ± standard deviation, number (n) and percentage in parenthesis
**: $p < 0.05$

	Group			
Side-effects	Dexmedetomidine (n = 20)	Pethidine (n = 20)	Tramadol (n = 20)	p-value
Hypotension	5 (25)	0 (0)	2 (10)	< 0.05
Bradycardia	4 (20)	0 (0)	0 (0)	< 0.05
Nausea and vomiting	0 (0)	0 (0)	1 (5)	> 0.05

*: Values are expressed in number and percentage in parenthesis

DISCUSSION

Post-neuraxial anesthesia shivering is a common clinical challenge with implications for patient comfort and perioperative safety. Our results confirm that dexmedetomidine, pethidine, and tramadol are effective treatment options, consistent with previous literature.

- Dexmedetomidine: Its alpha-2 agonist properties provide efficient anti-shivering effects with added sedation and sympatholysis, which may benefit patients prone to hypertension or tachycardia but requires monitoring for bradycardia and hypotension.
- Pethidine: Traditionally considered the drug of choice for shivering due to its combined opioid and anti-shivering action; however, it carries risks of nausea, vomiting, and respiratory depression, limiting its use in some populations.
- Tramadol: Offers a dual mechanism (opioid and serotonergic) with less respiratory depression but may cause dizziness and nausea.

The differences in side effect profiles should guide personalized treatment decisions, considering patient comorbidities and surgical context. The standardized use of digital ear thermometry and controlled ambient conditions enhanced result reliability.

CONCLUSION

Dexmedetomidine, pethidine, and tramadol effectively reduce shivering following neuraxial anesthesia. Dexmedetomidine presents a favorable profile with sedative benefits and stable hemodynamics but requires cardiovascular monitoring. Pethidine and tramadol remain viable alternatives depending on patient tolerance and side effect risk. Our findings support the individualized choice of anti-shivering agents to improve patient comfort and perioperative outcomes.

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