Section: Anaesthesiology

Original Research Article

A CLINICAL COMPARATIVE STUDY BETWEEN INTRA VENOUS DEXMEDETOMIDINE AND TRAMADOL FOR CONTROL OF POST SPINAL ANAESTHESIA SHIVERING IN CAESAREAN SECTION

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ABSTRACT

Background: Shivering is a frequent and distressing complication following spinal anaesthesia during caesarean section, significantly impacting maternal comfort, increasing oxygen consumption, and causing hemodynamic fluctuations. This study aimed to compare the efficacy and safety of intravenous Dexmedetomidine and Tramadol in controlling post-spinal anaesthesia shivering in parturients. **Materials and Methods:** A total of 60 patients scheduled for elective lower segment caesarean section under spinal anaesthesia were randomly allocated into two groups. Group D received intravenous Dexmedetomidine (0.5 µg/kg), and Group T received intravenous Tramadol (0.5 mg/kg) at the onset of shivering. The outcomes assessed included incidence and grade of shivering, time to cessation, hemodynamic changes, and side effects. **Results:** The results showed that 66.7% of patients in the Dexmedetomidine group achieved complete control of shivering (Grade 0) compared to 36.7% in the Tramadol group. The time taken for cessation of shivering was significantly shorter with Dexmedetomidine (4.23 ± 1.18 minutes) than with Tramadol (6.56 ± 1.09 minutes). Additionally, adverse effects such as nausea and vomiting were more common in the Tramadol group, whereas Dexmedetomidine showed minimal but manageable bradycardia and hypotension. **Conclusion:** It is concluded that intravenous Dexmedetomidine is more effective and better tolerated than Tramadol for the management of post-spinal shivering in caesarean section patients, providing faster relief and greater maternal comfort with fewer complications.

INTRODUCTION

Shivering is a well-documented and often distressing complication observed after spinal anaesthesia, particularly during caesarean section deliveries. It is characterized by involuntary, oscillatory muscular activity that not only causes patient discomfort but also increases oxygen consumption, carbon dioxide production, and catecholamine release, which may pose additional risk to both mother and fetus.[1] The incidence of shivering following spinal anaesthesia has been reported to range between 40–70%, making it a significant concern in obstetric anesthesia practice.[2]

Spinal anaesthesia-induced shivering occurs due to various factors such as redistribution of body heat from core to peripheral compartments, inhibition of thermoregulatory vasoconstriction, and sympathetic blockade leading to vasodilation.[3] Although shivering is not life-threatening, it may interfere with monitoring, wound healing, and maternal bonding immediately after birth.[4]

Several pharmacologic agents have been studied for their anti-shivering efficacy, including clonidine, meperidine, ketamine, magnesium sulfate, tramadol, and dexmedetomidine.[5] Among these, Tramadol, a centrally acting synthetic opioid with dual mechanism—mu-opioid receptor agonism and inhibition of serotonin/norepinephrine reuptake—has been shown to effectively reduce shivering with mild side effects such as nausea and vomiting.[6]

Dexmedetomidine, a highly selective alpha-2 adrenergic agonist, has emerged as a promising alternative due to its sedative, anxiolytic, and thermoregulatory properties. It acts by reducing the shivering threshold and modulating the central thermoregulatory control without causing respiratory depression—a desirable trait in obstetric patients.[7]

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Studies have indicated that dexmedetomidine may offer superior control over post-spinal shivering with minimal side effects and better maternal satisfaction.[8]

Furthermore, understanding the impact of these agents on maternal haemodynamics, sedation levels, neonatal outcomes, and overall maternal experience is critical in selecting the ideal drug for obstetric settings. A growing body of evidence suggests that dexmedetomidine, owing to its hemodynamic stability and minimal respiratory depression, could be a safer choice compared to tramadol, especially in high-risk patients.[9]

Given the evolving preferences for maternal comfort, safety, and rapid recovery post-delivery, this study seeks to compare the efficacy and safety of intravenous dexmedetomidine and tramadol in controlling post-spinal anaesthesia shivering in women undergoing caesarean sections.[10] The results aim to provide clearer clinical guidance and enhance maternal care in anaesthesia practice.

MATERIALS AND METHODS

This prospective, randomized, comparative clinical study will be conducted on a total of 60 female patients undergoing elective lower segment caesarean section (LSCS) under spinal anaesthesia. After obtaining informed consent, patients will be randomly allocated into two equal groups of 30 each. Group D will receive intravenous Inj. Dexmedetomidine at a dose of 0.5 µg/kg, while Group T will receive intravenous Inj. Tramadol at a dose of 0.5 µg/kg. The respective drugs will be administered at the onset of shivering during the intraoperative period.

Inclusion criteria for the study include female patients aged between 18 and 40 years, classified under the American Society of Anesthesiologists (ASA) physical status I, II, or III. Eligible patients must have a baseline body temperature between 97°F to 99°F, weight ranging from 50 to 70 kg, and height between 150 to 170 cm. Patient approval and informed consent are mandatory for inclusion.

Patients will be excluded from the study if they have contraindications for spinal anaesthesia, a known history of psychiatric illness, or any renal or hepatic dysfunction. Additional exclusion criteria include the presence of hypo- or hypertension, thyroid disorders (either hypo- or hyperthyroidism), body temperatures outside the range of 97°F to 99°F, weight exceeding 70 kg or below 50 kg, height less than 150 cm or more than 170 cm, and any known allergy to the study drugs.

All patients will undergo thorough pre-anaesthetic evaluation, including detailed history, general physical examination (assessing build, nourishment, presence of clubbing, cyanosis, lymphadenopathy, edema, and jugular venous pressure), and systemic examination covering the respiratory system, cardiovascular system, skin, spine, and oral cavity. Vitals including temperature, pulse rate, respiratory rate, systolic and diastolic blood pressure, and oxygen saturation (SpO_2) will be recorded. Routine investigations such as complete blood count (CBC), renal function tests (RFT), liver function tests (LFT), and random blood sugar (RBS) will be performed.

A 20G intravenous cannula will be secured, and intravenous Ringer lactate will be initiated for preloading. Premedication will include intravenous Ondansetron 0.08 mg/kg and Glycopyrrolate 0.004 mg/kg administered slowly.

Spinal anaesthesia will be administered using 2 ml of 0.5% hyperbaric Bupivacaine at the L3-L4 intervertebral space with a 25G Quincke spinal needle, in the left lateral position, following strict aseptic precautions. Patients will be turned to the supine position immediately following the injection, which will be considered the starting time (time 'zero').

Intraoperative monitoring will include continuous assessment and charting of vital parameters, such as temperature, pulse rate, respiratory rate, systolic and diastolic blood pressure, and oxygen saturation, to observe haemodynamic stability and detect any complications.

RESULTS

Table 1 shows the age distribution of patients enrolled in the study, divided into two groups: Group D (Dexmedetomidine) and Group T (Tramadol). The majority of participants in both groups were in the age range of 23–27 years, comprising the largest cohort (26 patients), followed by those aged 28–32 years. Very few patients were in the older age brackets of 33–40 years, showing that the study population predominantly consisted of young parturients.

Table 2 presents the distribution of shivering grades following administration of the study drugs. Grade 0, indicating complete absence of shivering, was observed in 20 patients of Group D and only 11 patients in Group T, suggesting superior efficacy of Dexmedetomidine in completely abolishing shivering. Higher grades (Grade 2 and Grade 3) were more frequent in the Tramadol group, indicating a less effective control over shivering intensity.

Table 3 summarizes the mean onset time of shivering after spinal anaesthesia. The mean onset time was comparable between the two groups—6.83 ± 1.21 minutes for Dexmedetomidine and 6.91 ± 1.15 minutes for Tramadol—suggesting no significant difference in the initial appearance of shivering post-anaesthesia.

Table 4 describes the time taken for shivering to cease after administration of the study drugs. The Dexmedetomidine group showed a significantly faster cessation of shivering (mean 4.23 ± 1.18 minutes) compared to the Tramadol group (mean 6.56 ± 1.09 minutes), highlighting a more rapid action of Dexmedetomidine in terminating the shivering response.

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Table 5 outlines the incidence of side effects in both groups. While Dexmedetomidine was associated with a few cases of bradycardia and hypotension, the Tramadol group reported a higher incidence of nausea and vomiting. Overall, the total number of adverse effects was notably higher in the Tramadol group (11) compared to the Dexmedetomidine group (5), emphasizing better tolerability of Dexmedetomidine in the parturient population.

Table 1: Age Distribution of Patients

Age Group (Years)	Group D (Dexmedetomidine)	Group T (Tramadol)	Total
18–22	6	5	11
23–27	14	12	26
28–32	7	9	16
33–37	2	3	5
38–40	1	1	2
Total	**30**	**30**	**60**

Table 2: Distribution of Shivering Grades After Drug Administration

Shivering Grade	Group D (Dexmedetomidine)	Group T (Tramadol)	Total
Grade 0	20	11	31
Grade 1	5	8	13
Grade 2	3	7	10
Grade 3	2	4	6
Total	**30**	**30**	**60**

Table 3: Onset of Shivering (Minutes)

Onset Time (min)	Group D (Dexmedetomidine)	Group T (Tramadol)
Mean ± SD	6.83 ± 1.21	6.91 ± 1.15

Table 4: Time Taken for Shivering to Cease (Minutes)

Time (min)	Group D (Dexmedetomidine)	Group T (Tramadol)
Mean ± SD	4.23 ± 1.18	6.56 ± 1.09

Table 5: Incidence of Side Effects

Side Effect	Group D (Dexmedetomidine)	Group T (Tramadol)
Nausea	0	6
Vomiting	0	4
Bradycardia	3	1
Hypotension	2	0
Total Cases	5	11

DISCUSSION

Post-spinal anaesthesia shivering remains a significant concern in obstetric anaesthesia, not only due to maternal discomfort but also because of increased oxygen consumption, altered hemodynamics, and interference with monitoring. In this clinical comparative study of 60 parturients undergoing caesarean section under spinal anaesthesia, intravenous Dexmedetomidine and Tramadol were evaluated for their efficacy in controlling shivering, along with their effects on hemodynamic parameters and side effects.

The findings demonstrated that Dexmedetomidine provided superior control over shivering intensity and incidence. Grade 0 shivering was observed in 66.7% of patients in Group D, while only 36.7% achieved this in Group T, supporting previous evidence suggesting the strong anti-shivering properties of alpha-2 agonists.[11] This may be attributed to Dexmedetomidine's central thermoregulatory modulation, especially its action on the hypothalamus and dorsal horn neurons, which lower the shivering threshold without causing respiratory depression.[12]

Moreover, the mean time to cessation of shivering was significantly shorter in the Dexmedetomidine group (4.23 ± 1.18 minutes) compared to the Tramadol group (6.56 ± 1.09 minutes), which aligns with other studies showing the rapid onset of Dexmedetomidine's central sedative and anti-shivering action.[13] Although both drugs had similar onset times for the appearance of shivering, the faster response in Dexmedetomidine-treated patients enhances its clinical desirability for prompt control.

Side effect profiles also favored Dexmedetomidine. While minor bradycardia and hypotension were observed in Group D, these were manageable and less distressing than the higher rates of nausea and vomiting in the Tramadol group. This affirms the growing body of literature suggesting Dexmedetomidine has a safer and more comfortable profile in obstetric patients [14]. Maternal comfort and minimal sedation, along with fewer gastrointestinal side effects, are especially important in conscious parturients undergoing caesarean delivery.

Furthermore, Dexmedetomidine's hemodynamic stability, coupled with its anxiolytic and mild sedative properties, offers added advantages during neuraxial anaesthesia. In contrast, while Tramadol is

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effective, its dual action on opioid receptors and monoamine reuptake pathways often leads to emetogenic side effects and less predictable outcomes.[15]

CONCLUSION

This study concludes that intravenous Dexmedetomidine at 0.5 µg/kg is more effective than intravenous Tramadol in controlling post-spinal anaesthesia shivering in parturients undergoing caesarean section. Dexmedetomidine exhibited a faster cessation of shivering, reduced incidence and intensity, better tolerability, and fewer adverse effects. Hence, Dexmedetomidine may be considered a preferred agent in clinical practice for the effective and safe management of post-spinal shivering in obstetric anaesthesia.

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