

# Compare the Efficacy of Dexmedetomidine and Tramadol in Preventing Intraoperative Shivering in Patients Undergoing Elective Lower Abdominal Surgeries Under Subarachnoid Block

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## Abstract

**Background:** Shivering is an unpleasant and stressful symptom for the patient undergoing surgery. It occurs as a thermoregulatory response to hypothermia. Shivering obscures intraoperative monitoring. It can be detrimental to patients with low cardiorespiratory reserve as it increases oxygen demand, produces arterial hypoxemia and lactic acidosis.

**Aims:** To study and compare the effectiveness of dexmedetomidine and tramadol to prevent intraoperative shivering in patients undergoing lower abdominal surgeries under subarachnoid block.

**Materials and Methods:** A cross-sectional comparative study was conducted in Kilpauk Medical College Hospital and Royapettah Hospital in Department of Anaesthesiology in patients aged between 18 and 50 years belonging to the American Society of Anesthesiologists I and II undergoing elective surgical procedures under subarachnoid block. 80 patients were randomly divided into two groups ( $n = 40$ ) Group D (dexmedetomidine) and Group T (tramadol). The drugs were infused intravenously 10 min after subarachnoid block. The patients were monitored throughout the procedure.

**Results:** There was a significant reduction in the incidence of shivering in both tramadol and dexmedetomidine groups. Sedation profile was better with the dexmedetomidine when compared with tramadol.

**Conclusion:** Both the dexmedetomidine and tramadol were effective in the prevention of post-spinal shivering. Dexmedetomidine had better sedation profile without any respiratory depression and had fewer incidences of nausea and vomiting when compared to Tramadol. Thus, it can be used as a better alternate for shivering prophylaxis for patients undergoing surgeries under regional anesthesia.

**Key words:** Dexmedetomidine, Sedation, Shivering, Subarachnoid block, Tramadol

## INTRODUCTION

Shivering is a very unpleasant and physiologically stressful symptom for the patient undergoing surgery and it occurs in various frequencies as a thermoregulatory response to

hypothermia. Shivering obscures intraoperative monitoring like electrocardiogram,  $SPO_2$ , blood pressure and also increases the intraocular and intracranial pressures. It can be detrimental to patients with low cardiorespiratory reserve since it increases oxygen demand and consumption, produces arterial hypoxemia and lactic acidosis.<sup>1</sup> Some patients find the accompanying cold sensation to be worsened than the surgical pain. Complications of hypothermia and shivering include Ischemia, increased peripheral vascular resistance, increased myocardial oxygen consumption, increased basal metabolic rate, monitoring artifacts showing aberrant values, delayed drug metabolism, altered mental status, and cardiac arrhythmias.

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Various methods are available for the control of shivering during anesthesia. Non-pharmacological methods like electrical heaters and radiant warmers are being used to maintain normothermia. However, this equipment may not be practical in all settings. Drugs such as pethidine (meperidine), tramadol, clonidine, nefopam, and ketamine have been used to prevent/treat shivering during spinal anesthesia.<sup>2</sup> Many drugs have been found effective in controlling shivering but most of them produced significant adverse effects such as nausea, vomiting, and respiratory depression. This study was aimed at finding an alternate drug for control of shivering. Dexmedetomidine (highly selective alpha 2 agonists) is a new drug approved for sedation of critically ill or injured patients in intensive care unit. It produces sedation, anxiolysis, hypnosis, analgesia, sympatholytic and has anti-shivering properties. Since it has lesser side effects than other anti-shivering agents, this study was conducted to elucidate the efficacy of dexmedetomidine in the prevention of shivering.<sup>3</sup>

### Aim

To study and compare the effectiveness of dexmedetomidine and tramadol in the prevention of intraoperative shivering in patients undergoing lower abdominal surgeries under subarachnoid block (SAB).

## MATERIALS AND METHODS

A cross-sectional comparative study was conducted in Kilpauk Medical College Hospital and Royapettah Hospital in Department of Anaesthesiology. Institutional Ethics Committee approval and written informed consent were obtained. 80 patients, aged from 18 to 60 years, were assessed under the American Society of Anesthesiologists (ASA) physical status I and II scheduled for elective lower abdominal surgical surgeries under SAB will be enrolled in the study. Inclusion criteria were patients undergoing elective lower abdominal surgeries under SAB, age group between 18 and 60 years belonging to ASA I and II. Exclusion criteria were patient refusal, ASA III and IV, pregnant women, patients who are known to be allergic to study drugs, Raynaud's syndrome, cardiopulmonary, liver diseases, renal diseases and initial body temperature <36.0 and >37.5. Patients were randomly allotted to two groups. The patients were assessed preoperatively by clinical examination and kept nil per oral for 8 h duration. Antacid prophylaxis was given before shifting the patient to theater. The operating room temperature was maintained at 23-25°C (measured by a wall thermometer). The Boyles machine was checked; emergency intubation cart and emergency drugs were kept ready. The patients were shifted to the operation theater, monitors with PR, NIBP, SPO<sub>2</sub>; temperature (esophageal) was connected.

Intravenous (IV) access was secured with 18-gauge cannula and patients were preloaded with ringer lactate at 10 ml/kg over 15 min before performing spinal anesthesia. Under strict aseptic precautions, the patient in right lateral position subarachnoid block instituted at L3-L4 interspaces using a 25-gauge Quincke spinal needle and 3.5 ml of hyperbaric bupivacaine was injected intrathecally. IV fluids administered to the patients were kept at room temperature and without inline warming. All patients will be covered with one layer of surgical drapes over the chest, thighs, and calves during the operation. No other warming device will be used. A core temperature below 36°C will be considered hypothermia. The patients will be randomly allotted to one of the two groups using a random list. Group D will receive dexmedetomidine ( $n = 40$ ) and Group T will receive tramadol ( $n = 40$ ), 10 min after intrathecal injection, either one of the drugs was infused intravenously. Group D, IV bolus of dexmedetomidine 0.5 mcg/kg in 100 ml normal saline over a period of 10 min. Group T, 1 mg/kg tramadol in 100 ml normal saline intravenously. All the patients received supplemental oxygen via face mask during surgery. Patients were monitored throughout the procedure and postoperatively for 24 h.

- Motor block is assessed using a modified Bromage scale
- Sensory block is assessed by the pinprick test
- Shivering is graded on a scale similar to that validated by Tsai and Chu<sup>4</sup>
- Sedation score will be assessed using Ramsay Sedation Scale.<sup>5</sup>

Patient's heart rate, blood pressure, oxygen saturation, and temperature were recorded and incidence of severity of shivering every 5 min until the end of surgery. If the patient's heart rate falls 20% <baseline injection atropine IV hypotension <20% baseline was treated with injection ephedrine IV and IV fluid bolus. Nausea and vomiting were treated with injection ondansetron 0.1 mg/kg IV was administered. Patients who developed shivering during the study period were excluded from the study.

### Statistical Analysis

Descriptive statistics was done for all data and was reported in terms of mean values and percentages. Continuous variables were analyzed with the unpaired *t*-test. Categorical variables were analyzed with Fisher's exact test. Statistical significance was taken as  $P < 0.05$ . The data were analyzed using SPSS version 16.

## RESULTS

The majority of the tramadol group patients had mean heart rate ranging from 84.28 to 74.45 between baseline

and 110 min intraoperatively. Similarly, majority of the dexmedetomidine group patients had mean heart rate ranging from 82.63 to 74.00 between baseline and 110 min intraoperatively. The association between the intervention groups and mean heart rate is considered to be not statistically significant since  $P > 0.05$  as per two-tail unpaired  $t$ -test (Table 1).

The majority of the tramadol group patients had a mean arterial pressure ranging from 70.70 mm Hg to 76.88 mm Hg between baseline and 110 min intraoperatively. Similarly, majority of the dexmedetomidine group patients had mean arterial pressure ranging from 72.08 mm Hg to 84.48 mmHg between baseline and 110 min intraoperatively. The association between the intervention groups and mean arterial pressure is considered to be not statistically significant since  $P > 0.05$  as per two-tail unpaired  $t$ -test (Table 2).

The majority of the tramadol group patients had mean temperature ranging from 36.12°C and 35.90°C between baseline and 110 min intraoperatively. Similarly, majority of the dexmedetomidine group patients had mean temperature ranging from 35.89°C to 36.09°C between baseline and 110 min intraoperatively. The association between the intervention groups and mean temperature is considered to be not statistically significant since  $P > 0.05$  as per two-tail unpaired  $t$ -test (Table 3).

The majority of the tramadol group patients had mean shivering grade ranging from 0.00 to 0.05 between baseline and 65 min intraoperatively. Similarly, majority of the dexmedetomidine group patients had mean shivering grade ranging from 0.00 to 0.05 between baseline and 65 min intraoperatively. The association between the intervention groups and mean shivering is considered to be not statistically significant since  $P > 0.05$  as per two-tail unpaired  $t$ -test (Table 4).

The association between the intervention groups and mean sedation score is considered to be statistically significant from 20 to 100 min since  $P < 0.05$  as per unpaired  $t$ -test. In patients belonging to tramadol intervention group, the mean sedation score is decreased to an average of 1.84 points in comparison with patients belonging to dexmedetomidine intervention group in whom the mean sedation score is an average of 2.67 points. This indicates that there is a true difference among intervention groups, and the difference is significant with a  $P$ -value of 0.0000 according to unpaired  $t$ -test. In this study, no patient from tramadol group had bradycardia but three patients from dexmedetomidine group had a fall in heart rate of  $<60$  beats/min. The  $P = 0.067$  that is not statistically significant (Table 5).

**Table 1: Comparison of heart rate of both groups**

Time (minutes)	Group T		Group D		P value
	Number	Mean±SD	Number	Mean±SD	
Baseline	40	84.28±6.71	40	82.63±5.66	0.238
5	40	84.95±8.92	40	88.23±8.49	0.097
10	40	85.63±9.92	40	92.23±8.48	0.112
15	40	84.85±10.85	40	86.85±12.4	0.445
20	40	84.95±11.21	40	82.8±12.85	0.428
25	40	82.38±10.98	40	81.43±10.35	0.692
30	40	79.65±10.34	40	78.85±8.92	0.712
35	40	77.73±8.92	40	77.33±30	0.833
40	40	77.6±8.21	40	75.98±6.91	0.341
45	40	76.65±6.92	40	75.7±6.51	0.529
50	40	74.88±7.2	40	74.45±6.41	0.781
55	40	82.63±5.66	40	84.95±8.92	0.169
60	40	88.58±8.68	40	85.33±10.74	0.141
65	40	93.38±8.83	40	84.85±10.85	0.332
70	40	89.25±8.31	40	84.95±11.21	0.245
75	40	84.28±10.22	40	82.38±10.98	0.426
80	40	81.43±9.02	40	79.65±10.34	0.416
85	40	78.85±8.92	40	77.73±8.92	0.574
90	40	77.33±7.92	40	77.6±8.21	0.879
95	40	75.98±6.91	40	76.65±6.92	0.664
100	40	75.7±6.51	40	74.88±7.2	0.592
110	40	74.45±6.41	40	74±10.34	0.149

SD: Standard deviation

**Table 2: Comparison of mean arterial pressure of both groups**

Time (minutes)	Group T		Group D		P value
	Number	Mean±SD	Number	Mean±SD	
Baseline	40	78.4±6.32	40	84.48±8.98	0.132
5	40	74±5.5	40	74.13±5.14	0.917
10	40	71.5±6.66	40	73.08±4.55	0.221
15	40	70.7±6.46	40	71.6±5.49	0.504
20	40	71.78±5.78	40	71.48±6.1	0.822
25	40	73.28±6	40	73.13±6.27	0.913
35	40	71.73±5.42	40	72.08±5.99	0.785
35	40	71.38±6.33	40	71.35±6.17	0.986
40	40	73.75±5.78	40	73.88±5.29	0.920
45	40	74.4±5.57	40	74.28±5.67	0.921
50	40	76.88±5.81	40	77.25±5.51	0.768
55	40	74.63±6.77	40	75.65±6.26	0.484
60	40	74±5.5	40	74.1±5.21	0.934
65	40	72.95±6.12	40	73.3±4.6	0.773
70	40	72±5.18	40	72.08±5.29	0.949
75	40	71.63±5.56	40	72.23±5.5	0.629
80	40	72.73±5.93	40	73.2±6.02	0.723
85	40	71.48±5.54	40	72.58±4.83	0.347
90	40	71.38±6.33	40	71.43±5.92	0.971
95	40	73.75±5.78	40	74.18±5.29	0.732
100	40	74.4±5.57	40	74.93±5.42	0.670
110	40	74.63±6.77	40	74.3±5.56	0.057

SD: Standard deviation

## DISCUSSION

Shivering continues to be a common problem faced by the anesthesiologist during intra- and post-operative periods following spinal anesthesia. Unfortunately, there is no gold standard drug or definitive strategy drawn in the

**Table 3: Comparison of temperature of both groups**

Time (minutes)	Group T		Group D		P value
	Number	Mean±SD	Number	Mean±SD	
Baseline	40	36.12±0.22	40	36.09±0.21	0.533
10	40	35.92±0.18	40	35.91±0.16	0.844
20	40	35.9±0.15	40	35.89±0.14	0.876
30	40	35.96±0.14	40	35.96±0.14	0.874
40	40	35.99±0.13	40	35.98±0.12	0.717
50	40	36.02±0.15	40	36.01±0.14	0.819
60	40	36.04±0.14	40	36.03±0.14	0.752
70	40	36.03±0.14	40	36.02±0.14	0.634
80	40	36.03±0.14	40	36.02±0.14	0.634
90	40	36.02±0.13	40	36.01±0.12	0.928
100	40	36.03±0.15	40	36.02±0.14	0.763
110	40	36.09±0.2	40	36.09±0.21	0.912

SD: Standard deviation

**Table 4: Comparison of shivering grade of both groups**

Time (minutes)	Group T		Group D		P value
	N	Mean±SD	N	Mean±SD	
5	40	0±0	40	0±0	NA
10	40	0±0	40	0±0	NA
15	40	0±0	40	0±0	NA
20	40	0.05±0.32	40	0±0	0.324
25	40	0.15±0.66	39	0.08±0.48	0.576
30	40	0.25±0.78	40	0.13±0.56	0.413
35	40	0.2±0.72	40	0.18±0.64	0.870
40	40	0.18±0.64	40	0.15±0.66	0.864
45	40	0.2±0.72	40	0.13±0.56	0.606
50	40	0.13±0.56	40	0±0	0.168
55	40	0.1±0.44	40	0±0	0.160
60	40	0.05±0.32	40	0±0	0.324
65	40	0.05±0.32	40	0.05±0.32	1.000
70	40	0±0	40	0±0	NA
75	40	0±0	40	0±0	NA
80	40	0±0	40	0±0	NA
85	40	0±0	40	0±0	NA
90	40	0±0	40	0±0	NA
95	40	0±0	40	0±0	NA
100	40	0±0	40	0±0	NA
110	40	0±0	40	0±0	NA

SD: Standard deviation, NA: Not available

management of this commonly encountered problem. Multiple neurotransmitter pathways have been found to involve in shivering and most of the drugs such as opioids (pethidine and tramadol), doxapram, ketanserin, propofol, ketamine, clonidine, and nefopam used acts on these pathways to control shivering. However, adverse effects such as hypotension, sedation, respiratory depression, nausea, and vomiting limit their use. Hence, this study was undertaken to study and compare the effectiveness of dexmedetomidine and tramadol in the prevention of intraoperative shivering in patients undergoing elective lower abdominal surgeries under spinal anesthesia. Furthermore, in this study, we compared the side effect profile of these drugs. Few studies have attempted to

**Table 5: Comparison of sedation score of both groups**

Time (minutes)	Group T		Group D		P value
	Number	Mean±SD	Number	Mean±SD	
Pre-operatively	40	0±0	40	0±0	NA
10	40	2±0	40	2±0	NA
20	40	2±0	40	2.98±0.16	<0.0001
30	40	2±0	40	2.98±0.16	<0.0001
40	40	2.03±0.16	40	3±0	<0.0001
50	40	2.03±0.16	40	3±0	<0.0001
60	40	2.05±0.22	40	2.98±0.16	<0.0001
70	40	2.05±0.22	40	2.93±0.27	<0.0001
80	40	2.08±0.27	40	2.93±0.27	<0.0001
90	40	2.08±0.27	40	2.95±0.22	<0.0001
100	40	2.08±0.27	40	2.95±0.22	<0.0001
110	40	2.05±0.22	40	2.15±0.36	0.140

SD: Standard deviation, NA: Not available

study the correlation between heart rate, mean arterial pressure, temperature, shivering grade, respiratory rate, oxygen saturation and side effect profile of tramadol, normal saline, and other drugs with dexmedetomidine. Usta *et al.*<sup>6</sup> conducted the study to evaluate the effect of dexmedetomidine on shivering in patients undergoing minor surgical procedures under spinal anesthesia with hyperbaric bupivacaine. In that 60 patients (ASA 1 and 2, aged 18-50 years) were equally divided into two Groups C and D. In that Group D received dexmedetomidine and the Group C received normal saline as placebo. He concluded that dexmedetomidine infusion in the perioperative period significantly reduced the incidence of shivering in patients undergoing minor procedures under spinal anesthesia without any significant adverse effects during the perioperative period.

Fern and Misiran<sup>7</sup> in their study demonstrated that all the three drugs dexmedetomidine, pethidine, and tramadol were effective in treating post-neuraxial anesthesia shivering. Dexmedetomidine appears to be a more effective than pethidine and tramadol (100% vs. 85% vs. 55%, respectively). However, the only significant difference statistically was demonstrated only between dexmedetomidine and tramadol and not between other drugs in reducing post-neuraxial anesthesia shivering. In our study, out of 80 patients 3 patients in dexmedetomidine group and 4 patients in tramadol group developed shivering grade ranging from 2 to 3 which was not statistically significant. In our study, sedation scores in dexmedetomidine group were significantly higher than the baseline values and values in tramadol group which were statistically significant. Most of the patients in dexmedetomidine group achieved the sedation score of 3 and in tramadol group achieved the score of 2. In the study by Bozgeyik *et al.*<sup>8</sup> showed average sedation score of 3 in dexmedetomidine group which was statistically significant



when compared to average score 2 in tramadol group intraoperatively. This sedation score in dexmedetomidine group might have removed anxiety in patients. In our study heart rate, blood pressure, respiratory rate, oxygen saturation, and side effect profile were not statistically significant. This observation was confirmed by similar findings in the study by Iqbal *et al.*<sup>9</sup> stating no significant difference in these variables between the study drugs. Iqbal *et al.* in their study compared granisetron with meperidine.

## CONCLUSION

In our study, both the dexmedetomidine and tramadol were effective in the prevention of post spinal shivering. Dexmedetomidine had better sedation profile without any respiratory depression and had fewer incidences of nausea and vomiting when compared to tramadol. Hence, it can be used as a better alternate for shivering prophylaxis in patients undergoing surgeries under regional anesthesia.

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