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Comparison of Intravenous Dexmedetomidine and Tramadol for Management of Post-Spinal Anesthesia Shivering in Obstetric Cases

Shais Talat, Saqib Islam, Abdul Hameed Bhatti, Khalid Mehmood, Adam Talat, Najaf Imtiaz

ABSTRACT

Objective: The objective of this study is to compare the efficacy of dexmedetomidine and tramadol in controlling post-spinal anesthesia shivering in female patients after cesarean section.

Study Design and Setting: Quasi-experimental Study. Anesthesia Department of Combined Military Hospital, Thal from October 2022-March 2023.

Methodology: This study was conducted in ASA I and II patients aged 18-45. Sixty patients were enrolled for the study, who were divided into two group, group D received Inj dexmedetomidine (0.5mcg/kg) while group T received Inj Tramadol (0.5mg/kg). Time from injection of drug to cessation of shivering was recorded. End point of study was 30 mins after entry of patient in Post Anesthesia Care Unit (PACU).

Results: The study found that both drugs were effective in preventing shivering, but dexmedetomidine had a faster onset of action and a longer duration of action than tramadol. Mean time of cessation of shivering in both groups was calculated. In group D mean time of cessation was 2.9 ±0.9 while in group T it was 3.75 ±0.9. P-value was found to be highly significant 0.001.

Conclusion: The study concludes that dexmedetomidine is a more effective and safer alternative to tramadol for management of shivering in patients undergoing lower segment cesarean section under spinal anesthesia.

Key Words: Dexmedetomidine, shivering, tramadol

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INTRODUCTION:

Shivering is a common complication of intrathecal block.

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Incidence of shivering postoperatively as reported in literature is about 50-60%.[1] Shivering is distressing for the patient and leads to anxiety, pain increased oxygen consumption, increased intraocular and intragastric pressure and produce artifacts during monitoring.[2] As advancements in medical practices continue to evolve, the management of shivering in postoperative patients, particularly those undergoing cesarean sections, remains a pertinent challenge. The physical and psychological ramifications of shivering extend to both the immediate well-being of the patient and their overall postoperative experience. Understanding the multifactorial nature of shivering and exploring innovative solutions is essential to improve patient outcomes.

Different theories have been proposed to explain the mechanisms underlying shivering. Pain, loss of heat, postoperative increased sympathetic tone and release of pyrogens have been described in literature.[2] Regional anesthesia is associated with greater heat loss than general anesthesia resulting in increased postoperative shivering as reported by Koay et al.[3] Reason for this include cold crystalloid infusion, vasodilation and loss of shivering in area of block.

Different methods are used for prevention and treatment of shivering. Non-pharmacological methods include warming blankets, forced air warmers and use of warm crystalloids

infusion. Common pharmacological methods include pethidine, tramadol, ketamine, and clonidine.[4] Tramadol is an opioid agonist which works by inhibition of serotonin reuptake and norepinephrine in CNS. It is commonly used drug for control of post spinal anesthesia shivering. Tramadol is effective for control of shivering but at the same time it causes nausea and vomitingwhich is a cause of distress for mothers and hinders the early feeding and bonding with the neonate.[5]

Dexmedetomidine is a centrally acting alpha 2 receptor agonist and is gaining popularity and acceptance in ICU and OT setup because of its sedative and anxiolytic properties. It also decreases shivering threshold.[6] Dexmedetomidine has been evaluated as an agent for terminating shivering in several studies.[7] Mittal et al has found dexmedetomidine to be superior to tramadol with better hemodynamic stability and less side effects than tramadol in patients operated under spinal anesthesia.[8] Sedation, bradycardia and dry mouth are commonly reported side effects with it.

Most of the patient population in our setup consist of mothers coming for cesarean section and tramadol was commonly used but it was associated with frequent nausea and vomiting which caused much distress to mothers. The increasing prevalence of cesarean section deliveries in recent years further underscores the significance of this study. As this procedure becomes more commonplace, it is crucial to refine perioperative practices to ensure the well-being of both mothers and newborns. In an era where patient-centric care and personalized medicine are gaining prominence, tailoring our approach to postoperative shivering management is in line with the broader objective of optimizing healthcare outcomes. Consequently, our research strives to contribute to this paradigm shift by offering a novel perspective on shivering control, acknowledging the unique needs and challenges faced by mothers undergoing cesarean sections. By addressing shivering and its side effects in this specific patient population, we aim to enhance not only the physical recovery of the mother but also her ability to engage in the critical early moments of bonding and nurturing her newborn. We evaluated the effectiveness of dexmedetomidine and compared it with tramadol for preventing shivering in caesarean section patients. We assessed the time to cessation of shivering, compared adverse events, and evaluated hemodynamic stability. We have found a lack of research in this patient population regarding the use of dexmedetomidine as an anti-shivering agent. By doing so, we tried fill the gap in the literature and provide an alternative into the optimal treatment for shivering in this patient population.

METHODOLOGY:

This Quasi-experimental Study was conducted in tertiary care hospital setting of Combined Military Hospital Thal Operation theater after approval from independent local hospital ethical review committee via ERC No.04/09/22(38) from October 2022 to March 2023.

Sample size was calculated[9] considering expected difference between two group means of 150s with expected standard deviation of 180s. Power of test was set to 80% with level of significance of 5%. Sample size came out 23 in each group but we took 30 participants in each group to decrease bias and improve results.[9] Total sample size was 60.

ASA I and II patients between the ages of 18 and 45 who were scheduled for elective lower segment cesarean section under spinal anesthesia were enrolled in the study after being briefed and providing written informed consent. The study included patients who were hemodynamically stable with no known comorbidities.

Patients coming for emergency surgery, those with pyrexia, history of allergy to dexmedetomidine or opioids, hypovolemia, premedication, heart blocks, or bradycardia were excluded from study.

Patients who developed shivering during or 30 minutes after the cesarean section were uniformly divided into two groups by non-probability consecutive sampling to receive either intravenous dexmedetomidine (0.5mcg/kg) diluted to 1mcg/ml (Group D) or intravenous tramadol (0.5mg/kg) diluted to 1mg/ml (Group T). The primary outcome which was observed was time from the injection of the drug to cessation of shivering. If shivering recurred after initial cessation, a second dose of the allocated drug was administered. The study endpoint was 30 minutes after entry of the patient in the post anesthesia recovery unit.

Operation theater was warmed to a temperature of 24°C before patient was brought in and was maintained throughout the operation. Standard ASA monitoring was applied including pulse oximeter, non-invasive BP, ECG, and temperature probe. All patients were given infusion of warm Ringer lactate solution (22-24°C) 10ml/kg with an 18G IV cannula. The medications and anesthetics administered to the patients were not heated and there were no additional methods used to warm the patients. Furthermore, the patients did not receive any premedication. Spinal Anesthesia was given to all patients with 25G or 27G Quincke Spinal needle in L3-L4 or L2-L3 interspace in sitting position and Inj Bupivacaine 0.5%, 12-15mg was injected in subarachnoid space. Sensory level of anesthesia was confirmed using alcohol-soaked gauzes using Bromage scale (0 = block not present, 1 = only hip blocked, 2 = both hip and knee blocked, 3=all three hip, knee and ankle blocked).[10] All operations were performed by consultant gynecologist. Vitals of patients were monitored and charted every 5 mins intraoperatively. Temperature of the patient was recorded with probe applied to axilla. Oxygen was given with simple face mask throughout the surgery. OT nurse designated to the case monitored the patient for development of shivering intraoperatively and postoperatively in PACU.

Wrench classification[11] of shivering was used which divides shivering into five grades: Grade 0, which means no shivering was observed; Grade 1, which indicates that there was no visible muscle activity but the patient had cyanosis or piloerection; Grade 2, which means only one muscle had activity; Grade 3, which means that more than one muscle had activity; and Grade 4, which means that the whole body had muscle activity.[11] Patients who experienced Grade 3 or Grade 4 muscle activity were considered in the analysis, as subjective method was used to evaluate shivering.

Patients with shivering were given either of the two drugs slow IV by attending anesthesiologist and the time shivering started and ended were noted. Total time of the operation, duration of spinal anesthesia, occurrence of unpleasant experiences like nausea, vomiting, heart rate of less than 50 beats per minute, decrease in MAP of more than 15% from baseline, and dizziness were documented.

The data, recorded on proforma was transferred to SPSS 25.0 (version for windows) for statistical analysis. Descriptive statistics were used to summarize the data, with qualitative data expressed as percentages and frequency and quantitative data expressed as mean ± standard deviation. T-test was used to analyze the variations in continuous variables between the two groups, while the chi-square test was utilized to examine the differences in categorical variables. Statistical significance was considered at p = 0.05.

RESULTS:

Total 60 patients were included in the study, 30 in each group which met the inclusion criteria. Groups were comparable according to their ages.

In Group D; Mean Age was 30.33 ± 9.1 years (minimum was 19 and maximum was 42 years). 70% cases had Grade 2 shivering, 10% cases had Grade 3 shivering, and 20% cases had Grade 4 shivering. Table-1. Mean time of cessation of shivering was 2.9 ± 0.9 (minimum was 1.5 minutes and maximum were 4.5 minutes). Table-2

In Group T; Mean Age 32.5 ± 6.8 years (minimum was 19 and Maximum was 42 years). 33.3% cases had Grade 2 shivering, 30% cases had Grade 3 shivering, and 36.7% cases had Grade 4 shivering. Table-1. Mean time of cessation of shivering was 3.7 ± 0.9 (minimum was 2.5 minutes and maximum were 5.5 minutes). Table-2 Second episode of shivering was observed in 33.3% cases in group receiving tramadol while in dexmedetomidine group it was observed to be 16.7%. However, the difference was not found to be statistically significant. Table-3

Stratification of cessation time of shivering with regards to age groups was done. P–value in Group-D was 0.29 and in Group-T was 0.32. Comparison of means of Age in both groups was done and p-value was found to be 0.29. Comparison of means of cessation time of shivering in both groups was done and p-value was found to be highly significant (0.0004). Table-2

Table 1: Distribution of grade of shivering in study cases (n = 60)

Grades of shivering	Group D (n=30)	
	Frequency	**Percentage**
02	21	70
03	03	10
04	06	20
Total	30	100
Grades of shivering	Group T (n=30)	
	Frequency	**Percentage**
02	10	33.3
03	09	30
04	11	36.7
Total	30	100

Table 2: Time of cessation of shivering in study cases (n=60)

	Group D (n=30)	**Group T** (n=30)	**p-value**
Mean	2.9	3.75	0.001
SD	0.9	0.9	

Table 3 : Distribution of second episode of shivering in study cases (n=60)

Second episode of shivering	Group D (n=30)		**p-value**
	Frequency	**Percentage**	
Yes	05	16.7	**0.136**
No	25	83.3	
Total	30	100	
Second episode of shivering	Group D (n=30)		**p-value**
	Frequency	**Percentage**	
Yes	10	33.3	**0.136**
No	20	66.7	
Total	30	100	

DISCUSSSION:

Experiencing shivering during surgery under regional anesthesia can be an uncomfortable and distressing ordeal for the patient. Shivering can be attributed to various factors, such as disruptions in central thermoregulation, vasodilation leading to internal heat redistribution, and heat loss to the surrounding environment.[12] Shivering is not only uncomfortable for the patient but it also causes many of the adverse outcomes like increase oxygen consumption, increase heart rate, increase CO2 production and increase lactic acid production.

Mechanism of post-operative shivering is not proven yet but multiple theories exist which fixes the cause on heat loss to environment, problem with central thermoregulation and heat redistribution.[13] Risk factors identified for shivering include age, temperature of environment, temperature of drugs and block level.[14]

Tramadol is an agent which is used most commonly for

shivering.[15] It is an opioid which acts on ì receptor with some activity on kappa and delta receptors. The mechanism by which tramadol ends shivering is via its opioid or noradrenergic activity. It is associated with multiple side effects including nausea and vomiting which is cause of distress in obstetric population.[16,17]

Dexmedetomidine is alpha 2 receptor agonist which is used as antihypertensive, analgesic, sedative and anti-shivering agent.[18,19] Dexmedetomidine can terminate shivering via inhibition of alpha 2 mediated adenyl cyclase in CNS and causing vasoconstriction. Moreover it can regulate hypothalamic regulatory activity.[20] Dexmedetomidine acts centrally and decrease the vasoconstriction and threshold for shivering comparatively.[21] Dexmedetomidine is gaining popularity in ICUs and OT and is being used for sedation of patients on ventilatory support, procedural sedation and as an adjunct to local anesthetics. Our study primarily focuses on patients undergoing cesarean section under spinal anesthesia as incidence of shivering in this population is almost 67.5%.[22] Mittal et al has reported a success rate of 100% with dexmedetomidine when used as an anti-shivering drug.[8] These results depict the success of dexmedetomidine as a superior anti shivering agent in different patients group. However, there was a gap with little evidence available for use of intravenous dexmedetomidine in healthy obstetric population which this study aims to fill.

We found that intravenous dexmedetomidine in a dose of 0.5 mcg/kg is a superior anti shivering agent as compared to tramadol with no effects on hemodynamic status and significantly less side effects.

Hypotension, sedation and bradycardia are the side effects reported in literature with dexmedetomidine however with the dose of 0.5 mcg/kg no such side effects were observed.[23] In our study 30 patients who received dexmedetomidine did not develop hypotension with MAP less than 60mmhg requiring vasopressors, bradycardia was observed after administration, but heart rate did not go below 50 beats per minute. Recurrence of shivering after one dose of tramadol was found to be 33.3% in tramadol group as compared to 16.7 in dexmedetomidine group but it was not found to be statistically significant and further studies with a large sample size is needed to prove this relationship.

Authors Contribution:
Shais Talat: reviewed all the cases for inclusion, data collection, statistical analysis, drafted this article
Saqib Islam: conceptualized and supervised the study, reviewed all the cases for inclusion, critically reviewed the manuscript
Abdul Hameed Bhatti: Data Collection
Khalid Mahmood: Data Collection
Adam Talat: Data Collection
Nafaz Imtiaz: Conceptualized and supervised that study.

REFERENCES:

1. Golmohammadi M, Karami N, Tahmasebi R. Incidence of Shivering During Cesarean Section in Patients under Spinal Anesthesia with or without Fentanyl. Studies in Medical Sciences. 2020;31(6):423-32.
2. Lopez MB. Postanaesthetic Shivering – from Pathophysiology to Prevention. Romanian Journal of Anaesthesia and Intensive Care. 2018;25(1):73-81 DOI: https://doi.org/10.21454 /rjaic.7518.251.xum.
3. Koay CK, Chan WY, Chin M-K. Shivering During Regional Anaesthesia and Its Control with Pethidine. Singapore medical journal. 1991;32 3:160-2.
4. Park SM, Mangat HS, Berger K, Rosengart AJ. Efficacy Spectrum of Antishivering Medications: Meta-Analysis of Randomized Controlled Trials. Crit Care Med. 2012;40(11): 3070-82 DOI: https://doi.org/10.1097/ CCM. 0b013e 31825b931e.
5. Ng KFJ, Tsui SL, Yang JC, Ho ET. Increased Nausea and Dizziness When Using Tramadol for Post-Operative Patient-Controlled Analgesia (Pca) Compared with Morphine after Intraoperative Loading with Morphine. European journal of anaesthesiology. 1998;15 5:565-70 DOI: https://doi.org/ 10.1046 /j.1365-2346.1998.00354.x.
6. Li Y-Z, Jiang Y, Lin H, Yang X-P. Subarachnoid and Epidural Dexmedetomidine for the Prevention of Post-Anesthetic Shivering: A Meta-Analysis and Systematic Review. Drug design, development and therapy. 2019:3785-98 DOI: https://doi.org/10.2147/DDDT.S204411.
7. Botros JM, Mahmoud AMS, Ragab SG, Ahmed MAA, Roushdy HMS, Yassin HM, et al. Comparative Study between Dexmedetomidine and Ondansteron for Prevention of Post Spinal Shivering. A Randomized Controlled Trial. BMC anesthesiology. 2018;18:1-8 DOI: https://doi.org/10.1186 /s12871-018-0640-3.
8. 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;58(3):257-62 DOI: https://doi.org/10.4103/0019-5049.135031.
9. Dhand N, Singh M. Sample Size Calculator for Comparing Two Independent Means.
10. Singh A, Gupta A, Datta PK, Pandey M. Intrathecal Levobupivacaine Versus Bupivacaine for Inguinal Hernia Surgery: A Randomized Controlled Trial. Korean Journal of Anesthesiology. 2018;71(3):220-5 DOI: https://doi.org/10.4097 /kja.d.18.27191.
11. Wrench IJ, Singh P, Dennis AR, Mahajan RP, Crossley AWA. The Minimum Effective Doses of Pethidine and Doxapram in the Treatment of Post-Anaesthetic Shivering. Anaesthesia. 1997;52(1):32-6 DOI: https://doi.org/10.1111/j.1365-2044.1997.006-az006.x.
12. Lopez MB. Postanaesthetic Shivering–from Pathophysiology to Prevention. Romanian journal of anaesthesia and intensive care. 2018;25(1):73.
13. De Witte J, Sessler Daniel I. Perioperative Shivering: Physiology and Pharmacology. Anesthesiology. 2002;96(2) :467-84 DOI: https://doi.org/10.1097/00000542-200202000-00036.

14. Wódarski B, Chutkowski R, Banasiewicz J, Moorthi K, Wójtowicz S, Malec-Milewska M, et al. Risk Factors for Shivering During Caesarean Section under Spinal Anaesthesia. A Prospective Observational Study. Acta Anaesthesiologica Scandinavica. 2020;64(1):112-6 DOI: https://doi.org/10.1111 /aas.13462.

15. Yaakop AF, Hassan MH, Omar SC, Mazlan MZ, Mukmin LA, W. Hassan WN. Tramadol Vs. Pethidine to Control Perioperative Shivering in Cesarean Section under Spinal Anesthesia: A Double-Blind Study. Anaesth Pain Intensive Care. 2022;26(3):283-90 DOI: https://doi.org/ 10.35975/ apic.v26i3.1893.

16. Reddy V, Chiruvella S. Clonidine Versus Tramadol for Post Spinal Shivering During Caesarean Section: A Randomized Double Blind Clinical Study. Journal of Obstetric Anaesthesia and Critical Care. 2011;1(1):26-9 DOI: https://doi.org/ 10.4103/ 2249-4472.84252.

17. Ng KF, Tsui SL, Yang JC, Ho ET. Increased Nausea and Dizziness When Using Tramadol for Post-Operative Patient-Controlled Analgesia (Pca) Compared with Morphine after Intraoperative Loading with Morphine. Eur J Anaesthesiol. 1998;15(5):565-70 DOI: https://doi.org/10.1046/j.1365-2346.1998.00354.x.

18. Salarian S, Taherkhanchi B, Dabbagh A, Darban M, Bagheri B. Dexmedetomidine Mechanism of Action: An Update. Journal of Cellular & Molecular Anesthesia. 2016;1(2):91-4 DOI: https://doi.org/10.22037/jcma.v1i2.11398.

19. Grewal A. Dexmedetomidine: New Avenues. J Anaesthesiol Clin Pharmacol. 2011;27(3):297-302 DOI: https://doi.org/10.4103 /0970-9185.83670.

20. Miao S, Shi M, Zou L, Wang G. Effect of Intrathecal Dexmedetomidine on Preventing Shivering in Cesarean Section after Spinal Anesthesia: A Meta-Analysis and Trial Sequential Analysis. Drug Design, Development and Therapy. 2018:3775-83.

21. Talke P, Tayefeh F, Sessler DI, Jeffrey R, Noursalehi M, Richardson C. Dexmedetomidine Does Not Alter the Sweating Threshold, but Comparably and Linearly Decreases the Vasoconstriction and Shivering Thresholds. Anesthesiology. 1997;87(4):835-41 DOI: https://doi.org/10.1097/00000542-199710000-00017.

22. Sachidananda R, Basavaraj K, Shaikh SI, Umesh G, Bhat T, Arpitha B. Comparison of Prophylactic Intravenous Magnesium Sulfate with Tramadol for Postspinal Shivering in Elective Cesarean Section: A Placebo Controlled Randomized Double-Blind Pilot Study. Anesth Essays Res. 2018;12(1):130-4 DOI: https://doi.org/10.4103 /aer. AER_ 196_17.

23. Reel B, Maani CV. Dexmedetomidine: StatPearls Publishing, Treasure Island (FL); 2022.