Journal of Biomedical and Pharmaceutical Research
Available Online at www.jbpr.in
CODEN: - JBPRAU (Source: - American Chemical Society)
NLM (National Library of Medicine): ID: (101671502)
Index Copernicus Value 2018: 88.52
Research Article
Volume 10, Issue 2: March-April : 2021, 63-68
ISSN (Online): 2279-0594
ISSN (Print): 2589-8752

A COMPARISON OF TRAMADOL AND DEXMEDETOMIDINE'S EFFECTIVENESS IN TREATING SHIVERING AFTER SPINAL ANESTHESIA

Dr. Amol Jatale
Assistant Professor Dept. of Anaesthesiology Datta Meghe Medical College, Nagpur.

Article Info: Received 18 February 2021; Accepted 25 March 2021
Corresponding author: Dr. Amol Jatale

Abstract

BACKGROUND: Shivering is preceded by hypothermia and vasoconstriction. Shivering is an involuntary muscle activity that increases baseline metabolic heat output by around 600%. Shivering may result from cooling the hypothalamic preoptic region. Because it improves the amount of core hypothermia that may be tolerated by boosting the cutaneous thermal input to the central thermoregulatory system, warming the skin can assist treat shivering during regional anesthesia. Shivering is brought on by cooling the hypothalamic preoptic region. Shivering is caused by efferent impulses that are received by the medial forebrain bundle. The posterior hypothalamus was thought to be the origin of a central descending shivering pathway in the past. Mild perioperative hypothermia doubles the risk of morbid cardiac events in individuals with coronary artery disease or those at high risk of getting the illness.

AIM: This study compared and assessed the two medications, tramadol and dexmedetomidine, for their ability to decrease shivering that occurs after spinal anesthesia.

MATERIAL AND METHOD: This study used a double blind, randomized design and was carried out in the department of anesthesia. Regarding their involvement in the study and the use of their data for the ongoing research project, all participants provided their informed written consent. Shivering occurred in 100 of the 150 patients that were involved in this trial. These 100 patients, who were in ASA PS I, II, and III and ranged in age from 19 to 68, were scheduled to receive spinal anesthetic from the hospital. The patients were randomly assigned to one of two groups consisting of fifty patients each, to receive an intravenous infusion via syringe pump of either tramadol 0.5 mg/kg or dexmedetomidine 0.5µg/kg. The intensity of the shivering, when it began, when it ended, if it recurred, and any adverse effects were recorded at predefined intervals.

RESULTS: Incidence of shivering among different surgical procedures. Out of 150 patients who initially recruited in the study, 20 were from orthopaedic surgery, 39 from general surgery, 80 from uro-surgery and 11 from gynaecological surgery. Among those patients 12 (5 Group A and 07 Group B) from orthopaedics, 37 (21 in Group, 16 in Group B) from general surgery, 42 (19 Group A, 23 Group B) from uro-surgery and 9 (4 in Group, 5 in Group B) from gynaecological surgical patients developed shivering.

CONCLUSION: Both dexmedetomidine (0.5µg/kg) and tramadol (0.5 mg/kg) are effective in treating post-spinal anaesthesia shivering; however, dexmedetomidine needed less time than tramadol to totally cease the shivering. Moreover, dexmedetomidine has less adverse effects, such as nausea and vomiting. The recurrence of shivering was also greatly reduced with dexmedetomidine in comparison to tramadol. To confirm that dexmedetomidine is a particularly effective anti-shivering drug, more research with varying dosages is needed.

KEYWORDS: Spinal Anesthesia, Tramadol, Shivering, Dexmedetomidine and Induced hypothermia

Introduction

Shivering is an involuntary, repetitive muscular contraction that raises body temperature through metabolism. The body's core temperature normally ranges from 36.5 to 37.0 °C, although it varies depending on the circadian cycle. Shivering is a typical thermoregulatory response to cold, yet non-thermoregulatory shivering can also occur. Hypothermia is the term used to describe a body temperature that is lower than 35°C (95°F). External influences, primary metabolic abnormalities, or therapeutic interventions may cause this syndrome. Secondary hypothermia leads to induced hypothermia. The body tries to produce more heat through metabolism when its core temperature drops, a process known as shivering.[1]

Vasodilatation is caused by sympathetic block in spinal and epidural anesthesia. It also causes the loss of thermo-regulatory vasoconstriction below the point of blockage. The core temperature falls as a result of heat loss. Shivering results from a drop in core body temperature, which is brought on by rapid fluid infusion, the cool operating room atmosphere, and the prolonged impairment of thermo-regulatory autonomic function while under anesthesia. One typical and disturbing side effect of neuraxial anesthesia is shivering. Additionally, shivering has been connected to pre-existing high-grade fever, blood transfusion reactions, and drug reactions. Shivering is most commonly caused by perioperative hypothermia, though.[2] Kolawole and Bolaji discovered that 8.18% of patients receiving subarachnoid blocks for lower leg and lower abdominal surgery had shivering.[1]

Patients who shiver consume more oxygen, increasing their risk of hypoxemia and perhaps delaying their discharge from the post-anesthesia care unit. Therefore, oxygen therapy is advised. Shivering during central neuraxial anesthesia can interfere with blood pressure, ECG, and pulse oximetry monitoring. Not only can it be an unpleasant experience that reduces patient satisfaction, but its adverse effects necessitate prompt intervention to avoid them. Shivering can be treated non-pharmacologically by using extra blankets and draperies. These have been shown to reduce the degree of shivering and are one of the primary therapeutic measures for the centers in Ilorin and Benin. Many drugs have been used in interventional therapy for shivering. Although it is more common under general anesthesia, shivering occurs in 40–60% of individuals under regional anesthesia, according to De Witte J et al.[3] Numerous pharmacological medications, such as pethidine, clonidine, magnesium sulfate, ketamine, nevefopam, amytryptyline, urapidil, dolasetron, and doxapram, have been investigated and contrasted in a number of trials. Bradycardia, hypotension, respiratory depression, and other side effects are possible with these drugs. Numerous studies have demonstrated the effectiveness of tramadol in alleviating shivering. Moreover, tramadol causes observable nausea and vomiting, although dexmedetomidine has very few adverse effects.[4,5]

Even though tramadol is a weak opioid, it is commonly available. It's a synthetic opioid analgesic. It uses two distinct mechanisms to work. suppression of binding to the ε type opioid receptor and the reuptake of norepinephrine and serotonin. Its analgesic effect is about one-tenth that of morphine. When taken in therapeutic doses, tramadol has no effect on blood pressure or heart rate, but it can have various side effects such as nausea, vomiting, disorientation, and analgesia. With 1600 times more selectivity for the α2 adrenoceptor than the α1 receptor, dexmedetomidine is a selective α2 adrenergic agonist. In addition to its anti-shivering effects, it induces hypnosis, analgesia, sympathy-lysis, drowsiness, and anxiolysis.[6] Thus, the goal of this research is to find out how shivering after spinal anesthesia is impacted by tramadol and dexmedetomidine.

MATERIAL AND METHODS

This study used a double blind, randomized design and was carried out in the department of

anesthesia. Regarding their involvement in the study and the use of their data for the ongoing research project, all participants provided their informed written consent. Shivering occurred in 100 of the 150 patients that were involved in this trial. These 100 patients, who were in ASA PS I, II, and III and ranged in age from 19 to 68, were scheduled to receive spinal anesthetic from the hospital. The patients were randomly assigned to one of two groups consisting of fifty patients each, to receive an intravenous infusion via syringe pump of either tramadol 0.5 mg/kg or dexmedetomidine 0.5µg/kg. The intensity of the shivering, when it began, when it ended, if it recurred, and any adverse effects were recorded at predefined intervals.

Inclusion Criteria

- ASA grade I or II or III
- Age 18 to 65 years
- Undergoing Spinal anesthesia
- Lower abdominal surgeries and lower limb general surgeries.

Exclusion Criteria

- known hypersensitivity or allergy to study drugs.
- Cardio-pulmonary, renal, or hepatic impairment.
- known history of substance or alcohol abuse
- blood transfusion during surgery hypo- or hyperthyroidism
- convulsions or psychiatric disorder
- patient refusal
- pregnancy and lactation

Methodology

Individuals who were willing to participate in our trial and were between the ages of 19 and 68 and were scheduled for lower limb general procedures and lower abdomen surgeries under spinal anesthesia were randomized to either the Inj. Dexmedetomidine or the Inj. Tramadol group.

- Dexmedetomidine injections come in 0.5 ml (50 µg) or 1 ml (100 µg) ampoules. To make 50 ml (4 µg/ml), 2 ml of the medication is put into a 50 ml syringe and diluted with regular saline. After clearing the air from the syringe, the other end is attached to a three-way cannula and the syringe is then connected to the IV extension line.
- Tramadol injections come in 1 ml (50 mg) or 2 ml (100 mg) ampoules. The medicine is put into a 50 ml syringe and diluted with regular saline to make a total volume of 50 ml (4 mg/ml). After clearing the air from the syringe, the other end is attached to a three-way cannula and the syringe is then connected to the IV extension line.

Procedure

The patient was transferred from the surgery ward to the preoperative ward, taking with him his medical record file. We took the patient's height, weight, and general health measurements. This is how the BMI was calculated. To measure the preoperative axillary temperature, a thermometer was utilized. An intravenous (IV) access was established in the pre-operative ward using an 18-G cannula and preloaded with fluid prior to the patient being sent to the operation room. The operating room was kept at a consistent 23–25°C temperature. The prepared research medication was placed into the syringe pump, which was then calibrated according to the patient's body weight. Every patient was covered by a single layer of surgical drapes that showed only the surgery site. During the surgery, room temperature IV fluids were used.

If the patient shivered after receiving a subarachnoid block, the prepared medicine infusion was begun immediately, and the duration and intensity of the shivering were tracked. A three-way adaptor was used by a blinded observer to give the study medicine in 50ml of NS over a five-minute period, in addition to IV fluid treatment at 1.5ml/kg/hr. Intraoperatively, blood pressure, heart rate, oxygen saturation, and ECG changes were monitored at 3-minute intervals for 30 minutes, then at 15-minute intervals. Other measurements

were taken at the beginning and end of the shivering, such as the axillary temperature. Along with the previously stated patient, this one was also routinely monitored and inquired about any discomfort or clinical signs. The drug infusion was stopped after five minutes, and the degree of shivering was noted using Crossley's grading method.

STATISTICAL ANALYSIS

The Statistical Package for the Social Sciences (SPSS) version 20.0 (IBM, Chicago, IL) was used to conduct the statistical analysis. When appropriate, data are provided as numbers or as mean ±SD. Utilizing the independent two-sample t-test, patient variables (age, weight, height, parity, and gestational age) were examined.

RESULT:

Table 1: Incidence of Shivering

Gender	Shivering(n)	Incidence (%)
Male	60	42.8
Female	40	41.7
Total	100	42.40

Table 1 showing the incidence of shivering in the hospital among different gender. We included 150 patients in our study, 93 were males and 57 were females. Out of 93 males 60 developed shivering and out of 57 females 40 developed shivering. Hence the incidence of shivering in our setup is 42.40%, it is 42.8% among males and 41.7% among females.

Table 2: Incidence of Shivering In Different Surgical Procedures

	Orthopedic Surgery	General Surgery	Uro-surgery	Gynecological Surgery	Total Cases
No of pts developedshivering **(Group A) [n]**	5	21	19	4	49
No of pts developedshivering **(Group B)[n]**	07	16	23	5	51
Total pts developed Shivering (**n**)	12	37	42	9	100
Total Patients (**n**)	20	39	80	11	150

Table 2 shows, incidence of shivering among different surgical procedures. Out of 150 patients who initially recruited in the study, 20 were from orthopedic surgery, 39 from general surgery, 80 from uro-surgery and 11 from gynecological surgery. Among those patients 12 (5 Group A and 07 Group B) from orthopedics, 37 (21 in Group, 16 in Group B) from general surgery, 42 (19 Group A, 23 Group B) from uro-surgery and 9 (4 in Group, 5 in Group B) from gynecological surgical patients developed shivering.

Table 3: Demographic Data

	GROUP A (Mean+ SD)	GROUP B (Mean+ SD)
AGE (years)	46.70±12.55	44.88±11.37
HEIGHT (m)	1.62±0.05	1.65±0.07
WEIGHT (kg)	60.37±7.92	61.85±9.16
BMI (kg/m^2)	22.33±3.12	23.64±3.76

Table 3 shows comparison of age, height, weight and BMI of the patient among the 2 groups. The mean age of the patients in Group A is 46.70±12.55 yrs. and in Group B is 44.88±11.37 yrs. The mean height of the patients in Group A and Group B are 1.62±0.05 & 1.65±0.07 meters respectively. The mean weight of patients in Group A was 60.37±7.92 kgs and in Group B

61.85±9.16 kgs. Mean BMI in Group A is 22.33±3.12 kg/m2 and in Group B is 23.64±3.76 kg/m^2. All of the above data are comparable in both groups.

DISCUSSION

The length of time it took for the shivering to end is measured from the beginning of the shivering to the Grade 0 shivering. Group A took 3.50±1.02 minutes and Group B took 5.02±1.40 minutes to stop shivering during our experiment. Shivering occurs far more quickly when dexmedetomidine is used to control it rather with tramadol. At higher grades, shivering needs to be managed with more time and medication.

Liu ZX et al.2015[7] conducted a meta-analysis with 0.5µg/kg of dexmedetomidine and compared it with a placebo group. The results showed that dexmedetomidine was more effective at reducing shivering than the placebo group. According to the findings, dexmedetomidine was superior to a placebo in terms of effectiveness, but it was not superior to other anti-shivering drugs. **Bansal et al.2011**[8] In our study recurrence of shivering was defined as progress ION of shivering to Grade 1 or more, 15 minutes after the initial shivering which was controlled with the study drug. Tramadol is observed to have a much higher frequency of shivering recurrence than dexmedetomidine (2 vs. 11), while the mean recurrence time for both medications is similar.

Niranjan Kumar Verma et al.2013[9] in his study used Tramadol 2mg/kg (maximum 100 mg) given IV slowly over two minutes in post spinal anti-shivering agent in comparison to Clonidine 0.5 mcg/kg diluted to 10 ml and Dexmedetomidine 0.5 mcg/kg diluted to 10 ml. According to their research, recurrence was zero when using Tramadol 2 mg/kg in contrast to Clonidine and Dexmedetomidine. **Joshi S S et al.2008**[10], in their study was given either 0.03 mg/kg of inj. butorphanol 1%, 0.06 mg/kg of inj. ondansetron or 1.0 mg/kg of inj. tramadol 1% IV. They came to the conclusion that there was no statistically significant variation in recurrence between the groups. This is in contrast to the findings made by **Maheswari et al.2018**[11], found a lower risk of recurrence with tramadol compared to butorphanol

Tanveer Singh Kundra et al.2017[1] in their study compared dexmedetomidine with tramadol for their efficacy on post spinal anesthesia shivering. One patient in the dexmedetomidine group had bradycardia during their investigation, but not in the tramadol group. However, the event was not statistically significant. Just after shivering stops, dexmedetomidine significantly lowers heart rate (HR), although it has no effect on the frequency of bradycardia (HR<60/min). When ingesting dexmedetomidine, the natural drop in heart rate that happens immediately after the shivering stops is due to the drug's capacity to activate α2 adrenoceptors in the central nervous system postsynaptically.

During the spinal anesthesia process, the patient reported the tympanic and nasopharyngeal temperatures to be unbearable and painful. Although rectal temperature measurement was feasible, it was not performed during lower abdomen surgery due to its difficulty. So we measured the temperature in the axilla. The patient's characteristics and the duration of the procedure may have impacted the temperature and rate of IV fluid, even if the volume infused was documented. This could have had an impact on the outcome. Furthermore, sympathetic blockade during spinal anesthesia or the study drug may have caused side effects such as bradycardia and hypotension. The lack of a fixed equipotent dose for the two study drugs is another disadvantage that was disregarded throughout the trial's design.

CONCLUSION:

Both dexmedetomidine (0.5µg/kg) and tramadol (0.5 mg/kg) are effective in treating post-spinal anesthetic shivering; however, dexmedetomidine needed less time than tramadol to completely cease the shivering. Moreover, dexmedetomidine has less adverse effects, such as nausea and vomiting. The recurrence of shivering was also greatly reduced with dexmedetomidine in comparison to tramadol. To confirm that dexmedetomidine is a particularly effective anti-shivering drug, more research with varying dosages is needed.

REFERENCES: -

1. Kundra TS, Kuthiala G, Shrivastava A, Kaur P. A comparative study on the efficacy of dexmedetomidine and tramadol on post-spinal anesthesia shivering. Saudi J Anaesth. 2017 Jan-Mar;11(1):2-8.
2. Crossley AW. Thermoregulation, mild perioperative hypothermia and postanesthetic shivering. Br J Anaesth 2000;84:615-28.
3. Crowley LJ, Buggy DJ. Shivering and neuraxial anesthesia. Reg Anesth Pain Med. 2008;33:241–52.
4. Blaine Easley R, Brady KM, Tobias JD. Dexmedetomidine for the treatment of postanesthesia shivering in children. *Paediatr Anaesth.* 2007;17:341–6.
5. Shukla U, Malhotra K, Prabhakar T. A comparative study of the effect of clonidine and tramadol on post spinal anaesthesia shivering. Indian J Anaesth 2011;55:242 6.
6. Maze M, Tranquilli W: Alpha-2 adrenoceptor agonists: Defining the role in clinical anaesthesia. Anesthesiology 1991;74:581-605.
7. Liu ZX, Xu FY, Liang X, et al. Efficacy of dexmedetomidine on postoperative shivering: a meta-analysis of clinical trials. Can J Anaesth. 2015;62(7):816-829.
8. Bansal P, Jain G. Control of shivering with clonidine, butorphanol, and tramadol under spinal anesthesia: A comparative study. Local Reg Anesth. 2011;4:29–34.
9. Varma NK,Kumar M, Comparison of Clonidine, Dexmedetomidine and Tramadol for Control of Post Spinal Shivering: A Randomized Double Blind Clinical Study; IJ LSSR;2016;2(6): 658- 664
10. Joshi SS, Arora A, George A, Shidhaye RV. Comparison of intravenous butorphanol, ondansetron and tramadol for shivering during regional anesthesia: A prospective randomized double-blind study. Anaesth Pain & Intensive Care 2013;17(1):33-39
11. Maheshwari BS, Shah SK, Chadha IA. Tramadol and butrophanol for control of shivering: Randomised double blind comparative study. J Anaesth Clin Pharmacol. 2008;24:343–6.