Original Article

Comparison of Ondansetron & Dexmedetomidine for Prevention of Post Spinal Shivering

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Abstract

Introduction: Spinal anesthesia is a big component of an anesthetist's toolset and is used commonly in anesthetic practices. A frequent problem following spinal anesthesia is shivering due to hypothermia. Its incidence is 0000-% if no prophylactic measures are taken. Hypothermia during an intraoperative period is caused by cold operating rooms, body cavity exposure, extremes of age, prolonged procedures, reduced metabolism, and direct inhibition by anesthetics.

Objective: To compare the efficacy of ondansetron and dexmedetomidine in preventing shivering under spinal anesthesia.

Setting: Armed Forces Institute of Urology.

Study Design: Randomized control trial.

Duration: 3 months.

Materials and Methods: The selected patients were randomly allocated using computer-generated methods into 02 groups containing 50 patients each according to study drug. Ondansetron group (0.1mg/kg) (Group O), and Dexmedetomidine group (1mcg/1kg) (Group D). shivering incidences were noted at selected time intervals and rescue doses of pethidine were administered as required.

Results: Our study shows that Group O had high mean shivering scores at 5, 30, and 4 minutes as compared to Group D.

Conclusion: Our study concludes that dexmedetomidine provides better control of shivering than ondansetron under spinal anesthesia.

Keywords: Dexmedetomidine, ondansetron, shivering, spinal anesthesia.

Introduction

Core body temperature less than 36-degree C is defined as hypothermia. Hypothermia during an intraoperative period is caused by cold operating rooms, body cavity exposure, extremes of age, prolonged procedures, reduced metabolism, and direct inhibition by anesthetics.[1] In normal unanaesthetized patients the hypothalamus maintains core body temperature within a narrow inter-threshold range. Anesthetic agents inhibit central thermoregulation by interfering with hypothalamic reflex responses. The hypothalamic inter-threshold range is increased by both general and regional anesthetics but the (background) mechanism is different for both of them. Intrathecal blocks cause hypothermia by the mechanism of vasodilatation and the internal distribution of heat. Unanesthetized dermatomes also send feedback of altered temperature to the hypothalamus.

Hypothermia leads to myocardial ischemia, arrhythmias, and increased peripheral vascular resistance. There is an altered drug metabolism, impaired mental and renal function with a potential of coagulopathy & impaired wound healing including increased incidence of surgical site infections.[2]

Shivering is the commonest complication of an intrathecal block with incidence ranging between 10-40% in different studies. Erroneous pulse oximeter & ECG recording are also noted. Shivering can occur due to hypothermia or neurological effects of anesthetic agents & Intrathecal block shivering may lead to increased oxygen consumption and cardiac output. The risk of myocardial ischemia is increased manifolds. Intraocular and intracranial pressures are raised as well.

Temperature can be monitored from the tympanic membrane, nasopharynx, esophagus, bladder, rectum, and skin.[3,4] Nasopharyngeal probes measure accurate body temperature if placed near nasopharyngeal mucosa. There is a small risk of epistaxis that can be avoided by careful insertion & lubrication. Perioperative hypothermia can be prevented by physical methods such as ambient operating room temperature, use of forced-air warming blankets, heated humidification of inspired gases, use of warm IV fluids & pharmacologic methods by administration of drugs like Meperidine, Tramadol, Clonidine, and Ketamine, etc. but their safety and efficacy remains unclear and inconsistent.[5]

Ondansetron is a 5-HT3 receptor antagonistic commonly used as an antiemetic. It has recently been used effectively for the prevention and treatment of shivering with a favorable safety profile.[6] Dexmedetomidine is a selection α2 agonist which causes dose-dependent sedation, anxiolysis, and analgesia without depressing respiratory drive. It is used for hypothermia prevention with promising results. In this study, we compared Ondansetron and Dexmedetomidine for the prevention of post-spinal shivering.[7,8]

Materials and Methods

It was a prospective (quasi-experimental) study. Local ethical committee approval was obtained from AFIU. Each participant was informed in detail about the study protocol and complete written informed consent was obtained before enrollment in the study. 100 patients of both genders, aged 18-60 years, ASA physical status I & II, undergoing elective urological procedures were included in this trial. Patients who were excluded were thyroid disorders, severe cardiopulmonary diseases pregnancy, uncooperative patients, patients requiring blood transfusion, and patients with severe hepatic and renal diseases. The selected patients were randomly allocated using computer-generated methods into 02 groups containing 50 patients each according to the study drug. Ondansetron group (0.1mg/kg) (Group O), and Dexmedetomidine group (1mcg/1kg) (Group D). Preoperatively demographic characteristics as age, sex, height, and weight were recorded. After admission to the OR, standard ASA monitoring was applied to all patients in form of pulse oximetry, ECG, and non-invasive blood pressure (NIBP). The temperature of OR was maintained between 24°C to 26°C. Before intrathecal block, each patient was preloaded with 15ml/kg of normal saline solution. The block was introduced at either L3/4 or L4/5 interspace with 2.5ml of 0.5% hyperbaric Bupivacaine (12.5mg) by an attending anesthesiologist. After completion of intrathecal blocks, the patient lay supine and oxygen was administered via a facemask (4L/min) till the end of the procedure. Nasopharyngeal temperature monitoring was done every 5 minutes for 45 minutes after intrathecal blocks. Intravenous fluids were kept at room temperature (24°C to 26°C). All the patients were covered with a standard single blanket. Just after the intrathecal injection, one of the study drugs was given slowly by IV route over five minutes. The study drugs were prepared, diluted to a volume of 5ml, and presented as coded syringes by an anesthetist. During and shortly after completion of surgical procedures;

the data of NIBP, heart rate, oxygen saturation, core body temperature & types of procedures were recorded.

The primary outcome was the incidence of shivering in the early 45 minutes after intrathecal block; as defined by a shivering score of 3 at any time of already defined assessment points (highest score). The shivering score was assessed at 5 minutes intervals for 45 minutes after intrathecal block and graded using a scale validated by Tsai and Chu.

Grade 0	*No shivering.*
Grade 1	Piloerection or peripheral vasoconstriction but no visible shivering.
Grade 2	Muscular activity in the only muscle group.
Grade 3	Muscular activity in more than one muscle group but no generalized.
Grade 4	Shivering involves the whole body.

If shivering of grade 3 continued beyond 15 minutes despite IV administration of study drugs and we needed to administer a rescue dose of pethidine 0.5mg/kg, then it was considered a significant side effect of the intrathecal block. The investigations who were involved in data collection and analysis were blinded to the allocation of groups and caregivers well unaware of administered IV study drugs nature.

Statistical Analysis:

Continuous parameters as age, weight, and height were presented as Mean +- SD. A P-value applying student t-test was used to find out the association between two variables. P-value <0.05 is considered significant. A Post-test chi-square test was applied. Confidence interval (CI) of 95%. Statistical analysis was performed using SPSS version 17.

Results

The study shows that the total number of participants was 100 with 50 in group O and 50 in group D respectively without exclusion of any participant. Patients included in this group were ASA Class l & ll. Mean and SD of age, weight, and height was calculated in both groups and was comparable. P-value was found to be <0.0000001, 0.0000071 & 0.00073 at 05, 40 and 45 minutes respectively. No reported case of prolonged shivering occurred requiring rescue drug Pethidine. Results are tabulated in Tables 1 & 2.

Table 1: incidence of shivering among groups

	Shivering	*GROUP D*	*Group O*	*p-Value*
5 MIN	Negative	44	13	<
	Positive	6	37	0.000001
40 MIN	Negative	31	9	0.0000071
	Positive	19	41	
45MIN	Negative	25	9	0.00073
	Positive	25	41	

Table 2: Shivering scores among groups

Shivering Score										
TIME	GROUP O					GROUP D				
	0	1	2	3	4	0	1	2	3	4
5 MIN	13	15	12	10	0	44	4	2	0	0
40 MIN	9	15	22	4	0	31	18	1	0	0
45 MIN	9	19	17	5	0	25	18	6	1	0

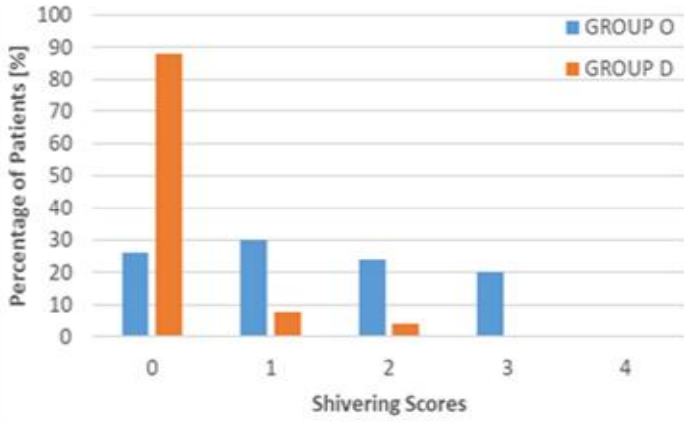

Figure 1: Scores after 5 MIN

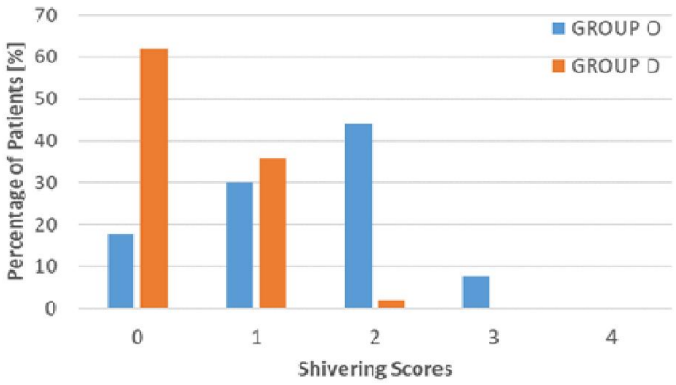

Figure 2: Scores after 40 MIN

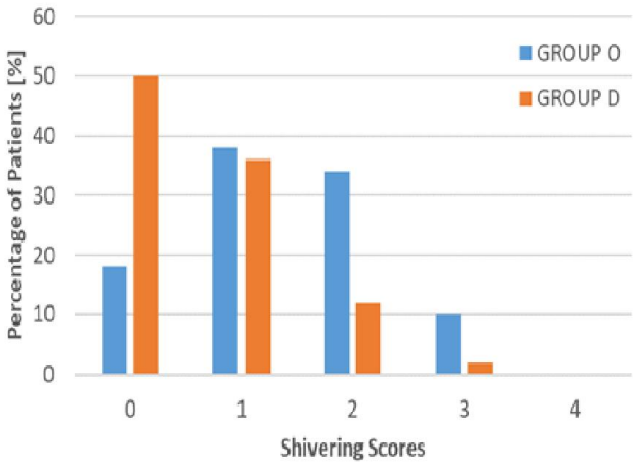

Figure 3: Scores after 45 MIN

Table 3:

Type of Surgery	*Group O*	*Group D*
CYSTO-TURBT	0	1
CYSTOLITHOLAPAXY	3	2
CYSTOSCOPY	4	4
DVIU	5	2
HYDROCELECTOMY	3	1
ORCHIDECTOMY	5	1
TURBT	4	8
TURP	4	10
URS	16	16
VERICOCELECTOMY	3	3
VESICOLITHOTOMY	0	2
PENILE ABCESS	1	0
TURED	2	0

Table 4:

	GROUP O			*Group D*		
	Male	Female	Total	Male	Female	Total
No. Of Patients	42	8	50	39	11	50
AGE (YEARS)	44.76 ± 13.35	36.75 ± 9.32	43.48 ± 13.05	49 ± 11.59	46.27 ± 12.67	48.4 ± 11.76
WEIGHT (KG)	66.05 ± 13.4	60.625 ± 8.53	65.18 ± 12.83	67.15 ± 10.23	58.18 ± 7.55	65.18 ± 10.34
HEIGHT (cm)	169.26 ± 9.04	159.625 ± 8.78	167.72 ± 9.6	168.59 ± 7.68	160.54 ± 6.33	166.82 ± 8.08

Discussion

After conducting this study, we have found the efficacy of prophylactic use of DEXMEDETOMIDINE & ONDANSETRON in reducing the incidence and severity of shivering that arises after intrathecal blocks. Side effects of both study drugs are very few and self-limiting; making them acceptable to most individuals. Ondansetron side effects are: headache & slight prolongation of QT interval on ECG. Dexmedetomidine side effects are: bradycardia, heart block, and hypotension.[9-11] Shivering during an intraoperative period can be caused by cold operating rooms & IV fluids, body cavity exposure, high flow of non-humidified gases, and prolonged procedures. Moreover, anesthetic agents, spinal and epidural anesthesia cause vasodilatation and vasoconstrictor reduced response to hypothermia. Although anesthetic agents alter the threshold for shivering; it is also caused by the body's effort to increase core body temperature & increase heat production. Though rarely shivering can be nonspecific neurologic signs during emergence and occasionally may be so intense leading to hyperthermia (38-39°C) and significant metabolic acidosis, which improve once shivering stops.

Rarely shivering is caused by sepsis, a drug reaction, or a transfusion reaction. Intense shivering increases oxygen consumption, CO_2 production, and cardiac output. Patients with preexisting cardiopulmonary diseases tolerate it very poorly.[12] Shivering can be prevented and managed by forced-air warming devices, heated humidified gases, warm IV fluids, warming lights, and increasing ambient OR temperatures. Ondansetron reduces the incidence of shivering especially in a dose of 0.1mg/Kg. Ejiro et al conducted a study comparing ONDANSETRON, TRAMADOL & placebo and found shivering 20%, 16.7%, and 53% in these groups respective by making it comparable to TRAMADOL in efficacy with minimal side effects.[13]

Mittal G compared Dexmedetomidine with Tramadol for post-spinal shivering time taken for cessation of shivering was significantly short.

A meta-analysis reviewing 8 RCT's found Ondansetron associated with a significant reduction of shivering when compared with placebo.[14] While no difference was seen between ondansetron and Pethidine. The mechanism by which ondansetron exhibits its anti-shivering effects is unclear but is proposed to be mediated by central inhibition of serotonin reuptake at the level of the anterior hypothalamic region. In a trial, Bajwa and colleagues

found significant effects of Dexmedetomidine as an anti-shivering agent. They found a 5% incidence of shivering as compared to 42.5% in the control group.[15] (23 Main. Megalla and colleagues[16] conducted a comparative study between Dexmedetomidine, Nalbuphine, and placebo. For effective control of shivering, Dexmedetomidine was 100% effective, 92% of patients in Nalbuphine and 32% in placebo. A lower dose of Dexmedetomidine (0.5mg/kg) is studied in this trial. (24 main)

Dexmedetomidine anti-shivering effects are exerted via α2 agonist action.[17] It may have some minor side effects like bradycardia, hypotension, and ones sedation.

No case of significant side effects of either drug was observed.

Conclusion

These results showed a significant difference in anti-shivering effects between dexmedetomidine and ondansetron regardless of considered effect modifiers e.g. age, weight, height, gender, etc.

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