

The Role of Dexmedetomidine and Pethidine in Controlling Intraoperative Shivering During Spinal Anesthesia

Simone Baker^{1D}, Zen Ki^{1D}, Scott Wills^{1D}

Department of Anesthesiology and Emergency Medicine, Grodno State Medical University, Grodno, Belarus, Europe.

Abstract

Background : Spinal anesthesia is a safe and widely used anesthetic procedure, practiced for both elective and emergency surgeries. The present study compares the efficacy of Dexmedetomidine and Pethidine to control intraoperative shivering during spinal anesthesia. **Subjects and Methods:** The study was conducted from January 2020 - July 2020 in a tertiary care centre including 60 patients aged between 20-60 years, belonging to ASA grade I/II, who developed grade 2-3 shivering following spinal anesthesia. These patients were randomized into two groups: Group I received a single intravenous bolus dose of 0.5 mcg/kg of Dexmedetomidine over 5 minutes and Group II received a single intravenous bolus dose of 0.5 mg/kg Pethidine over 5 minutes. Patients were monitored for drug failure, recurrence of shivering, and side effects. **Results:** Preoperative temperature in Group I and Group II was 37.1 degrees Celsius and 37.2 degrees Celsius, respectively. The temperature in both groups during shivering was 36.2 and 36.4 degrees Celsius in Group I and Group II, respectively. Preoperative heart rate in Group I and Group II was 84.2 beats/minute and 75.4 beats/minute, respectively. Heart rate in both groups during shivering was 83.6 and 73.5 beats/minute in Group I and Group II, respectively. Grade 3 shivering was observed in 14 patients of Group I and in 19 patients of Group II ($p < 0.05$). Sixteen and eleven patients in Group I and Group II, respectively were found to have Grade 4 shivering ($p < 0.05$). Five patients of Group I and four patients of Group II experience recurrent shivering ($P < 0.05$). Nausea was reported by 2 patients in Group I and 1 patient in Group II ($P < 0.05$). **Conclusion:** Dexmedetomidine has better intraoperative shivering control during spinal anesthesia.

Keywords: Dexmedetomidine, Pethidine, Spinal anesthesia

Corresponding Author: Simone Baker, Department of Anesthesiology and Emergency Medicine, Grodno State Medical University, Grodno, Belarus, Europe.

E-mail: simone.baker_grodno@yahoo.com

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Introduction

For the purpose of elective and emergency surgeries, spinal anesthesia has proved to be a safe anesthetic procedure. Shivering is a common post-anesthesia incidence which is defined as involuntary and repetitive skeletal muscle activity. It is a physiological response towards hypothermia to raise metabolic heat production.

Several studies have reported a high rate (40-50%) of intraoperative shivering during and after spinal anesthesia.^[1] Spinal anesthesia damages the thermoregulation system by inhibiting tonic vasoconstriction that plays an important role in the body's temperature regulation. It also redistributes the body heat from the core to the peripheral tissues. The above factors put a patient at the risk of hypothermia and shivering.^[2]

Intra and post-operative shivering are caused due to various reasons such as increased sympathetic tone, temperature loss, pyrogens' systemic release, and pain.^[3] This can often result

in a two-fold rise in oxygen utilization and a three-fold surge in carbon dioxide generation. It also elevates the intracranial and intraocular pressure, increases wound pain and causes a delay in healing, which ultimately results in deferred release from post-operative care. Therefore, shivering is a highly uncomfortable experience during anesthetic procedures, and its associated adverse effects need primary prevention along with emergent control on occurrence.^[4]

Several drugs such as Tramadol, Clonidine, Doxapram, Dexmedetomidine, Pethidine, Nefopam, Neostigmine, and Magnesium sulfate are often used to control intraoperative shivering during anesthesia.^[5] This study was conducted to compare the efficacy of Dexmedetomidine and Pethidine in controlling intraoperative shivering during spinal anesthesia.

Subjects and Methods

The study was conducted from January 2020 - July 2020 in a tertiary care centre including 60 patients between the age of 20-60 years, falling under ASA grade I and II, who developed grade 2-3 shivering following spinal anesthesia. These patients were randomized into two equal groups: 30 patients in Group I were administered a single intravenous bolus dose of 0.5 mcg/kg of Dexmedetomidine over 5 minutes, and 30 patients in Group II were administered a single intravenous bolus dose of 0.5 mg/kg Pethidine over 5 minutes. Informed consent was taken in writing from all patients and the study design was approved by the Institutional Ethical Committee.

The time between 'initial drug administration' and 'disappearance of shivering' was recorded in seconds. Patients were observed for drug failure, recurrence of shivering, and side effects at an interval of 5, 10, 20, and 30 minutes until the conclusion of surgery. Results were analyzed using SPSS and a P-value < 0.05 indicated a significant difference between the two study groups.

Results

[Table 1, Figure a & b] depict that preoperative temperature in Group I and Group II was 37.1 degrees Celsius and 37.2 degrees Celsius, respectively. The temperature in both groups during shivering was 36.2 and 36.4 degrees Celsius in Group I and Group II, respectively. Preoperative heart rate in Group I and Group II was 84.2 beats/minute and 75.4 beats/minute, respectively. Heart rate in both groups during shivering was 83.6 and 73.5 beats/minute in Group I and Group II, respectively. Grade 3 shivering was observed in 14 patients of Group I and in 19 patients of Group II ($p < 0.05$). Sixteen and eleven patients in Group I and Group II, respectively were found to have Grade 4 shivering ($p < 0.05$).

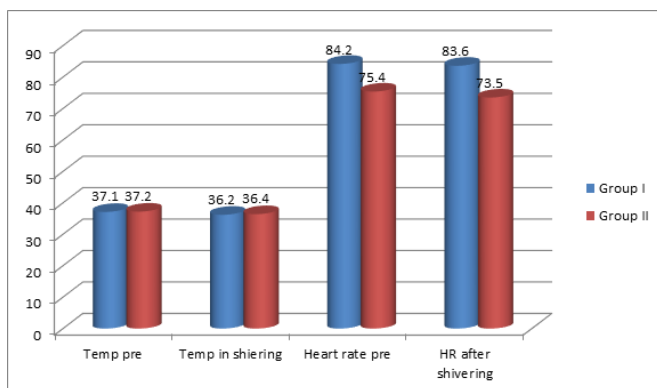


Figure 1: Comparison of variables

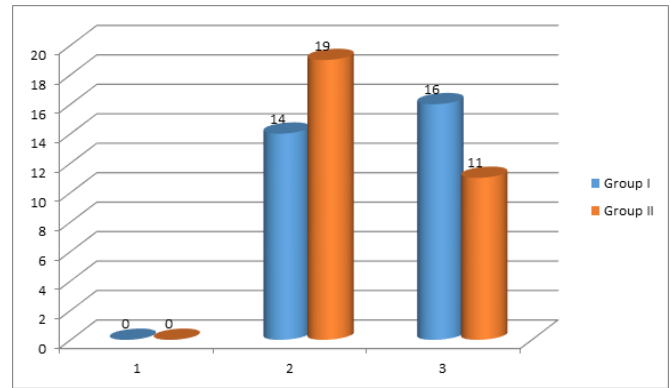


Figure 2: Comparison of variables

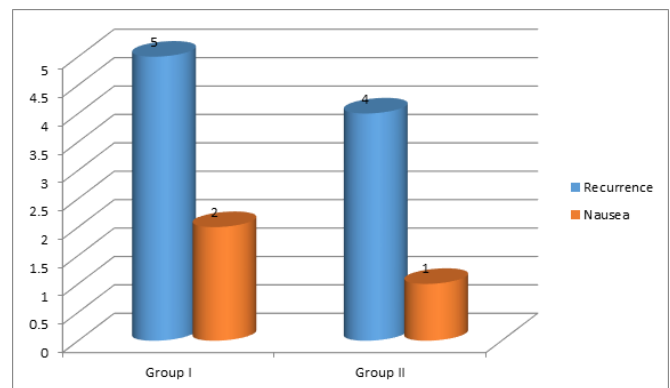


Figure 3: Postoperative complications

Five patients of Group I and four patients of Group II experience recurrent shivering ($P < 0.05$). Nausea was reported by 2 patients in Group I and 1 patient in Group II ($P < 0.05$).

Discussion

Spinal anesthesia is a safe and widely used anesthetic technique in different surgeries worldwide. It is a type of central neuraxial blockade, with epidural anesthesia being the other commonly used technique. The neurotransmitter pathways involved in the initiation of shivering include opioids, anticholinergic, α_2 adrenergic agonists, and serotonergic receptors. [6] Thus, drugs acting on these pathways (pethidine, clonidine tramadol, ondansetron) are often used to treat shivering. However, their side effects involve hypertension, hyper-tension, nausea, vomiting, sedation, and respiratory depression which limit their use to treat shivering. Recent studies on α_2 agonists showed that these drugs can effectively reduce shivering by binding to α_2 receptor and mediate vasoconstriction and anti-shivering effects. [7]

Table 1: Comparison of variables

Variables	Group I	Group II	P-value
Temperature			
Preoperative	37.1	37.2	0.98
During shivering	36.2	36.4	0.91
Heart rate			
Preoperative	84.2	75.4	0.05
After shivering	83.6	73.5	0.02
The disappearance of shivering (sec)	486.2	290.5	0.001
Grade of shivering			
1	0	0	0.04
2	14	19	
3	16	11	

Panneer et al performed a study including 60 participants (18-60 years, ASA grade I-II), undergoing lower limb orthopedic surgery under spinal anesthesia.^[8] In their study, one group received inj. Dexmedetomidine 0.5 µg/kg, and the other was administered inj. Clonidine 1 µg/kg at the onset of shivering. The patient demographics, ASA grade, temperature, duration of surgery, duration of anesthesia, onset and grade of shivering were found to be comparable between the two groups. However, Dexmedetomidine took significantly less time to control shivering and reduce its recurrence rate as compared to Clonidine. Also, patients administered Clonidine showed a significantly high incidence of hypotension and bradycardia.

Mohamed conducted a prospective, double-blinded, randomized controlled study involving 100 subjects, under ASA I and II, undergoing elective lower abdominal and lower limb surgeries, under spinal anesthesia.^[9] Patients in whom grade 3 or 4 (n=16) post-spinal shivering was observed, were randomly allocated into two: Group 1 was administered Dexmedetomidine 0.5 mcg/kg IV and Group 2 was administered Nefopam 0.15mg/kg IV. The study concluded that Nefopam shows better control of intraoperative shivering post-spinal anesthesia over Dexmedetomidine.

Mittal et al assessed the efficacy of injection dexmedetomidine 0.5 µg/kg and injection tramadol 0.5 mg/kg to control intraoperative shivering post-spinal anesthesia.^[10] They concluded that the former controlled shivering in lesser time (2.52 ± 0.44 compared to 2.23 ± 0.43 in our study) and with minimum side effects.

Conclusion

Dexmedetomidine showed better intraoperative shivering control during spinal anesthesia with less complications as compared to Pethidine.

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