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Original Research Article

Comparison of Evaluating Anti-Shivering effect of Magnesium Sulphate and Ondansetron during Spinal Anaesthesia

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Abstract:

Background: Spinal anaesthesia interferes with the body's ability to regulate temperature; sudden vasodilation caused by sympathetic blockade alters temperature perception, leading to a sensation of cold, this temperature decrease trigger shivering as a compensatory mechanism to maintain homeostasis.

Aim of the Work: To evaluate the effectiveness of ondansetron and magnesium sulphate as pharmacological interventions in preventing shivering associated with spinal anaesthesia in perioperative settings in Amaltas Institute of Medical Sciences Dewas.

Patients and Methods: A Single Centre, Hospital, Inpatient-based, Prospective Observational Study conducted on 90 ASA grade I and II patients, posted for surgeries undergoing spinal anesthesia in Amaltas Institute of Medical Science, Dewas, following approval from the Ethics Committee of the Amaltas Institute of Medical Science, Dewas.

Results: Ondansetron was significantly more effective than Magnesium Sulphate in preventing shivering during spinal anesthesia as 88.9% of patients receiving Ondansetron experienced no shivering, whereas only 62.2% of patients receiving Magnesium Sulphate had no shivering. Only 4.44% of patients in the Ondansetron group required rescue medication (Tramadol), compared to 17.8% in Magnesium Sulphate group. The mean time to rescue medication was significantly longer for Ondansetron (59.7 minutes) compared to Magnesium Sulphate (45.4 minutes). Both Ondansetron and Magnesium Sulphate were well-tolerated with minimal side effects.

Conclusion: Ondansetron is an effective drug in the prevention of shivering in patients undergoing spinal anesthesia.

Keywords: Ondansetron, Magnesium Sulphate, Anti-Shivering Agent, Spinal Anesthesia.

Introduction

Shivering is a common phenomenon observed during and after spinal anaesthesia, affecting a significant number of patients undergoing various surgical procedures [1]. Spinal anaesthesia stands as a cornerstone in modern anaesthesia practice due to its safety, efficacy, adaptability, and positive impact on patient outcomes [2,3]. Spinal anaesthesia is adaptable to different surgical settings, from major abdominal surgeries to orthopaedic procedures, obstetric interventions, and even outpatient surgeries [2,3]. Its versatility allows for adjustments in dosage and concentration, tailoring anaesthesia to individual patient needs and surgical requirements [4]. Spinal anaesthesia interferes with the body's ability to regulate temperature. The sudden vasodilation caused by sympathetic blockade alters temperature perception, leading to a sensation of cold, triggering shivering as the body attempts to generate heat [5].While shivering is often benign, it can have notable implications. Shivering can cause discomfort and anxiety for the patient, affecting their overall experience during and after surgery [1]. Pharmacological prevention of shivering associated with spinal anaesthesia involves the use of various medications targeting the body's thermoregulatory mechanisms. Meperidine, Clonidine, Tramadol, Ketamine, Dexmedetomidine, Ondansetron, and Magnesium Sulphate are among the drugs utilized, each with its benefits and considerations [6,7]. Careful selection, appropriate dosing, and a multimodal approach considering patient specific factors are essential in effectively preventing shivering and ensuring optimal perioperative outcomes. Evaluating the effectiveness of medications like ondansetron and magnesium sulphate aids in identifying the most efficient strategies to reduce shivering, ultimately enhancing patient comfort and satisfaction during the perioperative

period. Understanding their effectiveness also allows anaesthesiologists to tailor perioperative strategies, potentially reducing the need for additional interventions or management strategies. If proven effective, these drugs can be strategically incorporated into anaesthesia protocols, optimizing their use while minimizing waste of resources on less effective interventions.

Aim of the study: The purpose of this study was to compare the effectiveness of ondansetron and magnesium sulphate as pharmacological interventions in preventing shivering associated with spinal anaesthesia in perioperative settings.

Methodology

This study was Single Centre, Hospital, Inpatient-based, Prospective Observational Study conducted in Amaltas Institute of Medical Science, Dewas., following approval from the Ethics Committee of the Amaltas Institute of Medical Science, Dewas. Patient informed consent was obtained. Study spanned a period of 18 months. Convenience sampling was employed and Sample size of 90 participants (45 in each group), based on power analysis to ensure adequate statistical power to detect clinically significant differences between the groups were taken using following criteria

Inclusion Criteria includes Patients of age more than 18 years and less than 60 years, ASA class and class II admitted for surgeries requiring Spinal anaesthesia and patients who gave written informed consent to participate in the study.

Exclusion Criteria was Patients with co-morbid condition like uncontrolled diabetes mellitus, asthma, uncontrolled hypertension, cardiac disease, hematological disease, epilepsy etc. Patients allergic to Magnesium sulphate, Ondansetron and Patients belonging to ASA Class III and above.

The outcomes were measured using established scales for shivering assessment, and standardized questionnaires for patient-reported satisfaction.

Patients were randomly divided into two equal groups according to drugs administered to control shivering,

Group M received intravenous magnesium sulphate infusion 30 mg/kg in 100ml normal saline infusion over half an hour before spinal anaesthesia,

Group O: received intravenous ondansetron, 8 mg in 100 ml normal saline infusion prophylactically before subarachnoid block.

Demographic details, variables(medical history, baseline vital signs) at predetermined intervals: pre-anaesthesia baseline, immediately postanaesthesia, and at 5 minutes intervals up to 120 minutes post-anaesthesia to capture acute changes and recovery phases were recorded. Participants received either magnesium sulfate or ondansetron according to the study protocol. Shivering incidence and severity were assessed using standardized scales. Research personnel observed and record any shivering episodes or changes (if any) in patient comfort levels at specific time intervals. Recorded data were analyzed using the statistical software Stata 17.0. All statistical analyses were conducted in compliance with ethical guidelines; ensuring participant confidentiality and integrity of data.

Results

Demographic data of the two groups of patients showed no statistically significant differences as regard age, sex, BMI and ASA state ($P>0.05$) whereas incidence of shivering was significantly different between the Magnesium Sulphate and Ondansetron groups ($p=0.003$) as shown in the table 1. In study, the intensity and severity of shivering was measured using the Crossley and Mahajan grading [8], the patient ratio subjected to shivering and their grades distributed between the groups shows statistically significant differences ($p=0.031$).

In study, the need for rescue with Tramadol was significantly different between the Magnesium Sulphate and Ondansetron groups ($p=0.044$). Similarly the Ondansetron group required significantly less rescue medication with Tramadol compared to the Magnesium Sulphate group, further indicating the superior efficacy of Ondansetron in preventing shivering during spinal anesthesia.

The time (longer time to rescue indicates that patients in this group experienced a delayed onset of shivering) to rescue medication (Tramadol) was (45.4±5.96 v/s 59.7±6.5) significantly different between the Magnesium Sulphate and Ondansetron groups ($p<0.001$).

Highlighting the greater efficacy of Ondansetron in preventing shivering for a longer duration during spinal anesthesia. Both groups experienced minimal side effects overall. Nausea was slightly more common in the Magnesium Sulphate group, while the incidence of hypotension was comparable between the two groups.

There were no cases of vomiting or bradycardia in either group. The sedation scores of patients in the Magnesium Sulphate and Ondansetron groups were similar, with no significant differences observed.

Table 1: Demographic Profile and Shivering

Data	Magnesium Sulphate Group (n = 45)	Ondansetron Group (n = 45)	
Age (years) Range Mean±SD	 31-60 47.61±9.78	 31-60 48.12±11.12	 P-value = 0.971
Gender Male Female	 20(44.4%) 25(55.6%)	 22(48.9%) 23(51.1%)	 P-value = 0.673
ASA I II	 26(57.8%) 19(42.2%)	 21(46.7%) 24(53.3%)	 P-value =0.291
BMI Categories Normal Overweight Obese	 15(33.3%) 21 (46.7%) 9 (20%)	 15(33.3%) 22 (48.9%) 8 (17.8%)	 P-value = 0.961
Shivering Yes No	 28(62.2%) 17(37.8%)	 40(88.9%) 5(11.1%)	 P-value = 0.003

Table 2: Severity of Shivering (n=90)

Severity of Shivering	Group			
	Magnesium Sulphate (n = 45)		Ondansetron (n =45)	
	n	%	n	%
No Shivering	28	62.2	40	88.9
Grade 1	7	15.6	4	8.89
Grade 2	5	11.1	1	2.22
Grade 3	4	8.89	0	0
Grade 4	1	2.22	0	0
P-value = 0.031				

Table 3: Need for Rescue Medication (n=90)

Rescue with Tramadol	Group			
	Magnesium Sulphate (n = 45)		Ondansetron (n =45)	
	n	%	n	%
No	37	82.2	43	95.6
Yes	8	17.8	2	4.44
P-value = 0.044				

Table 4: Time for giving Rescue Medication (n=90)

	Group			
	Magnesium Sulphate (n = 45)		Ondansetron (n =45)	
	n	%	n	%
Time to Rescue	45.5	5.96	59.7	6.5
P-value < 0.001				

Discussion

Shivering is a common and distressing complication during and after spinal anesthesia, affecting approximately 40-60% of patients. Magnesium Sulphate and Ondansetron were chosen for comparison due to their distinct pharmacological properties and previously reported benefits in managing postoperative symptoms.

In this study, Ondansetron demonstrated superior efficacy in preventing shivering. The superior efficacy of Ondansetron can be attributed to its action on central thermoregulatory pathways through the inhibition of serotonin-mediated responses, which play a critical role in the modulation of body temperature. Also this study revealed a significant difference in the need for rescue medication (Tramadol) between the two groups. The findings of this study are in line with previous research, such as the study by Botros JM et al. [9] who reported that Ondansetron significantly reduced the incidence of shivering compared to placebo. Additionally, Zheng G et al. [10] demonstrated through a meta-analysis that Ondansetron was effective in reducing the incidence of post-anesthesia shivering. Our study reveal a significant difference in the time to rescue medication between the two groups, similar results were observed by Zheng G et al. [10]

and suggested that Ondansetron significantly reduced the incidence of post-anesthesia shivering and provided longer-lasting protection compared to placebo. Additionally, Botros JM et al. [9] reported similar findings in their randomized placebo-controlled. Zheng G et al. [10] observed Ondansetron to reduce the incidence of hypotension, aligns with our findings that Ondansetron is well-tolerated with minimal side effects.

Supporting our study, Kamel AAF et al. [11] in their comparative study found that magnesium sulphate was less effective compared to ketamine and lidocaine. Suggesting a consistent trend of Magnesium Sulphate being less potent in managing post-operative symptoms.

Nnacheta TE et al. [12] concluded that Ondansetron was superior to tramadol in preventing shivering under spinal anesthesia. Our findings were consistent with this study, showing Ondansetron significant efficacy in reducing shivering incidence and severity.

Conclusion

Based on the results we obtained, we conclude Ondansetron demonstrated a favorable safety profile, superior efficacy and comparable side effect profile making them viable options for shivering prevention during spinal anesthesia and should be considered the preferred agent for shivering prevention in clinical practice.

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