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Research Article

Effect of Single-Dose Intravenous Dexamethasone and Ondansetron on Hemodynamic Stability and PONV in Lower-Limb Surgery under Spinal Anesthesia

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ABSTRACT

Background: Spinal anesthetic has improved perioperative care for lower-limb procedures. However, sympathetic blocking can induce considerable hemodynamic instability. While fluid preloading and vasopressors are established preventive interventions, dexamethasone and ondansetron, employed as antiemetics, have lately been studied for their cardiovascular-stabilizing effects. This study compares the effects of preoperative intravenous dexamethasone (8 mg) and ondansetron (8 mg) on hemodynamic stability and postoperative nausea and vomiting during spinal anesthesia.

Methods: 192 ASA I-II patients undergoing elective lower-limb orthopedic surgery under spinal anesthesia at Alkafeel Hospital in Karbala from 2nd September, 2022, to 3rd November, 2024, were assigned to four groups: dexamethasone (Group D), ondansetron (Group O), combination (Group B), and control (Group C). MAP, HR, and SpO_2 incidences of nausea and vomiting were measured at 5, 10, 15, 30, and 60 minutes after spinal block.

Results: MAP and HR did not differ significantly between groups ($p = 0.326$ and 0.458, respectively). At 5 minutes, Group B had greater MAP ($p = 0.001$) and HR ($p = 0.030$) than Group C. No significant differences in SpO_2 levels were seen ($p > 0.05$). The incidence of nausea was lowest in Group B (2.1%), compared to Group C (14.6%) ($p = 0.009$). Vomiting occurred in all groups, with zero incidences in Group B.

Conclusion: Combining dexamethasone and ondansetron before lower-limb surgery under spinal anesthesia improved cardiovascular stability and reduced nausea.

Introduction

The advancement of localized anesthetic has greatly improved perioperative treatment, particularly for lower limb procedures. Among the treatments available, spinal and epidural anesthesia are still popular due to their safety, cost-effectiveness, and capacity to provide superior analgesia without requiring airway equipment [1]. However, the most common and clinically significant adverse events following regional anesthesia are hemodynamic instability, specifically hypotension and bradycardia, which can result in organ hypoperfusion, increased morbidity, and even death in high-risk populations [2].

Sympathetic blockade is principally responsible for the hemodynamic changes that occur during spinal anesthesia, which result in decreased systemic vascular resistance, reduced venous return, and a subsequent decline in cardiac output [3].

These effects can be more severe in elderly patients and those with reduced cardiovascular reserves. As a result, reducing the breadth and severity of such disturbances is

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a primary priority in anesthetic practice. To treat these hemodynamic disturbances, pharmacologic treatments have been extensively researched. Traditional approaches, such as fluid preloading and vasopressor usage, are frequently complemented by adjunctive medicines, which may provide greater control with fewer side effects. Among these agents, dexamethasone and ondansetron—commonly used for their antiemetic effects—have recently gained attention for their cardiovascular-stabilizing properties [4]. Spinal anesthesia causes a thick sympathetic block, which is frequently larger than the sensory and motor blocks. This sympathetic blockage induces vasodilation, particularly in the venous system, resulting in blood pooling, decreased venous return (preload), and lower cardiac output [5]. Sympathetic blockade is principally responsible for spinal anesthesia-induced hypotension, which causes venous and arterial vasodilation and, as a result, a decrease in systemic vascular resistance, especially with high spinal blocks. The reported prevalence of hypotension after spinal anesthesia ranges from 60% to 70% in diverse clinical contexts [6,7]. Another mechanism of cardiovascular compromise is the Bezold-Jarisch reflex (BJR), a cardioinhibitory reaction that is triggered by a reduction in ventricular filling and causes unopposed parasympathetic activity, bradycardia, and hypotension [8]. This response is particularly hazardous in hypovolemic individuals or those with high spinal levels. Ondansetron, a selective serotonin (5-HT3) receptor antagonist, is usually used to prevent and treat postoperative nausea and vomiting. Aside from its antiemetic properties, it has been demonstrated to modulate cardiovascular physiology, particularly under spinal anesthesia [9]. Ondansetron's antihypotensive action is attributed to its capacity to suppress the 5-HT3-mediated activation of the Bezold-Jarisch reflex.

This inhibition prevents reflex-induced vasodilation and bradycardia, which are common after high-level spinal blocks. Preoperative ondansetron has been shown in clinical studies to lower the incidence of both hypotension and bradycardia during spinal anesthesia, particularly in obstetric and geriatric patients [2,10].

Furthermore, ondansetron may have peripheral vasoconstrictor qualities and improve baroreceptor sensitivity, which might contribute to its blood pressure-stabilizing effect [9]. The typical effective dosage of Dexamethasone is 4 to 8 mg intravenously, with the 8 mg dose being suggested to give superior hemodynamic control in various randomized controlled studies. Dexamethasone can enhance hemodynamics by decreasing pro-inflammatory cytokines including TNF-α and IL-6, which promote vasodilation and hypotension [11]. Furthermore, dexamethasone enhances vascular smooth muscle sensitivity to endogenous catecholamines by activating adrenergic receptors, which improves vascular tone and blood pressure control [12].

Although fewer trials have been conducted on dexamethasone, existing data indicates that it may enhance hemodynamic stability and minimize the requirement for vasopressors during spinal anesthesia, particularly in high-risk surgical groups [13]. Ondansetron, a selective 5-HT_3 receptor antagonist, has been proven in various meta-analyses and randomized trials to reduce spinal anesthesia-induced hypotension and bradycardia by suppressing the Bezold-Jarisch response [14]. Comparative studies show that both ondansetron and dexamethasone are effective in treating hypotension, but direct head-to-head randomized trials are uncommon, and there is no consistent evidence to show which drug is superior [13,14].

Another study found that when ondansetron and dexamethasone were delivered together, their antiemetic and vascular-stabilizing effects were improved, implying a possible synergistic activity [3]. Given the overlapping and complementary mechanisms of ondansetron acting centrally on the BJR and dexamethasone acting peripherally via vascular receptor modulation [10,14], there is strong theoretical justification for investigating their combined prophylactic use in high-risk surgeries performed under regional anesthesia. This study aims to fill a gap by assessing the effectiveness of a single preoperative dose of dexamethasone (8 mg IV) combined with ondansetron (8 mg IV) in improving intraoperative hemodynamic parameters, including mean arterial pressure and heart rate, in this patient population. Secondary outcomes, such as postoperative nausea and vomiting.

Methods

This study was approved by the Ethical Committee of the Faculty of Medicine, Jabir Ibn Hayyan University for Medical and Pharmaceutical Sciences (Approval No. 484/JMU, August 3, 2022). Written informed consent was obtained from all participants prior to enrollment, and the study was conducted in accordance with the Declaration of Helsinki.approved this prospective randomized, blind, and controlled clinical trial investigation. All 192 adult patients scheduled for elective lower-limb orthopedic surgery under spinal anesthesia provided written informed consent and signed it. The study was conducted at Alkafeel Hospital in Karbala from September 2nd, 2022, to November 3rd, 2024, and was equipped with proper anesthesia, monitoring, and care facilities.

Sample size

Four equal 48-person groups: Group D received 8 mg of dexamethasone IV, Group O received 8 mg of ondansetron IV, Group B received both 8 mg of dexamethasone and ondansetron IV, and Group C received normal saline IV. All study medicines were

produced in identical 10-mL syringes. To ensure equitable group distribution, use a block randomization system with eight-block increments.

Inclusion Criteria: Patients between the ages of 18 and 75, of both genders, with an ASA I or II physical condition, and scheduled for elective lower limb orthopedic therapies. Suitable for spinal anaesthesia. I provided informed written consent.

Exclusion Criteria: Known allergy to dexamethasone or ondansetron. Chronic corticosteroid or antiemetic use.

Cardiac instability or bradyarrhythmia. Severe hepatic or renal failure, pregnancy or breastfeeding, rejection of regional anesthesia, and any contraindication to spinal anesthesia

Anesthesia management

To ensure equitable distribution, participants were randomly allocated. Blindness was maintained using identical syringes prepared by an independent anesthetist. Each subject was given 10 ml/kg Ringer's fluid, then the designated medicine intravenously 15 minutes before spinal anesthesia. A 25G Quincke needle was used to provide spinal anesthesia in the L3-L4 or L4-L5 interspace while the patient was seated.

All patients received a typical dose of 2.5-3 mL of 0.5% hyperbaric bupivacaine.

Intraoperative monitoring included noninvasive blood pressure (NIBP), continuous ECG, and pulse oximetry (SpO_2). Hemodynamic parameters were measured at baseline and 5, 10, 15, 30, and 60 minutes after spinal block initiation. Demographic and baseline data include age, gender, weight, smoking history, and ASA categorization. Hemodynamic Parameters: Measure MAP, HR, and SpO_2.

Clinical symptoms: Rates of nausea and vomiting at 5, 10, 15, 30, and 60 minutes were recorded.

Statistical Analysis

Recorded data were analyzed using the statistical software for social sciences, version 26.0 (SPSS Inc., Chicago, Illinois, USA).

- Descriptive Statistics: Mean and standard deviation (SD) for continuous data; frequencies and percentages for categorical variables.
- Comparative Analysis: Two independent samples t-tests compare means & standard deviation between the control group and study groups (Dexamethasone & Ondansetron and Both) for continuous data, while chi-square tests compare proportions for nominal and ordinal data.
- Significance Level: A P value less than 0.05 was considered significant, and a P value larger than 0.05 was considered nonsignificant.

Results

(Table 1) shows the baseline socio-demographic characteristics of the 192 patients, who were evenly divided into four groups (n = 48 each).

There were no statistically significant differences between the groups in terms of gender distribution, age, or ASA physical status ($p > 0.05$), showing that the groups were similar at baseline.

(Table 2) compares mean arterial pressure (MAP) between groups. Group B showed statistically significant MAP preservation at 5 minutes ($p = 0.001$). The baseline MAP was comparable in all groups ($p = 0.326$).

Table 1- Socio-Demographic Characteristics.

Characteristics	Categories	Group D	Group O	Group B	Group C	P value
Sex n (%)	Male	20 (41.7)	24 (50)	22 (45.8)	26 (54.2)	0.970
	Female	28 (58.3)	24 (50)	26 (54.2)	22 (45.8)	
Age (year) n (%)	18-25	10 (20.8)	1 (2.1)	14 (29.2)	6 (12.5)	0.286
	26-35	9 (18.8)	11 (22.9)	7 (14.6)	10 (20.8)	
	36-45	27 (56.3)	19 (87.1)	21 (43.8)	26 (54.2)	
	46-55	1 (2.1)	2 (4.2)	5 (10.4)	2 (4.)	
	56-65	1 (2.1)	12 (25.0)	1 (2.1)	4 (8.3)	
	Over 65	0	3 (6.3)	0	0	
Weigh (kg) n (%)	40-60	2 (4.2)	6 (12.5)	7 (14.6)	7 (14.6)	0.438
	61-80	21 (43.8)	33 (68.7)	24 (50.)	35 (72.9)	
	81-100	23 (47.9)	9 (18.8)	17 (35.4)	4 (8.3)	
	101-120	2 (4.2)	0	0	2 (4.2)	
Chronic disease	No/yes	48/0	48/0	48/0	48/0	
ASA	ASA I/II	48/0	48/0	48/0	48/0	
Smoker n (%)	No	36 (75)	45 (93.8)	34 (70.8)	43 (89.6)	<0.001
	Yes	12 (25)	3 (6.2)	14 (29.2)	5 (10.4)	

Table 2- Comparison of Mean arterial pressure (MAP) according to study groups with control group.

Time interval	Group D Mean±SD	Group O Mean±SD	Group B Mean±SD	Group C Mean±SD	P value D&C	O&C	B&C

Baseline	92.33 ± 8.64	91.53 ± 6.04	91.87 ± 5.25	90.72 ± 7.39	0.326	0.556	0.379
MAP 5 min	84.63 ± 12.38	84.17 ± 11.84	87.57 ± 5.10	82.53 ± 8.99	0.341	0.445	0.001
MAP 10 min	77.37 ±10.74	76.17 ± 7.71	86.83 ± 7.07	73.64 ± 9.45	0.048	0.151	<0.001
MAP 15 min	76.17 ±13.69	75.30 ± 8.91	88.27 ± 6.39	70.59 ± 10.63	0.026	0.019	<0.001
MAP 30 min	75.36 ±9.11	74.16 ± 8.81	89.16 ± 10.33	68.41 ± 11.82	0.001	0.007	<0.001
MAP 60 min	78.48 ±10.14	79.71 ± 8.43	90.08 ± 7.65	72.34 ± 13.52	0.012	0.001	<0.001

At 5 minutes, there was a statistically significant difference between Group B (combination) and Group C (control) (p = 0.001), with Group B having higher MAP values, indicating better hemodynamic stability. (Table 3) shows baseline HR did not differ significantly across groups (p = 0.458). However, at 5 minutes, Group B had a substantially higher HR than Group C (p = 0.030), confirming the cardio-stabilizing impact of the combination therapy. At 5 minutes, Group B had a significantly higher heart rate than the control group (p = 0.030).

(Table 4) shows there were no significant variations in SpO_2 across groups at any time point (p > 0.05), showing that oxygenation remained steady in all participants regardless of intervention. No statistically significant differences in SpO_2 were found (p > 0.05). (Table 5) Nausea Incidence At 5 minutes post-spinal block, Group B exhibited the lowest incidence of nausea (2.1%) compared to Group C (14.6%).

The reduction was statistically significant between Groups B and C (p = 0.009). Incidence of nausea at 5 minutes: Group B had significantly lower nausea rates than Group C (p = 0.009).

(Table 6) shows vomiting incidence was generally low across all groups. Although Group B showed zero incidence of vomiting, the difference compared to other groups did not reach statistical significance (p > 0.05), possibly due to the low overall frequency. Incidence of vomiting at 5 minutes. No statistically significant differences among groups (p > 0.05).

Table 3- Comparison of Heart Rate among Study Groups and Control Group

Time interval	Group D Mean±SD	Group O Mean±SD	Group B Mean±SD	Group C Mean±SD	P value D&C	O&C	B&C
Baseline	82.80 ± 8.33	83.40 ± 8.06	83.40 ± 9.05	83.97 ± 7.06	0.458	0.713	0.731
HR 5 min	80.53 ±11.12	82.64 ± 10.02	84.62 ± 9.46	80.44 ± 9.46	0.968	0.268	0.030
HR 10 min	76.23 ± 10.60	80.52 ± 9.76	82.51 ± 10.34	74.80 ± 10.74	0.512	0.006	<0.001
HR15 min	70.92 ± 12.05	79.62 ± 8.31	83.50 ± 8.15	72.50 ± 9.15	0.469	<0.001	<0.001
HR 30 min	79.42 ± 11.29	81.54 ± 10.97	81.82 ± 10.43	76.34 ± 9.77	0.153	0.013	0.008
HR 60 min	77.94 ± 10.92	84.76 ± 9.83	82.16 ± 9.28	78.67 ± 9.93	0.733	0.003	0.731

Table 4- Comparison of SPO2 according to study groups with control group.

Time interval	Group D Mean±SD	Group O Mean±SD	Group B Mean±SD	Group C Mean±SD	P value D&C	O&C	B&C
Baseline	99.33 ± 0.64	99.53 ± 0.74	99.67 ± 0.81	99.48 ± 0.45	0.184	0.690	0.053
SPO2 3 min	99.43 ± 0.78	99.17 ± 0.80	99.18 ± 0.84	99.27 ± 0.99	0.379	0.586	0.586
SPO2 5 min	99.37 ± 0.74	99.43 ± 0.97	99.17 ± 0.71	99.18 ± 0.65	0.181	0.090	0.943
SPO2 15 min	99.47 ± 0.69	99.55 ± 0.99	99.67 ± 0.91	99.63 ± 0.38	0.159	0.601	0.778
SPO2 30 min	99.36 ± 0.11	99.16 ± 0.81	99.24 ± 0.33	99.29 ± 0.82	0.558	0.336	0.695
SPO2 60 min	99.48 ± 0.14	99.61 ± 0.91	99.28 ± 0.65	99.38 ± 0.74	0.358	0.174	0.482

Table 5- Distribution of Nausea according to study groups compare with control group

Time interval Nausea		Group D N/%	Group O N/%	Group B N/%	Group C N/%	P value D&C	O&C	B&C
Nausea 5min	No	43/89.6	44/91.7	47/97.9	41/85.4	0.284	0.148	0.009
	Yes	5/10.4	4/8.3	1/2.1	9/18.8			
Nausea 10min	No	41/85.4	44/91.7	47/97.9	35/72.9	0.132	0.016	<0.001
	Yes	7/14.6	48.3	1/2.1	13/27.1			
Nausea 15min	No	33/68.8	41/85.4	45/93.8	32/66.7	0.208	0.031	<0.001
	Yes	9/18.8	71/4.6	3/6.3	16/33.3			
Nausea 30min	No	36/75.0	42/87.5	46/95.8	31/64.6	0.266	0.009	<0.001
	Yes	12/25.0	6/12.5	2/4.2	17/35.4			
Nausea 60min	No	3675.0	41/85.4	46/95.8	28/58.3	0.083	0.003	<0.001
	Yes	12/25.0	7/14.6	2/4.2	20/41.7			

Table 6- Distribution of Vomiting according to study groups compare with control group

Time interval vomiting		Group D N/%	Group O N/%	Group B N/%	Group C N/%	P value D&C	O&C	B&C
Vomiting 5min	No	46/95.8	47/97.9	48/100.0	45/93.	0.646	0.307	0.078
	Yes	2/4.2	1/2.1	0/0.0	3/6.3			
Vomiting 10min	No	46/95.8	47/97.9	48/100.0	44/91.7	0.399	0.168	0.041
	Yes	2/4.2	1/2.1	0/0.0	4/8.3			
Vomiting 15min	No	45/93.8	46/95.8	47/97.9	43/89.6	0.558	0.239	0.092
	Yes	3/6.3	2/4.2	1/2.1	5/10.4			
Vomiting 30min	No	44/91.7	46/95.8	47/97.9	42/87.5	0.504	0.139	0.049
	Yes	4/8.3	2/4.	1/2.1	6/12.5			
Vomiting	No	44/91.7	46/95.8	47/97.9	41/85.4	0.522	0.161	0.064
60min	Yes	4/8.3	2/4.2	1/2.1	7/14.6			

Discussion

Spinal anesthesia causes sympathetic blockade, which frequently leads to hypotension and bradycardia, particularly in elderly or volume-depleted patients. This autonomic shift is often accompanied by reduced systemic vascular resistance and venous return. Maintaining hemodynamic stability during regional anesthesia is critical for preventing organ hypoperfusion and consequences in high-risk groups [15].

One of the most striking findings in this study is that the combination group (Group B) had considerably higher MAP and HR, particularly in the first 5 to 15 minutes after spinal anesthesia. This shows that dexamethasone and ondansetron have a synergistic hemodynamic stabilizing effect when taken simultaneously. At 5 minutes post-block, Group B had a considerably higher MAP than the control group ($p = 0.001$), and this pattern remained over successive measures. A similar pattern emerged for HR, with Group B retaining a significantly higher rate than Group C ($p = 0.030$). These data back up the concept that combining dexamethasone and ondansetron improves vascular tone and autonomic compensation.

At five minutes following the block, Group B exhibited a significantly higher mean arterial pressure compared to the control group ($p = 0.001$), and this trend persisted across subsequent measurements. A comparable pattern was observed for HR, with Group B maintaining a markedly higher rate than Group C ($p = 0.030$). These data support the notion that the combination of dexamethasone and ondansetron enhances vascular tone and autonomic compensation.

Ondansetron's function, a selective 5-HT3 receptor antagonist, prevents the Bezold-Jarisch reflex (BJR), a cardioinhibitory response that produces bradycardia and hypotension during spinal anesthesia [12,16]. Ondansetron activates reflex bradycardia and vasodilation caused by neuraxial inhibition by blocking serotonin-mediated vagal activation [10,14].

Recent trials have shown ondansetron's ability to reduce spinal-induced hypotension [17]. A meta-analysis determined that intravenous ondansetron considerably reduces hypotension and the need for vasopressors in both obstetric and nonobstetric patients. Although the majority of data comes from cesarean sections, growing research supports their use in orthopedic surgery [14].

Dexamethasone's hemodynamic impact is due to its anti-inflammatory characteristics, enhanced vascular reactivity to catecholamines, and ability to maintain endothelium integrity [18]. Furthermore, dexamethasone suppresses prostaglandin production, which may reduce vasodilation.

Although dexamethasone is most widely studied for its antiemetic and analgesic properties, studies have found a trend toward improved blood pressure profiles in individuals who receive it before neuraxial blocks [19].

Another study showed improved MAP with ondansetron in elderly individuals having spinal anesthesia [20], Although fewer studies have been conducted on dexamethasone in spinal anesthesia than ondansetron, some comparative research suggests that both ondansetron and dexamethasone may result in a decreased incidence of hypotension and bradycardia. Studies comparing preventative ondansetron alone and in combination with dexamethasone have demonstrated effectiveness in lowering post-spinal hypotension, while direct head-to-head randomized controlled studies are few [13,21,22].

The necessity of preventive pharmacologic intervention for hemodynamic stability in neuraxial anesthesia called for multimodal approaches, which bolstered the rationale for our investigation.

Several important therapeutic implications emerge from the combination group's improved MAP and HR control. Improved perfusion and decreased risk of ischemic episodes, particularly for individuals with cardiovascular problems. Reduced the need for vasopressors, lowering the risk of adverse consequences. Enhanced anesthetic safety profile, potentially increasing

the viability of regional anesthesia in high-risk patients [21,22].

The study found that all four groups maintained normal peripheral oxygen saturation (SpO_2) levels over time. The absence of statistically significant differences ($p > 0.05$) suggests that none of the examined interventions ondansetron, dexamethasone, or their combination exerted a direct or clinically meaningful effect on arterial oxygenation during spinal anesthesia.

This observation aligns with the concept that regional anesthesia, especially spinal anesthesia confined to the lower thoracic or lumbar regions, generally does not interfere with ventilatory drive or diaphragmatic motion. In contrast to general anesthesia, spinal anesthesia preserves spontaneous respiration and airway reflexes, thereby reducing the risk of hypoxemia unless a high-level block or pre-existing pulmonary pathology is present [4,23].

Furthermore, neither ondansetron nor dexamethasone exhibits any known pharmacological influence on respiratory centers or pulmonary gas exchange at the dosages employed in this study. Their mechanism of action, which involves serotonin antagonism and glucocorticoid-mediated anti-inflammatory pathways, is unlikely to produce an immediate effect on oxygenation.

The study observed no significant differences in SpO_2 levels across all time intervals, suggesting that these medications are safe for preserving respiratory function.

Although Group B (combination therapy) experienced no vomiting, and Groups D and O had lower rates than the control group, the difference was not statistically significant ($p > 0.05$). This finding could be related to the overall low incidence of vomiting across all groups, making statistical distinction difficult despite positive clinical trends. Vomiting is less common than nausea after spinal anesthesia, particularly in non-obstetric operations like orthopedic surgery, which constituted the patient population in this investigation. Furthermore, vomiting typically occurs later in the postoperative period, whereas this study concentrated on intraoperative and early postoperative outcomes [24]. Importantly, the lack of regurgitation observed in the combination group holds clinical significance, even if it does not reach statistical significance. It indicates a potential protective effect, which could be demonstrated through a larger sample size or over extended time periods.

Nejadi et al. found similar trends—reduced vomiting incidence with either dexamethasone or ondansetron—but underlined that anti-nausea effects are more consistent than anti-vomiting effects [25].

The lack of significance in vomiting outcomes in this trial could be attributed to a type II error caused by low event rates rather than a genuine lack of therapeutic efficacy. In the present study, the administration of intravenous dexamethasone in conjunction with ondansetron markedly enhanced MAP and HR at 5 minutes following spinal anesthesia compared to the control group. These findings align with previous research regarding the prophylactic advantages of ondansetron in preventing spinal-induced hypotension.

A comprehensive meta-analysis conducted by Hou et al. found that prophylactic ondansetron dramatically lowers the incidence of hypotension and bradycardia during spinal anesthesia by blocking serotonin-mediated reflexes, specifically the Bezold-Jarisch reflex [14].

Similarly, Mendonça et al. discovered that patients who took ondansetron before orthopedic surgery under spinal anesthesia required fewer vasopressors and had a lower incidence of hypotension. However, these trials frequently revealed a limited effect on heart rate alone [20].

Conversely, the present findings suggest that dexamethasone administration may enhance hemodynamic stability through glucocorticoid-mediated augmentation of vascular tone and responsiveness to endogenous catecholamines [12].

This study identified a statistically significant decrease in nausea within the combination group, corroborating previous research that indicates the enhanced antiemetic effectiveness of combining ondansetron with dexamethasone. Duttala et al. found that dexamethasone alone substantially decreased nausea and vomiting during a cesarean section conducted under spinal anesthesia [19].

In study about the Apfel simplified risk score discovered that combining a $5\text{-}HT_3$ receptor antagonist with a corticosteroid resulted in a superior complete response rate in avoiding postoperative nausea and vomiting (PONV) than either medication alone [26].

The results of this study are generally consistent with previous research regarding the individual impacts of dexamethasone and ondansetron. The study's distinctive characteristic is its demonstration of the synergistic effectiveness of their combination in enhancing cardiovascular stability and preventing symptoms in patients undergoing lower limb surgery under spinal anesthesia. These findings add to a growing body of evidence endorsing multimodal prophylactic strategies for hemodynamic and symptomatic issues associated with regional anesthesia. The combination of dexamethasone and ondansetron is cost-effective and broadly endorsed in clinical practice, thereby facilitating straightforward implementation of this intervention.

Although the study produced encouraging findings, several limitations must be acknowledged:

The research was carried out at a singular institution, which may restrict its broader applicability.

Follow-up was confined to the intraoperative and initial postoperative periods. The effect on vasopressor utilization and long-term outcomes, including discharge timing and readmission rates, was not assessed.

Future multicenter studies are necessary to confirm these results and assess the long-term safety and effectiveness of the combination.

Conclusion

The combination of ondansetron and dexamethasone improved MAP and HR stability during the critical intraoperative phase, especially at 5-15 minutes post spinal anesthesia, when patients are most susceptible to hypotension and bradycardia.

Patients who received a single dose of dexamethasone and ondansetron exhibited markedly reduced incidences of nausea compared to patients administered normal saline.

Vomiting rates were low and did not differ significantly between groups, with a trend favoring the combination group.

These findings add to the current literature by demonstrating the synergistic effect of combining ondansetron and dexamethasone in improving intraoperative hemodynamic outcomes and increasing patient comfort while maintaining safety. While earlier research has focused on the individual benefits of each medicine this is the first to investigate their combined effects in orthopedic surgery under regional anesthesia.

Recommendation

1. Include dexamethasone and ondansetron in the standard procedure for patients undergoing lower limb surgery under spinal anesthesia to reduce hypotension, bradycardia, and nausea.
2. Administer medications 15-30 minutes prior to the spinal block to optimize pharmacodynamic activity during the critical early intraoperative period. Consider employing this combination in elderly patients and individuals with cardiovascular risk factors to enhance hemodynamic management and avert potential complications.
3. Conduct multicenter randomized controlled trials to validate and extend findings across diverse patient populations and surgical environments.
4. Extend the review period to include postoperative recovery measures such as discharge readiness, pain levels, and patient satisfaction.

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