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ORIGINAL ARTICLE

Effect of Intrathecal versus Intravenous Dexamethasone on Quality of Spinal Anesthesia in Lower Limb Orthopedic Surgery

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ABSTRACT

Background: When it comes to orthopedic surgeries involving the lower limbs, spinal anesthesia offers the most predictable block due to the strong sensory as well as motor block that it provides, with the benefits of avoiding the risks of general anesthesia. This study aimed for comparing intrathecal dexamethasone versus intravenous dexamethasone on the quality of spinal anesthesia in lower limb orthopedic surgeries.

Methods: We carried out this prospective randomized controlled study on 63 adult patients who undergoing orthopedic lower limb procedures under the influence of spinal anesthesia; they were randomized into three equal groups (each containing 21
patients): group C (control), group V (intravenous dexamethasone) and group S (intrathecal dexamethasone). The Visual Analogue Scale (VAS) was done at first admission to the PACU, then at 1, 3, 6,12, and 24 hours at rest and during movement with an assessment of complications postoperatively.

Results: A significant longer duration of sensory block was revealed in group S compared to both group C and group V (191.43 ± 25.94, 109.52 ± 7.4, 110.67± 11.14, respectively). The visual analogue scale (VAS) was higher in the control group at 1, 3, and 6 hours postoperatively, especially at 3 hours. A statistically significant difference existed between the studied groups as regards intraoperative complications (P<0.001) in the control group; only six patients (28.6%) passed uncomplicated versus 76.2% of the patients who was given intravenous dexamethasone and 81% of the patients who was given intrathecal dexamethasone.

Conclusion: Adding Intrathecal dexamethasone to bupivacaine in spinal anesthesia was associated with longer duration and level of sensory block, lower VAS and the total amount of rescue analgesia with decreasing complications of spinal anesthesia as hypotension, shivering, and vomiting compared to intravenous route administration.

Keywords: Dexamethasone; Spinal Anesthesia; Lower Limb Orthopedic Surgery

INTRODUCTION

Because it offers a strong sensory and motor block without the dangers of general anesthesia—like gastric contents aspiration and trouble in regard to airway management, when it comes to orthopedic surgery affecting the lower extremities, spinal anesthesia is considered the gold standard reliable option [1,2].

Procedures lasting 90-120 minutes are suitable for bupivacaine. Thus, in order to make the sensory block last longer, local anesthetics were often combined with other medications such as opioids, epinephrine, phenylephrine, and clonidine. However, those additives are not devoid of side effects [3-5].

By lowering inflammation, inhibiting transmission across nociceptive C-fibers, and regulating ectopic

neuronal discharge, dexamethasone alleviates pain [6]. Dexamethasone addition to peripheral nerve blocks administered with local anesthetics can increase postoperative analgesia duration [7]. One possible way to prolong the sensory block and reduce spinal anesthetic issues is to inject bupivacaine and dexamethasone intrathecally [8].

Preoperative intravenous dexamethasone has also been studied as a method to increase postoperative analgesia and reduce complications after spinal anesthesia. Those effects may be attributed to the potent systemic anti-inflammatory and immunosuppressive properties of dexamethasone [9,10].

Therefore, this study aimed for comparing the effects of using intrathecal versus intravenous preoperative dexamethasone on the sensory block duration and complications of spinal anesthesia in lower limb surgery.

METHODS

We carried out this double-blinded randomized controlled clinical study in the Anesthesia, Intensive Care and Pain Management department, Faculty of Medicine, Zagazig University hospitals, from April 2023 to October 2023.

Assuming that the mean duration of sensory block of spinal anesthesia using intrathecal dexamethasone with bupivacaine was 119.12 ± 40 min [11] and the duration of sensory block was 102.7 ± 12.3 min when using intravenous dexamethasone before bupivacaine spinal anesthesia [12] at 80% power and 95%. CI, the sample size was calculated using Open epi info software to be 63 cases,21 cases in each group (intrathecal dexamethasone, intravenous dexamethasone, and control groups).

Inclusion criteria: Patients aged 18-60 years old from both sexes (male and female), who had body mass index less than 35 Kg/M^2, Patients to be of ASA_PS class I and II, patients who had lower limb orthopedic surgeries which did not exceed 2 hours duration.

Exclusion criteria: Patients who had any of the following conditions: malformation or local pathology or infection in the lumbar spine area, previous spinal column surgery, low back pain, history of convulsions or severe neurological deficit, bleeding disorders. In addition, patients who had severe hypovolemia or anemia, individuals who have already had long-term steroid therapy or sensitivity to the study drugs, and patients who had a history of drug abuse or any chronic use of drugs that modifies pain perception were also excluded.

Withdrawal criteria: At any point during their medical or surgical treatment, Patients were able to leave the trial at any time. Patients were excluded from the trial if the spinal block did not work or if the surgery took longer than the sensory block.

Ethical Consideration: The institutional review board at Zagazig University gave their approval to the research (IRB #10459). Every single participant gave their written informed consent. All procedures used in this study were in accordance with the World Medical Association's Helsinki Declaration, which addresses research involving human subjects.

Preoperative preparation: For every patient, a pre-anesthetic checkup was conducted the day prior to surgery. This involved taking a thorough medical history, monitoring vital signs (heart rate, blood pressure, respiration rate), and measuring the patient's weight and height. Investigations were done in all the patients, including complete blood count (CBC), coagulation profile, and any other investigations relevant to the patient's condition. Following a thorough explanation of the procedure, informed consent was acquired. Prior to the surgery, the patient was also briefed on the Visual Analogue Scale (VAS).

A Visual Analogue Scale (VAS) is a measurement instrument to pain rating scale from 0-10, where 0 equals no pain and 10 equals the most agonizing ache imaginable.

The patients were divided by complete randomization table into 3 groups:

Group C (21 cases): In which the patients were given 2 ml intravenous saline half an hour before spinal anesthesia, and 2 ml saline was added to the 3 ml hyperbaric bupivacaine in the subarachnoid space.

Group V (21case): The patients were given 2 ml (8 mg) intravenous dexamethasone half an hour before spinal anesthesia, and 2 ml saline was added to 3 ml hyperbaric bupivacaine in the subarachnoid space.

Group S (21 cases): In which the patients were given 2 ml intravenous saline half an hour before spinal anesthesia and 2ml (8 mg) dexamethasone was added to the 3 ml hyperbaric bupivacaine in the subarachnoid space.

Intraoperative management: Upon entering the operating room, all patients had standard monitoring, which included pulse oximetry, electrocardiogram (ECG), and noninvasive. We took baseline measurements of heart rate, blood pressure, as well as oxygen saturation to establish a baseline. After wearing nonsterile gloves, we cleaned the skin using alcohol swaps. For each

patient, a 20-gauge IV catheter was placed at the dorsum of the opposite hand to the site of surgery, and then crystalloid solution at 7 ml per kg was given.

There was a supply of anesthetic gas, airway equipment, a laryngoscope, and resuscitation medications in the operating room. Every single patient was positioned in a sitting position during spinal anesthesia. Povidone iodine antiseptics were used to clean the patient's back in strict accordance with aseptic procedure. Cleaning is done in a circular motion, starting at the selected access site. After subcutaneous infiltration of 1% lidocaine at the selected access site, which can be in the midline, paramedian, L3-L4, or L4-L5 spaces; Then a 25-gauge Quinke spinal needle is used for intrathecal injection of 15 mg (3ml) of 0.5% hyperbaric bupivacaine in addition to 2 ml of normal saline in the patients in groups C and V". In comparison, the patients in group S received 15mg (3ml) 0.5% hyperbaric bupivacaine in addition to 2 ml (8mg) dexamethasone.

After performing the spinal anesthesia, the case was put in the supine position with continuous monitoring of the hemodynamics and O2 saturation. To assess the sensory block level Pinprick test was used. After that, every 15 minutes, or until the patient reported pain. at the surgical site, the test was repeated.

From the moment patients experience maximum sensory block until they achieve four sensory level regressions or until they feel pain at the surgical site, we defined the duration of the sensory block as follows. First administered upon admission to the PACU, the VAS was repeated at at1,3,6,12 and 24 hours while at rest and while moving around. If the postoperative VAS was higher than or equal to 3, the patient was treated with 75 mg diclofenac sodium iv infusion as rescue analgesia.

Crystalloid fluid boluses or intravenous ephedrine 5-10 mg were administered to patients whose hypotension was described as a drop in systolic blood pressure of twenty percent or more from the baseline. Treated with intravenous atropine 0.01 mg/kg, bradycardia is defined as a heart rate of less than sixty beats per minute. The patients who complained nausea and vomiting were additionally given intravenous metoclopramide at a dose of 0.15 mg/kg. Any side effects were recorded within the first 24 hours, such as headache, hypotension, and shivering.

Statistical analysis:

We analyzed the data using SPSS, a statistical software for the social sciences, version 26. We used the absolute frequencies to characterize the categorical variables, and we compared them with chi-square tests and, when necessary, Monte Carlo tests. Using a chi-square trend test, we compared ordinal data from two sets. Parametric tests relied on the Shapiro-Wilk test to validate their assumptions. According to the data type, quantitative variables were described using means, standard deviations, medians, and interquartile ranges. Kruskal Wallis (for non-normal data) and one-way ANOVA (for normally distributed data) were used to compare the quantitative data between the two groups (for data that follows a normal distribution). The two groups were compared using pairwise comparison and Bonferroni when the difference was found to be statistically significant.

RESULTS

Non-statistically significant differences were found between the studied groups as regards age, gender, body mass index, ASA class, duration of surgery, total amount of fluid infused intraoperatively, or type of surgery (Tables 1 and 2).

Non-statistically significant differences were found between the studied groups as regards the beginning of the sensory block. However, a statistically significant difference was found between the studied groups as regards the duration of sensory block. On doing a post-hoc test, the duration of sensory block was significantly longer in group S compared to both group C and group V (191.43 ± 25.94, 109.52 ± 7.4, 110.67± 11.14, respectively) (Table 3).

Regarding the visual analogue scale (VAS), pain scores at 1,3 and 6 hours after surgery significantly differed among the groups. VAS increased in the control group to a median of 1 in 1st hour, a median of 6 at 3 hours, and a median of 4 at 6 hours, which was more than the other groups. (Table 4).

At one and three hours after surgery, there was a statistically significant difference in the groups' levels of pain. On comparing every two groups, the difference was statistically significant between Group V and Group S (P2 was 0.008). The difference was also significant compared to Group C and Group S (P3 was < 0.001) (all those within the S group had no pain). While at 3 hours, pain severity significantly differed between the control group and each other group. On comparing Group C and each of the two groups, the difference was statistically significant between Group C and Group

V (P1 was <0.001). It was significant between Group C and Group S (p3 was <0.001) (Table 5).

When comparing the groups, there was a statistically significant difference in the overall amount of rescue analgesia (diclofenac sodium). On doing the pairwise comparison, the difference was significant between the control group and the other group. Pairwise: The median of group c was 225, and the other groups were 75 (Figure 1).

There was a statistically significant difference between the studied groups regarding intraoperative complications (P<0.001) in the control group; only six patients (28.6%) passed uncomplicated versus 76.2% of the patients who received intravenous dexamethasone and 81% among the patients who were given intrathecal dexamethasone. Hypotension occurred in 47.6% within the control group versus 0% of the patients who received intravenous dexamethasone and 9.5% of patients who received intrathecal dexamethasone (hypotension was treated using ephedrine 5-10 mg) (Figure 2).

Table (1): Comparison of the studied groups regarding patients' characteristics**:**

	Group C	**Group V**	**Group S**	χ^2	**P**
	N=21 (%)	**N=21 (%)**	**N=21(%)**		
Gender:					
Male	16 (76.2%)	18 (85.7%)	17 (81%)	MC	0.937
Female	5 (23.8%)	3 (14.3%)	4 (19%)		
ASA class:					
I	15 (71.4%)	16 (76.2%)	12 (57.1%)	MC	0.46
II	6 (28.6%)	5 (23.8%)	9 (42.9%)		
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	F	P
Age (year)	38.48 ± 9.43	34.29 ± 9.17	39.19 ± 10.65	1.544	0.222
BMI (kg/m^2)	24.62 ± 3.49	26.29 ± 2.28	26.33 ± 3.1	2.224	0.117

χ^2 Chi square test MC Monte Carlo test F One Way ANOVA test

ASA: American Society of Anesthesiologists, BMI: Body mass index

Table (2) Comparison of the studied groups regarding operative data**:**

	Group C	**Group V**	**Group S**	**F**	**P**
	Mean ± SD	**Mean ± SD**	**Mean ± SD**		
Duration of surgery (min)	84.76 ± 10.06	76.43 ± 25.6	83.1 ± 25.52	0.87	0.424
Total mount of fluid intraop (CC)	1404.76 ± 201.19	1238.1 ± 339.82	1380.95 ± 465.16	1.375	0.261
Type of surgery					
Both bone fracture	7 (33.3%)	5 (23.8%)	5 (23.8%)		
Calcaneus fracture	4 (19%)	2 (9.5%)	1 (4.8%)		
Distal femur frac	2 (9.5%)	3 (14.3%)	3 (14.3%)		
Gamma nail	1 (4.8%)	3 (14.3%)	2 (9.5%)		
Intertrochanteric frac	3 (14.3%)	2 (9.5%)	2 (9.5%)	MC	0.9
Lateral malleolus frac	2 (9.5%)	2 (9.5%)	1 (4.8%)		
Medial malleolus	2 (9.5%)	2 (9.5%)	4 (19%)		
Fracture patella	0 (0%)	1 (4.8%)	0 (0%)		
Plate fibula extraction	0 (0%)	0 (0%)	2 (9.5%)		
Pott fracture	0 (0%)	0 (0%)	1 (4.8%)		
Tendon dislocation	0 (0%)	1 (4.8%)	0 (0%)		

Intraop: intraoperative

Frac: Fracture

χ^2 Chi square test MC Monte Carlo test F One Way ANOVA test

Table (3) Comparison of the studied groups regarding sensory block related data**:**

	Group C	Group V	Group S	F	p
	Mean ± SD	Mean ± SD	Mean ± SD		
Onset of sensory block (min)	4.42 ± 0.75	4.4 ± 1.51	4.8 ± 1.38	0.674	0.513
Duration of sensory block (min)	109.52 ± 7.4	110.67± 11.14	191.43 ± 25.94	163.13	<0.001**
Bonferroni test	P_1 0.697	P_2 <0.001**	P_3 <0.001**		
Level of block				χ^2	
T4	0 (0%)	0 (0%)	8 (38.1%)		
T5	0(0%)	0 (0%)	7 (33.3%)		
T6	0 (0%)	2 (9.5%)	4 (19%)		
T7	1 (4.8%)	0 (0%)	0 (0%)	MC	<0.001**
T8	1 (4.8%)	8 (38.1%)	0 (0%)		
T9	4 (19%)	7 (33.3%)	0 (0%)		
T10	13 (61.9%)	4 (19%)	2 (9.5%)		
T11	2 (9.5%)	0 (0%)	0 (0%)		
Chi square for trend	P1 0.001**	P_2 0.001**	P_3 <0.001**		

χ^2 Chi square test MC Monte Carlo test F One Way ANOVA test **p≤0.001 is statistically highly significant p1 difference between group C and V p2 difference between group V and S significant p3 difference between group C and S

Table (4) Comparison of the studied groups regarding VAS scores over time:

	Group C	Group V	Group S	KW	p
	Median (IQR)	Median (IQR)	Median (IQR)		
At PACU	0(0 – 0)	0(0 – 0)	0(0 – 0)	3.263	0.196
At 1 hour	1(1 – 2)	0(0 – 2)	0(0 – 0)	19.815	<0.001**
Pairwise	P_1 0.008*	P_2 0.081	P3 <0.001**		
At 3 hours	6(6 – 7)	3(3 – 4)	3(1 – 4)	38.806	<0.001**
Pairwise	P_1 <0.001**	P_2 0.577	P3 <0.001**		
At 6 hours	4(3 – 5)	2(1 – 3)	4(2 – 4)	18.373	<0.001**
Pairwise	P_1 <0.001**	P_2 0.052	P3 0.02*		
At 12 hours	1(1 – 2)	1(1 – 3)	2(1 – 3)	2.715	0.257
At 24 hours	0(0 – 1)	1(1 – 3)	2(1 – 3)	1.888	0.389

KW Kruskal Wallis test **p≤0.001 is statistically highly significant p1 difference between group C and V p2 difference between group V and S significant p3 difference between group C and S

PACU: Post Anesthesia Care Unit

Table (5) Comparison of the studied groups regarding pain severity over time**:**

	Group C	Group V	Group S	χ^2	P
	N=21(%)	N=21(%)	N=21(%)		
At PACU					
No pain	21 (100%)	21 (100%)	21 (100%)	0	>0.999
Mild	0 (0%)	0 (0%)	0 (0%)		
Moderate	0 (0%)	0 (0%)	0 (0%)		
Severe	0 (0%)	0 (0%)	0 (0%)		
At 1 hour					
No pain	16 (76.2%)	14 (66.7%)	21 (100%)	8.09	0.018*
Mild	5 (23.8%)	7 (33.3%)	0 (0%)		

Moderate **Severe**	0 (0%) 0 (0%)	0 (0%) 0 (0%)	0 (0%) 0 (0%)		
Chi square for trend	P_1 0.495	P_2 0.008*	P3 0.047*		
At 3 hours **No pain** **Mild** **Moderate** **Severe**	 0 (0%) 0 (0%) 11 (52.4%) 10 (47.6%)	 2 (9.5%) 10 (47.6%) 9 (42.9%) 0 (0%)	 7 (33.3%) 6 (28.6%) 8 (38.1%) 0 (0%)	 25.135	 <0.001**
Chi square for trend	P_1 <0.001**	P_2 0.23	P3 <0.001**		
At 6 hours **No pain** **Mild** **Moderate** **Severe**	 0 (0%) 6 (28.6%) 15 (71.4%) 0 (0%)	 6 (28.6%) 12 (57.1%) 1 (4.8%) 2 (9.5%)	 5 (23.8%) 5 (23.8%) 11 (52.4%) 0 (0%)	 3.016	
At 12 hours **No pain** **Mild** **Moderate**	 11 (52.4%) 10 (47.6%) 0 (0%)	 15 (71.4%) 4 (19%) 2 (9.5%)	 10 (47.6%) 9 (42.9%) 2 (9.5%)	 0.559	 0.454
At 24 hours **No pain** **Mild**	 21 (100%) 0 (0%)	 19 (90.5%) 2 (9.5%)	 19 (90.5%) 2 (9.5%)	 1.576	 0.209

χ^2 Chi square test MC Monte Carlo test *p<0.05 is statistically significant **p≤0.001 is statistically highly significant p1 difference between group C and V p2 difference between group V and S significant p3 difference between group C and S

PACU: Post Anesthesia Care Unit

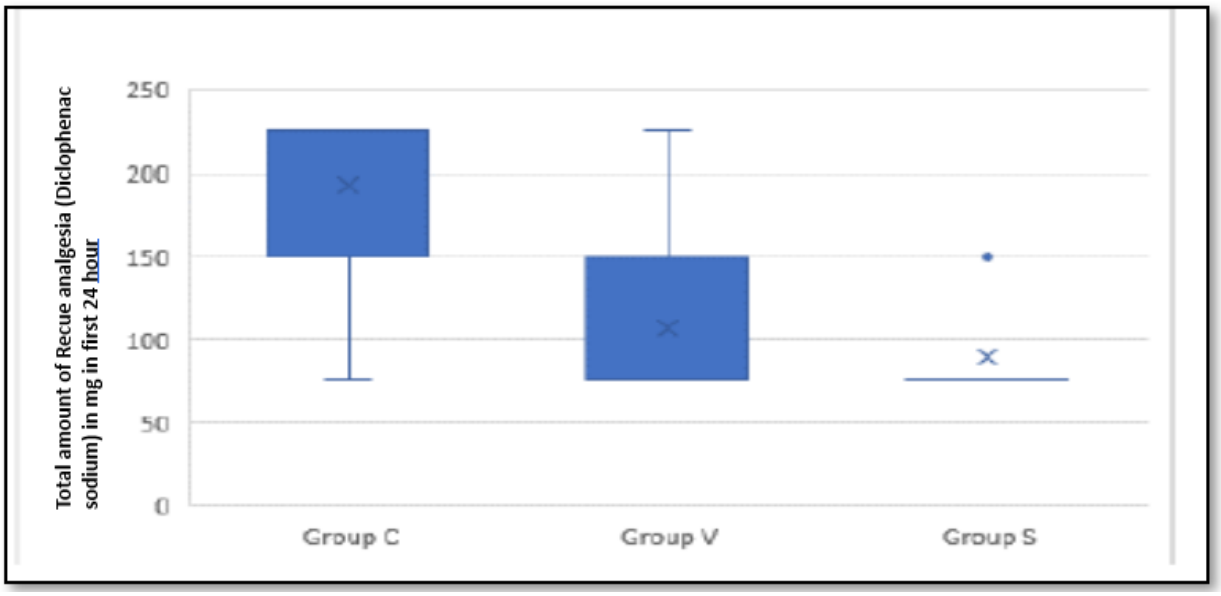

Figure (1) Boxplot showing comparison between the studied groups regarding rescue analgesia (Diclophenac sodium in mg during first 24 hours)

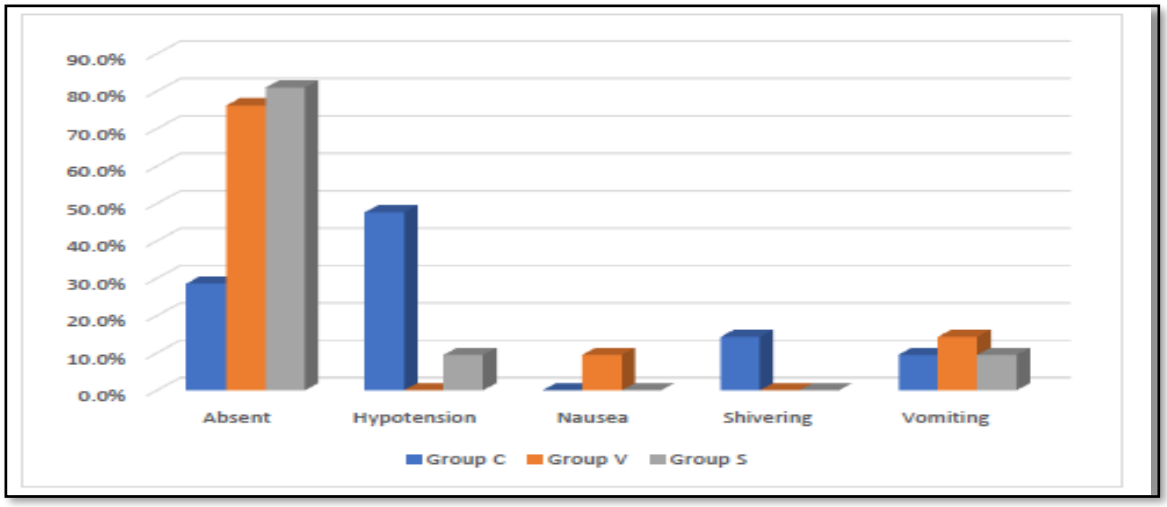

Figure (2) Multiple bar chart showing comparison between the studied groups regarding complications

DISCUSSION

Many orthopedic procedures now use spinal anesthesia as their preferred method of anesthesia. The main drawbacks of local anesthetics include their dosage-dependent adverse effects on the central nervous system and heart, as well as their duration of action. The synergistic action of adjuvants or additions with local anesthetics is to prolong the duration of sensory-motor block while lowering the cumulative dose need of the two. This is why they are typically used together [13].

To increase the effectiveness of local anesthetics, professionals have utilized a variety of medications, including opioids, epinephrine, anti-inflammatory medicines, midazolam, ketamine, magnesium sulfate, and neostigmine. Unfortunately, a number of these adjuvants cause unwanted side effects [14].

For the last decade, researchers have studied the possibility of using dexamethasone, a potent anti-inflammatory drug, in conjunction with local anesthetics during peripheral and neuraxial nerve blocks. It appears that steroids' intrinsic anti-inflammatory mechanism is distinct from the methods by which they enhance the analgesic effects. Both the local impact on nerve fibers and the systemic effects of dexamethasone enhance its analgesic characteristics, according to the research [15,16]. Analgesic effects of dexamethasone include decreased inflammation, suppression of ectopic neuronal discharge, and inhibition of transmission via nociceptive C-fibers [6].

This study revealed that using 8 mg intrathecal dexamethasone with bupivacaine was associated with higher sensory block level, longer duration of sensory block, lower VAS in the 1st postoperative hour, compared to bupivacaine alone or with intravenous dexamethasone, there is less overall rescue analgesia and fewer spinal anesthetic problems. The sensory block caused by intrathecal dexamethasone remained longer than that of the control and intravenous dexamethasone groups. These results agreed with Bani-Hashem et al. [11] who augmented spinal anesthesia with intrathecal dexamethasone for orthopedic procedures, and the results showed that the duration of sensory block was significantly longer in the case group (119±10.69 minutes) and then in the control group was (89.44±8.37 minutes).

Haque et al. [14] compared spinal anesthesia using dexamethasone with bupivacaine and spinal anesthesia using bupivacaine alone and found that dexamethasone significantly prolonged the duration of sensory block (122.11±10.59 minutes vs 92.32±8.34).

This was also consistent with the results of Bousabbeh et al. [17] , who investigated the efficacy of dexamethasone in conjunction with spinal anesthesia for procedures involving the involving the upper extremity of the femur; they revealed that the duration of sensory block was significantly higher in the Dexamethasone group 183.62 ± 33.93 minutes with ($P<0.001$) than in the control group 121.55 ± 16.42 minutes.

Bikfalvi et al. [18] assessed the sensory block duration after spinal anesthesia supplemented with intravenous dexamethasone. They reported a non-significant difference between the intravenous dexamethasone group and the control group, which was in line with the results of the present study.

The results of the current study showed that the maximum level of sensory block was significantly higher in the intrathecal dexamethasone group compared to both the control group and the intravenous dexamethasone group. This is not in agreement with the results of previous studies that examined the effect of intravenous or intrathecal dexamethasone on spinal anesthesia and reported no effect on the sensory block level as the study by Elshahawy et al. [19] who compared intrathecal dexamethasone and intrathecal dexmedetomidine and reported no effect on the sensory block level.

Bani-Hashem et al. [11] found that there was no substantial change in sensory block level when intrathecal dexamethasone was given to bupivacaine for spinal anesthesia in orthopedic surgery.

The study of Bikfalvi et al. [18] revealed that intravenous dexamethasone did not have any effect on the sensory block level of bupivacaine spinal anesthesia.

The three studied groups in the current study had nearly comparable results about the onset of sensory block. Consistent with earlier research, this one found that intrathecal or intravenous dexamethasone did not influence when spinal anesthesia's sensory block would occur [8,11,18]

The VAS pain score at 1,3 and 6 hours after surgery varied significantly among the groups. VAS increased in the control group to a median of 1 in 1st hour, a median of 6 in 3 hours, and a median of 4 in 6 hours, which was more than other groups. In the current study, the VAS was significantly lower in both the intravenous dexamethasone group and the intrathecal dexamethasone group than the control group at 1, 3, and 6 hours postoperatively. The total postoperative analgesic consumption was significantly lower in the intravenous and intrathecal dexamethasone groups than in the control group.

Movafegh et al. [20] studied the effect of intravenous dexamethasone administration with intrathecal meperidine on postoperative pain. They reported lower visual analog scale pain scores in the dexamethasone group at 6-h postoperatively. They also reported a lower total dose of diclofenac consumption in the dexamethasone group.

Bousabbeh et al. [17] revealed that the dexamethasone group had a significantly longer pain-free period than the control group when spinal anesthesia was introduced to femur upper extremity procedures ($P<0.001$). Additionally, when comparing the two groups' use of the Visual Analogue Pain Scale (VAS) in the first 24 hours after surgery, there was a significant difference at all measurement points, favoring the dexamethasone group over the control group.

Kiasari et al. [21] assessed the effects of intrathecal and intravenous dexamethasone on intrathecal morphine-related problems following a cesarean section, found that the pain score was considerably lower in the intrathecal injection group compared to the intravenous injection group .

Elshahawy et al. [19] reported that adding intrathecal dexamethasone or dexmedetomidine to bupivacaine resulted in lower VAS after 10 and 12 hours postoperatively than using bupivacaine alone.

In consistent with Bikfalvi et al. [18] who investigated the impact of intrathecal meperidine and intravenous dexamethasone on postoperative pain, the control group required a higher total dose of diclofenac sodium for pain relief compared to the other groups. In the group that received dexamethasone, the total amount of diclofenac was considerably reduced ($P < 0.05$).

Intraoperative complications (hypotension, nausea, vomiting, shivering) were fewer in intrathecal dexamethasone. In the control group, only six patients (28.6%) within the control group passed uncomplicated versus 76.2% of patients who received intravenous dexamethasone and 81% of patients who received intrathecal dexamethasone. Hypotension occurred in 47.6% of the control group versus 0% among patients who received intravenous dexamethasone and 9.5% among patients who received intrathecal dexamethasone.

These results did not agree with Bani-Hashem et al. [11] and Haque et al. [8] as they reported no difference in the frequency of complications between the intrathecal dexamethasone plus bupivacaine group and intrathecal bupivacaine only group. However, our results agreed with the results of Kaur et al. [22], who investigated the efficacy of fentanyl and intrathecal dexamethasone as adjuvants to spinal bupivacaine for orthopedic surgery found that the former had fewer adverse effects. At the same time, the latter extended the duration of analgesia and stabilized the hemodynamic profile.

Bikfalvi et al. [18] reported a lower incidence of perioperative nausea and vomiting in patients who received intravenous dexamethasone with spinal anesthesia than those who had only spinal anesthesia.

The study has certain drawbacks.; the first drawback is the small sample size of our study. Second, the study was done at single center, so to be

more validated it should be done at more than one center on larger sample size.

CONCLUSION

Adding Intrathecal dexamethasone to bupivacaine in spinal anesthesia was associated with longer duration and level of sensory block, lower VAS and the total amount of rescue analgesia with decreasing complications of spinal anesthesia as hypotension, shivering, and vomiting compared to intravenous route administration.

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