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Стаття надійшла до редакції
06.11.2020

UDC 616-089.888.61-089.5:615.211:615.015.2 https://doi.org/10.26641/2307-0404.2022.2.260256

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ADDING DEXAMETHASONE TO INTRATHECAL BUPIVACAINE 0.5%; COMPARING THE ANESTHETIC ABILITY WITH BUPIVACAINE 0.5% ALONE AMONG CESAREAN SECTION PATIENTS

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Цитування: Медичні перспективи. 2022. Т. 27, № 2. С. 82-88
Cited: Medicni perspektivi. 2022;27(2):82-88

Key words: *dexamethasone, bupivacaine, anesthesia, cesarean section*
Ключові слова: *дексаметазон, бупівакаїн, анестезія, кесарів розтин*
Ключевые слова: *дексаметазон, бупивакаин, анестезия, кесарево сечение*

Abstract. Adding dexamethasone to intrathecal bupivacaine 0.5%; comparing the anesthetic ability with bupivacaine 0.5% alone among cesarean section patients. Seyed Mohammad Nasirodin Tabatabaei, Alireza Rahat-Dahmarde, Jamshid Ordoni Avval, Hossein Ali Khazaie. *A perfect anesthesia technique is one in which anesthesia can be done in the shortest possible time with minimal hemodynamic changes and side effects This study is aimed to investigate the effects of concomitant administration of dexamethasone with bupivacaine on the duration of anesthesia and the quality of anesthesia-induced in patients undergoing cesarean section. This is a quasi-experimental*

study done on patients undergoing cesarean section by spinal anesthesia. All patients underwent standard monitoring after admission, then Ringer serum (5 cc/kg) was administered to the patients. The patients was then seated and subjected to intrathecal anesthesia with a midline approach in L3-L4 space. Patients were matched for baseline conditions. After recording background information, type and dosage of drugs used, blood pressure, heart rate, number and frequency of nausea and vomiting were listed in the checklist, and the data were analyzed using SPSS software. In this study, 70 pregnant women who were candidates for cesarean section were included. All our studied parameters, including the mean time to the start of analgesia, mean time of analgesia duration, analgesia duration, mean time to first request for analgesics were significantly improved among the intervention group. The use of dexamethasone and bupivacaine to induce spinal anesthesia during cesarean section can significantly shorten the onset time of analgesia and reduce postoperative nausea and vomiting. Dexamethasone can be used as an effective drug in cesarean section.

Реферат. Додавання дексаметазону до інтратекального бупівакаїну 0,5%; порівняння анестезуючої здатності тільки бупівакаїну 0,5% у пацієнтів із кесаревим розтином. Сейєд Мохаммад Насіродін Табатабаї, Аліреза Рахат-Дахмарде, Джамшид Ордоні Аввал, Хоссейн Алі Хазаі. *Досконала техніка анестезії – це та, при якій анестезію можна зробити в найкоротші терміни з мінімальними гемодинамічними змінами та побічними ефектами. Метою цього дослідження було дослідити вплив одночасного введення дексаметазону та бупівакаїну на тривалість анестезії та її якість у пацієнтів, яким зроблено кесарів розтин. Це квазіекспериментальне дослідження, проведене на пацієнтах, яким робили кесарів розтин за допомогою спинномозкової анестезії. Усім пацієнтам після надходження в стаціонар було проведено стандартний моніторинг, потім їм уведено сироватку Рінгера. Пацієнтам робили інтратекальну анестезію, в положенні сидячи, з доступом посередині в просторі L3-L4. Пацієнти були порівняні за вихідним станом. Після запису вихідної інформації (анамнезу) тип і дозування застосовуваних препаратів, кров'яний тиск, частота серцевих скорочень, кількість і частота нудоти та блювоти були внесені в контрольний список, а дані були проаналізовані за допомогою програмного забезпечення SPSS. У це дослідження було включено 70 вагітних жінок, які були кандидатами на кесарів розтин. Усі вивчені нами параметри, включаючи середній час до початку аналгезії, середній час тривалості знеболювання, тривалість аналгезії (знеболювання), середній час до першого запиту на анальгетики, були значно покращені серед групи втручання. Застосування дексаметазону та бупівакаїну для проведення спінальної анестезії під час кесаревого розтину може значно скоротити час початку знеболювання та зменшити післяопераційну нудоту та блювоту. Дексаметазон можна використовувати як ефективний препарат при кесаревому розтині.*

In recent decades, there have been important changes in the discussion of childbirth [1]. The incidence of cesarean section has increased considerably in the world [2, 3, 4]. In cesarean section, anesthesia is performed mainly through the spinal cord. This type of anesthesia can be easily prescribed, it is cost-effective, causes analgesia and muscle relaxation simultaneously, and it has a high rate of anesthesia [5]. A perfect anesthesia technique is one in which anesthesia can be done in the shortest possible time with minimal hemodynamic changes and side effects [6]. Presently the drug of choice for induction of spinal anesthesia is bupivacaine, which can cause analgesia for 90 to 120 minutes [7]. Numerous drugs such as opioids [8], phenylephrine [9], adrenaline [10, 11], clonidine [12], and neostigmine [13] have been used to prolong the effect of bupivacaine, but each of these drugs has its side effects. For example, after taking narcotics, respiratory failure occurs following vasoconstrictors, increasing heart rate and blood pressure, or taking clonidine, can causes excessive sedation [14]. Dexamethasone is a synthetic glucocorticoid that anesthesiologists increasingly use as an adjunct in the induction of spinal anesthesia [15-18]. Studies show that dexamethasone can improve the duration and quality of anesthesia [15, 19, 20, 21]. This study is aimed to investigate the effects of concomitant administration of dexamethasone with bupivacaine on the duration of anesthesia and the quality of anesthesia-induced in patients undergoing cesarean section.

MATERIALS AND METHODS OF RESEARCH

This is a quasi-experimental study. All patients undergoing an elective cesarean section by spinal anesthesia were included. The exclusion criteria consisted of gestational age<37 weeks, diabetes or hypertension, having one of the contraindications of intraspinal anesthesia, and BMI >35 kg/m^2.

This evaluation was conducted to compare the effects of intrathecal dexamethasone with bupivacaine. Consequently, after the ethics committee approved the study and the relevant codes were acquired, before sampling, written consent was obtained from all samples of the study to participate in the study, and patients were examined based on cardiovascular, nervous, and respiratory systems factors so that the research samples did not have any cardiovascular, respiratory and neurological diseases. These examinations were done through medical consultation with specialized cardiologist, internalist and neurologist doctors who performed evaluations such as echocardiography, chest X-ray and further imaging when required.

Seventy patients who were candidates for cesarean section were randomly divided into two groups. All

patients underwent standard monitoring after admission, then Ringer serum (5 cc/kg) was administered to the patient. The patient was then seated and subjected to intrathecal anesthesia with a midline approach in L3-L4 space. Patients were matched for baseline conditions.

Dexamethasone was used with other anesthetics such as lidocaine, and its effects on some parameters, including, nausea and vomiting were evaluated. However, there were insufficient studies on its effect on the duration and level of nerve block. Before doing the spinal anesthesia technique, the samples of the effective drug were considered and did not receive the study results in all the monitoring, and in all the samples, 500 ml of Ringer serum was infused to increase the intravascular volume. The study population was randomly divided into two groups of 35 people using the block method. In the control group, bupivacaine alone was used for anesthesia, and in the intervention group, dexamethasone was used in combination with bupivacaine. The dose of bupivacaine was 12.5 mg, and the dose of dexamethasone was 4 mg. Bupivacaine and dexamethasone did not have an antagonistic drug interaction but a synergistic effect. The block method was used to randomize, and the intervention was performed as a two-way blind (patient and recorder of the studied variables).

The spinal anesthesia technique was done in all samples in a sitting position. After determining the needle entry site, which was the fourth or third space between the lumbar vertebrae, the area was disinfected and dried with betadine. Then a special needle was inserted into the arachnoid mater from the space between the lumbar vertebrae, and after the cerebrospinal fluid was removed from the bottom of the needle, drugs were injected. After injecting the drugs into the arachnoid mater, the needle was removed, the patients were placed on their backs. Patients' blood pressure and pulse were measured and recorded immediately after, every 3 minutes for the first 10 minutes, and every 5-7 minutes after that. To determine the time to reach anesthesia at T10 level, an alcohol pad was applied to the patient's skin, which felt cold, and the same alcohol pad was applied to the patient's lower limbs and abdomen, when the patient after pulling an alcohol pad, did not feel cold in the navel area, the anesthesia had reached the T10 area. Pain feeling was also asked, and the onset of pain was recorded. Intraoperative and postoperative pain was measured with a VAS scale until discharge from the recovery unit. The first time a request for VAS-based housing was recorded was higher than 3 out of 10, and for each patient, prescribing painkillers was started from this time.

After recording background information, type and dose of drugs used, blood pressure, heart rate, number and frequency of nausea and vomiting were listed in the checklist, the data were analyzed using SPSS software and with the help of T-test and chi-square tests, and a significance level of $p<0.05$ was considered.

The research was approved by the Institutional Review Board on biomedical ethics, Zahedan University of Medical Sciences, and was conducted in accordance with the principles of bioethics set out in the WMA Declaration of Helsinki – "Ethical principles for medical research involving human subjects" and "Universal Declaration on Bioethics and Human Rights" (UNESCO).

Mean and standard deviation were used to describe the quantitative data, and percentage and frequency were used to describe the qualitative data. Chi-square statistical tests and quantitative data were used to analyze the qualitative data. Otherwise, equivalent nonparametric tests such as Mann-Whitney U were used.

RESULTS AND DISCUSSION

In this study, 70 pregnant women were candidates for cesarean section, the average age was 27.1±6.2 years and the mean gestational age was 37.68±2.84. The patients were divided into two groups receiving bupivacaine + dexamethasone and bupivacaine alone (p=0.293). The indication for cesarean section (CS) was prior CS in 54 (78.5%) of cases, abnormal lie and presentation in 10 (14.2%), and maternal pelvic deformity in 6 (8.5%) of cases. The duration of surgery was not significantly different in the group using both medications (47.5±6.2) versus. Bupivacaine group –46.9±5.7 (p=0.62)

Comparison of anesthetic ability the meantime of anesthesia reached the level of T-10 block in 9.7±2.8 minutes in the intervention group and 11.3±4.4 minutes in the control group (p=0.02). The meantime to sensory block anesthesia in the intervention group was 6.5±2.3 minutes, and in the intervention group, it was 8.2±1.6 (p=0.01).The mean time of anesthesia of motor block in the intervention group was 14.2±4.3 minutes, and in the control group, it was 17.5±9.1 (p=0.001). The mean anesthesia time of the motor block in the intervention group was 148.6±34.3 minutes and in the control group – 126.26+9.1 minutes (p=0.005).

The mean duration of analgesia in the intervention group was 2.5+1.3 hours, while in the control group it was 8.7±3.0. This difference was statistically significant (p=0.0001) (Table).

In the study, the patient's first request for a painkiller in the intervention group was 345.83±0.4 minutes and in the control group – 251.52±1.8 minutes (p=0.0001) (Table).

Comparison of cases and controls regarding anesthetic ability

Variable			Mean± SD	p value
Mean time to the start of anesthesia (minutes)	T10 level block	case	9.7±2.8	0.02
		control	11.3±4.4	
	Sensory block	case	6.2±5.3	0.01
		control	8.2±1.6	
	Motor block	case	14.4±2.3	0.001
		control	17.5±9.1	
Mean time of anesthesia duration (minutes)	Sensory block	case	131.21±5.2	0.0001
		control	109.18±8.4	
	Motor block	case	148.34±6.3	0.005
		control	126.26±9.1	
Anesthesia duration (hours)		case	5.1±2.3	0.0001
		control	8.7±3.0	
Mean time to first request for analgesics		case	345.83±0.4	0.0001
		control	251.52±1.8	
Mean VAS		case	5.4±1.0	0.001
		control	9.6±1	
Nausea/Vomiting(prevalence)		case	5 (14.3%)	0.185
		control	9 (25.7%)	

In the present study, the frequency of complications (nausea and vomiting) in the intervention group was 14.3% (n=5) and in the control group – 25.7% (n=9). This difference was not statistically significant (p=0.185) (table).

The mean score of pain during surgery in the intervention group was 1.5±0.4 and in the control group – 9.6±1.0. This difference was statistically significant (p=0.001) (Table).

Controlling postoperative pain and developing methods to manage it has always been one of the primary data of anesthesiologists. Correcting labor management and proper anesthesia to create analgesia and maintain maternal and fetal health during cesarean section are also important. There is disagreement about the differences between the use of different drugs and their side effects [22]. Steroids have strong anti-inflammatory and analgesic properties, but the analgesic mechanism of corticosteroids is not well understood. Epidural steroids are used to treat low back pain. Intrathecal dexamethasone may affect the production of intrathecal prostaglandins. Acute stimulation of peripheral tissues leads to sensitization of spinal cord horn neurons by the secretion of substances such as glutamate and aspartate. These amino acids activate N-methyl-D-Aspartate receptors and lead to the influx of calcium ions, which leads to the activation of phospholipase A2, which converts membrane phospholipase to arachidonic acid. Corticosteroids can reduce prostaglandin synthesis by inhibiting phospholipase A2 via producing calcium-dependent phospholipid-binding proteins called anoxins and inhibiting cyclooxygenases during inflammation [22].

Consequently, in the current study, the effect of adding dexamethasone to bupivacaine on the duration of anesthesia and the level of nerve block in cesarean section patients was investigated, and the results revealed that adding dexamethasone to bupivacaine

meaningfully improved the duration of sensory block and analgesia in spinal anesthesia.

The analgesic potential of dexamethasone comes from inhibition of neural discharge and transmission in nociceptive C fibers [23]. It has been reported that when dexamethasone is used perineural it causes vasoconstriction which is followed by slower absorption of the local anesthetic drug and prolonged duration of anesthesia [24, 25, 26, 27]. On the other hand, intravenously prescription of dexamethasone has been suggested to prolong the length of postoperative analgesia, which is perfectly aligned with our results showing a significantly higher mean time for anesthesia duration among patients receiving dexamethasone [28]. In addition, dexamethasone acquires anti-inflammatory qualities which can result in the suppression of edema and scar formation [26, 29]. Schalu et al. in the their study reported increased duration of analgesia after surgery among patients who received dexamethasone in addition to bupivacaine [30]. They also reported a prolonged sensory blockade without delaying the motor blockade which was consistent with our study and some other studies [26, 29, 31].

Though there was no significant difference between the two groups regarding symptoms such as nausea and vomiting, the rate was higher among those who did not take dexamethasone. This indicates that dexamethasone (8 mg) following systemic uptake, by its direct central effect on the solitary tract nucleus, its interaction with the neurotransmitter serotonin and tachykinin proteins NK1 and NK2 receptors and alpha adrenaline, controls the physiological functions of organs, and via regulating the hypothalamic-pituitary-adrenal axis, exerts its anti-nausea effects [36]. This reduction in nausea is due in part to better pain relief following dexamethasone. These findings are consistent [37] with the results of another study in which dexamethasone use significantly reduced the incidence of postoperative nausea and vomiting (PONV). Vomiting was not seen in any of the groups.

In the current study, dexamethasone was used as an inducer of anesthesia during cesarean section; the long-term effects, its side effects, and its effects on the newborn and Apgar score up to 15 minutes after drug administration has not been evaluated. Some potential side effects of dexamethasone, such as delayed wound healing, hyperglycemia, and adrenal suppression were not evaluated. Previous studies have indicated that taking small doses of dexamethasone does not cause significant side effects. One of the points that should be considered in future studies is that to better assess the patient's pain from surgery to 8 hours after, the interval between the patient's pain assessments should be shortened.

CONCLUSION

The use of dexamethasone and bupivacaine to induce spinal anesthesia during cesarean section can significantly shorten the onset time of anesthesia and reduce postoperative nausea and vomiting. Dexamethasone can be used as an effective drug in cesarean section.

Contributors:

Seyed Mohammad Nasirodin Tabatabaei and Hossein Ali Khazaie – conceptualization, methodology, data curation, writing – review & editing;

Alireza Rahat-Dahmarde – methodology, data curation, resources, writing – original draft, writing – review & editing;

Jamshid Ordoni Avval – methodology, resources, supervision, writing – review & editing

Funding. This research received no external funding.

Conflict of interests. The authors declare no conflict of interest.

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Стаття надійшла до редакції
28.12.2021