Original Article

Zahedan Journal of Research in Medical Sciences

Journal homepage: www.zjrms.ir

Comparative Study of Intrathecal Dexamethasone with Epinephrine as Adjuvants to Lidocaine in Cesarean Section

Fereshteh Naziri,[1] S. Mozafar Rabiee,[1] Nadeia Banihashem,*[1] Keyvan Hosseinjanzadeh,[1] Zeiba Shirkhani,[2] S. Sedigheh Solimanian[2]

1. Department of Anaesthesiology and Intensive Care, Babol University of Medical Sciences, Babol, Iran
2. Researcher, Babol University of Medical Sciences, Babol, Iran

Article information

Article history:
Received: 8 July 2012
Accepted: 20 Sep 2012
Available online: 7 Jan 2013
ZJRMS 2013; 15(9): 23-26

Keywords:
Lidocaine
Dexamethasone
Epinephrine
Spinal anesthesia
Cesarean section

*Corresponding author at:
Department of Anaesthesiology and Intensive Care, Babol University of Medical Sciences, Babol, Iran.
E-mail:
nbanihashem@yahoo.com

Abstract

***Background*:** Different additives have been used with local anesthetics to provide prolonged duration of sensory block in spinal anesthesia. The aim of present study was to evaluate the onset and duration of sensory block of intrathecal dexamethasone and epinephrine as adjuvants to lidocaine in patients who were candidate for cesarean section.

***Materials and Methods*:** This double-blind clinical trial research was conducted on 90 pregnant women candidate for cesarean section under spinal anesthesia. Patients were randomly allocated to receive intrathecally either 75 mg hyperbaric lidocaine plus 100 µg epinephrine or 75 mg hyperbaric lidocaine plus 4 mg dexamethasone or 75 mg hyperbaric lidocaine. The onset and duration of sensory block as well as postoperative analgesia were assessed.

***Results*:** The time to reach the peak sensory block in lidocaine group was shorter than that of other two groups (p<0.001). Duration of sensory block in the control group, dexamethasone group, and epinephrine group were 64.16±7.99 min, 74.79±12.78 min, and 99.30±10.93 min, respectively (p<0.001).

***Conclusion*:** The present research shows that intrathecal dexamethasone and intrathecal epinephrine as adjuvant to lidocaine increases sensory block duration in the women candidate for cesarean section.

Introduction

Spinal anesthesia is the most commonly used technique for cesarean section as it is very economical and easy to administer. It reduces mortality rate associated with cesarean section by sixteen times when compared with general anesthesia. Spinal anesthesia avoids the risks of general anesthesia such as aspiration of gastric contents, difficulty with airway management, infant respiratory distress, and mothers' awareness during operation [1].

Increasing the duration of local anesthetic drugs often is a matter of concern for anesthesiologists. Epinephrine, phenylephrine, clonidine, opioids, etc. are used to increase the duration of spinal anesthesia [2, 3]. Adding epinephrine to the local anesthetics may lead to tachycardia, pallor, and hypertension [1]. Opioids control postoperative pain well; however, they are followed by nausea, vomiting, drowsiness and pruritus. At present, there is no drug able to control pain specifically without having side effects [2, 3]. The use of corticosteroid compounds increases duration of anesthesia and analgesia in peripheral nerve blocks [4, 5]. In addition, intravenous (IV) and oral dexamethasone considerably alleviate postoperative pain [6-8]. Epidural and intrathecal steroids are used to reduce chronic pain [9-11]. In some studies, intrathecal dexamethasone increased duration of sensory block and postoperative analgesia [12-14]. Although intrathecal dexamethasone is used to control chronic pain; few studies have been conducted on the effects of sensory block and postoperative pain in patients undergoing surgery. The purpose of this investigation was to evaluate the effect of conjugation of dexamethasone or epinephrine with lidocaine on the duration and onset time of spinal anesthesia.

Materials and Methods

In this double-blind clinical trial research, 90 ASA class I female patients aged 18-35 years who were candidates for cesarean section were randomly divided into three groups of control group, epinephrine group, and dexamethasone group. To do so, a table was created by a computer using random numbers. Patients with history of long-term steroid therapy, allergy to the drugs, uncontrolled hypertension, neurological or psychological disorders, spinal column surgery, low back pain, opium addict or using any drug that modifies pain perception were excluded from the study.

After ethic committee approval, written informed consent was obtained from each patient preoperatively. In order to compare the sensory duration of dexamethasone or epinephrine added to lidocaine, the sample size was determined to be 30 persons in each group. We did so through reviewing the respective literature and based on the mean difference formula with α=5% and β=80% [12, 13]. After intravenous line preparation, a 5 cc/kg lactated ringers solution was infused to all patients. Patients received no premedication, and upon arrival of patients into the operating room, ECG, peripheral oxygen

saturation (SPO 2), and noninvasive arterial blood pressure (NIBP) were monitored and recorded at 5-minute intervals until the end of surgery and vital signs were recorded every 15 minutes in the Post Anesthesia Care Unit (PACU).

Spinal anesthesia was performed in a sitting position using 25G Quincke needle in L3-L4 or L4-L5 intervertebral disk space. In the control group, 75 mg lidocaine and 1ml saline was injected. In the epinephrine group, 75 mg lidocaine (made in Finland) and 100 µg epinephrine (made by Iranian Darou Pakhsh Holding Company) was injected. In the dexamethasone group, 75 mg lidocaine and 4 mg dexamethasone (2.5 ml) (made by Iran Hormone Company) was injected into intrathecal space. Immediately after injection of the drugs, the patients were laid in the supine position and a pillow was put under the right buttock of each patient. Five to six liters per minute of oxygen was given by mask. The sensory block level was assessed by a pin prick test by a short bevel needle along the mid-axillary line bilaterally. The sensory block level was controlled every 30 seconds for 20 minutes; then it was evaluated every 5 minutes until a 4 sensory level regression from highest level or to the end of the surgery. Onset time was defined from the time of injection of drugs into the intrathecal space to the peak of sensory block (highest dermatome level) and the duration of sensory block was defined from peak of sensory block up to 4 sensory level regressions or when the patients feel pain in the field of surgery.

After the end of sensory block, pain level was measured with respect to Visual Analogue Scale (VAS) (zero=no pain, 10=the most severe pain the individual has suffered) per hour. If the postoperative VAS was higher than 4, it was treated by morphine 2 mg IV. Analgesia duration was defined as the interval between injection of intrathecal drug and the time morphine was injected. Hypotension was defined as a decrease in systolic blood pressure to <90 mm Hg or 30% less than base value. Hypotension was treated with 10 mg ephedrine. The heart rate lower than 60 beats/min was treated by 0.5 mg atropine. All the patients were observed at the time of discharge from hospital and 1 month later and asked about any neurologic deficit. Then, the obtained data and results were entered into separately-designed tables and were analyzed using SPSS-16.

The demographic information, sensory block onset, sensory block duration and postoperative anesthesia were measured by one-way analysis of variance (ANOVA) and Tukey post hoc test and nausea and vomiting were measured by χ^2 test.

Results

One patient in dexamethasone group was excluded from the study, as she was put under general anesthesia due to uterine atony and needed hysterectomy. The information obtained from 89 patients was statistically analyzed. There were no differences between the means of age, weight and height in the three groups (Table 1). Onset of sensory block in lidocaine group was considerably shorter than dexamethasone and epinephrine groups. Sensory block duration in dexamethasone and epinephrine groups was longer than that in lidocaine group (Table 2). Postoperative analgesia in epinephrine group was longer than lidocaine and dexamethasone groups. In lidocaine group, duration of postoperative analgesia was shorter than that in epinephrine and dexamethasone groups (Table 2). Twenty-five patients (86%) in dexamethasone group, 15 patients (50%) in lidocaine group, and 14 patients (46.7%) in epinephrine group had considerable hypotension (p=0.003). Figure 1 shows changes of blood pressure in the three groups. Need for ephedrine in the control group, epinephrine group and dexamethasone group were 7.67±6.91, 7.5±8.67, 9.48±84.59 mg, respectively (p=0.58). Three patients in dexamethasone group and one patient in the control group suffered from bradycardia and were received atropine injection. Incidence of nausea and vomiting in dexamethasone group was significantly lower than the other two groups (p<0.05) and no neurological and infectious complication in patients were reported (Table 3).

Table 1. Comparison of characteristics of patients in the three groups

	Lidocaine (Mean±SD)	Lidocaine+dexamethasone (Mean±SD)	Lidocaine+epinephrine (Mean±SD)	p-Value
Age (yr)	27.5±4.16	28.21±5.74	28.13±6.21	0.0859
Weight (kg)	75.80±6.45	75.86±6.23	79.17±6.01	0.064
Length (cm)	158.50±2.57	158.72±2.97	159.3±3.87	0.607

Table 2. Comparison onset of sensory block, duration of sensory block and analgesia in the three groups

	Lidocaine (Mean±SD)	Lidocaine+dexamethasone (Mean±SD)	Lidocaine+epinephrine (Mean±SD)
Onset of sensory block	1.6±4.7*	2.83±7.52**	1.2±5.93***
Sensory block duration (min)	7.99±64.16*	12.78±74.79**	10.93±99.3**
Analgesia duration (min)	22.44±165*	40.41±175.13	25.56±240.63**

* p<0.001one-way analysis of variance (ANOVA)
**p≤0.001 Compared with lidocaine (Tukey post hoc test)
***p<0.05 Compared with lidocaine (Tukey post hoc test)

Table 3. Distribution of nausea, vomiting, in the three study groups

	Lidocaine N(%)	Lidocaine+dexamethasone N(%)	Lidocaine+epinephrine N(%)	p-Value
Nausea	16(53.3)	5(17.2)	10(33.3)	0.014
Vomiting	12(40)	3(10.3)	5(16.7)	0.016

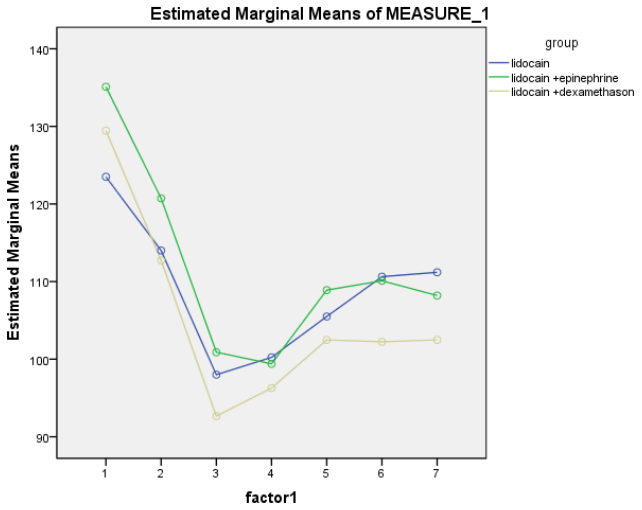

Figure 1. Comparing changes of blood pressure in the three groups

Discussion

In this study, adding 100 µg epinephrine or 4 mg dexamethasone to 75 mg intrathecal lidocaine increased sensory block duration; however, it did not delay the onset of sensory block.

Many studies have confirmed analgesic effects of steroids in peripheral and neuroaxial blocks [10-14]. Movafegh et al. reported that the addition of dexamethasone (8 mg) to lidocaine for spinal anesthesia provided significant prolongation of sensory and motor block in comparison with plain lidocaine and there is no difference between dexamethasone-lidocaine 5% and epinephrine (0.2 mg) - lidocaine 5% in sensory and motor block duration. Indeed, lidocaine-dexamethasone is not followed by any kind of hemodynamic, neurological complications or delay in the onset of sensory and motor block [13]. In another study, adding 8 mg dexamethasone to plain bupivacaine increased the duration of sensory block and postoperative analgesia and had no effect on the onset of sensory block [12]. However, in a study carried out by Abdel-Aleem et al., adding 8 mg dexamethasone to intrathecalbupivacaine had no effect on VAS and postoperative consumption of narcotics in patients candidate for cesarean setion [14]. Mirzaei et al. showed that injecting epidural corticosteroid and bupivacaine considerably reduces back pain after laminectomy surgery [9].

The study conducted by Kotani et al. revealed that intrathecal methylprednisolone and bupivacaine create excellent analgesia after restoring burns and injuries to organs [15]. Moreover, 5 mg intrathecal dexamethasone reduces postoperative anesthesia and morphine consumption after laparoscopy surgery [16]. Dexamethasone and bupivacaine in supraclavicular and axillary block significantly increase duration of analgesia [17, 18]. Analgesic mechanism of corticosteroids is not known well. It seems that controlling inflammatory or immune system has a role in increasing the duration of analgesia, as intrathecal steroids reduce production of prostaglandins by controlling phospholipase A2 and cyclooxygenase [19]. In a study conducted by Drager et al., it was hypothesized that local injection of dexamethasone could control the inflammatory response and reduce the release of inflammatory mediators (prostaglandin E2, thromboxane A_2 and other prostanoids) in the affected area, possibly increasing analgesia duration of local anesthetics in this way [20]. Some researchers believe that the analgesics effects of corticosteroids are caused by their systematic effects [4]. Prolongation of the block may be due to their direct effect on nerve fiber.

In this study, intrathecal dexamethasone reduced nausea and vomiting considerably. In a research conducted in 2012, injection of 8 mg intrathecal dexamethasone reduced nausea and vomiting in the women undergoing cesarean section [14]. In the study conducted by Movafegh, there was no difference between the incidence of nausea and vomiting in lidocaine-dexamethasone group, and plain lidocaine and lidocaine-epinephrine group. The mechanism of dexamethasone effect in preventing nausea and vomiting is not clear. Receptors of glucocorticosteroids are in postrema area, which regulates nausea and vomiting. Dexamethasone might prevent nausea and vomiting by regulating neurotransmitters or density of receptor in this center [21].

No neurological complications following injection of intrathecal steroids have been reported by previous studies [22]. A study reported histopathologic changes after repeated injections of intrathecal betamethasone [23]. Kotani et al. did not report any complication following injection of intrathecal methylprednisolone [15]. Sugita did not report any complication after injection of 8 mg intrathecal dexamethasone [24]. This study shows that, similar to epinephrine, intrathecal dexamethasone increases sensory block duration of lidocaine; however, it has no effect on postoperative analgesia.

The present study shows that adding dexamethasone to intrathecal lidocaine increases sensory block duration. This can be useful for the patients with no contraindications to epinephrine.

Acknowledgements

The present study is a part of the specialized dissertation of Dr. Keyvan Hosseinjanzadeh No. 9032746, which was supported scientifically and financially by the esteemed Deputy Research, Babol University of Medical Sciences (BUMS).

Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

Funding/Support

Zahedan University of Medical Sciences.

References

1. Brown DL. Spinal, epidural and caudal anesthesia. In: Miller RD. Anesthesia. 7th ed. Philadelphia: Churchill Livingstone; 2010: 1611-1638.
2. Murali Krishna T, Panda NB, Batra YK and Rajeev S. Combination of low doses of intrathecal ketamine and midazolam with bupivacaine improves postoperative analgesia in orthopaedic surgery. Eur J Anaesthesiol 2008; 25(4): 299-306.
3. Yu SC, Ngan Kee WD, Kwan AS. Addition of meperidine to bupivacaine for spinal anaesthesia for caesarean section. Br J Anaesth 2002; 88(3): 379-83.
4. Stan T, Goodman EJ, Bravo-Fernandez C and Holbrook CR. Adding methylprednisolone to local anesthetic increases the duration of axillary block. Reg Anesth Pain Med 2004; 29(4): 380-1.
5. Baxendale BR, Vater M, Lavery KM. Dexamethasone reduces pain and swelling following extraction of third molar teeth. Anaesthesia 1993; 48(11): 961-4.
6. Schmelzeisen R, Frolich JC. Prevention of postoperative swelling and pain by dexamethasone after operative removal of impacted third molar teeth. Eur J Clin Pharmacol 1993; 44(3): 275-7.
7. Elhakim M, Ali NM, Rashed I, et al. Dexamethasone reduces postoperative vomiting and pain after pediatric tonsillectomy. Can J Anaesth 2003; 50(4): 392-7.
8. Bisgaard T, Klarskov B, Kehlet H and Rosenberg J. Preoperative dexamethasone improves surgical outcome after laparoscopic cholecystectomy: A randomized double-blind placebo-controlled trial. Ann Surg 2003; 238(5): 651-60.
9. Mirzai H, Tekin I, Alincak H. Perioperative use of corticosteroid and bupivacaine combination in lumbar disc surgery: A randomized controlled trial. Spine (Phila Pa 1976). 2002; 27(4): 343-6.
10. Price C, Arden N, Coglan L and Rogers P. Cost-effectiveness and safety of epidural steroids in the management of sciatica. Health Technol Assess 2005; 9(33): 1-58.
11. Glasser RS, Knego RS, Delashaw JB and Fessler RG. The perioperative use of corticosteroids and bupivacaine in the management of lumbar disc disease. J Neurosurg 1993; 78(3): 383-7.
12. Bani-Hashem N, Hassan-Nasab B, AlijanPour E, et al. Addition of intrathecal dexamethasone to Bupivacaine for spinal anesthesia in orthopedic surgery. Saudi J Anaesth 2011; 5(4): 382-6.
13. Movafegh A, Ghafari MH. A comparison of the sensory and motor blockade duration of intrathecal lidocaine 5%, lidocaine 5% plus epinephrine and lidocaine 5% plus dexamthasone: A double blind randomized clinical trials study. Int J Pharmacol 2005; 1: 346-9.
14. Abdel-Aleem M, Osman A, Morsy K. Effect of coadministration of dexamethasone with intrathecal morphine on postoperative outcomes after cesarean delivery. Int J Gynaecol Obstet 2012; 116(2): 158-61.
15. Kotani N, Kushikata T, Hashimoto H, et al. Intrathecal methylprednisolone for intractable postherpetic neuralgia. N Engl J Med 2000; 343(21): 1514-9.
16. Thomas S, Beevi S. Epidural dexamethasone reduces postoperative pain and analgesic requirements. Can J Anaesth 2006; 53(9): 899-905.
17. Golwala MP, Swadia VN, Dhimar-Aditi A and Sridhar NV. Pain relief by dexamethasone as an adjuvant to local anaesthetics in supraclavicular brachial plexus block. J Anesth Clin Pharmacol 2009; 25(3): 285-8.
18. Movafegh A, Razazian M, Hajimaohamadi F and Meysamie A. Dexamethasone added to lidocaine prolongs axillary brachial plexus blockade. Anesth Analg 2006; 102(1): 263-7.
19. Kopacz DJ, Lacouture PG, Wu D, et al. The dose response and effects of dexamethasone on bupivacaine microcapsules for intercostal blockade (T9 to T11) in healthy volunteers. Anesth Analg 2003; 96(2): 576-82.
20. Drager C, Benziger D, Gao F, et al. Prolonged intercostal nerve blockade in sheep using controlled-release of bupivacaine and dexamethasone from polymer microspheres. Anesthesiology 1998; 89(4): 969-79.
21. Balki M, Carvalho JC. Intraoperative nausea and vomiting during cesarean section under regional anesthesia. Int J Obstet Anesth 2005; 14(3): 230-41.
22. Abram SE, Marsala M, Yaksh TL. Analgesic and neurotoxic effects of intrathecal corticosteroids in rats. Anesthesiology 1994; 81(5): 1198-205.
23. Latham JM, Fraser RD, Moore RJ, et al. The pathologic effects of intrathecal betamethasone. Spine 1997; 22(14): 1558-62.
24. Sugita K, Kobayashi S, Yokoo A and Inoue T. Intrathecal steroid therapy for post traumatic visual disturbance. Neurochirurgia 1983; 26(4): 112-7.

Please cite this article as: Naziri F, Rabiee SM, Banihashem N, Hosseinjanzadeh K, Shirkhani Z, Solimanian SS. Comparative study of intrathecal dexamethasone with epinephrine as adjuvants to lidocaine in cesarean section. Zahedan J Res Med Sci (ZJRMS) 2013; 15(9): 23-26.