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TO STUDY THE EFFICACY OF INTRAVENOUS DEXAMETHASONE IN PROLONGING THE DURATION OF INTRATHECAL ISOBARIC LEVO-BUPIVACAINE IN ELECTIVE CESAREAN SECTION

Anaesthesiology

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ABSTRACT

Background and Aims: Evaluation for the purpose of enhancing quality of analgesia and prolonging duration of spinal anesthesia by adding various additives have been done.

Methods: A randomized, double-blind study was conducted to evaluate the efficacy of intravenous dexamethasone in sixty patients scheduled for lower segment cesarean section under spinal anesthesia,were randomly allocated into two groups, group LD(n=30) and group LS(n=30).All the patients received intrathecal injection of isobaric levo-bupivacaine 0.5% heavy 10 mg. Group LD and Group LS received injection dexamethasone 8 mg intravenously and normal saline (NS) 2 cc respectively immediately after spinal anesthesia. Characteristics of block, visual analog pain scale (VAS) score, time of rescue analgesia, total analgesic requirement in the first 24 h, intra- and post-operative hemodynamics, nausea and vomiting or any other side effects were recorded.

Results: The mean duration of sensory block (min) in group LD and group LS was 168.4±2.33 mins and 122.6± 1.87 mins , respectively which was highly significant. Similarly, time to the requirement of first rescue analgesia was prolonged in group LD (7.8 h) as compared to group LS (4.25 h). Significant changes were also seen in VAS score in postoperative period after 1 h of surgery in group LD and group LS. The incidence of PONV was significantly high in group LS (18 patients) in comparison to group LD (1 patient).

Conclusion: We concluded that administration of dexamethasone 8 mg intravenously prolongs the duration of postoperative analgesia and sensory block in patients undergoing lower segment cesarean section with intrathecal isobaric levo-bupivacaine.

KEYWORDS

Dexamethasone, Levo-bupivacaine, Spinal Anaesthesia

INTRODUCTION

Subarchnoid block is the most commonly used technique for perioperative anaesthesia and analgesia in cesarean section patient due to its rapid onset and effective sensory and motor blockade. Inadequate analgesia results in delayed recovery and prolonged hospitalization ultimately leading to increased health-care cost [1]. The duration of sensory block is relatively short with single shot subarachnoid block, however addition of adjuvants such as fentanyl, morphine, clonidine, ephedrine, pethidine to local anaesthetics can prolong the duration of analgesia [2] .But are associated with certain side effects such as sedation, nausea, vomiting, pruritus, respiratory depression, hypotension, psychotomimetic effects, etc[3]. Hence, drugs having minimal side effects and prolonged analgesia is preferred in cesarean sections.

Levo-bupivacaine, a pure enantiomer of racemic bupivacaine, is truly isobaric with respect to CSF of pregnant women [4] and is less cardiotoxic and neurotoxic[5]. The decreased toxicity of levobupivacaine is attributed to its faster protein binding rate. The claimed benefits of this agent are its baricity providing less position sensitive block [6], reduced cardiac toxicity on overdose[7] and more specific effects on sensory rather than motor nerve fibers. There are very few studies using intrathecal levobupivacaine in parturients undergoing cesarean sections.

Dexamethasone is potent, selective glucocorticoid having minimal mineralocorticoid action [8,9]. When administered intravenously, systemic anti-inflammatory and immunosuppressive properties may be responsible for the prolongation of analgesia. In literature, various studies have proved the efficacy of steroids for the prolongation of effects of regional nerve blocks [10].

We conducted a randomized, double-blind study on parturients posted for elective lower segment cesarean section to primarily evaluate the efficacy of IV dexamethasone in prolonging the duration of postoperative analgesia, to study the effect on spinal anesthesia (sensory and motor block) with levo-bupivacaine and to measure total tramadol requirement in first 24 h. Secondary outcomes include effects on hemodynamic and incidence of postoperative nausea and vomiting [PONV] and other side effects were noted

METHODS

After obtaining institutional ethical clearance and informed consent, sixty adult females aged between 20 and 35 years belonging to the American Society of Anesthesiologists (ASA) health status classes I and II posted for elective lower segment cesarean section surgery were included in the study. Patients who refused to participate, having bleeding diathesis, severe hypovolemia, infection at the site of injection, fetal distress, severe preeclampsia, eclampsia, cord prolapse, patients on chronic steroid therapy, having cardiac diseases, were excluded from the study.

After written informed consent from the patient, all routine investigations and thorough preanesthetic check-up was done. After shifting the patient to operating theater, baseline values of heart rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), and oxygen saturation (SpO2) were recorded. After securing IV access, all patients were preloaded with 10 ml/kg lactated ringers solution before subarachnoid block. Under all aseptic techniques, 25-gauge Quincke's needle was inserted intrathecally at L3–L4 or L4–L5 interspace by midline approach with the patient in sitting position. After successful dural puncture anesthetic solution, injection isobaric levobupivacaine 0.5% 10 mg was injected. Patients were placed in the supine position once the drug was administered. Sensations were tested by the pinprick method with 24-gauge needle and quality of motor block was assessed using Bromage score. The level of D6 block was achieved in all patients. Visual analog pain scale (VAS) scores were explained to all patients preoperatively and were recorded for 24 h postoperatively. Patients were randomly divided using computer-generated random number table into two groups, LD (n=30) received injection dexamethasone 8 mg intravenously, and group LS (n=30) received injection normal saline 2 cc immediately after spinal anesthesia.

Systolic and diastolic pressures were recorded every 5 min for the first 20 min after subarachnoid block and there after every 15 min till the end of surgery. Duration of analgesia was recorded as the time from intrathecal injection to the time of the first complaint of pain or VAS score more than 3. No additional analgesia was administered unless patient complained of pain or when VAS score was more than 3, whichever occurred earlier. Whenever demanded rescue analgesia was given in the form of IV tramadol 100 mg. The time of rescue analgesia and total analgesic dose in the first 24 h was recorded. The incidence of

nausea and vomiting was recorded from the time of IV administration of dexamethasone till 24 hrs of postoperative period. Injection ondansetron 4mg IV was given in case of vomiting.

Statistical analysis

Statistical analysis was conducted with Statistical Package for Social Sciences (SPSS version 19.0) (SPSS, Inc, Chicago IL, USA). To calculate the sample size, a power analysis of alpha = 0.05 and 0.09 showed that thirty patients per study group were needed. Data were compiled systematically where parametric variables such as age, weight, height, surgical time, HR, SpO2, SBP, DBP were analyzed with unpaired t-test while for nonparametric data like VAS, Mann–Whitney U test was applied. A $P < 0.05$ was considered statistically significant.

Results

Demographic data is shown in Table 1.Also baseline hemodynamics were comparable.

Table 1: Demographic data

Parameters	Group LS (n = 30)	Group LD (n = 30)	P value
Age (years)	32.9 ±4.5	33.5 ±3.5	0 .56
Height (m)	1.62 ± 0.04	1.61 ± 0.03	0.28
Weight (kg)	71.9 ± 9.45	73.3 ± 8.80	0.55
Surgical time (min)	60.11 ± 6.76	58.8 ± 4.24	0.37

Results expressed as mean ± SD

In our study, the mean duration of sensory block in group LD was 168.4±2.33 mins, whereas in group LS was 122.6±1.87 mins which was statistically significant (p<0.0001).The mean duration of motor block in group LD and group LS was 145.5±2.56 and 144.3±3.33mins,respectively which was not statistically significant (P > 0.05)(Table 2).

Table 2: Characteristics of block

Parameters	Group LS (n = 30) Mean ± SD	Group LD (n = 30) Mean ± SD	P value
Time to onset of sensory block (to reach T10) (min)	4.87±0.73	4.6±0.08	0.82
Time to onset of motor block (min)	3.87±0.22	3.66±0.57	0.06
Duration of sensory block(min)	122.6±1.87	168.4±2.33	<0.0001
Duration of motor block(min)	144.3±3.33	145.5±2.56	0.12
Mean time for first rescue analgesia (h)	4.25	7.80	<0.0001

In addition, mean time to requirement of the first rescue analgesia was 7.8 h in group LD; whereas in group LS, it was 4.25 which was also statistically significant ($P < 0.001$) (Figure 1). An significant changes was also seen in VAS score in the first 24 hrs postoperative period after 1 h of surgery in group LD and group LS (Table 3).The incidence of PONV was significantly high in group LS (18 patients) in comparison to group LD (1 patient) (p<0.0001)(Figure 2).

Figure 1: Mean Duration of first rescue analgesia

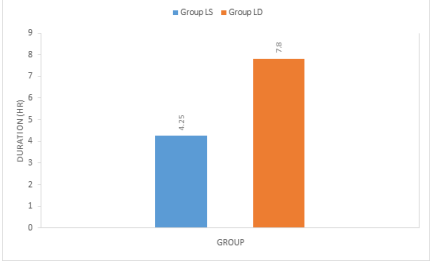
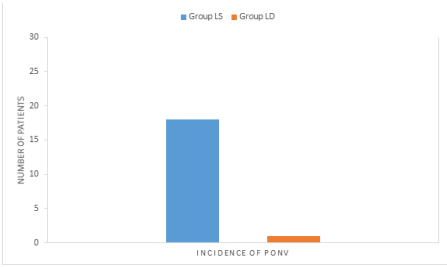


Table 3: VAS Score

Postoperative Period	Group LS	Group LD	P
30 mins	0	0.30	0.30
1 hr	1	0	<0.001
2 hr	2	1	<0.001
4 hr	3	1	<0.001
6 hr	5	2	<0.001
8 hr	5	4	<0.001
12 hr	6	4	<0.001
18 hr	6	4	<0.001
24 hr	7	5	<0.001

Figure 2: Incidence of Post-operative nausea and vomiting



There was no significant difference seen in heart rate, SBP, DBP, oxygen saturation between both the groups throughout the study. Also there was no significant complications.

DISCUSSION

Multimodal analgesia is the most essential modality to render patient pain free[11,12].The results of the current study indicate that administration of dexamethasone (8 mg) intravenously in patients undergoing lower segment cesarean section under spinal anesthesia with isobaric levobupivacaine results in prolonging the duration of sensory block and postoperative analgesia without any complications. Postsurgical pain may be attributed to direct tissue damage, nerve injury, or inflammation[13] Out of these, acute inflammation induced by tissue injury is considered to play an important role in the genesis of pain[11,13]. Dexamethasone, a high potency glucocorticoid, being an anti-inflammatory agent has been used successfully for prolonging the action of local anesthetic drugs [8,9]. IV use of dexamethasone also attenuates the need for analgesia in dental surgeries (e.g., tooth extraction), ENT surgeries (e.g., mastoidectomy, tonsillectomy, adenoidectomy, etc.), ano-rectal surgeries[14]. A study conducted by Abdelmonem and Rizk concluded that when dexamethasone, whether IV or local is added to bupivacaine in perianal block extend the postoperative analgesia[15]. Samona et al [16]and Jain et al [17]have compared different dosage of dexamethasone and have found reduces post-operative pain . Role of intravenous dexamethasone has not just confined to systemic analgesia rather its role has been defined in prolonging the peripheral nerve blockade. It has a complex mechanism of action involving binding of steroid ring to the receptor effect site, which results in gene transcription, and resulting in decreased release of mediators like bradykinin, IL 1, 2 and 6, resulting in pain relief[14]. Chalifoux have found that low doses of intravenous dexamethasone (4 mg and 10 mg) significantly prolongs the analgesic duration of interscalene block[18]. In the present study, IV dexamethasone was administered immediately after spinal anesthesia.

Levobupivacaine is a relatively new amide local anesthetic and has been already investigated in epidural and locoregional techniques, but more has to be known regarding its characteristics in spinal anesthesia. Feroz et al found that 0.5% isobaric levobupivacaine, is as effective as 0.5% hyperbaric bupivacaine for spinal anesthesia in Cesarean section[19]. Rashmi et al illustrated that 10 mg of isobaric levobupivacaine provided adequate analgesia for parturients who underwent elective cesarean section[20].

Hypotension is one of the most common complications of spinal anesthesia[21] and it assumes greater significance in case of cesarean delivery as it affects the fetus by decreasing placental perfusion in addition to its adverse effects on the parturient. As hypotension and a resultant decrease in cerebral blood flow is the most common cause of nausea and vomiting after regional anesthesia for cesarean section[22], this can explain the lower incidence of nausea and vomiting found in Group LD when compared with Group LS, in the present study. Herrera et al. conducted a pilot study to assess the hemodynamic impact of intrathecal isobaric levobupivacaine versus hyperbaric bupivacaine for hip fracture surgery and observed better hemodynamic stability and lower incidence of intraoperative hypotension in the levobupivacaine group[23]. Guler et al. in a randomized trial also reported that the side effects such as hypotension, bradycardia, and nausea are less in intrathecal levobupivacaine compared with intrathecal bupivacaine[24]. We can explain the reduced incidence of nausea in the levobupivacaine group with the fact that the doses we administered developed adequate blocks and caused less hypotension. In our study, VAS was significantly lower with dexamethasone group as compared to control group. We observed increase in the duration of postoperative analgesia and the first analgesic requirement was also prolonged. The total dose of tramadol consumption was reduced in the

first 24 h after surgery. Prolongation of sensory blockade is also seen without delaying in motor blockade. These findings are in consistent with other studies where IV dexamethasone is proved better for postoperative pain relief[13,17,25,26]

Dexamethasone also has antiemetic action; proposed mechanism is the presence of glucocorticoid receptors on the central nuclei that are involved in control of nausea and vomiting, decrease in 5-HT turnover in central nervous system, or changes in permeability of blood-cerebrospinal fluid barrier to serum proteins[27].Vlok found that there is a significant reduction in post-operative nausea and vomiting and post-operative pain as compared to tramadol, pethidine, magnesium sulphate and tramadol [28]. Sehavat et al suggested that a single prophylactic dose of dexamethasone 8 mg after an operation can reduce postoperative nausea and vomiting[29]. In our study, 8mg dexamethasone intravenously after spinal anaesthesia reduced the incidence of nausea and vomiting.

CONCLUSION

Administration of injection dexamethasone 8 mg intravenously significantly prolongs the duration of postoperative analgesia and sensory block in patients undergoing lower segment cesarean section under spinal anesthesia with isobaric levo-bupivacaine.

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