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ORIGINAL ARTICLE

Comparative Evaluation of a Single Intraoperative Dose of Intravenous Dexamethasone 8 mg and Betamethasone 8 mg on Post Caesarean Delivery Analgesia: A Randomised Controlled Trial

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Abstract

Background: Administration of glucocorticoids prior to surgery has been shown to reduce the requirement for postoperative opioids and inpatient time, with minimal side effects. **Objective:** The efficacy of intravenous dexamethasone and betamethasone in parturients undergoing elective lower segment caesarean section under spinal anesthesia was evaluated in this randomized, double-blind research.

Material & Methods: A total of 120 patients scheduled for a lower segment caesarean section under spinal anesthesia were randomly assigned to one of three groups (40 patients each): D (treatment: 8 mg IV dexamethasone), B (treatment: 8 mg IV betamethasone), and C (control: 2 ml of normal saline). The study medication was given intravenously shortly after spinal anesthesia. **Results:** The mean duration of sensory block (min) in group D and group B was 196.00 ±10.63 and 193.73 ±10.46, respectively, which was significantly higher than in group C, 180.38± 9.90. Time to the requirement of first rescue analgesia was also prolonged in group D (14.07± 2.10 h) and group B (12.23± 4.20 h) as compared to group C (5.66± 3.20 h). The duration of motor block, intraoperative and postoperative hemodynamic parameters were comparable. **Conclusion:** We conclude that administration of intravenous dexamethasone 8 mg and betamethasone 8 mg intravenously prolongs the duration of postoperative analgesia and sensory block in patients undergoing lower segment caesarean section under spinal anesthesia.

Key Words

Lower Segment Caesarean Section, Spinal Anesthesia, Dexamethasone, Betamethasone

Introduction

Spinal anaesthesia is widely used for perioperative anaesthesia and analgesia in caesarean section patient with an added advantage of retaining consciousness, excellent surgical field, extended pain relief, and earlier return of gastrointestinal function.[1] Bupivacaine is the drug of choice in spinal anesthesia as it provides effective block for 90-120 min. To prolong its analgesic effects various additives have been tried, like opioids, adrenaline, clonidine, dexmedetomidine, and neostigmine. However, these adjuncts have their own side effects like nausea, vomiting, pruritis, urinary retention, and respiratory depression with opioids; hypertension, and tachycardia with vasoconstrictors; and excessive sedation. [2] Dexamethasone and betamethasone are synthetic adrenocortical steroid with long half- life (36-54 hours) used widely in anaesthesia as an antiemetic, anti-

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inflammatory and to prolong postoperative analgesia and to reduce postoperative nausea vomiting. [3,4]

Although use of perineural and intrathecal steroids prolongs the effects of regional nerve block, steroids administered by this route are associated with complications which include adhesive arachnoiditis, aseptic meningitis, and cauda equine syndrome. [3-5] We decided to conduct the present study to evaluate the effects of intravenous dexamethasone and betamethasone on the subarachnoid block with bupivacaine in patients posted for lower segment caesarean section.

Material and Method

One hundred and twenty (120) female patients of ASA grade II, aged 20 to 40 years, scheduled for a lower segment caesarean section under spinal anaesthesia were included in this prospective, randomised study. Written informed consent was taken from all the patients.

ASA grade > II, patients who have received analgesics 24 hours before surgery, those who have received corticosteroid drugs, contraindication for spinal anaesthesia, history of allergy to the study drugs, history of cardiac, respiratory, hepatic or renal disease, uncontrolled hypertension, diabetes mellitus, peptic ulcer, severe hypovolemia, foetal distress, severe preeclampsia, eclampsia, and cord prolapse.

Patients were kept fasting for 6 hours prior to surgery. All patients were coloaded with 10 ml/kg of ringer lactate solution along with the spinal anaesthesia. Patients were randomly allotted into three equal groups: Group B received 8 mg of betamethasone, and Group C (control group) received 10 ml of normal saline immediately after spinal anaesthesia with 2.5 ml of 0.5% hyperbaric bupivacaine. In the operating room, standard ASA monitoring was applied. According to the group allocation, patients received either dexamethasone 8 mg or betamethasone 8 mg or 2 ml of normal saline simultaneously with the spinal anaesthesia with 2.5 ml of 0.5% hyperbaric bupivacaine in the sitting position. Thereafter, patients were placed in the supine position to attain the level of T6 block and maintained in this position until the end of surgery. An anaesthesia colleague blinded the study, recorded the hemodynamic parameters, sensory and motor block, and SpO2 every 10 minutes after the block until the end of surgery. The sensory level was assessed by loss of pinprick sensation using a blunt 25G needle at mid-axillary line every 2 minutes till the fixation of the sensory level. The peak sensory level and the time to reach peak sensory level were recorded before surgery. Thereafter, the sensory level was checked every 15 minutes till the two-segment regression level and regression to segment S1 were achieved. The motor level was assessed according to the modified Bromage scale: Bromage 0: The patient is able to move their hip, knee, ankle and toes. Bromage 1: The patient is unable to move their hip, able to move knee, ankle, and toes. Bromage 2: The patient is unable to move their hip and knee, able to move ankle, and toes. Bromage 3: The patient is unable to move their hip, knee and ankle, able to move their toes.

Hypotension, defined as a decrease in MAP >20% of the baseline or fall in systolic blood pressure <90 mmHg was treated with boluses of intravenous phenylephrine 50 mcg and fluids where appropriate. Bradycardia, defined as heart rate <50 beats per minute, was treated with intravenous atropine 0.5mg. Nausea was defined as a subjective unpleasant sensation associated with the awareness of the urge to vomit. Vomiting was defined as the forceful expulsion of liquid gastric contents.

Monitoring was done for 24 hours for assessment of sensory and motor response and/or pain and the need for rescue analgesia during the intra and post-operative period. Duration of analgesia was recorded as the time from intrathecal injection to the time of first complaint of pain or VAS score >4. No additional analgesic was administered unless the patient complained of pain or when VAS >4, whichever was earlier. IV diclofenac sodium 75 mg was administered for rescue analgesia. Patients were observed for side effects of drugs like headache, dizziness, drowsiness, and myalgia for 24 hours postoperatively. In case of failed spinal anaesthesia, general anaesthesia was given and patients were excluded from the study.

Statistical Methods: The recorded data was compiled and entered into a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Statistical software SPSS (version 20.0) and Microsoft Excel were used to carry out the statistical analysis of data. Continuous variables were expressed as Mean ± SD. Analysis of variance (ANOVA) was employed for inter Group analysis of data and for multiple comparisons,the least significant difference (LSD) test was applied. Graphically, the data was presented by bar and line diagrams. A P-value of less than 0.05 was considered statistically significant. All P-values were two tailed.

Results

There were no significant differences in demographic

Table 1. Patient Baseline Demographic Characteristics

Demographics	GROUP B (n=40)	GROUP D (n=40)	GROUP C (n=40)	P
Age	25±7.85	26±6.79	27±8.60	1.44
Height (cm)	155.73±2.81	156.95±2.94	155.23±2.75	1.68
Bodymass(kg)	63.05±4.77	62.60±5.57	64.90±5.26	0.66
Body mass index	25.92±2.71	22.90±2.53	23.14±2.26	0.87
ASA status I/II	30/10	28/12	29/11	0.53
Durationof surgery	101.00±11.22	103.45±15.84	106.84±15.56	0.45

Values are mean ±standard deviation. ASA = American Society of Anaesthesiologists physical status

** < 0.05 = statistically significant*

Table 2. Sensory and Motor Characteristics of Spinal Anaesthesia

	GROUP B (n=40)	GROUP D (n=40)	GROUP C (n=40)	B vs D	B vs C	D vs C
Time to peak sensory block(min)	5.1±1.3	5.8±1.5	5.9±1.7	0.053	0.022*	0.718
Time to two segmental regression (min).	58.5±20.3	60.8±15.4	55.8±1.7	0.734	0.594	0.317
Sensory regression to S1 (min).	193.7±10.4	196.0± 0.63	180.3± 9.9	0.239	0.006*	<0.001*
Time to reach modified bromage 3(min)	5.7±1.4	6.7±1.7	6.5±1.7	0.674	0.239	0.485
Motor regression modified Bormage 0(min)	230.3±50.1	240.8±30.7	205.5±35.6	0.071	0.567	<0.454

** < 0.05 = statistically significant*

Table 3. VAS Scores in Postoperative Period

	GROUP B (n=40)	GROUP D (n=40)	GROUP C (n=40)	B vs D	B vs C	D vs C
30 min	0	0	0	0.053	0.232	0.618
1 hr	0.5±0.2	1.0±0.6	1.1±0.8	0.714	0.524	0.117
2 hr	1.3± 0.6	1.1± 0.3	2.7±0.4	0.249	0. 07*	<0.001*
4 hr	2.7±1.4	1.7±0.7	1.5±0.7	0.674	0.049*	0.045*
6 hr	2.5±1.5	2.8±1.2	4.3±0.9	0.671	0.047*	<0.054*
8hr	2.2±1.1	2.5±1.0	4.3±1.0	0.671	0.057*	<0.050*
12hr	3.0±1.7	2.8±1.5	5.1±1.3	0.723	0.052*	0.068*
18 hr	5.5±2.2	6.2±1.7	5.2±1.2	0.734	0.594	0.317
24 hr	4.7±1.46	4.0± 0.6	4.8± 1.0	0 .239	0.346	0.221

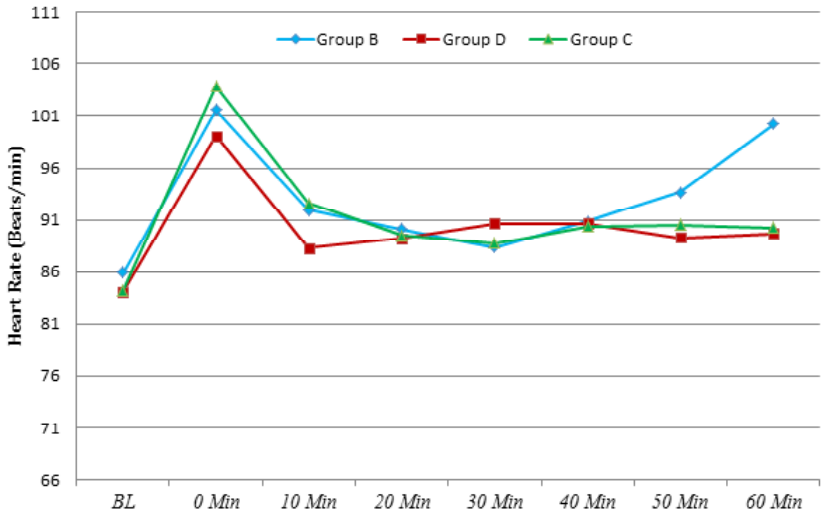
characteristics among the three groups (*Table 1*). The maximum cephalic spread of sensory block was comparable among three groups. Time to reach peak sensory block and time to reach two segmental regressions of sensory block were also comparable among the three groups. Early regression of sensory block to segment S1 was seen in group C as compared to group B and group D. This difference was statistically

Table 4: Comparison of Vasopressor, Atropine, Antiemetic need and Side Effects

SIDE EFFECT	GROUP B (n=40)	GROUP D (n=40)	GROUP C (n=40)	p-value
Rescue Mephentermine	8 (20.00)	10 (25.00)	11 (32.50)	NS
Atropine	2(5)	2(5)	3(7.5)	NS
Rescue antiemetic intraoperative	1(2.5)	1(2.5)	6(15)	0.001*
Rescue antiemetic postoperative	1(2.5)	1(2.5)	2(5)	0.252
Headache	1 (2.5)	1(2.5)	0 (0.00)	NS
Drowsiness	1 (5.00)	1 (2.50)	0 (0.00)	NS
Dizziness	0 (0.00)	0 (0.00)	0 (0.00)	NS
Myalagia	0 (0.00)	0 (0.00)	0 (0.00)	NS
Headache	1 (2.50)	2 (5.00)	0 (0.00)	NS

Data is expressed as number (%) compared with control group, NS -Non- significant * < 0.05 = statistically significant

Fig. 1 **Showing intraoperative heart rate (beats/min) in three groups**

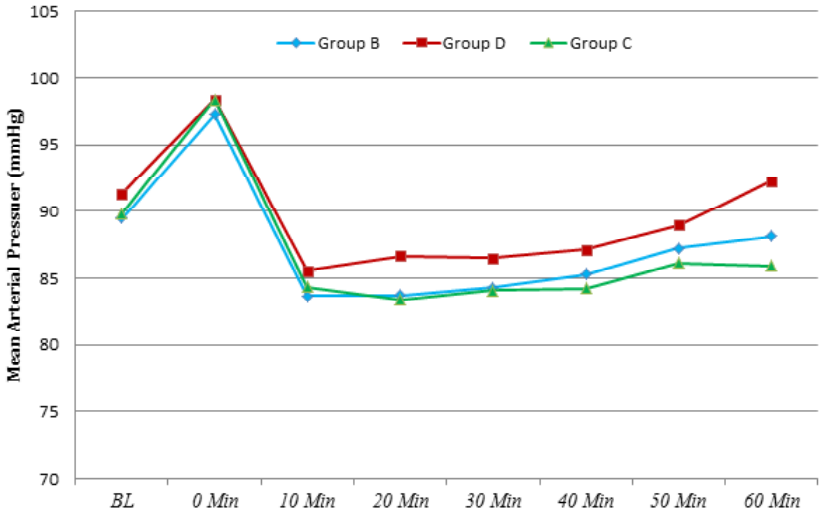


significant. The results were comparable between Group D and Group B. Time to reach modified Bromage 3 Motor Block and Time to Motor Regression to modified Bromage 0 were comparable among the three groups (*Table 2*).

Time to the requirement of first rescue analgesia was prolonged in group D (14.07± 2.10h) and group B (12.23 h± 4.20 h) which was significantly higher than in group C ((5.66 ± 3.20h). (P < 0.001). However, two groups receiving IV glucocorticoids were comparable (*Table 2*). Significant changes were also seen in VAS score in the postoperative period after 1 hour of surgery in groups D and B when compared to group C. However, the scores were comparable 12 hours postoperatively. VAS scores in the two groups receiving steroids were comparable throughout the study period (*Table 3*). There were no significant differences among the three groups in hemodynamic variables and requirements for phenylephrine and atropine (*Table 4*).

The incidence of nausea and vomiting and the need for rescue antiemetic was significantly lower in group D and B as compared to group C in the intra operative period. The difference was found to be statistically non-significant in the post operative period among the three groups.

Fig. 2 Showing intraoperative mean arterial pressure (mmHg) in three groups



(*Table 4*).

Discussion

The results of the current study indicate that administration of dexamethasone (8 mg) and betamethasone (8 mg) intravenously in patients undergoing lower segment caesarean section under spinal anaesthesia results in prolonging the duration of sensory block and postoperative analgesia without any adverse effects.

Dexamethasone and betamethasone are high potency glucocorticoids. These have been used successfully for prolonging the action of local anaesthetic drugs. [6-8] Various narrative reviews , meta-analysis on the effect of intravenous dexamethasone on postoperative pain after spinal anaesthesia report a high level of evidence that IV dexamethasone enhances postoperative analgesia after spinal anaesthesia, by reducing the 24-h morphine equivalent consumption and by prolonging the time to first analgesic request in patients undergoing varied surgical procedures like abdominal hysterectomy , lower limb orthopaedic surgeries , and inguinal herniorrhaphy. [12-18] In a study conducted by Abdelmonem A et al.it was concluded that when dexamethasone, whether IV or local ,is added to intrathecal bupivacaine in perianal block, extends the postoperative analgesia. [9] Maged *et al*, compared local and IV dexamethasone on postoperative pain and recovery after caesarean section concluded that IV administration of dexamethasone and local subcutaneous infiltration of wound with local anesthetic and dexamethasone, markedly decreased the sensation of pain and the needs for postoperative analgesics up to 24 h after cesarean section. [10] Similar results have been shown by Shallu *et al*. where iv administration of dexamethasone 8mg iv in patients undergoing lower segment cesarean section under spinal anesthesia prolonged the duration of postoperative analgesia and sensory block.[11]

Till date, there is only a single study comparing intrathecal and intravenous betamethasone for post-operative pain following caesarean section. In this study, Naguib T *et al*. found that the mean duration of postoperative analgesia was 336.8±86 min in the intrathecal group and 312.4±106 min in the IV group and was significantly longer as compared with 245.4±93 min in the control group. Supplemental analgesic dose requirements for the first 24 hours were also significantly less in patients receiving betamethasone compared to the control group.[19] In our study, IV dexamethasone was administered immediately after spinal anaesthesia and we could not evaluate any effects in immediate block characteristics and hemodynamic effects in immediate intraoperative period. The beneficial effects could be appreciated towards end of the procedure and in postoperative period.

The dose of dexamethasone varies in different types of surgeries, ranging from 4 mg to 16 mg. However, the optimal dose is still not defined. In their study, Oliveria et al. concluded that a dose of dexamethasone at 0.1 mg/kg is an effective adjuvant in multimodal strategies to reduce postoperative pain and opioid consumption.[3] Hence, we used 8 mg of dexamethasone and 8 mg of betamethasone, nearly equipotent doses in our study.

The precise mechanism of action of dexamethasone is not known. After intracellular uptake, glucocorticoids activate cytoplasmic glucocorticoid receptors, which bind to glucocorticoid response elements in the DNA. This leads to both decreased production of inflammatory proteins such as COX2, iNOS, cytoplasmic PLA2, interleukins, inflammatory chemokines, etc., and increased production of anti-inflammatory proteins, which results in a reduction in oedema, scar tissue formation, and suppression of immune response.[14] In contrast to studies showing an anti- emetic effect of corticosteroids [20], our study did not demonstrate any significant effect on PONV. Nortcliffe et al. also observed similar outcomes in caesarean section patients where corticosteroids did not confer any advantage or reduce perioperative nausea and vomiting.[21] There are certain limitations to our study. We conducted this study only on the ASA-1 and ASA-II groups of pregnant patients posted for lower segment caesarean section under spinal anaesthesia. Second, we followed up the patients only until 24 h. Furthermore, it was not a dose response study. Nonetheless, in the literature, it is studied that 8 mg is the most effective dose. [3,4] It was found that a single dose does not inhibit the hypothalamic adrenal axis. In addition, there is no any adverse effect seen as impaired wound healing, increase blood sugar level, and gastrointestinal discomfort.[18] Hence, it is unlikely that the patients in our study exhibited any delayed untoward effects.

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Conflicts of Interest

There are no conflicts of interest.

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