ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 17, Issue 9, 2024

Online - 2455-3891
Print - 0974-2441

Research Article

EPIDURAL DEXAMETHASONE FOR POST-OPERATIVE ANALGESIA IN PATIENTS UNDERGOING INFRAUMBILICAL SURGERIES

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Received: 02 June 2024, Revised and Accepted: 14 July 2024

ABSTRACT

Objectives: This study was designed to evaluate the effect of adding dexamethasone to epidural bupivacaine for post-operative analgesia in infraumbilical surgeries. This study aimed to evaluate the efficacy of epidural dexamethasone used as an adjuvant to bupivacaine to compare sensory and motor block characteristics, intraoperative hemodynamic parameters, duration of post-operative analgesia, and any side effects of study drugs in both the groups.

Methods: Seventy-two patients undergoing any infraumbilical surgeries were divided into the following two groups. (1) Group D (n=36): 18 mL of isobaric bupivacaine 0.5% and 2 mL (8 mg) of dexamethasone given epidurally and (2) Group B (n=36): 18 mL of isobaric bupivacaine 0.5% and 2 mL of normal saline given epidurally. Intraoperative hemodynamic parameters, onset, and duration of sensory and motor blockade, two-segment regression time, and duration of post-operative analgesia were assessed.

Results: The time of onset of sensory and motor blockage was faster in the dexamethasone group as compared to the control group ($p<0.05$). The time taken to achieve the T10 sensory block was comparatively shorter in Group D compared to Group B ($p<0.001$). Duration of analgesia was markedly prolonged in the dexamethasone group ($p<0.001$). One patient (0.36%) in the dexamethasone group and five patients (13.88%) in the control group had nausea ($p>0.05$). None of our patients had vomiting in the two groups.

Conclusion: The study showed that adding dexamethasone to bupivacaine (0.5%) epidurally shortened the onset of sensory and motor block, reduced post-operative visual analog scale score, prolonged the duration of analgesia with hemodynamic stability and minimum side effects.

Keywords: Dexamethasone, Epidural anesthesia, Post-operative analgesia, Infraumbilical surgeries.

 DOI: http://dx.doi.org/10.22159/ajpcr.2024v17i9.51706. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Uncontrolled post-operative pain may produce a range of harmful effects. Attenuation of post-operative pain may decrease perioperative mortality and morbidity. Epidural anesthesia and analgesia are a safe and effective method for the control of post-operative pain. Prolonging the duration of local anesthesia is often desirable because it provides analgesia in the post-operative period [1].

Bupivacaine hydrochloride is an amide type of local anesthetic which is most commonly used for epidural anesthesia. Various adjuvants have been used to prolong epidural anesthesia. The combination of epidural opioid and local anesthetic provides good pain control during the 1st post-operative day, but it is associated with nausea, vomiting, sedation, pruritus, urinary retention, and respiratory depression.

Several studies reveal that the addition of dexamethasone to bupivacaine significantly prolongs the duration of the motor block and improves the quality of analgesia following interscalene and supraclavicular block. Another study revealed that an epidural bupivacaine-dexamethasone mixture had almost the same analgesic potency as bupivacaine-fentanyl with opioid-sparing and anti-emetic effects.

Corticosteroids have a powerful anti-inflammatory action and have demonstrated reduced pain and swelling after various surgeries, but the exact mechanism of analgesic effect is not fully understood. Steroids are also known to inhibit phospholipase A_2 and the expression of cyclo-oxygenase-2 during inflammation. Thus, reduced prostaglandin synthesis suppresses hyperalgesia associated with acute nociception during surgery. Although steroids given epidurally were effective in the treatment of lower back pain, in addition to reducing post-operative pain and analgesic requirements, the potential efficacy of post-operative analgesia has not been elucidated [2].

This randomized, double-blind, and controlled study was designed to evaluate the effect of epidural dexamethasone for post-operative analgesia in patients undergoing infraumbilical surgeries.

METHODS

After approval from the Institutional Ethical Committee, written informed consent was obtained from all the patients. In this randomized and clinical trial study, patients undergoing any infraumbilical surgeries were enrolled.

Sample size

Sample size (n=36 cases per each group) is calculated using OpenEPI software considering, the duration of analgesia of 372±58.1 and 286.6±8min for bupivacaine + dexamethasone & bupivacaine only respectively from previous study, "a randomized double-blind study to compare analgesic efficacy and side effects of epidural dexamethasone in two groups" done by Bahman Naghipour et al and M. R. Razavizadeh et al at 99% level of significance, 90% power.

Patients with complicated inguinal hernia (e.g., incarcerated and strangulated), peptic ulcer disease, diabetes mellitus, coagulopathies, skin infection on lumbar spine, severe or morbid obesity, and renal or liver disease, those with allergy to local anesthetics, and those on long-term steroid therapy were excluded from the study.

Seventy-two patients between ages 18 and 70 years of American Society Anesthesiology classification I and II posted for any infraumbilical surgeries were included in the study. Pre-operative anesthetic check-up with detailed history and investigations were done. All patients were kept NBM for 6 h. Patients were explained the procedure and written informed consent was obtained. Vital parameters pulse, blood pressure, % saturation of oxygen (SpO_2), and respiratory rate were taken in the recovery room. The Intravenous (IV) line was secured with an 18 gauge IV cannula. Preloading was done with injection ringer lactate 10 mL/kg IV. Premedication was given 30–45 min before induction with injection glycopyrrolate 0.005–0.01 mg/kg i.m. and injection midazolam 0.07–0.15 mg/kg i.m.

Single-shot epidural anesthesia was given to all patients of both groups under aseptic and antiseptic conditions with patients in sitting position. After skin infiltration with lignocaine (plain) 2%, an 18 G Tuohy needle was inserted at the L2–3 level. Epidural space attained by the hanging drop technique and confirmed by "loss of resistance technique." A test dose of 3 mL of lignocaine 2% and epinephrine injected to rule out IV or subarachnoid injection. In Group D (n=36), patients were given 18 mL of isobaric bupivacaine 0.5% and 2 mL (8 mg) of dexamethasone epidurally. In Group B (n=36), patients were given 18 mL of isobaric bupivacaine 0.5% and 2 mL of normal saline epidurally. In the present study, hemodynamic parameters observed were heart rate, systolic blood pressure, diastolic blood pressure, and % saturation of oxygen (SpO_2) at 5 min interval till 45 min and at 15 min interval till 90 min and at 30 min till the end of the surgery intraoperatively. Time for onset at sensory block, time taken to achieve T10 level, and time for onset of motor block were noted. Side effects, such as nausea, vomiting, and pruritus, were recorded till the end of the surgery.

The post-operative assessment was done for pulse rate (/min), blood pressure, % saturation of oxygen (SpO_2), visual analog scale (VAS) for pain, and time to two segmental regression. Rescue analgesia with injective tramadol 1 mg/kg IV was given when VAS ≥4 and duration of analgesia was calculated. The following side effects were monitored – urinary retention, pruritus, nausea and vomiting, delayed wound healing, and infection at the local site at follow-up after 1 week. Post-operative blood sugar levels at the 4th and 6th h were assessed.

The onset of sensory block was defined as the time interval between the end of the drug injection and the total abolition of pinprick response at the site of surgery. The duration of sensory analgesia was defined as the time from the onset of sensory block up to pain perception at the site of surgery by the patient. The onset of motor block was defined as the time interval between the end of drug injection and the time when a complete paralysis-modified Bromage 1. The duration of the motor block was defined as the time from the onset of the motor block to the restoration of normal musculature force-modified Bromage 6. The duration of analgesia was considered from the time to achieve the T10 sensory block to the requirement of the first rescue analgesic.

Data analysis

The statistical analysis was done by student's t-test for comparison of parameters among groups and comparison analyzed using Chi-square test with the use of Statistical Packages for the Social Sciences and Open EPI Software.

RESULTS AND DISCUSSION

Seventy-two patients were studied in the two groups, 36 in each group. Demographic data and duration of surgery were similar in both groups (Table 1).

In the present study, different types of infraumbilical surgeries were included such as inguinal hernia repair (18.05%), hydrocele repair (19.44%), dynamic hip screw plating (2.77%), tibia interlock nail (9.72%), femur interlock nail (11.11%), tubal recanalization (2.77%), debridement of lower limb (6.94%), skin thickness grafting (9.72%), vaginal hysterectomy (5.55%), abdominal tubal ligation (11.11%), and patellar cerclage (2.77%).

Table 1: Demographic parameters in both groups

Particulars	Group D (mean±SD)	Group B (mean±SD)	p-value
Age (years)	37.9±12.06	36.77±10.96	p>0.0.05
Weight (kg)	54.7±7.59	52.5±7.29	p>0.05
Height (cm)	158.58±5.71	157.4±5.15	p>0.05
Duration of surgery (min)	100.97±30.09	100.13±27.18	p>0.05

Tachy or brady arrhythmias were not observed among the two groups. In both groups, there was a fall in mean systolic and diastolic blood pressure intraoperatively but it was not >20% of the basal value and does not require pharmacological interventions. Hence, clinically patient in both groups remained hemodynamically stable intraoperatively and postoperatively. In both the groups, intraoperative and post-operative fall in mean oxygen saturation was not <90% and the fall in mean respiratory rate was not <12/min. Hence, clinically there was no respiratory depression intraoperatively and postoperatively (p>0.05) among the two groups.

The onset of sensory and motor block was significantly more rapid in the dexamethasone group than in the control group. The time taken to achieve the T10 sensory block was comparatively shorter in Group D compared to Group B, which was statistically highly significant (p<0.001). The total duration of sensory blockade was longer in the dexamethasone group as compared to the control group, which was statistically highly significant between the groups (p<0.001). The total duration of the motor block in Group D was 134.44±34.01 min and in Group B 138.61±24.04 min, which was statistically insignificant (p>0.05). The time from epidural drug administration to two-segment regression was statistically insignificant among groups (p>0.05) (Table 2).

The difference in VAS score remained significant up to 14 h in both groups. VAS score was ≥4, at the 8th h in Group D and at the 5th h in Group B. VAS ≤4 remained for a longer period in the dexamethasone group as compared to the control group. Thus, the duration of analgesia was markedly prolonged in the dexamethasone group than in the control group (p<0.001) (Table 2).

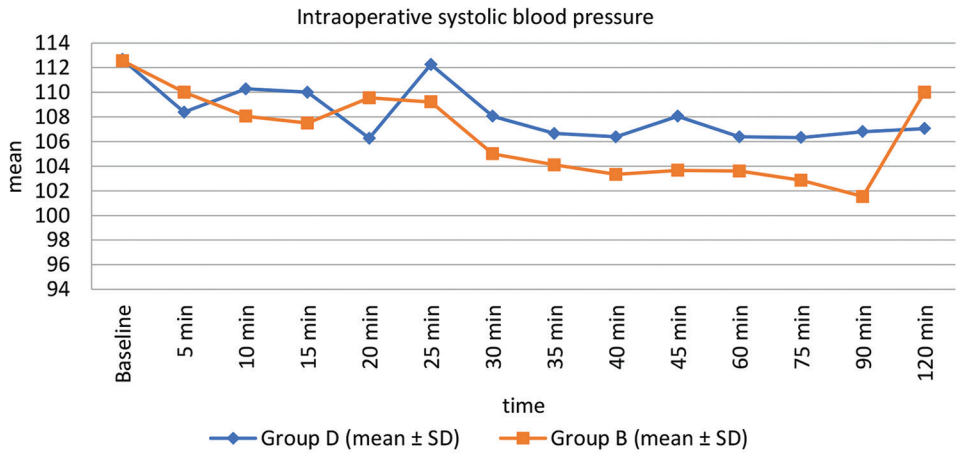
Only 5 (13.88%) of the patients in Group B and only 1 (0.38%) patient in Group D had nausea (p=0.048). None of the patients in either group had vomiting (Table 2).

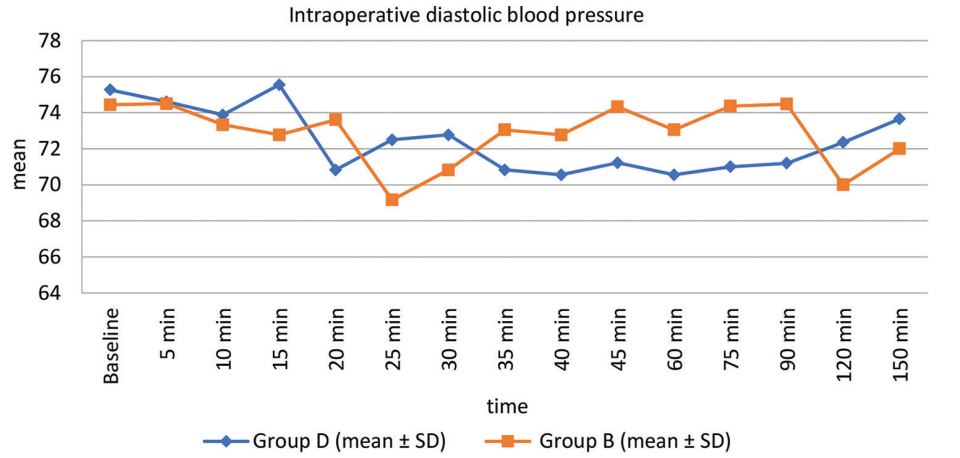
Pre-operative blood glucose was similar in both groups. There was no significant increase in blood glucose level recorded at the 4th and 6th h after baseline levels in any of the groups (p<0.05).

This study was planned to compare and assess the clinical effect of epidural dexamethasone for post-operative analgesia in patients undergoing open infraumbilical surgeries.

Individual patient characteristics such as age, gender, and body weight are important factors influencing any pharmacologic therapy. There was statistically no significant difference in terms of age, weight, and height distribution between the two groups (p>0.05).

The time of onset of sensory blockage at the surgical site, the onset of sensory block at T10, and the time to achieve motor block were significantly early in Group D. Razavizadeh *et al*., in 2017, evaluated the effect of epidural dexamethasone for post-operative analgesia in patients undergoing unilateral inguinal herniorrhaphy. This study suggests that the onset of anesthesia was significantly more rapid in





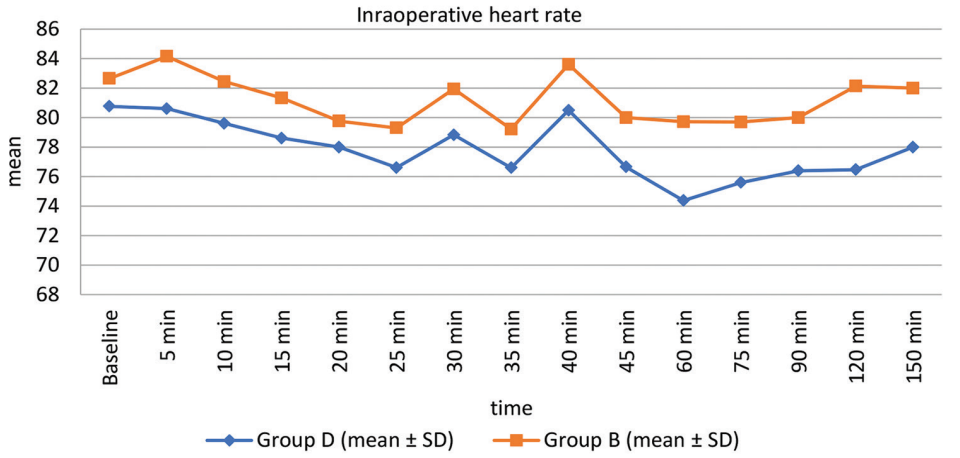
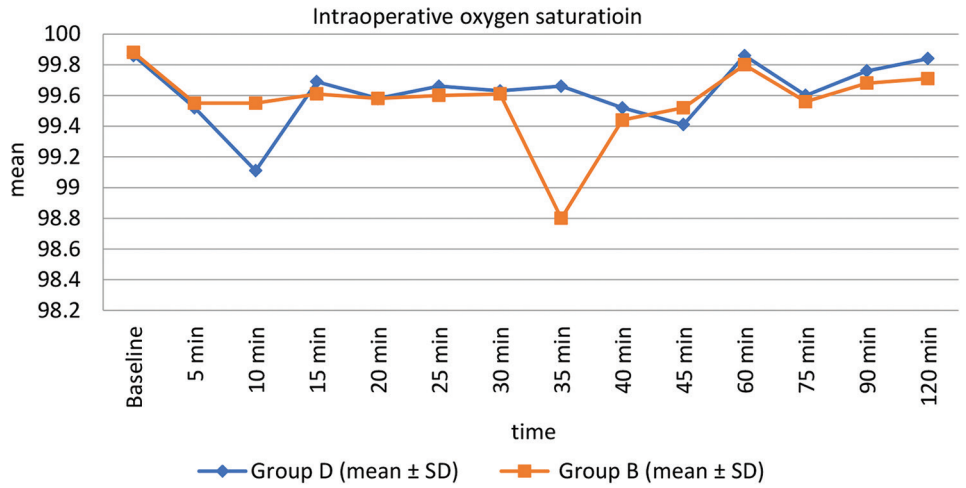


Table 2: Block characteristics in two groups

Characteristics	Group D (mean±SD)	Group B (mean±SD)	p-value
Onset of sensory block in epidural anesthesia (min)	12.80±2.03	14.55±2.09	p<0.001
Onset of motor block in epidural anesthesia (min)	13.69±2.59	14.69±2.13	p<0.05
Time is taken to achieve T10 sensory level	16.67±4.24	19.84±2.31	p<0.001
Total duration of sensory blockage	259.16±24.18	203.33±86.32	p<0.001
Total duration of motor blockage	134.44±34.01	138.61±24.04	p>0.05
Time of two-segment regression	139.91±16.19	148.5±33.61	p>0.05
Duration of analgesia (min)	492.22±97.36	319.44±75.45	p<0.001
Nausea (%)	1 (0.36)	5 (13.88)	p>0.05
Vomiting	0	0	-



the dexamethasone group (7.64±2.74 min) than in the control group (12.09±2.79 min) (p<0.05) [1]. Wahdan *et al*., in 2017, studied the effect of epidural levobupivacaine versus a combination of levobupivacaine and dexamethasone in patients receiving epidural analgesia. In this study, the mean time of onset of sensory block at level T10 was statistically shorter (p<0.05) in levobupivacaine 0.125% with dexamethasone 4 mg group (10.8±2.87 min) compared with levobupivacaine 0.125% group (12.8±2.26 min). No incidence of motor block was detected between the two groups [3].

In the present study, the post-operative pain was assessed by VAS. Patients in both groups showed 0 score during the entire surgical period. The VAS score ≤4 lasted for a longer period in Group D as compared to Group B. Adel-Aziz *et al*., in 2017, studied the efficacy of adding dexamethasone to epidural bupivacaine for lower limb orthopedic surgery. In their study, they demonstrated that the mean value of post-operative VAS scores was significantly lower in the dexamethasone group than in the saline group (p<0.05) except immediately post-operative where it was insignificant (p>0.05) [3]. Thomas and Beevi, in 2006, evaluated the effect of epidural dexamethasone for post-operative pain and analgesic requirements. In their study, they proved that the VAS pain scores in the epidural dexamethasone Groups (D1, D2) were lower than observed in the control group. The differences were significant from the 12th to 20th h postoperatively in Group D1 and D2 than control Group 1 (p<0.05) [4]. Elham M. El-feky et al in 2014 evaluated that modified objective pain score that was comparable in the first 2 h, in the 3rd, 6th and 12 h the pain score was significantly decreased in both dexmedetomidine group and the dexamethasone group without significant difference in between them (p<0.05) [8].

On comparison between two groups, mean duration of analgesia was statistically significantly higher in Group D, that is, dexamethasone added to bupivacaine epidurally prolonged the duration of analgesia postoperatively as compared to bupivacaine alone through epidural (p<0.05). Razavizadeh *et al*., in 2017, conducted a study to evaluate the epidural dexamethasone for post-operative analgesia in patients undergoing unilateral inguinal herniorrhaphy. They observed that the duration of analgesia was markedly prolonged in the dexamethasone group (692.55±245.88 min) than in the control group (286.59±84.02 min) (p<0.001) [1]. Naghipour *et al*., in 2013, evaluated that the efficacy of dexamethasone added to bupivacaine prolongs the duration of epidural analgesia. In this study, they demonstrated that the duration of analgesia was significantly longer in the dexamethasone than in the control group (372±58.1 min in the dexamethasone group versus 234.6±24.3 min in the control group) [5]. Zahi almajali MD et al in 2014 observed that mean duration of analgesia was more significant in group 2 (272 min) than in control group 1 (186 min) (p<0.05) [7]. Gamal T. Yousef et al in 2014 studied that postoperative analgesia persisted for a longer duration in groups RM and RD, 8 hr and 12 hr, respectively compared with group R, with p<0.001[11]

No significant increase in blood glucose level at the 4th and 6th h after surgery was found from baseline levels in any of the groups. No significant differences were found among the groups (p>0.05). No patient experienced wound infection or delayed wound healing at follow-up after 1 week. Hefni *et al*., in 2014, evaluated the efficacy of epidural dexamethasone for post-operative analgesia in patients going for abdominal hysterectomy. In their study, they revealed that pre-operative blood glucose was similar in all groups and there were no significant differences among the four groups (p>0.05) [6].

In the present study, nausea occurred in 0.36% of patients in Group D and 13.88% of patients in Group B. One patient (0.36%) in the dexamethasone group and five patients (13.88%) in the control group had nausea, which was statistically not significant (p>0.05). Vomiting or any other side effects were not observed in any of the group. None of the patients had micturition disturbance in any group. Razavizadeh *et al*., in 2017, evaluated the epidural dexamethasone for post-operative analgesia in patients undergoing unilateral inguinal herniorrhaphy. In their study, they revealed that only 5 (22.7%) of the patients had nausea in the 1st h after epidural anesthesia from the control group (p=0.048). No patients in the dexamethasone group had nausea. None of the patients in either group had vomiting [1]. Wahdan *et al*., in 2019, studied the efficacy of epidural levobupivacaine and dexamethasone in patients receiving epidural analgesia. In their study, they discussed that there were no statistically significant differences among the two studied groups with regard to nausea, vomiting, and shivering (p>0.05) [3]. Youn yi jo et al in 2011 studied that no significant differences were found in the incidence of nausea and vomiting between the groups (p>0.05). The frequency of pruritus was higher in group 3 compared to group 1 and 2, which was statistically significant (p<0.05) [9]. Ahmed Z. Mohamed et al in 2015 found that 20% of patients in group B and 14.3% of patients in group D had PONV, which was not statistically significant (p>0.05). In group B, 25.7% of patients and in group D, 20% of patients had shivering which was not statistically significant (p>0.05) [10].

CONCLUSION

We concluded that dexamethasone administered epidurally shortened the onset of sensory and motor block, reduced post-operative VAS score, and prolonged the duration of analgesia with hemodynamic stability and minimum side effects. Hence, single-shot epidural dexamethasone added to bupivacaine can be a promising technique for pain management in patients undergoing any infraumbilical surgeries. Thus, dexamethasone was found to be a good adjuvant for bupivacaine in epidural block.

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