

Comparison of Caudal Bupivacaine Alone with Dexmedetomidine as an Adjuvant with Bupivacaine for Post Operative Analgesia in Paediatric Patient Undergoing Inguinal Region Surgeries

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1. Introduction

Caudal epidural analgesia has become one of the most popular and commonly performed regional blocks in paediatric anaesthesia. It is a reliable and safe technique that can be used with general anaesthesia for intra and post operative analgesia in patients undergoing lower abdominal surgeries.

Bupivacaine is a long-acting reliable local anaesthetic agent that is used as a caudal analgesic, but different auxiliary agents need to be co-administered to improve its analgesic efficiency. The main disadvantage of caudal analgesia is the short duration of action after a single injection [1].

Prolongation of caudal analgesia using a single-shot technique has been achieved by the addition of various adjuvants, such as epinephrine, opioids, ketamine, and α_2 agonists. Postoperative pain can result in an uncooperative and restless child. Hence, it is preferable to prevent the onset of pain rather than to relieve its existence.

Dexmedetomidine (DEX) is a highly selective α_2 agonist with sedative and analgesic properties. It has an α_2/α_1 selectivity ratio of 1600:1, which is eight times more potent than clonidine (200:1) [2].

2. Aims and Objective

- The aim of this study was to compare the postoperative analgesic effects of bupivacaine alone with the additive effects of dexmedetomidine on bupivacaine-induced caudal analgesia in paediatric patients undergoing inguinal region surgery.
- To assess analgesic efficacy
- Duration of postoperative analgesia
- Hemodynamic stability intraoperative
- Postoperative sedation
- Any adverse effects

3. Materials and Methods

After obtaining approval of the ethical committee and parental written informed consent.

Total no patients: 40 paediatric patients

Aged 2 – 12 years

Inclusion Criteria

American society of anaesthesiologist's (ASA) physical status I and II scheduled for inguinal region surgeries under general anaesthesia combined with caudal analgesia.

Exclusion Criteria

- Children with sacral bone abnormalities
- Spina bifida
- Coagulopathy
- Mental delay or retardation
- Known allergy to the study drugs,
- Local infection at the site of injection were excluded from the study.

Materials

- 23G needle
- Bupivacaine 0.5%
- Normal saline 0.8%
- Dexmedetomidine 100ugm
- Iv cannula 24G and 22G
- This was a randomized single-blinded prospective study.

The children were randomly allocated into 2 groups:

- Group I (BD): (n = 20) received 0.5 mL/kg bupivacaine 0.25% with dexmedetomidine 1 μ g/kg
- Group II (B): (n = 20) received 0.5 mL/kg bupivacaine 0.25%.

Procedure

- After applying standard monitors, general anaesthesia was induced with inhalation of sevoflurane in oxygen via face mask.
- An intravenous cannula was placed and fluid therapy was standardized.
- After securing the tube in place the patients were placed in the lateral decubitus position and a single dose caudal block was performed using a 23g needle and standard loss of resistance technique.
- No other narcotics, analgesics, or sedatives were administered intra-operatively. Standard monitoring was used during anaesthesia and surgery.
- Heart rate (HR), mean arterial pressure (MAP), and oxygen saturation (SPO₂) were recorded.
- After extubation the patients were transferred to the post anaesthesia care unit (PACU) and were monitored for vital signs (heart rate, non invasive blood pressure, and saturation of peripheral oxygen).

The Face, Legs, Activity, Cry, Consolability (FLACC) pain score

Categories	0	1	2
Face	Smile or no particular expression	Occasional grimace, frown, withdrawn, disinterested	Frequent to constant frown, clenched jaw, quivering chin
Legs	Normal position or relaxed	Uneasy or restless	Kicking legs or drawn up
Activity	Lying quietly, normal position moves easily	Squirming, shifting back and forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers, occasional complaints	Crying steadily, screams or soabs, frequent complaints
Consolability	Content or relaxed	Reassured by occasional hugging, touching, talking, distractable	Difficult to console

- The Face, Legs, Activity, Cry, Consolability (FLACC) pain score with its 0 – 10 score range was used to assess pain immediately postoperative and at hours 2, 4, 6, 12, 18, and 24 of the postoperative period(3).
- Inj paracetamol 20mg/kg was given when the FLACC score was ≥ 4 . The time to first request for analgesia was recorded.

Score	Description
1	Anxious and agitated or restless or both.
2	Co-operative, oriented, and calm.
3	Responsive to commands only.
4	Exhibiting brisk response to light glabellar tap or loud auditory stimulus.
5	Exhibiting a sluggish response to light glabellar tap or loud auditory stimulus.
6	Unresponsive.

The level of sedation was recorded using Ramsay’s sedation scale (4).

- Postoperative adverse effects such as nausea, vomiting, hypotension, bradycardia, and respiratory depression were recorded and treated.

4. Result

- The time of the first rescue analgesic requirement was significantly prolonged in group BD in comparison to group B.
- Also the mean total consumption of intra- venous paracetamol rescue analgesia in the 24 hour postoperative study period was significantly decreased in group (BD) when compared with group B.
- Though the pain score (flacc) was lower in group (BD) from the immediate postoperative period to 24 hours after surgery than in group b.
- Though sedation score starts to decrease significantly in both study groups in the second hour after surgery, group (BD) has significantly higher sedation scores starting

immediately after surgery and up to 4 hours postoperative than group B.

- From the sixth hour up to 24 hours both groups have more or less same sedation score.

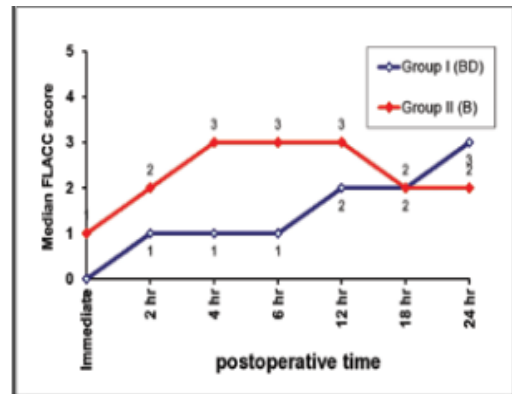


Fig. 1. FLACC score. Group I (BD): caudal bupivacaine + dexmedetomidine. Group II (B): caudal bupivacaine.

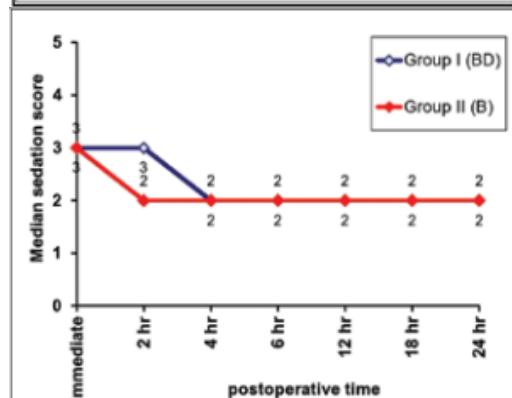


Fig. 2. Sedation score. Group I (BD): caudal bupivacaine + dexmedetomidine. Group II (B): caudal bupivacaine.

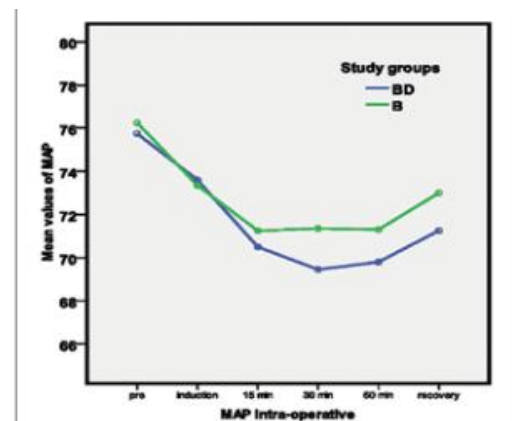


Fig 3. Intra-operative mean arterial blood pressure (MAP) changes. Group BD: caudal bupivacaine + dexmedetomidine. Group B: caudal bupivacaine.

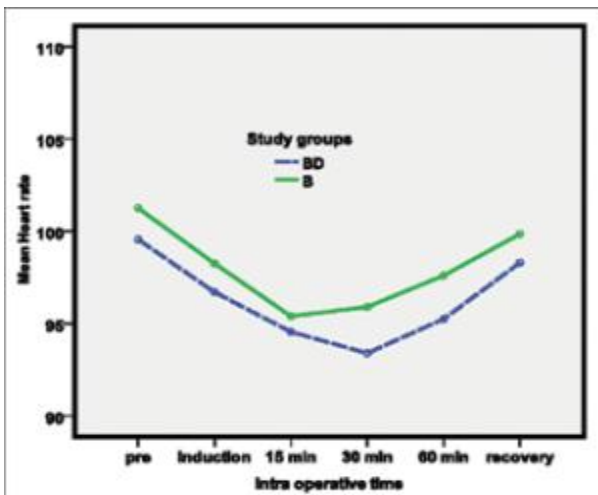


Fig 4. Intra-operative heart rate (HR) changes. Group BD: caudal bupivacaine + dexmedetomidine. Group B: caudal bupivacaine.

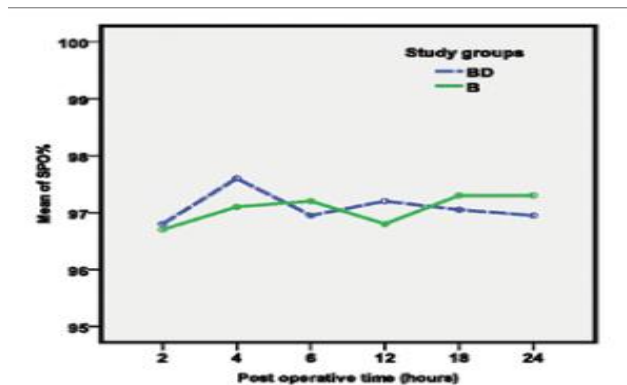


Fig 7. Post-operative arterial oxygen saturation (SPO2) changes. Group BD: caudal bupivacaine + dexmedetomidine. Group B: caudal bupivacaine.

There were no recorded cases of postoperative adverse effects groups in both groups

5. Discussion

- For caudal block, administration of 1 to 2 µg/kg of dexmedetomidine with bupivacaine prolongs the duration of analgesia without significant side effects and also reduces the onset time of sensory-motor block, the total dose of analgesics required and the chances of postoperative shivering. Delaying motor regression and need of first rescue analgesic. Prolonging the duration of sensory block and postoperative analgesia (5) as in our results.
- El-Hennawy et al.,(6) who compared the use of single dose caudal epidural injection of dexmedetomidine or clonidine or placebo (normal saline) added to bupivacaine, and proved that the duration of analgesia was found to be significantly prolonged with dexmedetomidine, and to a lesser extent with clonidine than with plain bupivacaine, without any increase in the incidence of side-effects.
- Maroof et al used dexmedetomidine epidurals at approximately 1.5 µg/kg to decrease the incidence of postoperative shivering without any reports of neurological deficit. Also, studies in children indicated that neuraxial administration of dexmedetomidine at no more than 2 µg/kg and a concentration of no more than 2 µg/ml does not cause neurotoxicity (7,8,9).
- Xiang et al have also demonstrated that supplementation of caudal bupivacaine with dexmedetomidine (1 µg/kg) reduced the hemodynamic response to hernial sac traction in children undergoing inguinal hernia repair(10).
- This study shows that addition of caudal dexmedetomidine 1µg/kg to bupivacaine (0.25%) 0;5 ml/kg prolong the duration of analgesia in comparison to plain bupivacaine with out an increase in adverse effects .

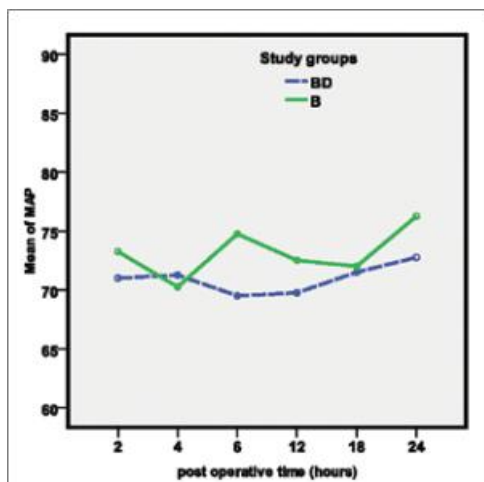


Fig 5. Post-operative mean arterial blood pressure (MAP) changes. Group BD: caudal bupivacaine + dexmedetomidine. Group B: caudal bupivacaine.

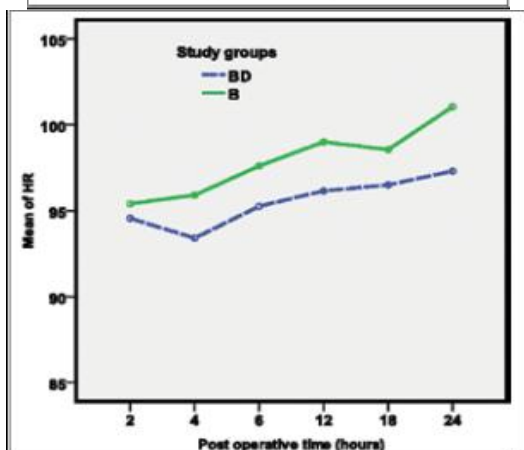


Fig. 6. Post-operative heart rate (HR) changes. Group BD: caudal bupivacaine + dexmedetomidine. Group B: caudal bupivacaine.

6. Conclusions

The results of our study show that administration of bupivacaine-dexmedetomidine was more beneficial than administration of bupivacaine alone with regard to inducing analgesia, sedation ,eliminating the need for post operative opioid with no significant haemodynamic changes and no

side effects, such as motor block, hypotension, bradycardia in the group of 2- to 12-year-old children examined after elective inguinal region surgery.

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