

Efficacy of Dexamethasone and Dexmedetomidine as an adjuvant to Bupivacaine 0.25% versus plain 0.25 % Bupivacaine in caudal block in paediatric patients undergoing infra umbilical surgery

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ABSTRACT

Background: To compare efficacy of Dexamethasone and Dexmedetomidine as an adjuvant to Bupivacaine 0.25% versus Plain 0.25 % Bupivacaine in caudal block in paediatric patients undergoing infra umbilical surgery.

Methods: Seventy- five Pediatric patients selected for infraumbilical surgery of either gender was classified into 3 groups of 25 each. In group I, the patients received inj Bupivacaine 0.25% :1 ml/kg + 1 ml 0.9% normal saline. In group II, the patients received inj. Bupivacaine 0.25%: 1 ml/kg + inj Dexamethasone (0.1 mg/kg) making volume to 1 ml. In group III, the patients received inj Bupivacaine 0.25%: 1 ml/kg + inj Dexmedetomidine (1 µg/kg) making volume to 1 ml. Parameters such as time of analgesia (min), Ramsay sedation score and the modified objective pain score (MOPS) and adverse effects were recorded.

Results: The mean weight in group I was 22.5 kgs, in group II was 21.6 kgs and in group III patients was 20.2 kgs. The height was 90.1 cms, 84.5 cms and 85.6 cms in group I, II and group III respectively. The mean duration of analgesia was 321.4 minutes in group I, 485.2 minutes in group B and 464.2 minutes in group III. The difference was significant (P< 0.05). At 30 minutes, the mean MOPS was 3.2, 4.2 and 3.8 in group I, II and III respectively. At 1 hour, it was 4.1, 4.5 and 3.5, at 3 hours was 3.7, 3.2 and 3.1 and 6 hours was 3.3, 2.7 and 1.2 in group I, II and III respectively. The difference was significant (P< 0.05). The mean Ramsay sedation score was 3.9 in group I, 3 in group II and 3.4 in group III. The difference was significant (P< 0.05). Among adverse events, bradycardia was seen in 1 in group I, 1 in group II and 3 in group III. Hypotension was 1 in group I, 2 each in group II and III. Vomiting was seen in 2 in group I, 1 in group II and 2 in group III. The difference was significant (P< 0.05).

Conclusion: Contrary to caudal local anaesthetic alone or in combination with dexamethasone, caudal dexmedetomidine is a superior adjuvant in extending postoperative analgesia. They both displayed similar adverse effect profiles, with the exception of bradycardia, which was somewhat more common with dexmedetomidine.

Keywords: dexamethasone, Caudal local anesthetic, dexmedetomidine

INTRODUCTION

Particularly in children, pain is one of the most misunderstood, underdiagnosed, and mistreated medical conditions. The newly established Joint Commission on Accreditation of Health Care Organisations views pain as the fifth vital sign and mandates that carers assess it frequently.¹ Poor pain management during childhood may have long-term detrimental impacts, including damaging neuroendocrine reactions, disturbed eating and sleeping patterns, and increased pain sensitivity

during subsequent painful episodes. An unwilling and restless child may come from postoperative pain. Therefore, preventing the onset of pain is preferable to treating it once it has already started.² Caudal analgesia is a good, dependable, and straightforward approach for administering intraoperative and postoperative analgesia in paediatric infraumbilical surgery. Because single shot caudal analgesia has a short duration and is associated with infection, catheter injection may be used to increase the analgesic time.³ Researching various adjuvants to local anaesthetics has helped solve this issue. These chemicals have been utilised to lengthen the analgesic effect and improve the block quality.⁵ Depending on the kind and dosage used, several of these adjuvants, including fentanyl, clonidine, dexmedetomidine, neostigmine, ketamine, and midazolam, have side effects.⁴ Dexamethasone is a long-acting corticosteroid having anti-inflammatory qualities. When combined with local anaesthetics in the epidural area, it has been shown to reduce the requirement for postoperative rescue analgesics after abdominal and orthopaedic surgeries.⁵ The potent anti-inflammatory effects of dexamethasone boost the efficiency of analgesics in a natural way.⁶ A 2 adrenergic receptor agonist with sedative and analgesic properties is dexmedetomidine. It prolongs postoperative analgesia when used caudally with local anaesthetics.⁷ We compare the intraoperative hemodynamics, postoperative analgesia, sedation and side effects of dexamethasone and dexmedetomidine when used as an adjuvant to bupivacaine to caudal epidural block in children undergoing infraumbilical surgeries.

MATERIALS AND METHODS

This study comprised of seventy- five Pediatric patients selected for infraumbilical surgery of either gender. Parents’ written consent was obtained before starting the study.

Demographic data such as name, age, gender etc. was recorded. Patients were classified into 3 groups of 25 each. In group I, the patients received inj Bupivacaine 0.25% :1 ml/kg + 1 ml 0.9% normal saline. In group II, the patients received inj. Bupivacaine 0.25%: 1 ml/kg + inj Dexamethasone (0.1 mg/kg) making volume to 1 ml. In group III, the patients received inj Bupivacaine 0.25%: 1 ml/kg + inj Dexmedetomidine (1 µg/kg) making volume to 1 ml. Parameters such as time of analgesia (min), Ramsay sedation score and the modified objective pain score (MOPS) was assessed at 30 minutes, 1, 3, 6 hours. The MOPS consists of 5 parameters: crying (0 = none, 1 = consolable, 2 = non consolable), movements (0 = none, 1 = restless, 2 = thrashing), agitation (0 = asleep or calm, 1 = mild, 2 = hysterical), posture (0 = normal, 1 = flexed, 2 = holds injury site), verbal (0 = asleep or not complaint, 1 = complaint but cannot localized, 2 = complaint but can localize). The adverse effects were also recorded. The results were compiled and subjected for statistical analysis. P value less than 0.05 was considered significant.

RESULT

Table I Baseline parameters

| Parameters | Group I | Group II | Group III | P value |
|-----------------------------|---------|----------|-----------|---------|
| Weight (kgs) | 22.5 | 21.6 | 20.2 | 0.91 |
| Height (cms) | 90.1 | 84.5 | 85.6 | 0.72 |
| Time of analgesia (minutes) | 321.4 | 485.2 | 464.2 | 0.01 |

The mean weight in group I was 22.5 kgs, in group II was 21.6 kgs and in group III patients was 20.2 kgs. The height was 90.1 cms, 84.5 cms and 85.6 cms in group I, II and group III respectively.

The mean duration of analgesia was 321.4 minutes in group I, 485.2 minutes in group B and 464.2 minutes in group III. The difference was significant ($P < 0.05$) (Table I).

Table III Modified objective pain score

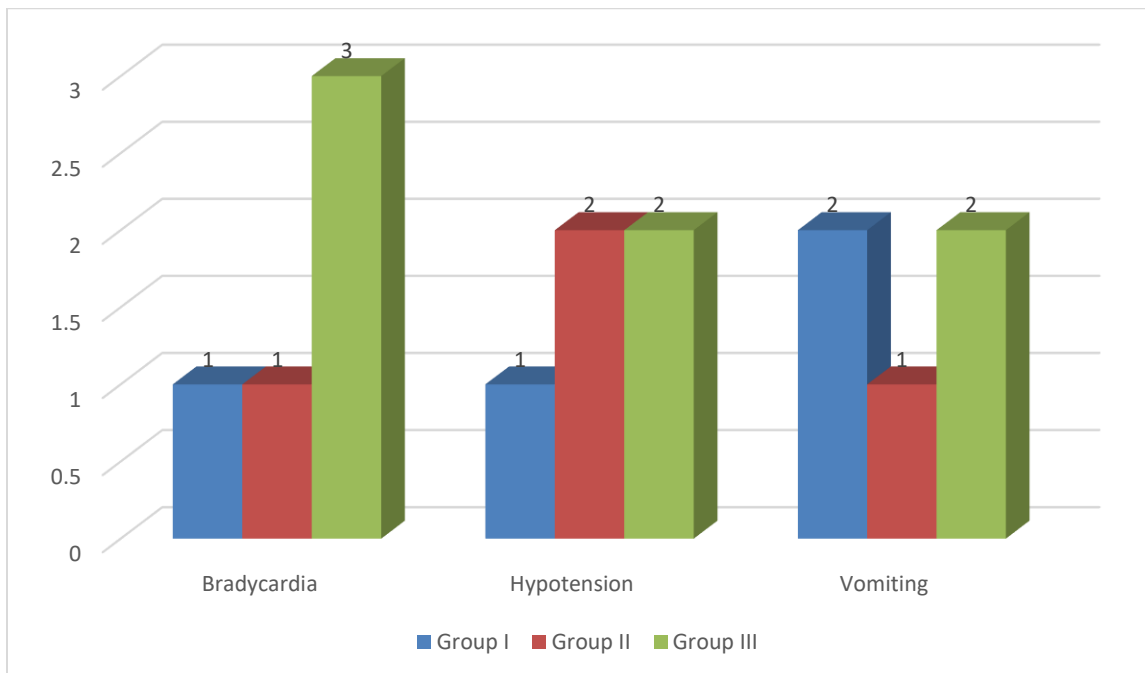
| MOPS | Group I | Group II | Group III | P value |
|---------------|---------|----------|-----------|---------|
| At 30 minutes | 3.2 | 4.2 | 3.8 | 0.86 |
| 1 hour | 4.1 | 4.5 | 3.5 | 0.82 |
| 3 hours | 3.7 | 3.2 | 3.1 | 1 |
| 6 hours | 3.3 | 2.7 | 1.2 | 0.05 |

At 30 minutes, the mean MOPS was 3.2, 4.2 and 3.8 in group I, II and III respectively. At 1 hour, it was 4.1, 4.5 and 3.5, at 3 hours was 3.7, 3.2 and 3.1 and 6 hours was 3.3, 2.7 and 1.2 in group I, II and III respectively. The difference was significant ($P < 0.05$) (Table III).

Table IV Ramsay sedation score

| RSS | Group I | Group II | Group III | P value |
|---------------|---------|----------|-----------|---------|
| At 30 minutes | 4.1 | 4.3 | 4.5 | 0.87 |
| 1 hour | 4.3 | 3.2 | 2.8 | 0.94 |
| 3 hours | 3.2 | 3.1 | 1.5 | 0.90 |
| 6 hours | 3.8 | 3.2 | 1.8 | 0.75 |
| Mean | 3.9 | 3.0 | 3.4 | |

The mean Ramsay sedation score was 3.9 in group I, 3 in group II and 3.4 in group III. The difference was significant ($P < 0.05$) (Table IV).



Graph I Adverse events

Among adverse events, bradycardia was seen in 1 in group I, 1 in group II and 3 in group III. Hypotension was 1 in group I, 2 each in group II and III. Vomiting was seen in 2 in group I, 1 in group II and 2 in group III. The difference was significant ($P < 0.05$) (Graph I).

DISCUSSION

Various multimodal techniques have been designed for pediatric pain relief. These include both systemic and regional analgesia.⁸ The most commonly used regional technique is caudal epidural block.^{9,10} Advantages of the caudal block are early extubation, ambulation, and decreased the risk of chest infections, decreased postoperative analgesic requirements, and early discharge.¹¹ As one of the disadvantages of the caudal block is the relatively short duration of analgesia. Therefore, various additives, e.g., ketamine, ephedrine, clonidine, and opioids have been used to prolong the duration of analgesia provided by single injection. This study compared the intraoperative hemodynamics, postoperative analgesia, sedation and side effects of dexamethasone and dexmedetomidine when used as an adjuvant to bupivacaine to caudal epidural block in children undergoing infraumbilical surgeries.^{12,13}

The mean weight in group I was 22.5 kgs, in group II was 21.6 kgs and in group III patients was 20.2 kgs. The height was 90.1 cms, 84.5 cms and 85.6 cms in group I, II and group III respectively. The mean duration of analgesia was 321.4 minutes in group I, 485.2 minutes in group B and 464.2 minutes in group III. Parameswari A et al¹⁴ in their study, 130 children between the ages of 6 months and 6 years were divided at random into one of two groups for elective subumbilical operations. Caudal bupivacaine was administered to children in group C, while Caudal bupivacaine plus 0.1 mg/kg of dexamethasone was administered to children in group D. When dexamethasone was given to caudal bupivacaine, the mean duration of analgesia was 1044.92 minutes, compared to 435.85 minutes with plain bupivacaine. The average pain score and the quantity of rescue analgesic dosages needed were both lower in this group.

At 30 minutes, the mean MOPS was 3.2, 4.2 and 3.8 in group I, II and III respectively. At 1 hour, it was 4.1, 4.5 and 3.5, at 3 hours was 3.7, 3.2 and 3.1 and 6 hours was 3.3, 2.7 and 1.2 in group I, II and III respectively. Nasr et al¹⁵ compared caudal fentanyl or dexmedetomidine on lower abdominal and limb surgeries and cardiac surgery in pediatrics respectively and concluded that in dexmedetomidine group the pain score was decreased and the duration of postoperative analgesia was prolonged.

The mean Ramsay sedation score was 3.9 in group I, 3 in group II and 3.4 in group III. Among adverse events, bradycardia was seen in 1 in group I, 1 in group II and 3 in group III. Hypotension was 1 in group I, 2 each in group II and III. Vomiting was seen in 2 in group I, 1 in group II and 2 in group III. El-Feky et al¹⁶ in their study, 120 children who were scheduled for lower abdomen surgeries under general anaesthetic were split into 4 groups. 0.5 ml of a 0.25% bupivacaine and 1% lidocaine solution diluted in saline (at a dosage of 0.5 ml/kg) was administered caudally to the patients in Group I (Control). The patients in Group II (the fentanyl group) received fentanyl (1g/kg) in addition to the same caudal dosage as Group I. The same caudal mixture as Group I was administered to the patients in Group III, along with dexmedetomidine (1g/kg). The patients in group IV (dexamethasone group) received the same dosage of group I plus dexamethasone (0.1 mg/kg) caudally. Dexmedetomidine and dexamethasone groups had lower pain scores, longer analgesia durations, and fewer side effects.

CONCLUSION

Contrary to caudal local anaesthetic alone or in combination with dexamethasone, caudal dexmedetomidine is a superior adjuvant in extending postoperative analgesia. They both displayed similar adverse effect profiles, with the exception of bradycardia, which was somewhat more common with dexmedetomidine.

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