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Effectiveness of Caudal Epidural Block using Bupivacaine with tramadol for Pediatric Lower Extremity Orthopaedic Surgery

Dr Dillip Kumar Chand[1], Dr Dillip Kumar Das[2], Dr Sujit Kumar Lakra[3], Dr Bhargabi Mallik[4], Dr. Susajit Kumar Pradhan[5]

[1]Assistant Prof, Department of Orthopaedics. Shri Jagannath Medical College, Puri

[2]Assistant Prof, Department of Pediatrics. S.C.B Medical College, Cuttack

[3]Assistant Prof, Department of Orthopaedics. S.C.B Medical College, Cuttack

[4]Senior Resident, Department of Anaesthesiology. S.C.B Medical College, Cuttack

[5] Assistant Prof. Department of Anaesthesiology. S.C.B Medical College, Cuttack

Corresponding Author: Dr Bhargabi Mallik. Senior Resident, Department of Anaesthesiology. S.C.B Medical College, Cuttack, Odisha

Abstract

Background & Aim: Caudal block has been commonly used by the anaesthesiologists in pediatric surgery to relieve postoperative pain. This study compared the use of bupivacaine alone with bupivacaine plus tramadol for a single shot caudal block to find out whether tramadol can be an effective adjuvant to bupivacaine for providing better postoperative analgesia in children undergoing lower extremity surgery.

Material and methods: A total of 60 children undergoing lower extremity surgery were randomly allocated into two groups; 30 children in group BT were treated with bupivacaine-with tramadol, and 30 patients in Group B were treated with bupivacaine only. Caudal epidural block was performed immediately after induction of anaesthesia. Study outcomes were monitored in terms of duration of analgesia and total rescue analgesia (paracetamol) required in 1st 24 hrs.

Results: Mean duration of analgesia was significantly high in group BT compared to group B and total rescue analgesia required was more in group B compared to group BT which was statistically significant.

Conclusion: Tramadol when administered caudally with bupivacaine provided prolonged analgesia without any side effects in children undergoing lower extremity surgery.

Key words: Pain, postoperative, caudal, Bupivacaine, Tramadol

Introduction

In past pain has been underestimated in children & many times they received inadequate analgesia. Traditionally, pain relief is provided by systemic medications as non-steroidal anti-inflammatory drugs, local anesthetic infiltration around surgical wound or by regional anesthesia techniques. Later pain pathways have been identified in children & therefore post operative analgesia is gaining importance in children.[1]Pediatric regional anesthesia is excellent technique for balanced intraoperative & post-operative analgesia.[2]Most frequently used regional anesthesia technique is epidural block through caudal approach in pediatric lower extremity surgery.[3]It also decreases intravenous or inhalational agents 'requirement for general anesthesia, attenuate stress response to surgery, good immediate postoperative analgesia, and facilitate rapid smooth recovery.[4,5] The mean duration of surgical pain relief by caudal block is limited by the duration of action of local anesthetic being used. Drugs like opoids,

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clonidine, midazolam, neostigmine, ketamine ,etc. may be added to increase the duration of action of a single shot caudal block.[6] Caudal opoids have advantage of increasing the analgesic duration over bupivacaine alone bit it can produce adverse effect like vomiting, pruritis & respiratory depression which can be minimized by reducing concentration.[7] Tramadol an opoid agonist, is a synthetic analogue of codeine. It is a potent norepinephrine inhibitor and it also inhibits serotonin uptake with facilitation of its release. It has low respiratory depression effect. This study was done to compare bupivacaine 0.25%(1ml/Kg) alone and bupivacaine0.25%(1ml/Kg) with tramadol(1mg/Kg) as a single shot caudal block in pediatric lower extremity surgery.

Material and Methods

This study was conducted at a tertiary care hospital in Odisha. Informed consent was obtained from the parents. This study included 60 children of either sex, coming for various lower extremity procedures. Age group of 1-8yrs, ASA grade I and II and patients coming for lower extremity surgery were included in this study. ASA grade III and IV, infected wounds at sacrum, coagulopathy or on anticoagulation, congenital sacral anomalies and history of allergy to local anesthetics were excluded. This study was approved by the Ethics and Standards committee of this institution. Randomization was done using computer generated random number table and sealed envelope technique to divide into two groups like B&BT(n=30 each). Parameters like heart rate, blood pressure and respiratory rate was measured. General anesthesia was administered to all patients as per institutional protocol. Then patients were gently placed in the Sim's position (left lateral). Under strict aseptic conditions, sacral hiatus was identified by running the thumb up from coccyx towards the sacrum. After identifying the sacral hiatus, a24G needle with its bevel facing anteriorly was inserted at an angle of 60-70°to the skin till the sacro-coccygeal membrane was pierced, till a distinct "pop" was felt. The needle is now depressed to an angle of 20° and forwarded up to 2-3 mm to make sure that the entire bevel is inside the space. Confirmation of the needle point being in the epidural space was done with the "whoosh" test and the lack of resistance encountered by injection of 2-3ml of air. Aspiration was done to exclude dural puncture or vessel puncture and the drug was injected. After injection was complete, the needle was removed and the child was placed in supine position. Anesthesia was maintained with oxygen, nitrous oxide and Sevoflurane (0.2to 3%) with patient on spontaneous ventilation throughout the surgery. The children were randomly divided into 2 groups each containing of 30 members. **Group B** had the caudal block with 1 ml/kg of 0.25% of bupivacaine. **Group BT** had the caudal block with 1 ml/kg of 0.25% of bupivacaine plus Tramadol 1mg/kg. Pulse-oximetry, NIBP, respiratory rate and ECG were monitored. Anesthetic agents were discontinued at the beginning of skin closure and extubation done as per protocol.100% oxygen through a face mask was administered. On arrival to the recovery room, the child was monitored for another 1 hour with SpO2, respiratory rate, NIBP and heart rate every15minutes.Afterthatthechildwasshifted to the ward and monitored thereafter. Patients were monitored for heart rate, respiratory rate and blood pressure after administration of caudal block at 0,5,15,30,45,60,120 and 180 minutes and the values were recorded. Post-operative analgesia is assessed by Pediatric Objective Pain Scale. Duration of post-operative analgesia and total requirement of rescue analgesic required were monitored fin 1st

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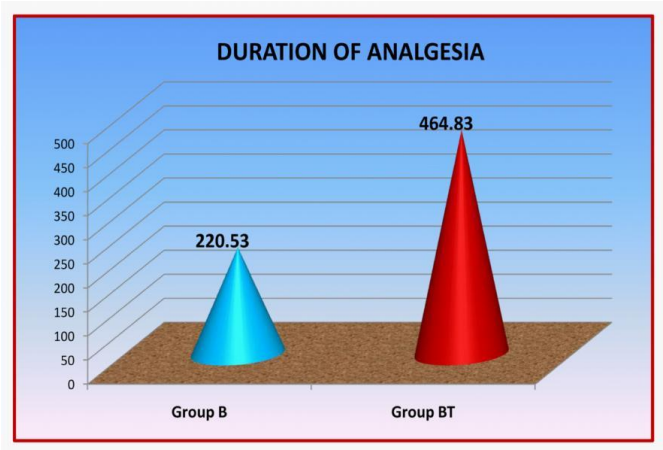
24hrs.Rescue analgesia with syrup Paracetamol (15mg/ kg) was given. Statistical analysis: The results of continuous variables are given as mean ± SD and proportion as percentage. The difference between the two groups was assessed by independent sample t test and chi-square test using SPSS software. For all the tests a 'p'value < 0.001 was considered for statistically significant.

Results

A total of 60 children undergoing lower extremity surgery were randomly allocated into two groups. 30 children in Group BT were treated with bupivacaine plus tramadol, and 30 patients in Group A were treated with bupivacaine only. The demographic parameters in patients of both groups were statistically not significant. A comparison of the duration of analgesia between groups is shown in figure1which was statistically significant. ($p < 0.001$). The mean duration of analgesia was significantly high in Group BT as compare to Group B.(fig 1)

Fig 1: Duration of analgesia



The total dose of paracetamol consumed in 24 hours was more in group B group compared to group BT which was statistically significant.($P < 0.001$) (fig 2)

Fig 2:PCM demand in 1st 24 hrs

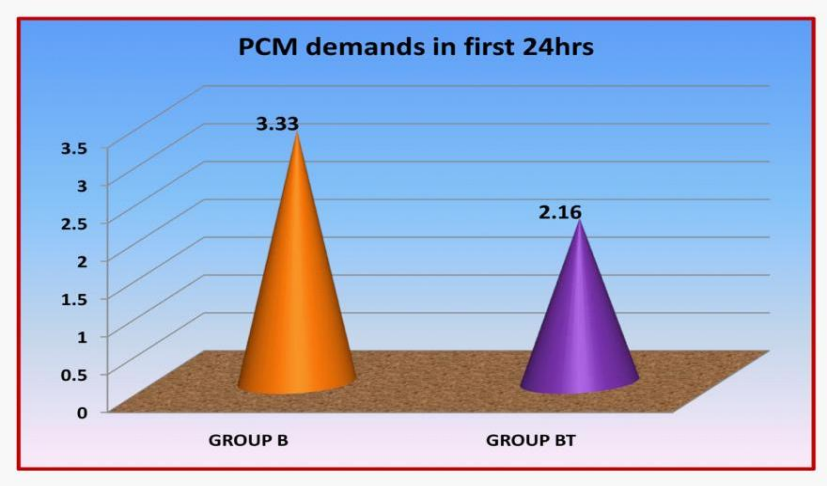


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Table 1 shows side effects in both groups which were not significant.

Table 1: Side effects

Side effects	Group B	Group BT
Bradycardia	2 (6.6)	**0**
Vomiting	2 (6.6)	5 (16.6)
Pruritus	**0**	2 (6.6)

Discussion

The best way to treat postoperative pain is to combine drugs with different modes of action. A weak opioid like tramadol is widely used to treat children with moderate to severe acute pain. Tramadol can be given to children to reduce pain after the surgery. Caudal block has proved useful for pain relief in a variety of lower abdominal operations. Ease of performance and reliability make caudal block the most commonly performed block in children. Caudal administration of bupivacaine is a widespread regional analgesic technique for intra and postoperative analgesia during lower abdominal surgeries in children.[8] The administration of opioids into the epidural space prolongs the duration of caudal analgesia. The mean duration of surgical analgesia provided by bupivacaine is limited according to many studies. Different drugs have been studied such as tramadol, fentanyl, clonidine, and midazolam, as adjuvants with bupivacaine to prolong the postoperative analgesia. Tramadol is an analgesic agent acting centrally through opioid receptors. Results of a study in 2009 showed that the mean duration of analgesia for the caudal bupivacaine group was 6.5 ± 4.1 h.[8] Another study showed that the mean duration of analgesia for caudal bupivacaine with the tramadol group was 13.5 ± 2.2 h.[9]Caudal anesthesia is the first technique of epidural anesthesia and is the most commonly used technique for the management of pain following a vast range of surgical procedures within the distribution of T10–S5 dermatomes for young children because of its technical simplicity, reliability, safety, and low failure rate. Various additives to the local anesthetic solution have been used in an attempt to prolong the duration of a single-shot caudal epidural injection. Opioids and non–opioids have traditionally been added to increase the duration of analgesia, but opioids have been associated with unacceptable side effects, as well as risks of late respiratory depression, prolonged sedation, urine retention, or hypotension.

Caudal analgesia is frequently used for postoperative analgesia in children undergoing urogenital surgeries. In this study mean duration of analgesia was significantly higher in the bupivacaine with tramadol group as compared to bupivacaine group. The results were in accordance with several studies done previously. In Samad and Shah's study,[10] caudal tramadol with bupivacaine produced significantly prolonged postoperative analgesia. The duration of postoperative analgesia was 17.88 ± 1.96 h in the tramadol – bupivacaine group as compared to 12.05 ± 1.63 h in the ketamine – bupivacaine group.

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Several other researchers observed prolonged analgesia provided by tramadol plus bupivacaine in children undergoing various surgery. Choudhuri and colleagues reported that caudally administered 0.5 ml/kg bupivacaine (0.25%) plus ketamine or bupivacaine (0.25%) plus tramadol 1 mg/kg provided a significantly longer duration of analgesia without an increase in the adverse effects when compared to bupivacaine alone.[11]Ozcengiz et al. got satisfactory results regarding postoperative pain relief in children undergoing inguinal surgeries by tramadol–bupivacaine mixtures in caudal blocks.[12] Batra et al. found tramadol–bupivacaine to provide prolonged and satisfactory analgesia in the postoperative period by caudal route in children operated for hypospadias.[13] Murthy and colleagues noticed epidural tramadol to be more effective than intravenous tramadol for postoperative pain relief.[14] Chrubasik found epidural tramadol to provide good analgesia postoperatively after abdominal surgeries and observed a very low concentration of tramadol in systemic circulation compared to intravenous administration.[15]
Parkash et al [16]studied caudal tramadol plus bupivacaine. They used different doses of 1 mg, 1.5 mg, and 2 mg/kg plus 0.5 ml/kg of 0.25% bupivacaine. They observed that a prolonged postoperative analgesic period was observed when 2 mg/kg of tramadol was used. In another study by Senel et al [17] on the efficacy of caudal tramadol and bupivacaine in children undergoing inguinal herniorrhaphy, the results showed that patients who received bupivacaine 0.25 ml/kg and tramadol 1.5 mg/kg had a significantly longer time to administration of first rescue analgesia.

Conclusion

Caudal block with bupivacaine and tramadol provided prolonged analgesia without any side effects in children undergoing lower extremity surgery.

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