



A COMPARATIVE STUDY BETWEEN CAUDAL ROPIVACAINE AND ROPIVACAINE PLUS DEXAMETHASONE FOR INFRAUMBILICAL SURGERY IN PEDIATRIC PATIENTS

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ABSTRACT

Background: Caudal block is one of the most popular regional block in children with high success rate for infra-umbilical surgeries. Among local anaesthetics ropivacaine provides a greater margin of safety, less motor blockade, less neurological and cardiac toxicity and similar duration of analgesia compared to bupivacaine. Addition of dexamethasone as an additive to local anesthesia decreases the postoperative rescue analgesia consumption. This study was designed to compare the effectiveness of intra-operative and postoperative analgesia on adding dexamethasone to 0.15% ropivacaine with 0.15% ropivacaine given alone. **Materials:** A prospective double blinded randomised controlled study was conducted consisting of 60 patients undergoing infra-umbilical surgeries under general anesthesia with Caudal block. Patients were randomised into two groups. Group A received 0.15% Inj.ropivacaine 1.5ml/kg with 1ml normal saline and Group B received 0.15% Inj.Ropivacaine 1.5ml/kg with 0.1mg/kg Inj.dexamethasone in caudal block **Results:** Mean FLACC pain score was comparable and statistically not significant ($P=0.083$) in both groups upto 30min postoperatively. At 60min mean pain score in group A was 0.30 ± 0.54 and in group B was 0 ($P=0.005$) which was statistically significant. In group A 40%(12) patients required rescue analgesia whereas in group B only 10%(3) patients required analgesia ($P= 0.007$) **Conclusion:** Patients remained hemodynamically stable throughout the procedure. After 60min postoperatively FLACC score was significantly higher in group A as compared to group B. It concludes that addition of dexamethasone significantly reduced postoperative pain and need for rescue analgesia without any side effects.

KEYWORDS : Ropivacaine, Dexamethasone, Caudal block, post-operative pain

INTRODUCTION:

Provision of pain relief is an essential part of anaesthesia. Inadequate and inappropriately managed pain in children can lead to long term physical, psychological and behavioural sequelae¹. Inadequate treatment of pain in children is common and has been due to fear of opioid induced respiratory depression and difficulty with pain assessments in very small children². Caudal block is one of the most popular regional block in children with high success rate, for surgeries below the level of umbilicus³. This technique is useful adjunct during general anaesthesia and for providing post-op analgesia⁴ for infra-umbilical operations. The quality and level of caudal block depends on multiple factors like dose volume and concentration of the injected drug. But the duration of analgesia is limited by duration of action of local anaesthetics.

Among local anaesthetics ropivacaine provides a greater margin of safety, less motor blockade, less neurological and cardiac toxicity and similar duration of analgesia compared to bupivacaine⁷. Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibers, hence it has a selective action on pain transmitting A α and C nerves rather than A β fibers, which are involved in motor function⁶. Various adjuvants has been tried to prolong duration of analgesia. Dexamethasone is a long-acting corticosteroid. When used along with local anaesthetics in epidural space, it decreases postoperative rescue analgesia consumption following abdominal and orthopaedic surgeries⁽⁷⁾⁽⁸⁾.

MATERIALS AND METHODS:

After ethical committee approval, this study was conducted on ASA grade I or II patients of either sex aged 6 months to 6 years posted for infra-umbilical surgeries with duration less than 3hours like hermitomy, circumcision etc.

All patients underwent detailed pre-anaesthetic check up. Adequate fasting was ensured. Group allocation was done according to computer generated random number table. Patients were shifted to the operation theatre. Pulse-oximeter,

NIBP and electrocardiography monitors were connected. Inhalation induction of anaesthesia was done using 100% oxygen and sevoflurane 8% and intravenous line secured. Pre-medication was done with Inj.glycopyrrolate and Inj.midazolam. Anaesthesia was induced with Inj.propofol and Inj.atracurium. Airway management was done with the use of LMA/ETT. Maintenance of anaesthesia was done with 33% O₂:67%N₂O mixture and sevoflurane 1.0-1.2 MAC by controlled ventilation.

Investigator, who was blinded to group assignments, performed caudal blocks in all patients. After securing airway, under all aseptic precautions, caudal block was performed in left lateral decubitus position using 22G short bevelled needle and the study drug was deposited after confirming negative aspiration for blood and CSF. Patients were divided into two groups. Group A received 0.15% Ropivacaine 1.5ml/kg with 1ml NS. Group B received 0.15% Ropivacaine 1.5ml/kg with 0.1mg/kg dexamethasone in saline to make volume of 1ml. The surgical incision was taken approximately 10 minutes after the caudal block. Continuous monitoring of vital parameters – HR, ECG, RR, NIBP, SpO₂ was done and values were recorded before premedication, at the time of caudal block, 3min, 6 min , 10 min after caudal block and thereafter every 10 min till the surgery was over. After surgery all anaesthetic drugs was discontinued, reversal given and patient was extubated. Any side effects were noted. After extubation pain score was assessed using face, Legs, Activity, Cry, Consolability (FLACC) scale on emergence and 1,2,4,6,12,24h until the first dose rescue analgesia. After surgery, patients were shifted to PACU for further observation. Paracetamol suppository 15mg/kg was given when FLACC score was > 4 . The duration of analgesia can be defined as the time period between administration of block until FLACC score reached $> = 4$. The final assessment of the duration of effective analgesia was done by comparing time from caudal block to the administration of first rescue analgesia.

Data was represented using appropriate diagrams like line graph and bar diagram. Chi-square test and independent-t test was used to assess statistical significance. P value < 0.05 was considered statistically significant.

RESULT

Table 1: comparison of demographic variables

Study variable	Group A	Group B	P value
Mean age	3.48 ± 1.86	3.79 ± 1.63	0.495
Male: female	24:6	28:2	0.129

Table 1 shows demographic variables of both the groups. A total of 60 patients were randomly allocated into two groups of 30. Both groups were comparable with respect to demographic variables.

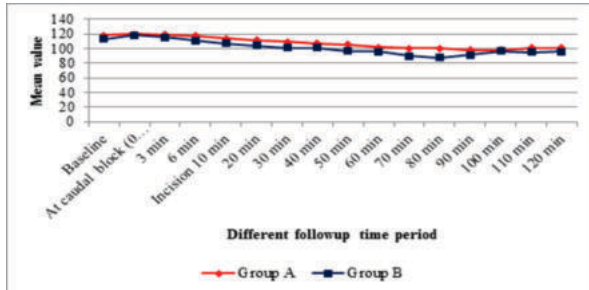


Figure 1: comparison of HR between two study groups.

Figure 1 shows mean HR between two study groups intraoperatively. The mean HR before premedication in group A was 118.07±13.40 whereas in group B was 113.27±18.68. Applying independent-t test showed P value 0.258 which was statistically not significant (p>0.05) Even after incision the mean value HR for group A was 113.93±13.62 and for group B was 106.83±18.64 (P= 0.098) which was statistically not significant. This trend continued every min thereafter till end of surgery.

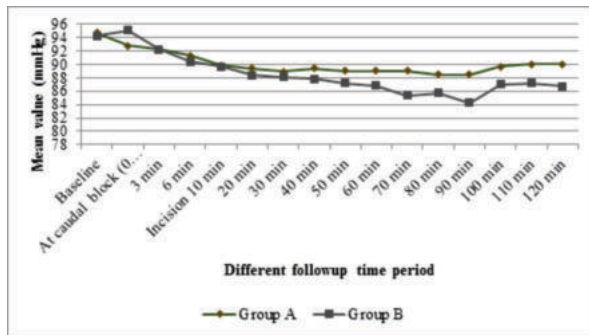


Figure 2: comparison of mean SBP variation between two study groups.

Figure 2 shows comparison of mean SBP variation between study groups intraoperatively. The mean SBP before premedication in group A was 94.73±7.45 whereas in group B was 94.20±6.71. Applying independent-t test showed P value 0.772 which was statistically not significant (P>0.05) Even after incision the mean value SBP for group A was 89.80±6.41 and for group B was 89.63±6.68 (p>0.05). This trend continued every min thereafter till end of surgery.

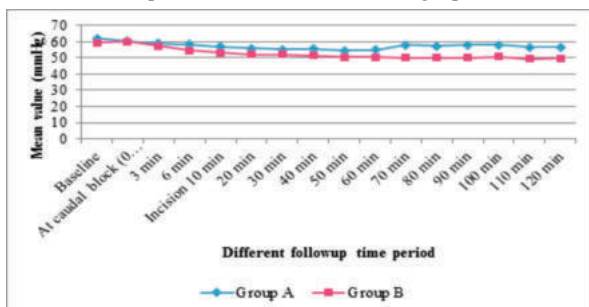


Figure 3: comparison of mean DBP between two study groups.

Figure 3 shows comparison of mean DBP between two study groups. The mean DBP before premedication in group A was 62.07±8.35 whereas in group B was 59.17±7.53. Applying independent-t test showed P value 0.163 which was statistically not significant (p>0.05) Even after incision the mean DBP for group A was 56.87±7.53 and for group B was 53.27 ± 6.74 (P>0.05). This trend continued every min thereafter till end of surgery.

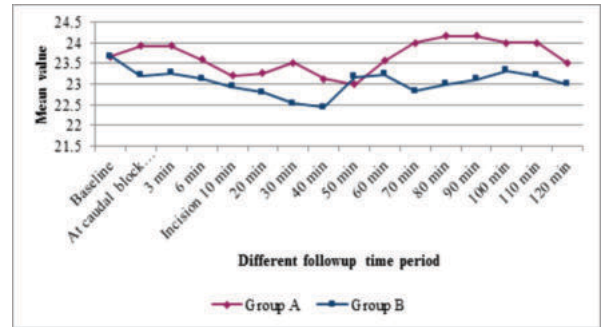


Figure 4: comparison of mean RR between two study groups.

Figure 4 shows comparison of mean RR between 2 study groups intraoperatively. The mean RR before premedication in group A was 23.67±1.39 and in group B was 23.67±1.58 . Applying unpaired-t test showed P value 1.000 which was statistically not significant (P>0.05) Even after incision the mean value RR for group A was 23.20±1.24 and for group B was 22.93±1.64 (P>0.05). Which was statistically not significant. This trend continued every min thereafter till end of surgery.

Table2: comparison of FLACC score between two study groups postoperatively

Postoperative flacc score	Group		P value
	Group A	Group B	
15min	0	0	-
30min	0.10±0.31	0	0.083
60min	0.30±0.54	0	0.005
90min	0.60±0.86	0	0.001
120min	1.10±1.13	0	<0.001
180min	1.60±1.28	0	<0.001
240min	2.10±1.60	0	<0.001
6hrs	2.60±1.52	0.07±0.25	<0.001
12hrs	3.07±1.55	0.40±0.67	<0.001
24hrs	3.50±1.59	1.23±1.3309	<0.001

Table 2 shows comparison of FLACC score between two study groups. Mean FLACC pain score in group A was 0.10±0.31 and in group B was 0 which was comparable and not significant (0.083) in both groups up to 30mins postoperatively.

But at 60min mean pain score in group A was 0.30±0.54 and in group A was 0 (P=0.005) Thereafter this trend continued. Thus, the difference in mean pain score at 60 min, 90 min, 180 min, 240 min, 360 min and 480 min post op were statistically highly significant.

Table3: comparison of rescue analgesia between 2 groups

Parameter	Group A	Group B	P value
Time of rescue analgesia	536.67±465.58	1320±240	0.016

Table 3 shows comparison of rescue analgesia between two groups. In Group A mean time of rescue analgesia among those who required was 536.67±465.58 whereas it was 1320±240 in group B. applying independent-t test showed P value 0.016 which was statistically significant

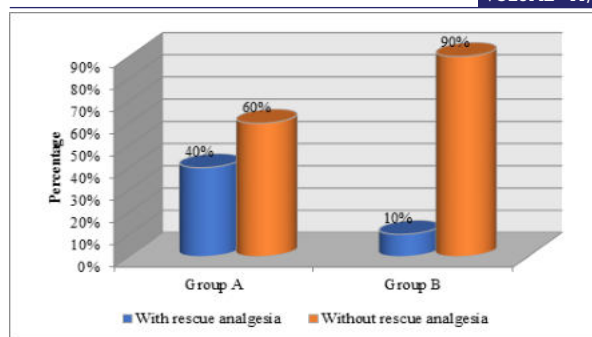


Fig: 5 showing comparison of total no:of patients requiring rescue analgesia

Figure 5 shows comparison of total no:of patients who required analgesia in both the groups to the total number of patients who did not required any rescue analgesia for 24hours post operatively. In group A 40% (12) patients required rescue analgesia whereas in group B only 10%(3) patients required analgesia. On applying chi-square test showed P value 0.007. The difference was statistically highly significant.

DISCUSSION

Day care surgery is a continually evolving specialty. This requires an anesthesia technique which has minimal stress response and maximum comfort with least residual effects to optimise early discharge. Postoperative analgesia provides not only pain relief but also inhibits trauma-induced nociceptive impulses to blunt autonomic reflexes. It allows the patients to breathe freely and ambulate early to enhance the early restoration of function

Inadequate pain relief in paediatric age group had shown to have long term adverse effects. They are prone to perceive more pain on subsequent pain exposure. Hence pain management becomes most important component in pediatric anaesthesia practice (Anand KJ et al, peter J W et al)^{9,10}. Raafat S.Hannallah, M.D., et al¹¹ 1987 evaluated 44 children aged 1.5- 12 years scheduled for orchidopexy under caudal analgesia and ilioinguinal/iliohypogastric nerve blocks for postoperative analgesia. He found that caudal block is superior to ilioinguinal block.

Among all the modalities of postoperative pain relief caudal block is most commonly used since decades. It is well tolerated and most reliable method. Caudal block provides effective and extended postoperative pain relief with lesser side-effects. Local anesthetic with additives can be administered as single injection to prolong postoperative analgesia. Various additives to local anaesthetic solutions have been used to prolong the duration of single-shot caudal anaesthesia^{12,13}

Caudal analgesia has shown better outcomes like early extubation, reduced length of hospital stay, early return of intestinal function^{14,15}, decreased requirement of anaesthetic drugs intra-operatively

Ropivacaine provides a greater margin of safety, less motor blockade, less neurological and cardiac toxicity and similar duration of analgesia compared to bupivacaine⁵.

Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibers, hence it has a selective action on pain transmitting A δ and C nerves rather than A β fibers, which are involved in motor function⁶. Dexamethasone is a long-acting corticosteroid. When used along with local anaesthetics in epidural space, it decreases postoperative rescue analgesia consumption following abdominal and orthopaedic surgeries⁽⁷⁾⁽⁸⁾. The anti-

inflammatory action of dexamethasone promotes analgesic effect.

In our study we compared ropivacaine alone and ropivacaine with dexamethasone in caudal block for intra-operative and postoperative analgesia. Both groups were comparable with respect to demographic variables and baseline vital parameters

Choudhary S et al¹⁶ in 2016 studied on "Evaluation of caudal dexamethasone with ropivacaine for post-operative analgesia in pediatric herniotomies: A randomized control study". This study states that Intraoperative hemodynamic parameters were maintained within 20% of baseline value in both groups and they concluded that caudal dexamethasone added to ropivacaine as a single shot injection resulted in significantly longer duration of analgesia as compared to caudal ropivacaine alone and the quality of analgesia was better after 2 post-operative hours, without any side effects.

Gamal T Yousef et al¹⁷, in 2014 conducted a study on enhancement of ropivacaine caudal analgesia using dexamethasone or magnesium in children undergoing inguinal hernia repair. Addition of magnesium or dexamethasone to caudal ropivacaine significantly prolonged analgesia duration 8 (5-11)h and 12 (8-16)h, respectively compared with 4 (3-5)h with the use of ropivacaine alone. The incidence of postoperative rescue analgesia was significantly higher in group received ropivacaine alone compared with other two groups. The time to 1st analgesic dose was significantly longer in groups Ropivacaine with magnesium (500 \pm 190) and Ropivacaine with dexamethasone (730 \pm 260 min) compared with ropivacaine alone (260 \pm 65 min).

Our study showed comparable hemodynamic parameters throughout intraoperative period and was maintained within 20% of baseline values. To assess the quality and duration of analgesia, postoperative pain assessment was done using FLACC scoring system in our study. Merkel et al 1997¹⁸, Mousumineogietal, Hennawayetal, Kannanetal evaluated FLACC scoring for assessing pain in children and found that it is reliable and valid in quantifying pain in nonverbal children.^{9,10}

FLACC score more than 4 suggests need for rescue analgesia. Mean FLACC pain score in group A was 0.10 \pm 0.31 and in group B was 0 which was comparable and not significant (P=0.083) in both groups up to 30mins postoperatively. The difference in mean pain score at 60 min, 90 min, 180 min, 240 min, 360 min and 480 min post-operatively were statistically highly significant in our study

In our study in group A 40% (12) patients required rescue analgesia whereas in group B only 10%(3) patients required analgesia (P= 0.007). The difference was statistically highly significant. In Group A mean time of rescue analgesia among those who required was 536.67 \pm 465.58 whereas it was 1320 \pm 240 in group B (P= 0.016) which was statistically significant.

CONCLUSION

In our study we concluded that the addition of 0.1 mg/kg dexamethasone to caudal ropivacaine for pediatric infra-umbilical surgeries as single shot injection resulted comparable hemodynamic parameters intra-operatively and significantly longer duration of analgesia as compared to the use of ropivacaine alone, and the quality of analgesia was better after first 2 post-operative hours, without any side effects.

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