

A STUDY COMPARING CAUDAL BLOCK AND PENILE BLOCK USING ROPIVACAINE FOR POST OPERATIVE ANALGESIA IN PEDIATRIC PATIENT POSTED FOR CIRCUMCISION”

¹Dr.Sheetal Jayakar, ^{2*}Dr.Aravindaraghavan E, ³Dr. Pati Satvika,

¹Associate Professor, Dr.D.Y. Patil Medical college and hospital, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

^{2*}³nd year PG in MD Anaesthesia, Dept of Anaesthesia, Dr.D.Y. Patil Medical college and hospital,

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

³nd year PG in MD Anaesthesia, Dept of Anaesthesia Dr.D.Y. Patil Medical college and hospital,

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Abstract

Introduction: Circumcision is a painful procedure in children for which various methods are being used for pain relief. The aim of this study was to compare caudal block and penile block using ropivacaine for post-operative analgesia in paediatric patient posted for circumcision.

Methods and Materials: It was a prospective, randomised, double blinded study over a period of 6 months in 40 male patients, age between 1-7 years. The patients were divided in to two groups 20 each. GROUP C received caudal block with 0.2ml/kg of 0.25% ropivacaine by 23-G 1½ needle through sacral hiatus. GROUP P received penile block with 0.2ml/kg of 0.25% ropivacaine by 23G needle. The postoperative pain was evaluated by FLACC (Face, Legs, Activity, Crying and Consolability) pain Scale. The patient's Postoperative pain was recorded using emergence numerical pain score on a scale of 0-10: The Facial expression, Leg activity, Crying and Consolability and on Visual Analogue Scale (VAS) score.

Results: We found that the mean pulse rate in Group C was less than Group P which was statistically significant at 4, 8, 24 hours. But the changes were not clinically significant. It was found that the mean VAS Scores were on lower side in Group C when compared to Group P. The mean VAS Score ranged from 2.5 to 4.75 in Group C and 3.4 to 5.45 in Group P.

Conclusion: We have demonstrated that although penile block is a safe and effective method of providing post-circumcision analgesia, Caudal block is superior in terms of its reliability, prolonged duration of action and in reducing post-operative pain score.

Key Words: Circumcision, Caudal block, Penile block, Visual Analogue score, Post operative pain score

INTRODUCTION

Circumcision in males is the surgical removal of the prepuce from the penis. It is performed on an outpatient basis is commonly performed operation in male children. Pain is the most inevitable consequence after circumcision. Various methods are being used for postoperative pain of this operation such as dorsal penile nerve block (DPNB), caudal block, topical analgesia and also systemic non-steroidal anti-inflammatory drugs (NSAIDs) or opioids. It has been shown that local anaesthetic techniques are more effective than opioids.¹ Especially, caudal block and DPNB both provide effective analgesia for circumcision.²⁻⁵

Single-shot caudal block is one of the most useful and most often performed regional blocks in paediatric anaesthesia with less complications compared to central block techniques.^{6,9,10} They are suitable for lower extremity, perineal, inguinal, and lower abdominal surgery. Properly performed, a single-shot caudal block is a rapid and safe technique that leads to better patient comfort and

potentially better outcome, and it could also decrease the anaesthesia time by speeding room turnover⁶.

Penile blocks have become more commonly used in paediatric patients as adjunct to general anaesthesia for procedures on the penis such as circumcision, hypospadias repair, urethral dilation and papilloma laser fulguration. It provides anaesthesia to the distal 2/3 of the penis only⁷. An advantage of penile block over caudal anaesthesia is the lack of sensory and motor block to the lower extremities, which might interfere with ambulation postoperatively in a day surgery patient⁸.

The most preferred local anaesthetic in paediatrics is racemic bupivacaine as it has long duration of action. Ropivacaine is the analogous of bupivacaine having fewer cardiotoxic and neurotoxic side effects compared to bupivacaine.^{9,10} The analgesic effectiveness of ropivacaine is weaker than bupivacaine's in adults.¹¹ Whereas in infants, the analgesic effectiveness of ropivacaine is equal to that of bupivacaine, even in lower doses.¹² The injection of local anaesthetics into infants causes competitively decrease in dependent plasma proteins and increase of free local anaesthetic amounts. Therefore, infants are more susceptible to local anaesthetic toxicity.^{13,14}

Evidence suggests that inadequate relief of postoperative pain may result in harmful physiological and psychological consequences that may lead to significant morbidity, which may delay recovery and return to daily living.¹⁵ Therefore our aim was to compare caudal block and penile block using ropivacaine for post-operative analgesia in pediatric patient posted for circumcision.

MATERIALS AND METHODS

After approval from Institutional Ethics committee, we did a prospective, randomised, double blinded study done over a period of 6 months in 40 male patients, age 1-7 years, belonging to ASA I and ASA II fit, undergoing elective circumcision. Hemodynamically stable patients with all routine investigations within normal limits and without any other co-morbidities were included. Availability of written and informed consent and willingness of the parent to be a part of the study was confirmed. Patients with ASA physical status III or more, patients posted for emergency procedures, patients with major neurological, cardiac, respiratory, renal, hepatic or coagulation abnormalities, patients having history of hypersensitivity to local anaesthetic and opioids, patients having any contraindications to caudal block or penile block, patients having known foetal abnormalities were excluded from the study. Randomization done using computer generated random number table. The patients were divided in to two groups 20 each. GROUP C received caudal block with 0.2ml/kg of 0.25% ropivacaine by 23-G 1½ needle through sacral hiatus. Caudal block was performed by anaesthesiologist after giving sedation and before circumcision procedure. GROUP P received penile block with 0.2ml/kg of 0.25% ropivacaine by 23G needle. Penile block was performed by surgeon before incision. Block will be performed at 2 and 10 o'clock positions by two separate and equal injections.

Pre-operative visit was conducted on the previous day of surgery and detailed history and complaints were noted in case of elective surgeries. General and systemic examination of cardiovascular, respiratory and central nervous system was done. Routine laboratory investigations such as hemogram, liver function tests, renal function tests, serum electrolytes, urine routine, bleeding time and clotting time were done. Patients were nil by mouth 6 hours for solid food and 2 hours for liquid prior to surgery. Written and Informed consent was taken.

Before proceeding with the procedure fasting status of patients was confirmed. OT preparations such as the anesthesia machine, appropriate sized endotracheal tubes, two working laryngoscopes, a working suction apparatus and emergency drugs were kept ready. Intravenous (IV) access with a large bore catheter and normal saline with dextrose infusion was started. Standard monitors such as

electrocardiography, pulse oximetry and noninvasive blood pressure cuff were applied. Baseline systolic, diastolic blood pressure, heart rate, oxygen saturation readings were noted.

All subjects received a conventional preoperative dose of intravenous midazolam (0.03 mg/kg IV), as premedication before induction of anesthesia, and the induction was done using Propofol (2mg/kg IV). In group C (caudal group) after painting and draping, caudal block was performed, in left lateral position with ropivacaine 0.25%, 0.2 ml/kg (max 20 ml) and in group P (penile group) after painting and draping, penile block was performed in supine position with ropivacaine 0.25%, 0.2 ml/kg. Maintenance of anesthesia was done using Oxygen and Air (50:50) using face mask.

Heart rate (HR), blood pressure (BP), oxygen saturation (SPO₂) and respiratory rate (RR) were recorded throughout the procedure. If BP or HR increase by more than 20% of baseline after skin incision, then the block was considered unsuccessful, and fentanyl (1 mcg/kg) was given for pain relief.

The postoperative pain was evaluated by FLACC (Face, Legs, Activity, Crying and Consolability) pain Scale. The patient's Postoperative pain was recorded using emergence numerical pain score on a scale of 0-10: The Facial expression, Leg activity, Crying and Consolability and on Visual Analogue Scale (VAS) score.

In recovery or ward, rectal acetaminophen was administered for an age-appropriate pain score between 3 and 5 (0-10).

The patient was monitored for postoperative pain at 2hrs, 4hrs, 8hrs, 24hrs and the time of rescue analgesia was noted after performing the respective blocks.

VAS SCORE-

- 0-3 = Mild pain
- 3-7 = Moderate pain
- >7 = Maximum pain

Patients were monitored for vitals and analgesia, for 24 hours postoperatively.

Any adverse effects of any of the drug in the study were noted and treated accordingly.

STATISTICAL ANALYSIS

All cases will be completed within the stipulated time period. Data will be collected, compiled and tabulated. The statistical analysis will be done by using parametric test and the final interpretation will be done by using "Z" test (standard normal variant) with 95% significance. Quantitative data will be analyzed by student "t" test and qualitative data analysis by Chi square test.

OBSERVATIONS AND RESULTS

In order to display the results analytically, the following statistical method was adopted: - Age, time, VAS score, blood pressure was expressed as Mean \pm Standard deviation and compared across the 2 groups using unpaired t test.

Categorical variables like FLAAC score, ASA grading etc. Were presented in proportions and percentages. The statistical software SPSS version 16 has been used for the analysis. An alpha level of 5% has been taken, i.e. if any p value is less than 0.05 it has been considered as significant. Paired t test was used to compare the two means.

TABLE NO.1: Demographic profile

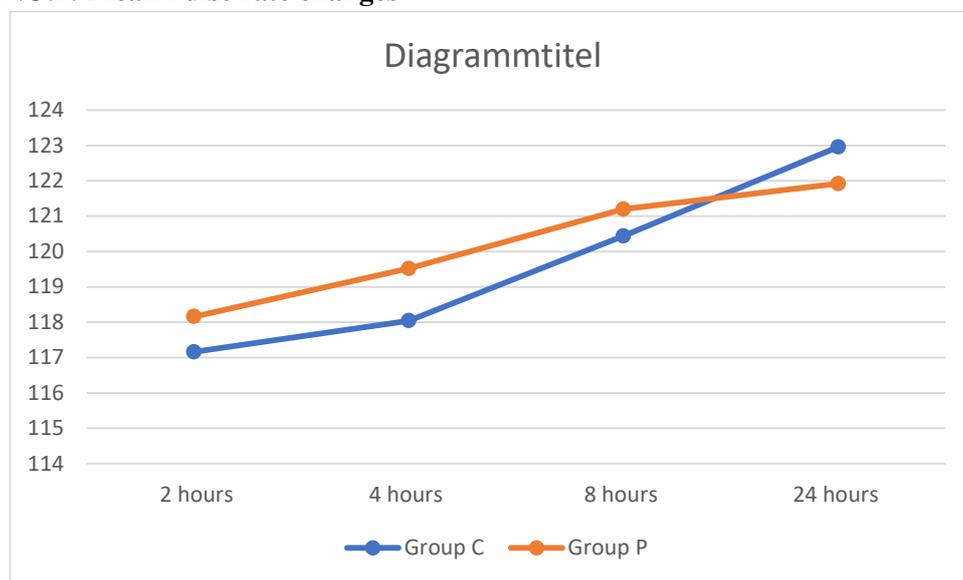
Variable	Group C (Mean \pm Std Dev) (n=20)	Group P (Mean \pm Std Dev) (n=20)	P value
Age	2.2 \pm 0.70	2.06 \pm 0.75	0.498
ASA I	12(48%)	10(40%)	0.284

ASaII	13(52%)	15(60%)	
Weight	15.05 ± 4.04	14.9 ± 4.33	0.91

TABLE NO. 2: Mean Pulse rate changes

Time duration	Group C Mean ± Std Dev	Group P Mean ± Std Dev	P value
2 hours	117.16±3.72	118.16±3.03	0.302
4 hours	118.04±4.03	119.52±2.61	0.038*
8 hours	120.44±5.22	121.2±2.84	0.004*
24 hours	122.96±5.15	121.92±3.27	0.030*

GRAPH NO.1: Mean Pulse rate changes

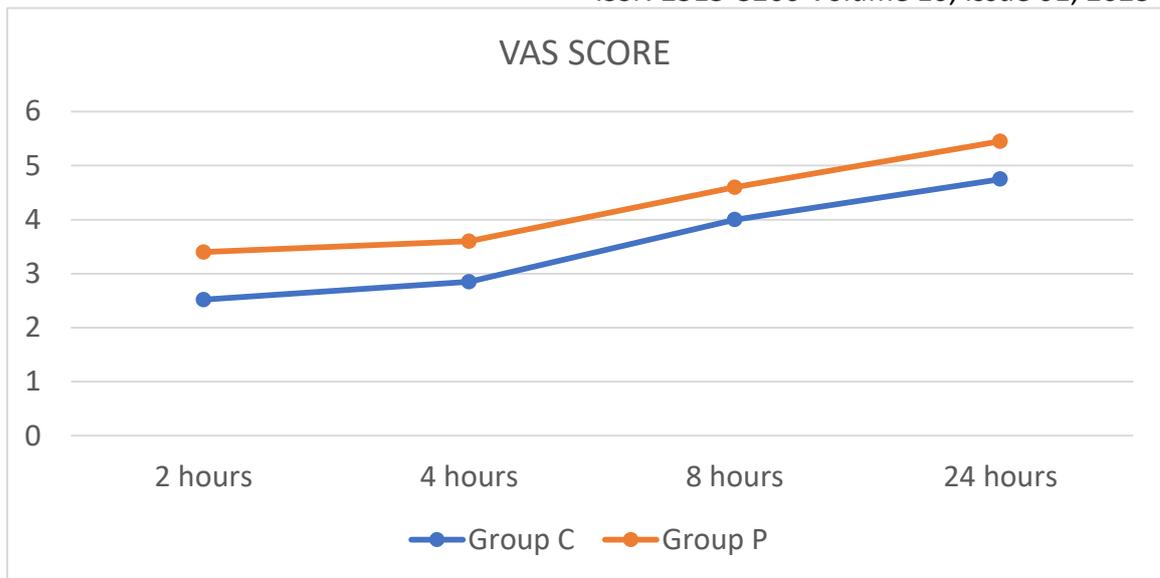


The above table and graph show the mean pulse rate changes in both the groups. It was found that the mean pulse rate in Group C was less than Group P which was statistically significant at 4, 8, 24 hours. But the changes were not clinically significant.

TABLE NO. 3 : VAS SCORE

Time duration	Group C Mean ± Std Dev	Group P Mean ± Std Dev	P value
2 hours	2.52±2.00	3.4±1.89	0.783
4 hours	2.85±0.812	3.6±0.68	0.003
8 hours	4±0.79	4.6±0.50	0.006
24 hours	4.75±0.71	5.45±0.51	0.001

GRAPH NO. 2: VAS SCORE

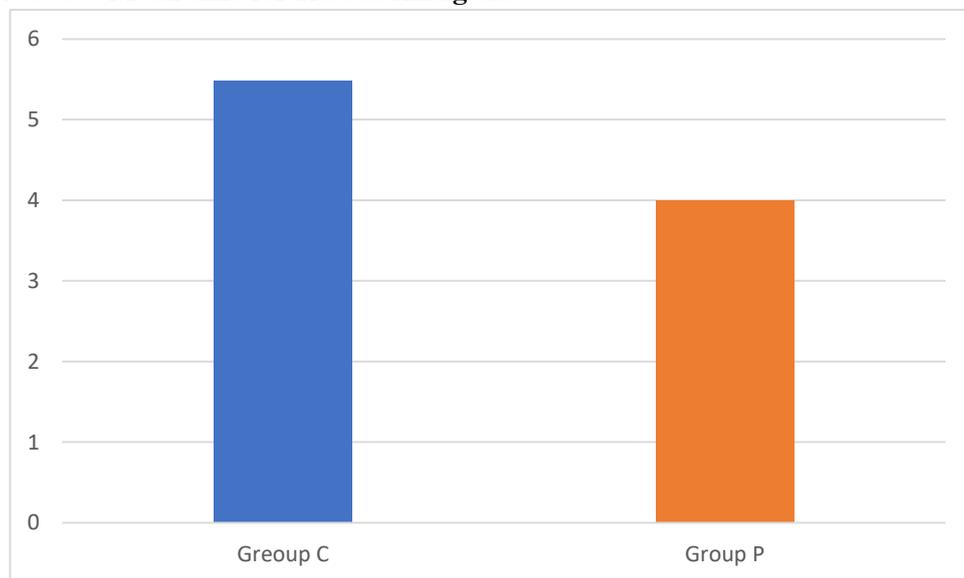


The above table and graph show the VAS SCORE changes in Group C and Group P. It was found that the mean VAS Scores were on lower side in Group C when compared to Group P. The mean VAS Score ranged from 2.5 to 4.75 in Group C and 3.4 to 5.45 in Group P.

TABLE NO. 4 : Mean time for Rescue Analgesia.

	Group C	Group P	P value
Mean time to rescue analgesia	5.48±2.36	4.00±1.73	0.014*

GRAPH NO. 3 : Mean time for Rescue Analgesia



The above table and graph show the time to first rescue analgesic requirement. It was found that the mean time for first rescue requirement was longer in caudal block group (Group C). The duration of postoperative analgesia was longer in Group C when compared to Group P. The analgesic administered was acetaminophen rectal suppository 15mg/kg, it was administered when the pain scores were 3-5

DISCUSSION

Children undergoing genitourinary surgery may face increased anxiety and pain due to multiple procedures required for some of the surgical conditions. For these reasons, many of these patients may benefit from regional blocks performed under sedation or general anaesthesia, as the association of the two techniques drastically cuts down the risk of both the procedures.

Bupivacaine is commonly used in paediatric patients for caudal block. However, its cardiotoxic side effect, although rarely observed, limits the usage of the medicine and causes the search for new less toxic medicines. Ropivacaine has less cardiotoxic effect compared to bupivacaine and its sensorial and motor effectiveness is superior to bupivacaine.^{9,17} Ropivacaine produces less motor block than equivalent concentrations of bupivacaine. In addition, ropivacaine undergoes slower absorption from the caudal epidural space in children compared to bupivacaine, which is possibly due to its intrinsic vasoconstriction properties. It has anaesthetic potency equivalent to bupivacaine and a toxic threshold much higher than that of bupivacaine. Ropivacaine concentrations used for caudal and epidural anaesthesia in children typically range from 0.2%-0.25% in a volume of 1ml/kg. Loading doses of 0.2% ropivacaine for epidural anaesthesia in infants and children range from 0.5-0.85mg/kg. Bupivacaine persists in the neonatal neural tissues longer than Ropivacaine. This has been attributed to lower lipid solubility and a shorter terminal half-life of Ropivacaine than Bupivacaine. The 0.2% preparation of ropivacaine can be used in all ages. However, pharmacodynamic responses may vary depending on age.¹⁸ Caudal analgesia effectiveness is directly related to volume and concentration of the medicine used for the block.¹⁹ It is indicated that ropivacaine 0.175% and 0.2% concentrations have similar analgesia time and quality in neonatal and infants.¹⁸ Therefore we have chosen to use ropivacaine over bupivacaine for comparison between caudal and penile block in paediatric patients. In our study, we compared the effect of caudal block with penile block using ropivacaine on postoperative analgesia in paediatric patients posted for circumcision.

In our study, it was found that the mean pulse rate and the mean arterial blood pressure was higher in Group P throughout the time period with the P value <0.05 at 4,8 and 24 hours. This result was compared with the study done by Bajwa et al²⁰, 2019 which was conducted in paediatric patients. Total of 30 samples (n = 30) were taken and divided into two groups of 15 each. The group A received caudal block and group B received penile block. The blocks were performed after general anaesthesia, pre incision heart rate, heart rate at the time of circumcision and changes in heart rate in both the groups were compared and tabulated. Where the group B with penile block showing increased heart rate with major variations. Where P value (group B) of heart rate at the time of circumcision was 0.0005, which was highly significant. This finding was similar to our study.

In our study, it was found that the mean systolic and diastolic blood pressure gradually decreased in Group C after the caudal block at 2,4 and 24 hours and were found to be stable in Group P after penile block (P-value <0.05). This finding was similar to the study done by Enas M Ashrey et al⁸, 2014. This study was conducted on 80 healthy boys aged 1-7 years, of American Society of Anesthesiologists (ASA) I and II health classes, scheduled for hypospadias repair, circumcision and meatal stenosis under general anaesthesia. The patients were randomly divided into two equal groups: group P (penile block, 0.25% bupivacaine, 0.5 mg/kg; n = 40) and group C (caudal block, 0.25% bupivacaine, 0.5 mg/kg; n = 40). The HR and the mean arterial blood pressure (MAP) showed no statistically significant differences between the two groups at the base value and after establishment of the block (P > 0.05). However, 5 min after the block, HR and MAP gradually decreased in group C whereas they remained stable in group P (P < 0.05).

In our study the mean FLACC Scores were monitored and tabulated at 2,4,8 and 24 hours post-operatively. It was found that mean FLACC Scores were lower in Group C (5.4 to 8.36) when

compared to the Group P (7.24 to 8.72) throughout postoperative period. This finding was compared with the study done by Mohamed B. Al-Metwally et al.2020 they studied caudal vs penile block for postoperative analgesia in children undergoing hypospadias repair. The study was conducted on 40 male children, ASA I-II, 4-8 years of age undergoing hypospadias repair surgery under general anesthesia. Children were randomly classified into two groups: (Group P) (penile group=20 patients) received a penile block of 2mL bupivacaine 0.25 per cent on each side, (Group C) (caudal block group=20 patients) with a caudal block of 0.25 per cent (1mg / kg) bupivacaine. Postoperative pain assessment will be conducted by mCHEOPS (Children's Hospital of Eastern Ontario Pain Scale). They found that the length of the block ranged from 1-5 hours in Penile Group and 1-10 hours in Caudal Group, with mean values of 2.57 ± 1.10 hours and 6.07 ± 2.10 hours respectively. The duration of analgesia was longer in caudal block group. Similarly, another study done by Canakci E et al²¹,2017 who compared three different techniques of preventive analgesia (Caudal, dorsal penile blocks and subcutaneous morphine) based on duration and quality of postoperative analgesia prior to circumcision in 60 male children 6- 12 years of age, C-group patients received 0.25 per cent bupivacaine at a dose of 1 mg / kg with volume of 0.50 ml / kg. Those in Group M received 100 mcg / kg of subcutaneous morphine. Patients in the DP community had a penile block of 1 mg / kg bupivacaine of 0.25%. They concluded that caudal block decrease postoperative pain measured by CHEOPS scores 1st, 6th, 12th, 24th postoperative more than the penile block, and administration of subcutaneous morphine (p-value <0.05).

In our study it was found that the mean VAS Scores in Group C and Group P were on lower side in Group C when compared to Group P at 2, 4, 8, 24 hours postoperatively. The mean VAS Score ranged from 2.5 to 4.75 in Group C and 3.4 to 5.45 in Group P. On the contrary, Kundra P et al²², 2013 the VAS Scores were found to be higher in caudal block group when compared to penile block group. They compared the penile and caudal blocks as regard to the quality of analgesia after hypospadias surgery on 54 children. P (penile block n=27) and C (caudal block n=27) respectively. The level of analgesia was measured using a visual analogue scale (VAS) score. In contrast to the results of the present report, In group P, lower mean VAS scores from 30min after surgery to 3rd day and the length of analgesia was highly longer (82 min) relative to caudal. Researchers found that the penile block had better quality of analgesia than caudal in children undergoing hypospadias repair.

In our study the mean time for rescue analgesia in hours were monitored and tabulated at 2,4,8 and 24 hours post-operatively. It was found that the first rescue analgesic demand was longer in Group C when compared to Group P throughout postoperative period. The duration of analgesia was longer in Group C when compared to Group P. the time to first analgesic demand in Group C was 5.48 hours while it was 4 hours in Group P. This finding was compared with the study done by Mahin Seyedhejazi et al²⁴,2011. They aimed to compare caudal or penile nerve block using bupivacaine in postoperative pain control in hypospadias repair in children. Caudal block was performed in group I and penile block was performed in group II. In group I (caudal group) caudal block was performed with bupivacaine 0.25%, 1 ml/kg (max 20 ml). In the second group (penile group) penile block was given with bupivacaine 0.5% 0.1ml/kg. Forty eight patients (19 of 43 patients [44%] in caudal group and 29 of 41 patients [70%] in penile group) received analgesia in the postoperative period (recovery period until 24 hours postoperative) and the difference was significant between two groups ($P = 0.025$). Acetaminophen as suppository (40 mg/kg) was the drug of choice in the postoperative period, but intravenous analgesic (meperidine) was also used in 8 patients (2 in caudal group and 6 in penile group). Overall the analgesic requirement in caudal group was less than in penile group which was similar to our finding.

In summary, we have demonstrated that although penile block is a safe and effective method of providing post-circumcision analgesia, Caudal block is superior in terms of its reliability, prolonged duration of action and in reducing post-operative pain score. Though the patients were equally comfortable in both the groups, the duration of postoperative analgesia was longer in caudal block group and total no. of doses of rescue analgesics given in caudal block group was lesser when compared to penile block group.

CONCLUSION

The use of either caudal block or penile block is safer in children. But caudal block provides longer duration of analgesia and reduces the no. of analgesic doses in post-operative period.

Acknowledgement: Department of Anaesthesia, Dr.D.Y.Patil Medical College, Pimpri, Pune for helping us to conduct the study

Conflict of Interest: None

Funding Source: None

REFERENCES

1. Lunn JN. Postoperative analgesia after circumcision. A randomized comparison between caudal analgesia and intramuscular morphine in boys. *Anaesthesia* 1979;34:552- 4.
2. Irwin MG, Cheng W. Comparison of subcutaneous ring block of the penis with caudal epidural block for post-circumcision analgesia in children. *Anaesth Intensive Care* 1996;24:365- 7.
3. Vater M, Wandless J. Caudal or dorsal nerve block? A comparison of two local anaesthetic techniques for postoperative analgesia following day case circumcision. *Acta AnaesthesiolScand* 1985;29:175-9.
4. Yeoman PM, Cooke R, Hain WR. Penile block for circumcision? A comparison with caudal blockade. *Anaesthesia* 1983;38:862-6.
5. Holder KJ, Peutrell JM, Weir PM. Regional anaesthesia for circumcision. Subcutaneous ring block of the penis and subpubic penile block compared. *Eur J Anaesthesiol* 1997;14:495-8.
6. Manuel Pradlo, James M. Sonner. Pocket clinician, Manual of Anesthesia Practice, Cambridge University Press; 2012.
7. Wider RT, Goldschneider KP. In: GAWALCO. Pain in children: a practical guide for primary care. Pain relief after out patient surgery. Humana press. Ch 11; pp 101–109.
8. AshreyEnas M, BosatBosat E. single-injection penile block versus caudal block in penile pediatric surgery. *Ains Shams Journal of Anesthesiology* , Ain-Shams Universiy. 2014;7:428-433.
9. Knudsen K, Suurkula MB, Blomberg S, Blomberg S, Sjøvall J, Edvardsson N. Central nervous and cardiovascular effects of i.v. infusions of ropivacaine, bupivacaine and placebo in volunteers. *Br J Anaesth.* 1997;78:507-514.
10. Scott DB, Lee A, Fagan D, Bowler GM, Bloomfield P, Lundh R. Acute toxicity of ropivacaine compared with that of bupivacaine. *AnesthAnalg.* 1989;69:563-569.
11. Polley LS, Columb MO, Naughton NN, Wagner DS, van de Ven CJ. Relative analgesic potencies of ropivacaine and bupivacaine for epidural analgesia in labor: implications for therapeutic indexes. *Anesthesiology.* 1999;90:944-950.
12. Breschan C, Jost R, Krumpholz R, Schaumberger F, Stettner H, Marhofer P, et al. A prospective study comparing the analgesic efficacy of levobupivacaine, ropivacaine, and bupivacaine in pediatric patients undergoing caudal blockade. *PediatrAnaesth.* 2005;15:301-306.
13. Berde CB. Toxicity of local anesthetics in infants and children. *J Pediatr.* 1993;122:387-391.

14. Lerman J, Strong HA, LeDez KM, Swartz J, Rieder MJ, Burrows FA. Effects of age on the serum concentration of alpha 1-acid glycoprotein and the binding of lidocaine in pediatric patients. *Clin Pharmacol Ther.* 1989;46:219-225.
15. Joshi GP, Ogunnaike BO. Consequences of inadequate postoperative pain relief and chronic persistent postoperative pain. *Anesthesiol Clin North America* 2005; 23:21–36.
16. Gandhi M, Vashisht R. Anaesthesia for paediatric urology in continuing education in anaesthesia, *Critical Care & Pain by Oxford University, Oxford journal* 2010; 10:152-157
17. Gunter JB. Benefit and risks of local anesthetics in infants and children. *Paediatr Drugs.* 2002;4:649-672.
18. Khalil S, Lingadevaru H, Bolos M, Rabb M, Matuszczak M, Maposa D et al. Caudal regional anesthesia, ropivacaine concentration, postoperative analgesia, and infants. *Anesth Analg.* 2006;102:395-399.
19. Wolf AR, Valley RD, Fear DW, Roy WL, Lerman J. Bupivacaine for caudal analgesia in infants and children: the optimal effective concentration. *Anesthesiology.* 1988;69:102-106
20. Mohammad Asim Bajwa, Aziz-Ur-Rahman, Amir Majeed, Muhammad Imran Azeem. Comparison of caudal block vs penile block in terms of surgical incision response for circumcision and postoperative analgesia requirements. *Asian journal of pediatric research.* 2019;3:1-5.
21. Mohamed B. Al-Metwally¹, Ezzat M. Al-Saudi , Ahmed M. Abo El Ata, Medhat H. Allam. Caudal B Intensive Care lock Versus Penile Block for Postoperative Analgesia in Children Undergoing Hypospadias Repair. *Anaesthesia and intensive care.* 2020;1:202-205.
22. Canakci E, Yagan O, Tas N, Mutlu T, Cirakoglu A, Benli E. Comparison of Preventive Analgesia Techniques in Circumcision Cases: Dorsal Penile Nerve Block, Caudal Block, or Subcutaneous Morphine? *J Pakistan Med Assoc.* 2017;67:159-65.
23. Kundra P, Yuvaraj K. Hypospadias surgery and locoregional anesthesia. *PediatrAnesth.* 2013;23:567-568.
24. MahinSeyedhejazi, Rasoul Azerfarin, FahimeKazemi, Maryam Amiri. Comparing caudal and penile nerve blockade using bupivacaine in hypospadias repair surgeries in children. *African Journal of Paediatric Surgery.* 2011;8:294-297.