Original Article

OPEN ACCESS

Comparison of Intravenous Dexamethasone along with Caudal Block versus Caudal Block Alone for Postoperative Analgesia in Pediatric Lower Abdominal Surgeries

Muhammad Haroon Anwar[1], Hassam Zulfiqar[2], Naseer Ahmad[3], Abeera Zareen[4], Jawad Zahir[5], Inam Ul Haq[6]

[1]Resident Anesthesia, Department of Anesthesiology and Critical Care Medicine, Pakistan Institute of Medical Sciences, Islamabad

[2] Resident Anesthesia Department of Anesthesia and Critical Care Medicine, Holy Family Hospital, Rawalpindi

[3]Conslutant Anesthetist, Department of Anesthesia and Critical Care Medicine, Holy Family Hospital, Rawalpindi

[4]Assistant Professor of Anesthesia, Head of Department of Anesthesia, Benazir Bhutto Hospital, Rawalpindi

[5]Professor & Head of Department of Anesthesia and Critical Care Medicine, Holy Family Hospital, Rawalpindi

[6]Department of Physiology, University of Hafar Al Batin, Eastern province, Saudia Arabia

Authors Contribution

[1,2,3]Substantial contributions to the conception or design of the work;or the acquisition

[4,5]Drafting the work or revising it critically for important intellectual contents, [6]Final approval of the version to be published

Funding Source: None

Conflict of Interest: None

Received: Sept 7, 2023

Accepted: Dec 24, 2023

Address of Correspondent

Dr. Muhammad Haroon Anwar Resident Anathesia, Department of Anesthesiology and Critical Care Medicine, Pakistan Institute of Medical Sciences, Islamabad haroonanwar22@gmail.com

ABSTRACT

Objective: To investigate the effectiveness of adding intravenous Dexamethasone to a caudal block in enhancing the duration and quality of postoperative analgesia in pediatric patients undergoing lower abdominal surgeries.

Methodology: This Randomized Control Trial was carried out Department of Anesthesia, Holy Family Hospital, Rawalpindi from December 2021May 2022. Patients fulfilling inclusion criteria were divided into two groups. Both groups received caudal block with 1 ml/kg of 0.25% Bupivacaine while group A received 0.25 mg/kg of Dexamethasone intravenously as an adjuvant. Post operatively patients were assessed by FLACC scores at different time intervals. All surgeries were conducted under general anesthesia with endotracheal intubation. Either Mapleson F (Jackson Rees Modification of Ayre's T piece) or circle system used as breathing circuit. Induction of anesthesia using propofol at a dose of 2-2.5 mg/kg along with O2 100% or with sevoflurane 2 to 3% at fresh gas flow of 6 L/minute was carried out. Data was analyzed using SPSS 26.0.

Results: Mean duration of analgesia in Group A was 7.77 ± 1.38 hours while it was 5.44 ± 0.91 hours in group B. The difference was statistically significant with a p value of less than 0.05 on Mann Whitney U test.

Conclusion: Addition of intravenous dexamethasone to caudal block significantly enhances the duration and quality of analgesia among pediatric patients undergoing lower abdominal surgeries.

Keywords: Anesthesia, Caudal Block, Dexamethasone, Adjuvants.

Cite this article as: Anwar MH, Zulfiqar H, Ahmad N, Zareen A, Zahir J, Haq IU. Comparison of Intravenous Dexamethasone along with Caudal Block versus Caudal Block Alone for Postoperative Analgesia in Pediatric Lower Abdominal Surgeries. Ann Pak Inst Med Sci. 2023; 19(4): 514-518. doi. 10.48036/apims.v19i4.825.

Introduction

Post-operative pain results in psychological, physical and financial stress leading to delayed recovery and discharge from hospital. There are numerous ways to alleviate post-operative pain such as by use of loco-regional anesthesia or by oral or parenteral drugs. Loco-regional techniques have better efficacy and lesser systemic side effects and their effects can be enhanced by use of adjuvants such as Dexamethasone, Clonidine etc. In pediatric age group most common day care surgeries and infra umbilical abdominal surgeries carried out under the cover of single shot caudal block for effective analgesia. Dexamethasone a simple steroid can be added to anesthetic regimen to enhance the duration of caudal block.

Anesthesiologist; a peri-operative physician has to effectively manage the perioperative pain so that quality of

life and post operative recovery can be improved. Pain particularly in the post operative period affects breathing, mobilization of the patient, wound healing and causes urinary retention. These effects are similar in adult and pediatric population. These adverse effects can be prevented by effective multimodal analgesia which is a part of Enhanced Recovery After Surgery protocol (ERAS).[1-3]

Multimodal analgesic regimen utilizes drugs from various classes such as Opioids, NSAIDs, Acetaminophen and Local Anesthetics. Thereby minimal doses of different drugs are effective in providing adequate analgesia and this reduces their dose dependent side effects.[1] This particularly important in minimizing the adverse effects of opioids. One of the important peri-operative techniques which minimizes the use of opioids is the use of locoregional anesthesia. These techniques require administration of local anesthetics can either provide surgical anesthesia or effective intra-operative and post operative analgesia in adjunct to General Anesthesia. One of the commonly used locoregional techniques in pediatric population is caudal block. Caudal block provides effective analgesia in pediatric lower abdominal surgeries such as inguinal hernia repair, urological interventions, and surgeries involving lower extremities. Clinical data shows that the complication rate of caudal block in pediatric population is low and it is safe to administer([4]).However, since it's a single shot technique; the duration of analgesia provided by caudal block is relatively short. Various drugs can be used as adjuncts to prolong the analgesic effect of caudal block. One of the adjunctive drugs is dexamethasone; a corticosteroid having anti-inflammatory effect.[5] Dexamethasone can be given both intravenously and intrathecally. In a study by Parameswari et al analgesic duration of bupivacaine caudal block was significantly prolonged by giving dexamethasone in epidural space.[6] Similarly, other studies have revealed that the administration of dexamethasone in the epidural space effectively prolongs the duration of caudal block.[7-10] However, in a meta-analysis; IV dexamethasone was recommended over caudal dexamethasone for prolonging the analgesic duration of caudal epidural block as there was a risk of potential neurotoxicity from administering Dexamethasone in the epidural space.[11] On the other hand various other studies have shown intravenous (IV) Dexamethasone to effectively prolong the duration of caudal block.[12-15] These studies have mainly employed a dosage of 0.5 mg/kg of IV Dexamethasone in prolonging the duration of caudal block. In our study we administered 0.25 mg/kg of Dexamethasone and studies its effect on duration of caudal block. Post operative quality of analgesia was assessed using Faces, Leg, Activity, Cry, Consolability (FLACC) behavioral pain scale which is a validated scale.[16]

Methodology

After obtaining approval from Institutional Ethical Review Board, this Randomized Control Trial was carried out at Department of Anesthesia, Holy Family Hospital, Rawalpindi from 1st December 2021 to 31st May 2022. The minimum sample size required in each group was determined to be 37 patients, based on a confidence interval of 95%, level of significance of 5%, and power of 90% taking mean pain score in group A to be 1.9 ± 2.0 and group B to 3.5 ± 2.2.[12]

74 patients fulfilling the inclusion criteria i.e., age: 2 years to 7 years, American Society of Anesthesiologists (ASA) class: 1 & 2 undergoing elective lower abdominal surgery with a surgery duration of less than 120 minutes were included in the study. Patients with a history of developmental delay, neurological disease and known allergy to study drugs were excluded from the study. Study participants were categorized into two groups by computer generated numbers. Upon arrival in the operating room, fasting status was confirmed, American Society of Anesthesiology standard monitors were attached which included Pulse oximeter, Non-invasive Blood pressure, ECG and temperature monitoring probe. Baseline vitals were recorded. Intravenous line using either 24G or 22G IV cannula was secured. Paeds saline infusion was started according to weight of the child.

All surgeries were conducted under general anesthesia with endotracheal intubation. Either Mapleson F (Jackson Rees Modification of Ayre's T piece) or circle system used as breathing circuit. Induction of anesthesia using propofol at a dose of 2-2.5 mg/kg along with O2 100% or with sevoflurane 2 to 3% at fresh gas flow of 6 L/minute was carried out. After sedation, muscle relaxation by using either succinylcholine 1.5mg/kg or atracurium 0.5mg/kg was achieved. Endotracheal intubation was done using appropriate size for age endotracheal tube under direct laryngoscopy. Proper endotracheal tube placement was confirmed with end tidal CO2 monitoring and by checking bilateral equal air entry using stethoscope. ETT fixed with adhesive sticking and Isoflurane started at 1.2% for maintenance of anesthesia. After induction of anesthesia, all patients received caudal block with 0.25% of Bupivacaine. The patients were placed in a lateral position and the skin over the sacrum was cleaned using

povidone-iodine solution, then under aseptic measures, single-dose caudal epidural injection was performed using a 22-gauge needle. The sacral hiatus was identified and needle was directed at 45 degrees to the skin and inserted till a pop was felt, indicating the transit through the sacrococcygeal ligament, the needle was then carefully brought down to 15 degrees angle and gradually moved forward. Careful aspiration for blood or CSF was done.

Swoosh test was performed with 2ml normal saline to check for proper positioning and to rule out any subcutaneous swelling. Then local anesthetic injection 0.25% bupivacaine was injected in caudal space as 1ml/kg according to individual patient's weight. The time of caudal block administration was recorded, patient was placed in supine position and the surgery was allowed to start 15 min after caudal injection. Group B patients received intravenous 2ml normal saline after caudal block, while group A patients received 0.25mg/kg dexamethasone intravenously. Patients' heart rate, saturation, blood pressure, temperature was monitored continuously throughout the intraoperative period. A failed caudal block was considered when the heart rate or blood pressure increased by more than 20% of baseline values upon skin incision and that patient was excluded from study.

Injection nalbuphine 0.1mg/kg IV was supplemented in these patients for pain relief. All the other patients enrolled for study who didn't show such trends were considered to have effective caudal block. Extubation was carried out in deep plane of anesthesia, after careful suctioning of oral cavity and then the patients were shifted to PACU; monitored there until fully conscious and awake. FLACC0 recorded there in PACU. Later patients were shifted to pediatric surgery ward, where the pain scores were assessed at regular intervals. Patients NPO status was maintained for 6 hours post operatively. FLACC score was assessed at 3 hourly intervals till 12 hours or till rescue analgesia was given. Utility and challenges of various

Results

Data was entered and analyzed on SPSS version 26. Mean age at presentation was 4.95 ± 1.84 years.78.4% of study subjects were male while rest were females. 100% of the patients belonged to ASA Class I. Majority of the patients (47.3%) underwent open Appendectomy followed by Herniotomy (46%) and Orchidopexy (6%). Mean duration of analgesia in group A which was 7.77 ± 1.38 hours while in group B mean duration of analgesia was 5.44 ± 0.91 hours. To find statistically significant difference; test of Normality (Sharpio wilk test) was applied which showed data to be non-parametric (p value <0.05). Mann Whitney U test was then applied to find out association between the group and point of time in the post-operative period when rescue analgesia was given. The difference was statistically significant with p value <0.05 at 3 and 6h intervals. Due to limited data available 9h post operatively p value couldn't be calculated. Furthermore, none of the study participants was pain free 12h post operatively. (Table I)

Table I: Mean post operative pain scores.

Time	Group	Mean	SD	P value
FLACC 0h	Group A	0	0	1.0
	Group B	0	0	
FLACC 3h	Group A	1.03	0.86	<0.001
	Group B	1.89	0.61	
FLACC 6h	Group A	2.75	0.60	<0.001
	Group B	3.53	0.51	
FLACC 9h	Group A	3.76	0	-
	Group B	2.00	0	

Discussion

In our study mean age of presentation was 4.95 ± 1.837 years and majority of the patients were male (78.4%). Our epidemiological findings are comparable with a number of studies.[6,14,17,18] The mean age among two groups were comparable in a study conducted by Abo Elwafa WA et al and it was found to be 5.2 years in interventional group.[17] It was found that dexamethasone significantly enhances the duration of caudal block in such age group.[12] All presenting patients belonged to American Society of Anesthesiology Physical Status (ASA-PS) class I. Majority of the patients were operated for appendicitis (47.3%) followed by herniotomy (46%). Similarly in another study majority of the children were operated for acute appendicitis and caudal block was found to be effective in providing them adequate post operative analgesia.[19]

In our study the duration of post-operative analgesia in patients receiving caudal block and IV dexamethasone was significantly greater than those receiving caudal block (7.77 ± 1.38 hours vs 5.44 ± 0.91 hours). The difference was statistically significant with p value < 0.05. Our findings are supported by a number of studies.[14,12,18,20]

In a study by Abo Elwafa WA et al addition of 0.5mg/kg of IV Dexamethasone to caudal epidural analgesia enhanced duration of post operative analgesia from 8.75 ±1.33 h to 11.35 ±2.36 h with a p- value of 0.01.[17]

Similarly, it was reported that addition of 0.5 mg/kg of IV Dexamethasone to Caudal block significantly enhances

the mean duration of post operative analgesia i.e. 800 minutes as compared to 500 minutes in control group.[12]

In a recent study conducted by Nadeem A et al, 0.5 mg/kg of IV dexamethasone enhanced the duration of caudal block analgesia among pediatric patients undergoing infra-umbilical surgeries. Mean pain score was significantly lower in dexamethasone-caudal group as compared to caudal group alone at 3h and 6h post operatively (1.03 ± 0.86 vs 1.89 ± 0.61 and 2.75 ± 0.60 vs 3.53 ±0.51).[18]

Nadeem A et al found that mean pain scores were significantly lower in dexamethasone group as compared to caudal group in first 2h of the post operative period (p value <0.05). Afterwards there was no statistical difference between the two group.[18]

Almost similar results were obtained by Obsa MS et al. They found duration of analgesia among caudal-dexamethasone group was 699.3±57.55 minutes as compared to caudal block group (347.4 ±40.53 minutes). The author administered 0.5mg/kg of Dexamethasone intravenously.[20]

In a recent study addition of 0.2 mg/kg of IV Dexamethasone to caudal enhance the duration of post operative analgesia from 181.17± 37.97 minutes to 190.67 ± 41.76. However, the difference was not statistically significant. This might be due to the fact that study employed a lower dose of local anesthetic that was 0.75 ml/kg of 0.25% Bupivacaine as compared to our dose of 1 ml/kg of 0.25% Bupivacaine.[21]

Our study adds a new insight that is reduced dose of dexamethasone (0.25 mg/kg) significantly prolongs the duration of caudal block and provides effective post operative analgesia.

Conclusion

The study concludes that addition of 0.25 mg/kg of dexamethasone intravenously to 0.25% bupivacaine used for caudal block significantly enhances the duration of post operative analgesia and reduces the intensity of post operative pain following pediatric lower abdominal surgeries.

References

1. Parks L, Routt M, De Villiers A. Enhanced Recovery After Surgery. J Adv Pract Oncol. 2018;9:511-519.
2. Loganathan AK, Joselyn AS, Babu M, Jehangir S. Implementation and outcomes of enhanced recovery protocols in pediatric surgery: a systematic review and meta-analysis. Pediatr Surg Int. 2022;38:157-168. https://doi.org/10.1007/s00383-021-05008-8
3. Brindle ME, Heiss K, Scott MJ, Herndon CA, Ljungqvist O, Koyle MA, on behalf Pediatric ERAS (Enhanced Recovery After Surgery) Society. Embracing change: the era for pediatric ERAS is here.Pediatr Surg Int. 2019;35:631-634. https://doi.org/10.1007/s00383-019-04476-3
4. Butterworth JF, Mackey DC, Wasnick JD, editors. Morgan & Mikhail's clinical anesthesiology. Seventh edition. New York: McGraw Hill; 2022.
5. She Y-J, Zhang Z-Y, Song X-R. Caudal dexmedetomidine decreases the required concentration of levobupivacaine for caudal block in pediatric patients: a randomized trial. Lonnqvist P-A, editor. Pediatr Anesth. 2013;23:1205-1212. https://doi.org/10.1111/pan.12278
6. Parameswari A, Krishna B, Manickam A, Vakamudi M. Analgesic efficacy of dexamethasone as an adjuvant to caudal bupivacaine for infraumbilical surgeries in children: A prospective, randomized study. J Anaesthesiol Clin Pharmacol.2017;33:509. https://doi.org/10.4103/joacp.JOACP_167_17
7. Kour L, Mehta A, Gandotra S, Aziz Z. Comparison of analgesic efficacy of dexamethasone versus tramadol in combination with ropivacaine in caudal anesthesia for children undergoing lower abdominal surgeries. Anesth Essays Res. 2020;14:515. https://doi.org/10.4103/aer.AER_110_20
8. Choudhary S, Dogra N, Dogra J, Jain P, Ola S, Ratre B. Evaluation of caudal dexamethasone with ropivacaine for post-operative analgesia in paediatric herniotomies: A randomised controlled study. Indian J Anaesth. 2016;60:30. https://doi.org/10.4103/0019-5049.174804
9. Patodi V, Jain K, Choudhary M, Sethi SK, Jain N, Mathur V. Effect of Dexamethasone as an Adjuncton Efficacy of Ropivacaine in Caudal Block forPostoperative Analgesia in Paediatric Infra-Umbilical Surgeries: A Randomised Double-blind Controlled Study. J Clin Diagn Res. 2021;15(5)31-35. https://doi.org/10.7860/JCDR/2021/47738.14918
10. Gashaw A, Dendir G, Sitot M, Balcha B, Aweke Z. Postoperative analgesic efficacy of caudal dexamethasone added to bupivacaine vs bupivacaine alone for pediatric elective infra-umbilical surgery at (Tikur Anbesa Specialized Hospital), Ethiopia: Prospective cohort study. Int J Surg Open.2020;24:170-176. https://doi.org/10.1016/j.ijso.2020.05.003
11. Chong MA, Szoke DJ, Berbenetz NM, Lin C. Dexamethasone as an Adjuvant for Caudal Blockade in Pediatric Surgical Patients: A Systematic Review and Meta-analysis. Anesth Analg.2018;127:520-528. https://doi.org/10.1213/ANE.0000000000003346
12. Murni Sari Ahmad A, Azarinah I, Esa K, Khairulamir Z, Hamidah I, Norsidah Abdul M. INTRAVENOUS DEXAMETHASONE IN COMBINATION WITH CAUDAL BLOCK PROLONGS POSTOPERATIVE ANALGESIA IN PEDIATRIC DAYCARE SURGERY. Middle East J Anaesthesiol. 2015;23:177-183.
13. Kim EM, Lee JR, Koo BN, Im YJ, Oh HJ, Lee JH. Analgesic efficacy of caudal dexamethasone combined with ropivacaine in children undergoing orchiopexy. Br J

Anaesth.2014;112:885-891. https://doi.org/10.1093/bja/aet484
14. Yousef G, Ibrahim T, Khder A, Ibrahim M. Enhancement of ropivacaine caudal analgesia using dexamethasone or magnesium in children undergoing inguinal hernia repair. Anesth Essays Res. 2014;8:13. https://doi.org/10.4103/0259-1162.128895
15. Abd-Elshafy SK, Yacoup AM, Abdalla EEM, El-Melegy TTH, Abd-Elsalam KA. A New Look on Adding Dexamethasone as an Adjuvant to Caudal Bupivacaine; Efficacy on Postoperative Pain and Vomiting in Pediatric Patients. Pain Physician.2016;19:E841-852. https://doi.org/10.36076/ppj/2016.19.E841
16. Crellin DJ, Harrison D, Santamaria N, Huque H, Babl FE. The Psychometric Properties of the FLACC Scale Used to Assess Procedural Pain. J Pain. 2018;19:862-872. https://doi.org/10.1016/j.jpain.2018.02.013
17. Abo Elwafa WA, Zakaria AA, Abdelrahman AH, Mahmoud WA. Intravenous Dexamethasone Prolongs the Analgesic Effect of Caudal Bupivacaine after Hypospadias Repair Surgery. Egypt J Hosp Med. 2020;81:1890-1895. https://doi.org/10.21608/ejhm.2020.121017
18. Nadeem A, Ahmed A. Intravenous dexamethasone along with caudal block improves analgesic efficacy following day-case inguinal hernia repair in children: a randomized controlled trial. J Pak Med Assoc. 2019;1. https://doi.org/10.5455/JPMA.301035
19. Gökhan Beyaz S. Comparison of Caudal Levobupivacaine versus Levobupivacaine plus Morphine Mixture for Postoperative Pain Management in Children. J Anesth Clin Res. 2013;1:1-4 https://doi.org/10.4172/2155-6148.1000278
20. Obsa MS, Awol MAb, Simie TG. Effect Intravenous Dexamethasone as an Adjuvant to Caudal Block on post operative analgesia: Prospective Cohort study design [Internet]. In Review; 2020 [cited 2023 Apr 24]. Available from: https://www.researchsquare.com/article/rs-35140/v1. https://doi.org/10.21203/rs.3.rs-35140/v1
21. Sharma N, Kachru N, Kumar S, Yadav R. Comparison of duration of Postoperative Analgesia after Caudal Block with or without Intravenous Dexamethasone in Paediatric Day Care Infraumbilical Surgeries under General Anaesthesia. Arch Anesth Crit Care. 2023;9(1):27-33. https://doi.org/10.18502/aacc.v9i1.11941