ORIGNAL ARTICLE

VERSATILE IN COMBINATION; TRAMADOL AND BUPIVACAINE, AS CAUDAL BLOCK ANALGESIA FOR PEDIATRIC INFRA-UMBILICAL SURGERIES.

[1]Naila Zahoor Awan*,[2]Muhammad Danish Muneeb,Ziauddin Kashmiri, RabiaTabassum, Samita khan

[1]Assistant professor Anesthesia, Baqai Medical University, Karachi.
[2]Assistant Professor Department of Surgery, Baqai Medical University, Karachi
[4]Professor and Head Department of Anesthesiology and Pain management, Surgical ICU, Consultant South city hospital. Senior registrar SMBBtrauma centre.

ABSTRACT

Objective:
To determine the effect of analgesia postoperatively when bupivacaine is used alone and in combination with tramadol as caudal block anesthesia in pediatric infra-umbilical surgeries

Subject and Methods:
A study conducted in Pediatric Surgery Department of Civil Hospital Karachi, Dow University of Health Sciences. This is a Randomized trial which includes a total of 60 children undergoing infra-umbilical surgeries. Patients got randomly allocated into 2 groups, 30 in (Bupivacaine-Tramadol) group A, which were given 0.5ml/kg 0.25% bupivacaine & 1mg/kg tramadol while 30 patients in group Bwho received 0.5ml/kg 0.25% bupivacaine as caudal block anesthesia respectively. Hemodynamic status was monitored. The end point of the study was onset of pain in patient if Baker-Wong FACES Pain Rating Scale Score >4. The time frame of our study was six months from 1st July – 31st December 2015.

Results:
The mean age was 4.66±1.79 years. Mean duration of postoperative analgesia was significantly prolonged in group A as compared to group B (p =0.0005).

Conclusion:
Tramadol when added with bupivacaine in caudal analgesic block has an additive and long-lasting effect and there was adecreased need to provide rescue analgesia after surgery.

Key Words:
Caudal block, Bupivacaine, Tramadol, Pediatric infra-umbilical surgeries

INTRODUCTION:

Pain in pediatric age group, apart from the child himself or herself, is distressing and depressing for the parents causing them to have avoidance and anxious behavior.[1.] Hauer J, Houtrow AJ. Pain assessment and treatment in children with significant impairment of the central nervous system. Pediatrics. 2017 Jun 1; 139(6):e20171002.[.]

Pain is uncomfortable and unpleasant subjective feeling, which is not communicable and expressed in pediatric age group as compared to the adults; children depend on their closed ones for their responses.[2.] Brown M, Rojas E, Gouda S. A mind–body approach to pediatric pain management. Children. 2017 Jun; 4(6):50.Treatment of acute pain is an important task of pediatric anesthesia. Regional anesthesia while beneath general anesthesia can deliver excellentlyinitial phase pain relief postoperatively. One of the local anesthetic methods prevalent in pediatric surgeries includes caudal epidural block. It usually has a short duration of action which is counted as its drawback. However

Assistant Professor Anesthesia, Baqai Medical University, Karachi.
Email: nailazahoorawan86@gmail.com

different additives which are used, enhances the effect of analgesia and therefore reduces the morbidity postoperatively and hence made caudal block anesthesia on demand. [3] Karuppiah NP, Shetty SR, Patla KP. Comparison between two doses of dexmedetomidine added to bupivacaine for caudal analgesia in paediatric infraumbilical surgeries. Indian journal of anaesthesia. 2016 Jun; 60(6):409.

Many studies have been conducted in this regard. 0.5ml/kg of 0.125% caudal levo bupivacaine and bupivacaine have same effectiveness level for postoperative analgesia after sub-umbilical surgeries in pediatric subjects.[4] Watanabe K, Tokumine J, Lefor AK, Moriyama K, Sakamoto H, Inoue T, Yorozu T. Postoperative analgesia comparing levobupivacaine and ropivacaine for brachial plexus block: A randomized prospective trial. Medicine. 2017 Mar; 96(12).A study on 66 children shows that when low dose neostigmine inaddition with caudalÊisobaric bupivacaine is used, it significantly prolonged the duration of first analgesic request 460±60.2 min vs. 286.4±47.8 mins ($p < 0.001$) and hence significantly reduced postoperative analgesic requirement.[5]

Refaee HH, Elela AH, Hanna MG, Ali MA, El Khateeb AM. Dexmedetomidine versus Magnesium as Adjuvants to Bupivacaine-Induced Caudal Block in Children: A Randomized, Double-Blinded, Placebo-Controlled, and Trial. Open access Macedonian journal of medical sciences. 2019 Jan 15; 7(1):73.Results of a study conducted on 34 children undergoing inguinoscrotal surgeries showed that Prolongation of analgesia after surgerywas 12.05±1.63 hours in ketamine–bupivacaine group compare to tramadol–bupivacaine group 17.88±1.96 hours (p 0.000).[5] Duration of analgesia was also prolonged when ropivacaine and bupivacaine with fentanyl were compared in post pediatric surgery 6.1±1.1 vs. 5.6±0.9.[6] Ona XB, Tuma SM, García LM, Solà I, Cosp XB. Drug therapy for preventing post-dural puncture headache. Cochrane Database of Systematic Reviews. 2013(2).

A recent study proposed dexmedetomidine, used as a single dose injection, mixing with bupivacaine as caudal epidural anesthesia, increases the time ofanalgesia postoperatively as compared to morphine in lower abdominal and perineal surgeries. The side effects pf morphine used in caudal block are more profound.[7] El Shamaa HA, Ibrahim M. A comparative study of the effect of caudal dexmedetomidine versus morphine added to bupivacaine in pediatric infra-umbilical surgery. Saudi journal of anaesthesia. 2014 Apr; 8(2):155.Postoperative analgesia was prolonged after bupivacaine-tramadol group as compared to bupivacaine group in a study of 30 children undergoing sub-umbilical surgeries, 9.1±3.14 vs. 6.3±2.93 ($p < 0.05$).[8] Doda M, Mukherjee S. Postoperative analgesia in children-comparative study between caudal bupivacaine and bupivacaine plus tramadol. Indian journal of anaesthesia. 2009 Aug; 53(4):463.

Pediatric population poses a great challenge to anesthesiologist regarding pain assessment. The aim of this study is to determine the analgesic effect of adjuvanttramadol when used in caudal anesthesia with respect to theduration.

Hence, we conducted this study to compare the duration of postoperative analgesia between bupivacaine and bupivacaine-tramadol in caudal block following pediatric infra-umbilical surgeries.

Postoperative analgesia

The duration of postoperative analgesia is defined by the time from the induction of caudal block anesthesia using bupivacaine or bupivacaine-tramadol (zero time) till the onset of pain postoperatively assessed by Baker-Wong FACES Pain Rating Scale(Score >4).

- Face 0 is very happy because he doesn't hurt at all.
- Face 2 hurts Just a little bit.
- Face 4 hurts juts a little more
- Face 6 hurts even more.
- Face 8 hurts a whole a lot.
- Face 10 hurts as much as you can imagine, although you don't have to be crying to feel this bad

METHODOLOGY:

This study was conducted in Pediatric Operation Theatre of Civil Hospital Karachi, Dow University of Health Sciences. The duration of study was 6 months from 1st July – 31st December 2015this is a Randomized Controlled Trial. Patients with American Society of Anesthesiologist (ASA) physical status I and II, Age 1-10yrs and those undergoing infra-umbilical surgeries (herniotomy, penile/scrotal surgery) were included in the study. Exclusion criteria was lack of consent by parents, age below 1year and above 10years, history of hypersensitive to local anesthetic drugs and Contraindication to neuraxial anesthesia. Using consecutive or non-probability sampling technique. Ethical approval was taken from ethical committee of Dow University of Health Sciences; patients meeting the inclusion criteria standards were included in the study. Informed and written consent was signed by the parents. Patients were randomly assigned by computer generated random number in two groups. Caudal block in group Awas given as 0.5ml/kg 0.25% bupivacaine & 1mg/kg tramadol whilein group Bas 0.5ml/kg 0.25% bupivacaine alone.

Patients were induced with sevoflurane along with oxygen through mask. Intravenous circulation was maintained using 20-22G cannula, 0.1mg/kg nalbuphine, 2mg/kg propofol, appropriate size LMA was inserted & maintained with isoflurane. Caudal block was given respecting the aseptic techniques by senioranesthetist in left lateral position using a 22G needle. Syringes having an equal volume of either 0.25% bupivacaine 0.5ml/kgÊor 0.25% bupivacaine 0.5ml/kgÊplus tramadol 1mg/kgwere prepared.ÊPatients were monitored for vitals like pulse and respiratory rate, saturation of oxygen and blood pressure. In recovery room, vitals and pain were assessed according to Baker-Wong FACES Pain Rating Scale by investigator blinded to group allocation. Assessment was done 5minutes after reaching recovery room, at 30min, 1 hour, 2 hour, 4hour & 6hour. The end point of the study was onset of pain in patient if pain score >4 or the patient complains of pain.

STATISTICAL ANALYSIS:

Analysis of data along with statistics was performed using statistical package of social sciences 20 (SPSS 20). Relevant description terms like frequency and percentage were determined for qualitative variables like ASA status and gender. Mean and Standard Deviation weredetermined for quantitative variables like age and duration of postoperative analgesia. T-test was applied to have the results for duration of post-operative analgesia compared between the twodefined groups. The p value of less than 0.05 was considered significant. Stratification was performed to rectify modifiers which effects like age, ASA status and gender to observe an outcome. Post-Stratification t-test was applied.

RESULTS:

A total of 60 patients undergoing infra-umbilical surgeries, were randomly defined in two groups, 30 patients in each group Caudal block of 0.5ml/kg 0.25% bupivacaine & 1mg/kg tramadol in group A and 0.5ml/kg 0.25% bupivacaine in group B was provided. The average age was 4.66±1.79 years. Age distribution with respect to groups is given in figure 1. Age and weight are shown in table 1. From 60 patients, 33(55%) were males and 27(45%) females. Gender format with relation to groups is also shown in 2. ASA status with relation to group is also shown in figure 2.

Mean duration of postoperative analgesia was significantly prolonged in groups A as compared to group B [8.47±1.74 vs. 6.6±1.67 (p =0.0005) as shown in table 2.

Stratification analysis was performed but it was observed that mean duration of postoperative analgesia was significantly prolonged in groups A as compared to group B in all age groups, gender, ASA status as presented in 3 to 5 respectively. This was also observed with respect to weight of the patients, mean duration of postoperative analgesia was significantly prolonged in groups A as compared to group B in =10 kg of patients and 11 to 20 kg weight of patients while it was not significant in >20 kg weight of patients, probably due to low

sample size in this categories (Table 6)

DISCUSSION:

Reliability and safe application of caudal block in children has made it a patient friendly procedure. Application of bupivacaine caudally provides regional anesthesia for lower abdominal and perineal surgeries in children, helping to achieve per operative and postoperative analgesia.[1.] Kendall MC, Alves LJ, Suh EI, McCormick ZL, De Oliveira GS. Regional anesthesia to ameliorate postoperative analgesia outcomes in pediatric surgical patients: an updated systematic review of randomized controlled trials. Local and regional anesthesia. 2018; 11:91.Tramadol is an opioid derivative and centrally acting analgesic drug, having profound effect in cases with severe pain. It's an analgesic with effects similar to meperidine, but the good side is that it is devoid of any respiratory depressing effects. Drowsiness is one of its effects but not profound as in opioids.

An important aspect in anesthesia is not only the provision of balanced drugs but also to have quality controlled postoperative analgesia.Bupivacaine used in caudal block technique for intraoperative and postoperative analgesiais now in use commonly during infra-umbilical procedures in children.[2.] Sharma J, Gupta R, Kumari A, Mahajan L, Singh J. A Comparative Study of 0.25% Levobupivacaine, 0.25% Ropivacaine, and 0.25% Bupivacaine in Paediatric Single Shot Caudal Block. Anesthesiology research and practice. 2018; 2018.Several workers have used bupivacaine in combination with a variety of drugs e.g. diamorphine[3.] Jordan S, Murphy FA, Boucher C, Davies S, Brown a, Watkins A, de Lloyd LJ, Morgan M, Morgan C. High dose versus low dose opioid epidural regimens for pain relief in labour [Protocol]., clonidine, tramadol [4.] Swain A, Nag DS, Sahu S, Samaddar DP. Adjuvants to local anesthetics: Current understanding and future trends. World J Clin Cases. 2017 Aug 16; 5(8):307-323. etc. and claimed to achieve longer lasting analgesic when a combination of these drugs was used. In present study the average age of the patient was 4.66±1.79 years. From 60, 33(55%) were males and 27(45%) females. In a study, mean age was 3.1 years.[5.] Senel AC, Akyol A, Dohman D, Solak M. Caudal bupivacaine-tramadol combination for postoperative analgesia in pediatric herniorrhaphy. Acta anaesthesiologica scandinavica. 2001 Jul; 45(6):786-9.

In this study mean duration of postoperative analgesia was significantly extended in bupivacaine plus tramadol group as compared to bupivacaine alone ($p = 0.0005$). A study also showed similar remarks when postoperative analgesia was compared and found prolonged in bupivacaine and tramadol group as compared to bupivacaine alone showing the results, $9.1+3.14$ vs. $6.3+2.93$ ($p < 0.05$).[8]

During a study showed that children who underwent hypospadias repair had better and prolonged postoperative analgesia with tramadol in caudal block rather than intravenous tramadol.[6.] Sayed JA, Elshafy SK, Kamel EZ, Riad MA, Mahmoud AA, Khalaf GS. The impact of caudally administrated tramadol on immune response and analgesic efficacy for pediatric patients: a comparative randomized clinical trial. The Korean journal of pain. 2018 Jul; 31(3):206...In cases of herniorrhaphy in pediatric age group, caudal administration of bupivacaine and tramadol togetherhad a superior analgesic effect with extended period of analgesia without additional demand for any other drug postoperatively.[7.] Dogra N, Dadheech R, Dhaka M, Gupta A. A study to compare caudal levobupivacaine, tramadol and a combination of both in paediatric inguinal hernia surgeries. Indian J Anaesth. 2018 May; 62(5):359-365. Doi: 10.4103/ija.IJA_747_17. PubMed PMID: 29910493; PubMed Central PMCID: PMC5971624.

Another study comparing the effects of different adjuvants concluded that 1 mcg/kg of clonidine, and bupivacaine 0.25% asÊcaudalÊblock and given as a solution of 0.75 ml/kg for sub umbilical surgeries in pediatric patients, showed significant extension of the time of post-operative analgesia when compared with 0.75 ml/kg of 0.25% bupivacaine in normal saline than 0.75 ml/kg of 0.25% bupivacaine with ketamine 0.5 mg/kg or 0.75 ml/kg of 0.25% bupivacaine with fentanyl 1 mcg/kg or 0.75 ml/kg

of 0.25% bupivacaine alone, without showing any adverse effects.[8.] Singh J, Shah RS, Vaidya N, Mahato PK, Shrestha S, Shrestha BL. Comparison of ketamine, fentanyl and clonidine as an adjuvant during bupivacaine caudal anaesthesia in paediatric patients. Kathmandu University Medical Journal. 2012; 10(3):25-9. A recent study suggested dexmedetomidine along with bupivacaine as a single dose injection,in caudal analgesia extends the tine of post-operativeÊanalgesiaÊafter infra abdominal and perineal surgeries, as compared with morphine given caudally.. Morphine was defined as the culprit for producing postoperative side effects rather than dexmedetomidine.[9.] Baduni N, Sanwal MK, Vajifdar H, Agarwala R. Postoperative analgesia in children: A comparison of three different doses of caudal epidural morphine. Journal of anaesthesiology, clinical pharmacology. 2016 Apr;32(2):220.

A study suggested that installation of epidural anesthesia with tramadol appears to cause immediate and delayed systemic absorption and interesting fact is that tramadol dosage change with either epidural or intravenous use.[10.] Swathi N, Ashwini N, Shukla MI. Comparative study of epidural bupivacaine with butorphanol and bupivacaine with tramadol for postoperative pain relief in abdominal surgeries. Anesth Essays Res. 2016 Sep-Dec;10(3):462-467.

Caudal block has been a crucial help in a variety of sub umbilicalsurgeries in children for the provision of intra operative and postoperative analgesia.[11.] Jarineshin H, Fekrat F, Kargar Kermanshah A. Treatment of Postoperative Pain in Pediatric Operations: Comparing the Efficiency of Bupivacaine, Bupivacaine-Dexmedetomidine and Bupivacaine-Fentanyl for Caudal Block. Anesth Pain Med. 2016 Jul 26;6(5):e39495.The health and cooperation of a child post-surgery depends upon the prolonged nature of the anesthesia with ease of access, enabling to control the hemodynamic and emotional stresses of child and ultimately leading to less morbidity and shorter hospital stay.

CONCLUSION:

Bupivacaine added with tramadol in the caudal anesthesia technique had a prolonged and relaxing effectwith lesser requirement for rescue analgesia particularly after the postoperative recovery, as compared to bupivacaine alone

TABLE 1
COMPARISON OF DEMOGRAPHIC CHARACTERISTICS BETWEEN GROUPS

Variables	Group A	Group B	P-Value
Age (Years)	4.59±1.87	4.73±1.73	0.76
Weight (kg)	13.83±7.47	14.13±7.02	0.87

Independent sample t test

TABLE 2
COMPARISON OF MEAN DURATION OF POSTOPERATIVE ANALGESIA BETWEEN GROUPS

Duration of postoperative analgesia (hours)	Group A	Group B	P-Value
Mean	8.47	6.67	0.0005
Standard Deviation	1.74	1.67	

Independent sample t test

TABLE 3
COMPARISON OF MEAN DURATION OF POSTOPERATIVE ANALGESIA BETWEEN GROUPS ACCORDING TO AGE STRATIFICATION

Age Groups (Years)	DURATION OF POSTOPERATIVE ANALGESIA (hours)						P-Value
	Group A			Group B			
	n	Mean	Std. Deviation	N	Mean	Std. Deviation	
<4 years	11	9.91	2.07	9	6.78	1.98	0.032
4 to 5 years	14	8.07	1.68	14	6.57	1.55	0.021
>5 Years	5	8.60	0.89	7	6.71	1.70	0.049

TABLE 4

COMPARISON OF MEAN DURATION OF POSTOPERATIVE ANALGESIA BETWEEN GROUPS ACCORDING TO GENDER STRATIFICATION

Gender	DURATION OF POSTOPERATIVE ANALGESIA (hours)						P-Value
	Group A			Group B			
	n	Mean	Std. Deviation	n	Mean	Std. Deviation	
Male	19	8.84	1.57	14	7.36	1.94	0.021
Female	11	7.82	1.88	16	6.06	1.12	0.006

TABLE 5

COMPARISON OF MEAN DURATION OF POSTOPERATIVE ANALGESIA BETWEEN GROUPS ACCORDINGTO ASA STRATIFICATION

ASA	DURATION OF POSTOPERATIVE ANALGESIA (hours)						P-Value
	Group A			Group B			
	n	Mean	Std. Deviation	n	Mean	Std. Deviation	
ASA-I	14	8.43	1.91	16	6.88	1.92	0.035
ASA-II	16	8.5	1.63	14	6.43	1.34	0.001

TABLE 6

COMPARISON OF MEAN DURATION OF POSTOPERATIVE ANALGESIA BETWEEN GROUPS ACCORDING TO WEIGHT STRATIFICATION

Weight (Kg)	DURATION OF POSTOPERATIVE ANALGESIA (hours)						P-Value
	Group A			Group B			
	n	Mean	Std. Deviation	N	Mean	Std. Deviation	
=10 kg	10	9.20	1.93	11	7.18	2.04	0.032
11 to 20 kg	15	8.20	1.69	15	6.27	1.33	0.002
>20 kg	5	7.80	1.09	4	6.75	1.71	0.29

REFERENCES:

1. Hauer J, Houtrow AJ. Pain assessment and treatment in children with significant impairment of the central nervous system. Pediatrics. 2017 Jun 1; 139(6):e20171002.
2. Brown M, Rojas E, Gouda S. A mind–body approach to pediatric pain management. Children. 2017 Jun; 4(6):50.
3. Karuppiah NP, Shetty SR, Patla KP. Comparison between two doses of dexmedetomidine added to

bupivacaine for caudal analgesia in paediatric infraumbilical surgeries. Indian journal of anaesthesia. 2016 Jun; 60(6):409.
4. Watanabe K, Tokumine J, Lefor AK, Moriyama K, Sakamoto H, Inoue T, Yorozu T. Postoperative analgesia comparing levobupivacaine and ropivacaine for brachial plexus block: A randomized prospective trial. Medicine. 2017 Mar; 96(12).
5. Refaee HH, Elela AH, Hanna MG, Ali MA, El Khateeb AM. Dexmedetomidine versus Magnesium as Adjuvants to Bupivacaine-Induced Caudal Block in Children: A Randomized, Double-Blinded, Placebo-Controlled, and Trial. Open access Macedonian journal of medical sciences. 2019 Jan 15; 7(1):73.
6. Ona XB, Tuma SM, García LM, Solà I, Cosp XB. Drug therapy for preventing post-dural puncture headache. Cochrane Database of Systematic Reviews. 2013(2).
7. El Shamaa HA, Ibrahim M. A comparative study of the effect of caudal dexmedetomidine versus morphine added to bupivacaine in pediatric infra-umbilical surgery. Saudi journal of anaesthesia. 2014 Apr; 8(2):155.
8. Doda M, Mukherjee S. Postoperative analgesia in children-comparative study between caudal bupivacaine and bupivacaine plus tramadol. Indian journal of anaesthesia. 2009 Aug; 53(4):463.
9. Kendall MC, Alves LJ, Suh EI, McCormick ZL, De Oliveira GS. Regional anesthesia to ameliorate postoperative analgesia outcomes in pediatric surgical patients: an updated systematic review of randomized controlled trials. Local and regional anesthesia. 2018; 11:91.
10. Sharma J, Gupta R, Kumari A, Mahajan L, Singh J. A Comparative Study of 0.25% Levobupivacaine, 0.25% Ropivacaine, and 0.25% Bupivacaine in Paediatric Single Shot Caudal Block. Anesthesiology research and practice. 2018; 2018.
11. Jordan S, Murphy FA, Boucher C, Davies S, Brown a, Watkins A, de Lloyd LJ, Morgan M, Morgan C. High dose versus low dose opioid epidural regimens for pain relief in labour [Protocol].
12. Swain A, Nag DS, Sahu S, Samaddar DP. Adjuvants to local anesthetics: Current understanding and future trends. World J Clin Cases. 2017 Aug 16; 5(8):307-323.
13. Senel AC, Akyol A, Dohman D, Solak M. Caudal bupivacaine-tramadol combination for postoperative analgesia in pediatric herniorrhaphy. Acta anaesthesiologica scandinavica. 2001 Jul; 45(6):786-9.
14. Sayed JA, Elshafy SK, Kamel EZ, Riad MA, Mahmoud AA, Khalaf GS. The impact of caudally administrated tramadol on immune response and analgesic efficacy for pediatric patients: a comparative randomized clinical trial. The Korean journal of pain. 2018 Jul; 31(3):206...
15. Dogra N, Dadheech R, Dhaka M, Gupta A. A study to compare caudal levobupivacaine, tramadol and a combination of both in paediatric inguinal hernia surgeries. Indian J Anaesth. 2018 May; 62(5):359-365. Doi: 10.4103/ija.IJA_747_17. PubMed PMID: 29910493; PubMed Central PMCID: PMC5971624.
16. Singh J, Shah RS, Vaidya N, Mahato PK, Shrestha S, Shrestha BL. Comparison of ketamine, fentanyl and clonidine as an adjuvant during bupivacaine caudal anaesthesia in paediatric patients. Kathmandu University Medical Journal. 2012; 10(3):25-9.
17. Baduni N, Sanwal MK, Vajifdar H, Agarwala R. Postoperative analgesia in children: A comparison of three different doses of caudal epidural morphine. Journal of anaesthesiology, clinical pharmacology. 2016 Apr;32(2):220.
18. Swathi N, Ashwini N, Shukla MI. Comparative study of epidural bupivacaine with butorphanol and bupivacaine with tramadol for postoperative pain relief in abdominal surgeries. Anesth Essays Res. 2016 Sep-Dec;10(3):462-467.
19. Jarineshin H, Fekrat F, Kargar Kermanshah A. Treatment of Postoperative Pain in Pediatric Operations: Comparing the Efficiency of Bupivacaine, Bupivacaine-Dexmedetomidine and Bupivacaine-Fentanyl for Caudal Block. Anesth Pain Med. 2016 Jul 26;6(5):e39495.